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EIA REPORT FOR PUBLIC REVIEW

ELOFF MINING COMPANY (PTY) LTD

PROPOSED ELOFF PHASE 3 PROJECT ENVIRONMENTAL IMPACT ASSESSMENT NEAR DELMAS IN MPUMALANGA PROVINCE
DMR REF: 30/5/1/2/3/2/1 (10169) EM

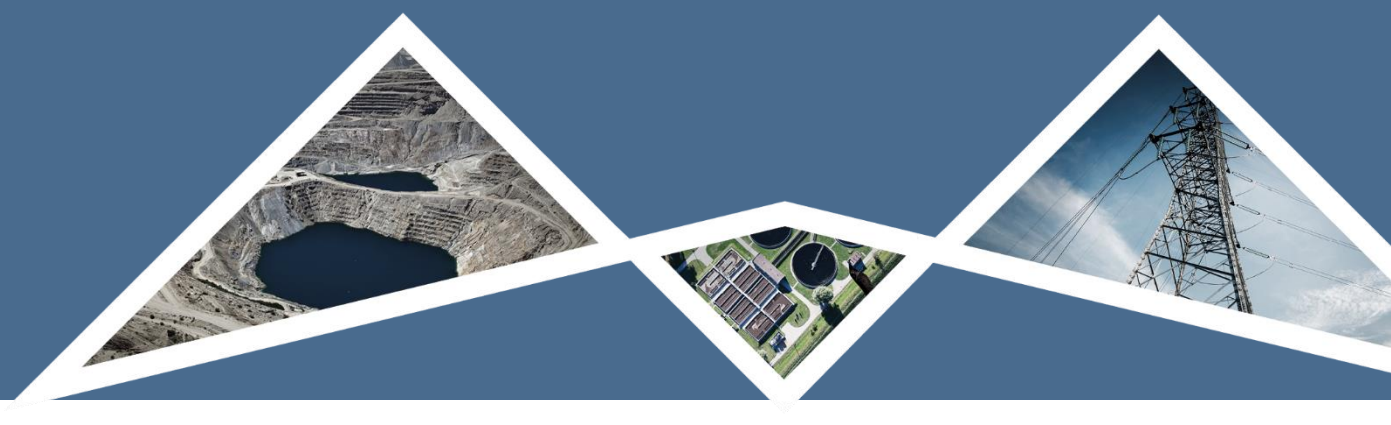

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Table of Contents

List of Figures

List of Tables

List of Appendices

Abbreviations

BFAP	:	The Bureau of Food and Agricultural Policy
CHPP	:	Coal Handling and Processing Plant
CMA	:	Catchment Management Agency
DEA	:	Department of Environmental Affairs[1]
DFE	:	Discard Facility Effluent
DMR	:	Department of Mineral Resources[2]
DWS	:	Department of Water Affairs and Sanitation[3]
EA	:	Environmental Authorisation
EAP	:	Environmental Assessment Practitioner
EIA	:	Environmental Impact Assessment
EIMS	:	Environmental Impact Management Services
ELWU	:	Existing Lawful Water Use
EN	:	Endangered
EMPr	:	Environmental Management Programme
GA	:	General Authorisation
GCCM:	:	Global Climate Change Models
GCS	:	GCS Water and Environmental Consultants
GDP	:	Gross Domestic Product
GHG	:	Greenhouse Gas
GN	:	Government Notice
GTIS	:	Gross Tonnes in Situ
HGM	:	Hydrogeomorphic
HIA	:	Heritage Impact Assessment
I&AP	:	Interested and Affected Party
IDP	:	Integrated Development Plan
IRP	:	Integrated Resource Plan
IWML	:	Integrated Waste Management Licence
IWULA	:	Integrated Water Use License Application
LC	:	Leachable Concentration
LOM	:	Life of Mine
MAE	:	Mean Annual Evaporation
mamsl	:	metres above mean sea level

[1] now DEFF: Department of environment Forestry and Fisheries
[2] now DME: Department of Minerals and Energy
[3] now DHSWS: Department of Human Settlements, Water and Sanitation DHSWS

MAP	:	Mean Annual Precipitation
MAR	:	Mean Annual Runoff
mbs	:	metres below surface
MCM	:	Million cubic metres
MPHG	:	Mpumalanga Highveld
MPRDA	:	Minerals and Petroleum Resources Development Act, 2002
MT	:	Million Tonnes
NAAQS	:	National Ambient Air Quality Standards
NAEIS	:	National Atmospheric Emissions Inventory System
NDP	:	National Development Plan
NEM:WA	:	National Environmental Management: Waste Amendment Act, 2008
NEMA	:	National Environmental Management Act, 2002
NEMA	:	National Environmental Management Act, 1998
NGDB	:	National Groundwater Database
NHRA	:	National Heritage Resources Act, 1999
NT	:	Near Threatened
NWA	:	National Water Act, 1998
ONAs	:	Other Natural Areas
PHRA	:	Provincial Heritage Resources Authority
POI	:	Point of Interest
RoM	:	Run of Mine
SAHRA	:	South African Heritage Resources Agency
SCC	:	Species of Conservation Concern
SLP	:	Social & Labour Plan
SLTO	:	Social Licence to Operate
SPLUMA	:	Spatial Planning and Land Use Management Act
STPE	:	Sewage Treatment Plant Effluent
SQR	:	Sub Quaternary Reaches
SWMP	:	Stormwater Management Plan
TC	:	Total concentration
tpm	:	Tonnes per Month
VKLM	:	Victor Khanye Local Municipality
VU	:	Vulnerable
WMA	:	Water Management Area
WULA	:	Water Use License Application
WUL	:	Water Use Licence

EXECUTIVE SUMMARY

Eloff Mining Company (Pty) Ltd has been granted a Mining Right (MP30/5/1/2/2/10169MR), in terms of the Minerals and Petroleum Resources Development Act (Act 28 of 2002 – MPRDA) as amended, for the mining of the Eloff Coal Resource (Eloff Project). Further, Eloff Mining Company applied for Environmental Authorisation ("**EA**") for the mining of coal and associated activities for Phase 1 Pit 1 of the Eloff Project which has been granted on the 25th April 2019. In addition to the above, Eloff Mining Company wishes to apply for EA for the development of Eloff Phase 3 ("**Phase 3 Project/ or the Project"**) opencast mining pit and associated infrastructure on the south-eastern part of the Eloff Project mining right area. The proposed Phase 3 Project covers an extent of approximately 251 hectares (ha) over portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR, and is located approximately 7.5km south-east of the town Delmas in Victor Khanye Local Municipality, within the Nkangala District Municipality, Mpumalanga Province. The proposed Phase 3 Project is anticipated to use a standard truck and shovel mining method based on strip mining design and layout. The existing Coal Handling and Processing Plant (CHPP) at the adjacent Kangala Colliery will be utilised, and it is anticipated that no new surface infrastructure such as offices, dams, stores facility, workshops, or change house will be required for the Phase 3 Project.

Portions 14, 15, 18, 22 and 23 of Farm Strydpan 243 IR were part of the approved Phase 1 Environmental Authorisation, however, these portions were not assessed in detail as part of the initial EIA. Therefore, Environmental Impact Assessment for the listed activities applicable to the Phase 3 project has to be conducted on the above-mentioned farm portions for the Eloff Phase 3 project.

A full Environmental Impact Assessment (EIA) process is being undertaken in support of the EA application. A new Water Use Licence Application (WULA) for the relevant water uses associated with the project is also underway as a separate application which is being undertaken by GCS Water and Environmental Consultants (GCS).

PURPOSE OF THE EIA REPORT

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required for the EIA Phase. The Scoping Phase also identified potentially sensitive areas within the study site.

The EIA Phase addresses those identified potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated with all phases of the Phase 3 Project including design, construction, operation, decommissioning and closure. The EIA Phase recommends appropriate mitigation measures for potentially significant environmental impacts.

The EIA Phase aimed to achieve the following:

- Provide an overall description and assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the Phase 3 Project.
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed project.
- Comparatively assess identified feasible alternatives put forward as part of the Phase 3 Project.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) for the proposed project has been undertaken in accordance with the requirements of the MPRDA, and National Environmental Management Act (NEMA) in line with the principles of Integrated Environmental Management (IEM). The PPP commenced on the 10th August 2018 with an initial notification and call to register as interested and affected parties (I&APs). The comments received from I&APs during the initial call to register and commenting period as well as on the scoping report so far have been captured in the Public Participation Report (PPR) in Appendix C , and a summary of the issues raised and sections addressing the issues is presented in Table 15 of Section 7.8. The main issues raised being on the following:

- Impact of blasting and vibrations, particularly on existing infrastructure;
- Impact of mining activities on groundwater and surface water resources;
- Needs and desirability;
- Concerns regarding dolomitic stability around the site;
- Social impacts including mining activities impact on landowner and surrounding communities' infrastructure;
- Employment concerns (i.e. loss of employment and job security from the potential loss of viable farming operations);
- Concerns about potential land use impacts and constraints as well as the impact on agriculture;
- Request for details on the formal process of lodging complaints/grievance mechanism;
- Concerns about cumulative impacts due to existing mining activities in the area; and
- Information requests and project participation inquiries.

Comments that were received within the review period have been collated and added to the PPR and the summary in Table 15 of Section 7.8 R. Acceptance of the scoping report was received from the Department of Mineral Resources (DMR) on 13 November 2019. Subsequent to this, an EIA Report including an EMPr, was compiled and is presented for public comment as part of the EIA process. During this time further stakeholder engagement will take place.

The EIA Report is available for public review and comment for a period of 30 days from the 11th February 2020 until 13th March 2020. Contact details are provided below:

- Environmental Impact Management Services (Pty) Ltd (EIMS)
- P.O. Box 2083 Pinegowrie 2123
- Phone: 011 789 7170 / Fax: (086) 571 9047
- Contact: Cheyenne Muthukarapan
- Email: kangala@eims.co.za

PROJECT ALTERNATIVES AND ENVIRONMENTAL IMPACT ASSESSMENT

A scoping assessment was undertaken to identify all the potential risks and impacts associated with each phase of the proposed mining as well as potentially feasible alternatives. A broad range of alternatives including location, process, technology and activity options were considered during scoping and the following alternatives have been assessed in more detail during the EIA phase:

- Location Alternatives – The sensitivity-based approached of determining the location of infrastructure will guide further investigations;
- Process Alternatives – Options dewatering of the mining pit area / mine workings, and a suitable water supply for dust suppression;

- Activity Alternatives – The option of mining within the Phase 3 Project area and the option of continuing with agricultural production in the Phase 3 Project area; and
- The no-go or 'do nothing' option is the same as keeping the current *status quo* of farming and provides the baseline against which the impacts of other alternatives should be compared.

The background information from the neighbouring Kangala Colliery and Eloff Phase 1 Project EIA and MWP documents as well as specialist studies undertaken for the proposed Eloff Phase 3 project, including the screening of all the activities underway and planned was assessed to ensure that all the potential impacts have been identified. Each of the identified risks and impacts at the various project phases were assessed. The assessment criteria include the nature, extent, duration, magnitude / intensity, reversibility, probability, public response, cumulative impact, and irreplaceable loss of resources.

The most significant risks and impacts identified were those that remain high in terms of significance even post mitigation measures being considered. The following impacts were determined to have a potentially moderate - high negative final significance:

- Further loss and fragmentation of the vegetation community as well the destruction of a portion of a Vulnerable vegetation type;
- Loss of semi-natural areas;
- Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance;
- Spread and/or establishment of alien and/or invasive species;
- Disturbance to wildlife;
- Infringement by humans into the few remaining natural grassland and wetlands areas;
- Introduction of feral species;
- Erosion;
- Lowering of the local groundwater levels (i.e. dewatering of the aquifer);
- Runoff reduction;
- Surface water quality impacts;
- Change in topography and slope;
- Loss in re-charge and dewatering of aquifers;
- Fracturing of aquifers;
- Acid mine drainage;
- Loss of land capability;
- Decline in air quality;
- Untreated run-off;
- Ground vibration, fly rock and air blast impacts;
- GDP and monetary impacts (positive and negative impacts);
- Net employment impacts (positive and negative impacts);
- Need and desirability (excluding GDP and Employment (positive and negative impacts);
- Impact on agricultural sector;
- Social investment in the local community (positive impact);

- Impact on food security;
- Industry competitiveness (positive impact); and
- Job and income loss and impacts on income distribution.

Mitigation measures have been identified based on input from the Environmental Assessment Practitioner (EAP), public consultation, and specialist assessments during the EIA phase of the Phase 3 Project. The associated EMPr (Appendix E) includes appropriate mitigation mechanisms for avoidance, minimisation and / or management of the negative impacts and enhancement of the positive.

1 INTRODUCTION

Eloff Mining Company (Pty) Ltd has been granted a Mining Right (MP30/5/1/2/2/10169MR), in terms of the Minerals and Petroleum Resources Development Act (Act 28 of 2002 – MPRDA) as amended, for the mining of the Eloff Coal Resource (Eloff Project). Eloff Mining Company has further applied for Environmental Authorisation ("**EA"**) for the mining of coal and associated activities for Phase 1 Pit 1 of the Eloff Project which has been granted on the 25th April 2019. In addition to the above, Eloff Mining Company wishes to apply for EA for the development of a Eloff Phase 3 ("Phase 3 Project) opencast mining pit and associated infrastructure on the southern-eastern part of the Eloff Project mining right and adjacent to the existing Kangala Colliery covering an extent of approximately 251 hectares (ha) (herein referred to as the Phase 3 Project). The proposed Phase 3 Project extends over portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR located approximately 7.5km south-east of the town Delmas in Victor Khanye Local Municipality, within the Nkangala District Municipality, Mpumalanga Province. The proposed Phase 3 Project is anticipated to use a standard truck and shovel mining method based on strip mining design and layout. The existing Coal Handling and Processing Plant (CHPP) at the adjacent Kangala Colliery will be utilised, and it is anticipated that no new surface infrastructure such as offices, dams, stores facility, workshops, or change house will be required for the project.

Portions 14, 15, 18, 22 and 23 of Farm Strydpan 243 IR were part of the approved Phase 1 Environmental Authorisation, however, these portions were not assessed in detail as part of the initial EIA. Therefore, Environmental Impact Assessment for the listed activities applicable to the Phase 3 project has to be conducted on the above-mentioned farm portions for the Eloff Phase 3 project. Although this EIA report is relevant to only the Eloff Phase 3 EIA application, several portions form part of both Phase 1 and Phase 3 projects. Table 1 indicates the relevant farm portions and associated infrastructure applicable to Eloff Phase 1 and Eloff Phase 3.

Table 1: Farm portions and infrastructure relevant to Eloff Phase 1 and Eloff Phase 3 projects.

Project Phase	Farm Portions	Proposed infrastructure
Phase 1	Strydpan 243 IR portion 21	Topsoil stockpile Crusher Open pit
	Strydpan 243 IR portion 18	Stockpile area
	Strydpan 243 IR portion 14	PCD Office and maintenance area Open pit
	Strydpan 243 IR portions 12, 20, 21 and 27	Open pit
Phase 3	Portions 14, 15, 16, 18, 19, 20, 22, 23 and 24 of the farm Strydpan 243 IR	Open pit
	Portion 59 of Strydpan 243 IR	Drilling may occur here, no other mining activity is currently planned to take place on this portion.

A full Environmental Impact Assessment (EIA) process is being undertaken in support of the EA application. A new Water Use Licence Application (WULA) for the relevant water uses associated with the project is also underway as a separate application which is being undertaken by GCS Water and Environmental Consultants (GCS).

The following mining rights, licenses, authorisations and permits are currently in place and have been considered in the compilation of this report (Table 2).

Table 2: Mining rights, licenses, authorisations and permits held by Eloff Mining Company and neighbouring Kangala Coal Mine.

Document	Applicable Properties	Reference Number
Eloff Project Mining Right (2019)	Various portions of the farms Droogefontein 242IR; Strydpan 243IR; and Stompiesfontein 273IR (a total of 181 properties)	MP30/5/1/2/2/10169MR
Eloff Phase 1 Pit 1 EA Environmental Authorisation	Portions, 12, 14, , 17, 18, , 21, 22, , 27 and 28of the farm Strydpan 243 IR	MP30/5/1/2/2/10169EM
Kangala Colliery Mining Right (2012)	Portion 1 and Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR	MP30/5/1/2/2/429MR
Kangala Colliery EMPr Update (2014)	Portion 1 and the Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR	MP30/5/1/2/2/429EM
Kangala Colliery Environmental Authorisation (2012)	Portion 1 and the Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR	17/2/3/N-21
Kangala Colliery Environmental Authorisation (2013) – Amendment	Portion 1 and the Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR	17/2/3/N-21
Kangala Colliery Waste Management Licence (2012)	Portion 1 and the Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR)	12/9/11/L445/6
Kangala Colliery Water Use Licence (2016)	Portion 1 and Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR	04/B20A/A/4683
Water Use Licence – Amendment (2013)	Portion 1 of the farm Wolvenfontein 244 IR	04/B20A/ABCGIJ/1506
Kangala Colliery Water Use Licence (2012)	Portion 1 of the farm Wolvenfontein 244 IR	04/B20A/ABCGIJ/1506
Kangala Colliery NHRA Demolition Permit (2013)	Farm Wolvenfontein 244 IR	Permit ID 229

It is in addition to the authorisations and licenses listed in Table 1, that Eloff Mining Company wishes to apply for EA in accordance with the National Environmental Management Act (NEMA) 2014 EIA Regulations for the relevant listed activities associated with the proposed Phase 3 Projects new opencast mining pit extension on portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR.

1.1 REPORT STRUCTURE

This report has been compiled in accordance with the 2014 NEMA EIA Regulations, as amended. A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in Table 3 below.

Table 3: Report structure

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 3(a):	Details of – i. The EAP who prepared the report; and ii. The expertise of the EAP, including a curriculum vitae;	Section 1.2 Appendix A
Appendix 3(b):	The location of the activity, including: (i) the 21-digit Surveyor General code of each cadastral land parcel; (ii) where available, the physical address and farm name; (iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties on which the activity is to be undertaken;	Table 4
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 6
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;	Section 3 Table 8 for listed activities
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
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 location;	Section 5
Appendix 3(g):	A motivation for the preferred development footprint within the approved site;	Section 6.1

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
Appendix 3(h):	A full description of the process followed to reach the proposed development footprint within the approved site, including: (i) details of the development footprint alternatives considered; (ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs; (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; (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects; (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) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated; (vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks; 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; (viii) the possible mitigation measures that could be applied and level of residual risk; (ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and (x) a concluding statement indicating the preferred alternative development location within the approved site;	(i) Section 6.1 (ii) Section 7 and Appendix C (iii) Section 7.8 (iv) Section 8 (v) Section 9.2 and 9.3 (vi) Section 9.1 (vii) Section 9.3 (viii) Section 9.3 (ix) Section 6.1 (x) Section 12
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 location 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	Section 9.1

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
	(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;	
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 13
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 site 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;	(i) Section 13.3 (ii) Figure 42 (iii) Table 32
Appendix 3(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;	Section 13.4
Appendix 3(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;	Section 6.6
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 13.4
Appendix 3(p)	Description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	Section 14

Environmental Regulation	Description – NEMA Regulation 982 (2014) as amended	Section in Report
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 13.3
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;	Section 4.2
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 15
Appendix 3(t)	where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	Section 10 Refer to Closure and Rehab Plan included as part of the EMPr (Appendix E)
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 (ii) a motivation for the deviation;	N/A
Appendix 3(v)	Any specific information that may be required by the competent authority; and	EMPr (Appendix E) Detailed Rehabilitation Plan Figure 42: Final sensitivity map Figure 43: Final layout Map superimposing all activities
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

EIMS has been appointed by Eloff Mining Company as the Independent EAP and to assist in preparing and submitting the EA application, Scoping and EIA Reports, and undertaking a Public Participation Process (PPP) in support of the proposed Phase 3 Project. The contact details of the EIMS consultant who compiled this EIA Report are as follows:

- Name of the consultant: John von Mayer
- Tel No.: 011 789 7170
- Fax No.: 011 787 3059
- E-mail address: kangala@eims.co.za

1.3 EXPERTISE OF THE EAP

1.3.1 EAP QUALIFICATIONS

In terms of Regulation 13 of the EIA Regulations (GN R. 982) as amended, an independent EAP, must be appointed by the applicant to manage the application. EIMS has been appointed by the Applicant as the EAP to assist with compiling the necessary reports and undertaking the statutory consultation processes, in support of the proposed Phase 3 Project. EIMS is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations, as well as 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 environmental 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 Curriculum Vitae (indicating the experience with environmental impact assessment and relevant application processes) of the consultant that is involved in the EIA process and the compilation of this EIA Report is presented in Appendix A.

1.3.2 SUMMARY OF THE EAP'S PAST EXPERIENCE

EIMS is a private and independent environmental management-consulting firm that was founded in 1993. EIMS has in excess of 20 years' experience in conducting EIA's, including many EIA's for mines and mining related projects. Please refer to the EIMS website (www.eims.co.za) for examples of EIA documentation currently available. John von Mayer is a senior consultant at EIMS and has been involved in numerous significant projects the past 10 years. He has experience in Project Management, small to large scale Environmental Impact Assessments, Environmental Auditing, Water Use Licensing, and Public Participation.

1.3.3 SPECIALIST CONSULTANTS

Specialist studies have been undertaken to address the key issues that require further investigation and these include the impact on biodiversity, wetlands, hydrology, hydrogeology, soils, heritage, air quality, social environment, land use, visual and climate change impacts, as well as impacts from blasting and vibrations. A closure cost assessment is also included as part of the EMPr (Appendix E). The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed Phase 3 Project. These impacts were assessed according to pre-defined impact rating methodology (Section 9).

The specialists have also recommended appropriate mitigation / management or optimisation measures to minimise potential negative impacts or enhance potential benefits, respectively. The specialist declarations of independence are included in the specialist reports presented in Appendix D.

2 DESCRIPTION OF THE PROPERTY

Table 4 indicates the farm portions that fall within the proposed Eloff Phase 3 Project ("Phase 3 Project") including details on the location of the proposed opencast mining pit as well as the distance from the proposed project area to the nearest towns.

Table 4: Locality details

Farm Name	**Mining Right holder** Eloff Mining Company is applying for EA and IWULA for the proposed Phase 3 Project which entails an opencast mining pit and topsoil stockpiles located on the following farms: • Portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of farm Strydpan 243 IR.		
Application Area (Ha)	The proposed Phase 3 Project covers an extent of approximately 251 hectares (ha)		
Magisterial District	Nkangala District Municipality.		
Distance and direction from nearest towns	The proposed project area is located approximately 7.0km south-west of the town Delmas and approximately 6.0km south-east of the town Eloff in the Victor Khanye Local Municipality, within the Nkangala District Municipality, Mpumalanga Province. The geographic coordinates at the centre of the site are approximately: 26°12'35.76" S and 28°38'43.20" E.		
21-digit Surveyor General Code for each Portion	**Farm Name:**	**Portion:**	**21 Digit Surveyor General Code**
	Strydpan 243 IR	14	T0IR00000000024300014
	Strydpan 243 IR	15	T0IR00000000024200015
	Strydpan 243 IR	16	T0IR00000000024300016
	Strydpan 243 IR	18	T0IR00000000024300018
	Strydpan 243 IR	19	T0IR00000000024300019
	Strydpan 243 IR	20	T0IR00000000024300020
	Strydpan 243 IR	22	T0IR00000000024300022
	Strydpan 243 IR	23	T0IR00000000024300023
	Strydpan 243 IR	24	T0IR00000000024300024
	Strydpan 243 IR	59	T0IR00000000024300059

Figure 1 and Figure 2 indicate the locality of the proposed location of the Phase 3 Project and the existing Kangala Coal Mine where the infrastructure (plant etc) is located.

2.1 SURROUNDING LAND USES

The proposed project footprint is situated approximately 7.0 km from the town of Delmas and 6.0 km from Eloff both within the Victor Khanye Local Municipality, which is part of the Nkangala District Municipality, Mpumalanga Province. The proposed Phase 3 Project area, and its surroundings, can be described as the coal-energy-industrial complex for both the Gauteng and Mpumalanga provinces, and on the other hand is an area comparatively productive in maize and crop farming. The proposed site is located within an area that is predominantly under cultivation, besides the existing mining activities taking place on the neighbouring Kangala Mine. These agricultural areas also have isolated farmsteads that are comprised of farm buildings including residential buildings and storage facilities. There are also some areas of remaining natural vegetation in close proximity.

The major land use types on site and its vicinity include:

- Three large areas of settlement including Sundra, Eloff and Delmas that lie to the north of the project area, the closest being Delmas and Eloff which are approximately 7.0 km and 6.0 km to the north of the proposed Phase 3 Project;
- Two areas (Vischkuil and Droogfontein) which are identified as urban but are in fact areas of small holdings. Activities within these areas appear to include intensive / industrial agriculture such as agricultural tunnels as well as large individual private houses; and
- A number of other large coal mines including the neighbouring Kangala Colliery, one approximately 3.2km to the east and one approximately 2.2km to the south of the proposed Phase 3 Project.

There is only one protected area in the vicinity of the proposed site, which is the Marievale Bird Sanctuary, a Provincial Nature Reserve located approximately 16km from the proposed project area. Due to the distance and the fact that there are already other existing mines in close proximity, it is highly unlikely that this protected area will be affected by the proposed project.

There are numerous regional roads in the area including the R42 which runs approximately 1.4km to the south and the R55 which runs approximately 3.8km to the north of the proposed Phase 3 Project.

2.2 PROPERTY OWNERSHIP

As stated above, the proposed location of the Phase 3 Project involves portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR. All these properties are owned by Eloff Mining Company but are currently being leased for farming purposes.

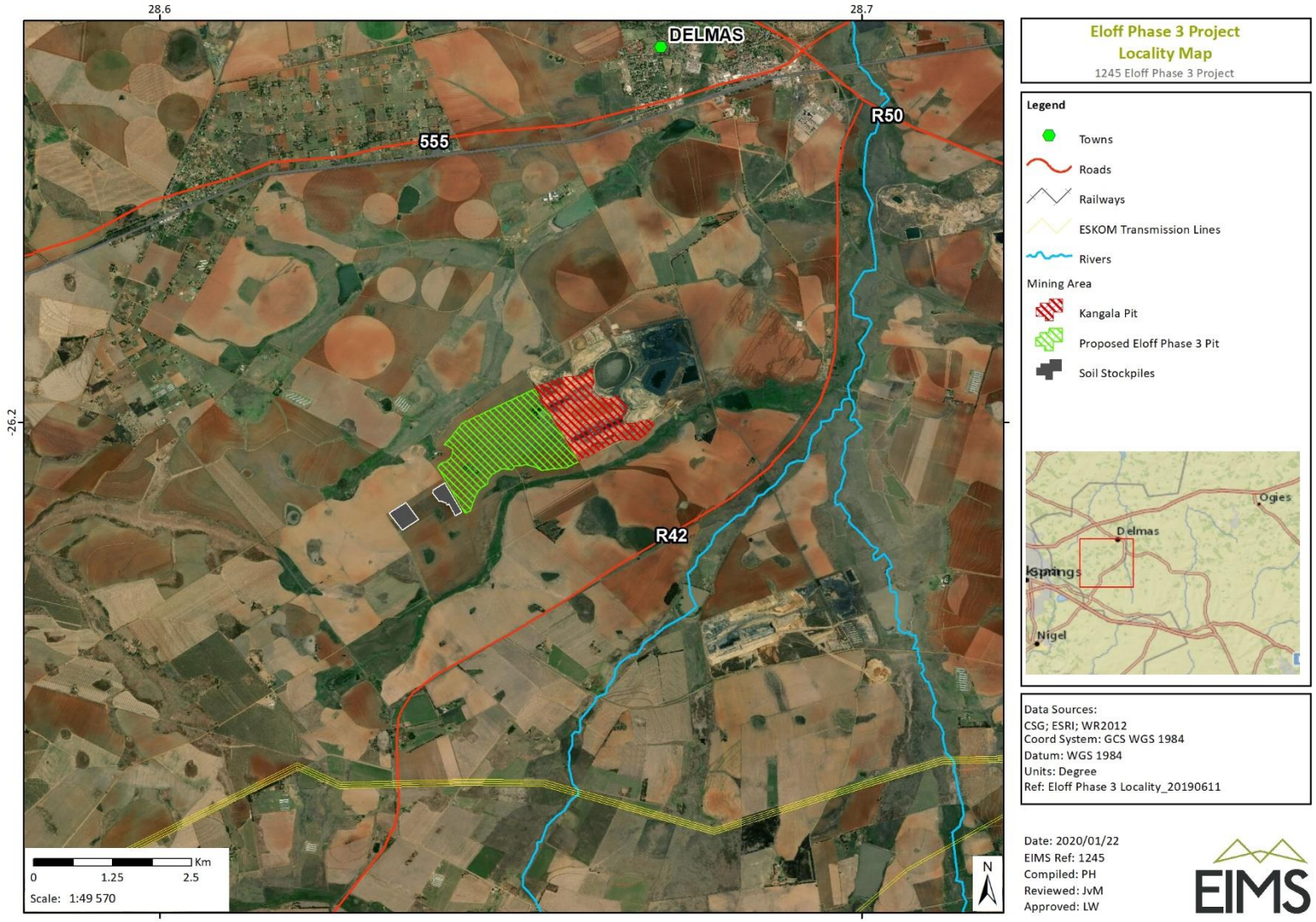

Figure 1: Aerial imagery locality map indicating the existing Kangala Colliery and the proposed Eloff Phase 3 Project

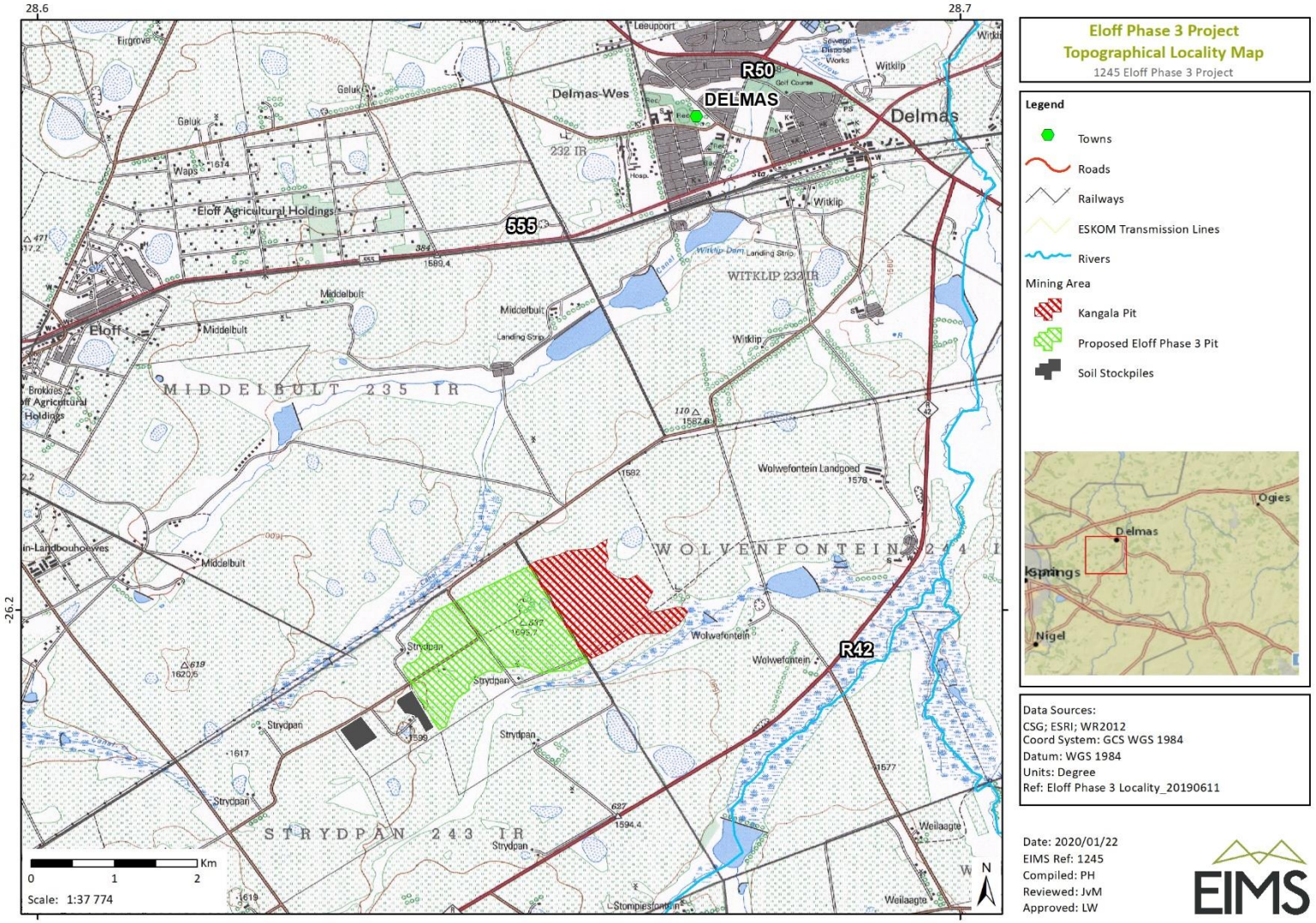

Figure 2: Topographical locality map indicating the existing Kangala Colliery opencast mining pit and the proposed Phase 3.

3 DESCRIPTION AND SCOPE OF THE PROPOSED PROJECT

The section below provides a detailed project description for the proposed Eloff Phase 3 Project. The majority of key information presented in this chapter was obtained from the Mining Works Programme (MWP) for the Eloff Phase 3 Project as well as the neighbouring Kangala Colliery. The aim of the project description is to indicate the proposed activities to take place at the Eloff Phase 3 Project area. Furthermore, the detailed project description below is designed to facilitate the understanding of the proposed project related activities which are anticipated to lead to the impacts identified and assessed in this EIA Report, and for which management measures have been, or will be designed.

It is important to note that there are several other projects pertaining to Mining Right and EA applications or amendments to existing authorisations taking place in the vicinity of the proposed Eloff Phase 3 Project. These are briefly explained below towards ensuring understanding of the proposed Eloff Phase 3 Project in relation to other project activities taking place in close proximity (Figure 3).

1. There is the existing Kangala Colliery which is on portion 1 and RE of portion 2 of the farm Wolvenfontein 244IR, an extent of 951 hectares (ha). Kangala Colliery has a mining right and approved MWP as well as EMPr, these were obtained in 2012. An update or amendment to the approved EMPr, through an EIA process, was undertaken in 2014.
2. The greater Eloff Coal Resources (Eloff Project) mining right application involving numerous portions of the farms Droogefontein 242 IR, Strydpan 243 IR and Stompiesfontein 273 IR, an overall extent of 8,818.61 ha. The mining right application was submitted and accepted by the Department of Mineral Resources (DMR) on the 20th April 2017. The mining right was granted on the 05th December 2018 and executed on the 25th April 2019.
3. Phase 1 Pit 1 EA in support of the Eloff Project mining right application, whereby Phase 1 Pit 1 pertains to the proposed first opencast mining pit within the Eloff Project area. The EA for Phase 1 Pit 1 has been approved and granted.
4. Eloff Phase 3 Project is an EA application for a new mining pit on portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR, which falls within the Eloff Project mining right area.

The remainder of this section and overall EIA report pertains to the Eloff Phase 3 Project (Item 4 in the list above) which involves a new opencast mining pit adjacent to the existing Kangala Colliery pit.

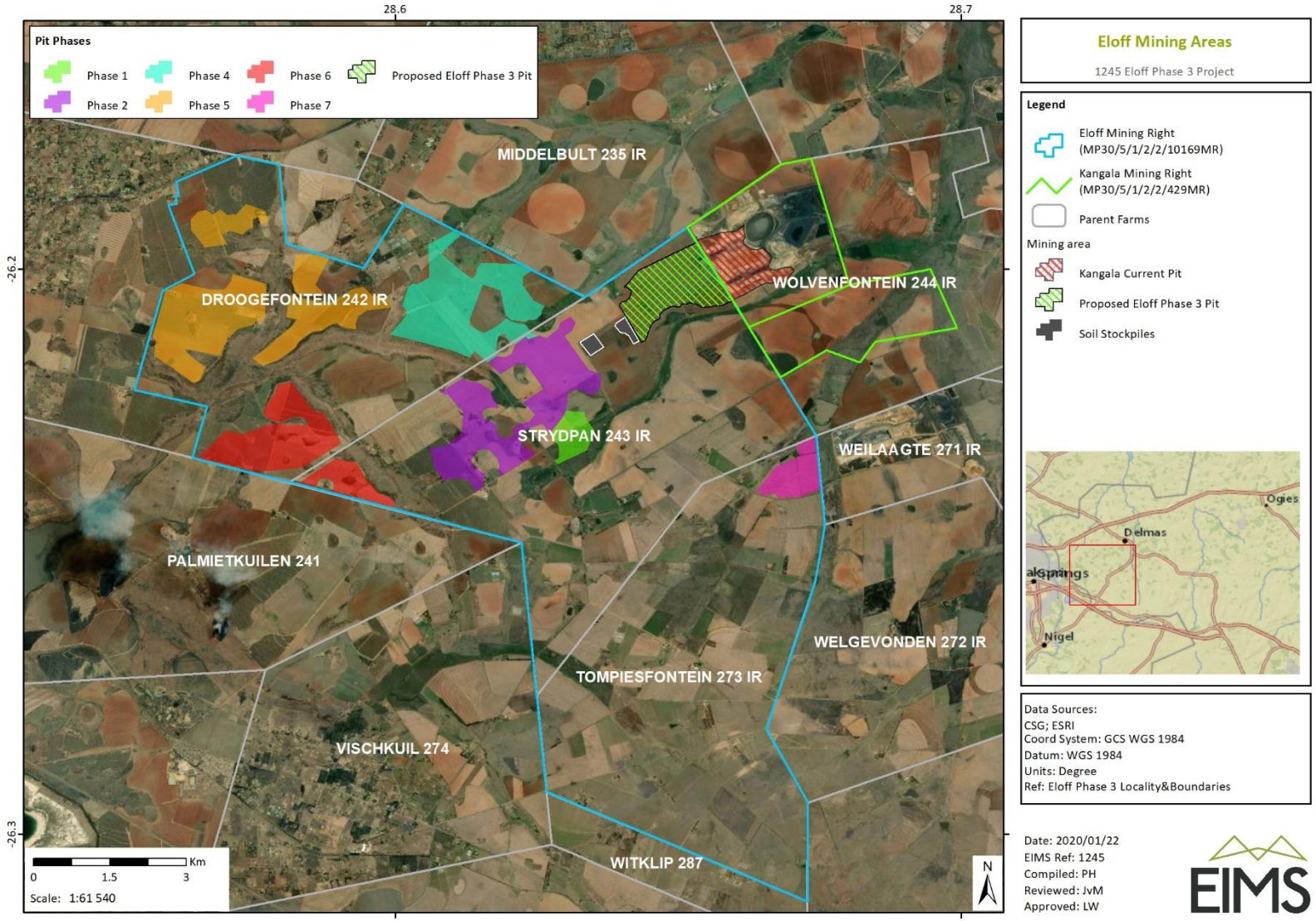

Figure 3: Locality map indicating the Eloff mining areas which includes the Eloff Phase 3 Project and its close proximity to the Kangala Colliery existing mining pit

3.1 RESOURCE DETAILS

The proposed project area lies within the Delmas Coalfield. This coalfield lies west of the Witbank Coalfield and north of the Highveld Coalfield and along the northern edge of the Main Karoo sedimentary basin. The basement rocks to this sub-basin of the Karoo, consist of granite of Archaen age, quartzite of the Witwatersrand Supergroup, lavas of the Ventersdorp Supergroup, and rocks belonging to the Transvaal Supergroup (i.e. dolomite and chert of the Malmani Subgroup of the Chuniespoort Group and shale and sandstone of the Pretoria Group).

Three major coal seams are present in the area where the Eloff Phase 3 Project is proposed. These are named from the base upwards: The Bottom, Middle and Top Seam. Whilst the Middle and Top Seams are discrete units which can respectively be correlated directly with the Witbank 4 and 5 Seams, the Bottom Seam is a complex coal zone that is difficult to correlate. It is commonly thought to represent a combination of the 1, 2 and 3 Seams, with the major portion being equivalent to the 2 Seam. In general, the seam has a thickness of between 0.5m and 1.0m with an isolated maximum of 1.47m. The depth of the seam below surface varies from just over 20m in the north to a maximum of 90.21m in the Stompiesfontein Basin, with a maximum depth of approximately 70m within the proposed project area.

Figure 4 illustrates the coal seams, coal plies, and partings. For practical mining reasons, a series of mining selections have been allocated, in order for the coal seams and plies to be subdivided and combined into logical mining units.

a. Top Seam

In general, the seam has a thickness of between 0.5 m and 1.0 m with an isolated maximum of 1.47 m. The depth of the seam below surface varies from just over 20 m in the north to a maximum of 90.21 m in the Stompiesfontein Basin. The Top Seam is not present in the north-east area where the current opencast mining is planned.

b. Mid Seam

The Middle Seam is developed over the entire Eloff Prospect except for the high ground associated with the Western Ridge on Droogefontein and parts of the Plateau area. The Middle Seam is divided by the MP Parting into the basal MB and the upper MT plies. Over its greater extent the seam width of the MB Ply is less than 0.5 m and is not included for mining. The MT Ply is developed over the southern part of the mining area, which is situated in the north-western corner of the Eloff area. The thickness of the MT Ply is between 0.5 m and 1.0 m and is included in the mining plan and production schedule.

c. Bottom Seam

The Bottom Seam covers the full extent of the Eloff Project area. The thickness of the Bottom Seam is usually between 15.0 m to 26.0 m but can vary considerably over short distances due to pre-Karoo dolomite floor undulations. It is separated from the Mid Seam by a 5.0 m to 15.0 m thick sandstone to shale parting. The Bottom Seam is subdivided from top to bottom into the BA, BB, BC, and BD coal plies, which are all separated by carbonaceous shale partings. The BA Ply is developed fairly consistently over the Eloff Project area. In the planned mining area, it is mostly developed along the southern to centre portion of the mining area. The BB Ply is developed over most of the Eloff Project area and seam thickness is generally substantially lower than for the two BC Plies. The BC Ply is economically by far the most important unit within the Bottom Seam and for mining purposes it is divided into the BC1 and BC2 plies. The BD Seam is divided (from the bottom up) by the BP5 and BP4 Parting into the BD3, BD2 and BD1 plies. BD1 Ply is present over most of the planned mining area while BD2 is developed in two strips running east-west and BD3 is sporadically developed over the planned mining area. Only BD1 and BD2 plies are included in the mining design.

The Top Seam is overlain by a thin laminated siltstone or carbonaceous shale. This is followed by up to 15 m of fine to medium grained sandstone. A glauconitic sandstone with thickness between 10 m and 15 m follows. The glauconitic indicates a marine transgression. This marine transgression is a basin-wide event and effectively ends all peat accumulation and thus further coal development in the Main Karoo Basin. The effect of surface weathering has a significant impact on coal distribution in the area. Vryheid Formation rocks are weathered to

depths between 9 m and 40 m below surface. The weathering profile is variable, and generally, only the Top and Mid Seams are affected by the weathering. Together with this weathering, a deep soil profile is present, which in turn allow for the easy free dig of overburden material to access the coal seams in the open pit mining operation.

Locally, the pre-Karoo basement floor (mainly dolomites) has a direct impact on the coal seam structures. This is mainly due to the pre-Karoo karst topography and possible sinkhole structures. These features caused a highly erratic palaeo-floor. The effect is greatest on the lower coal seams and gradually becomes less towards the upper coal layers.

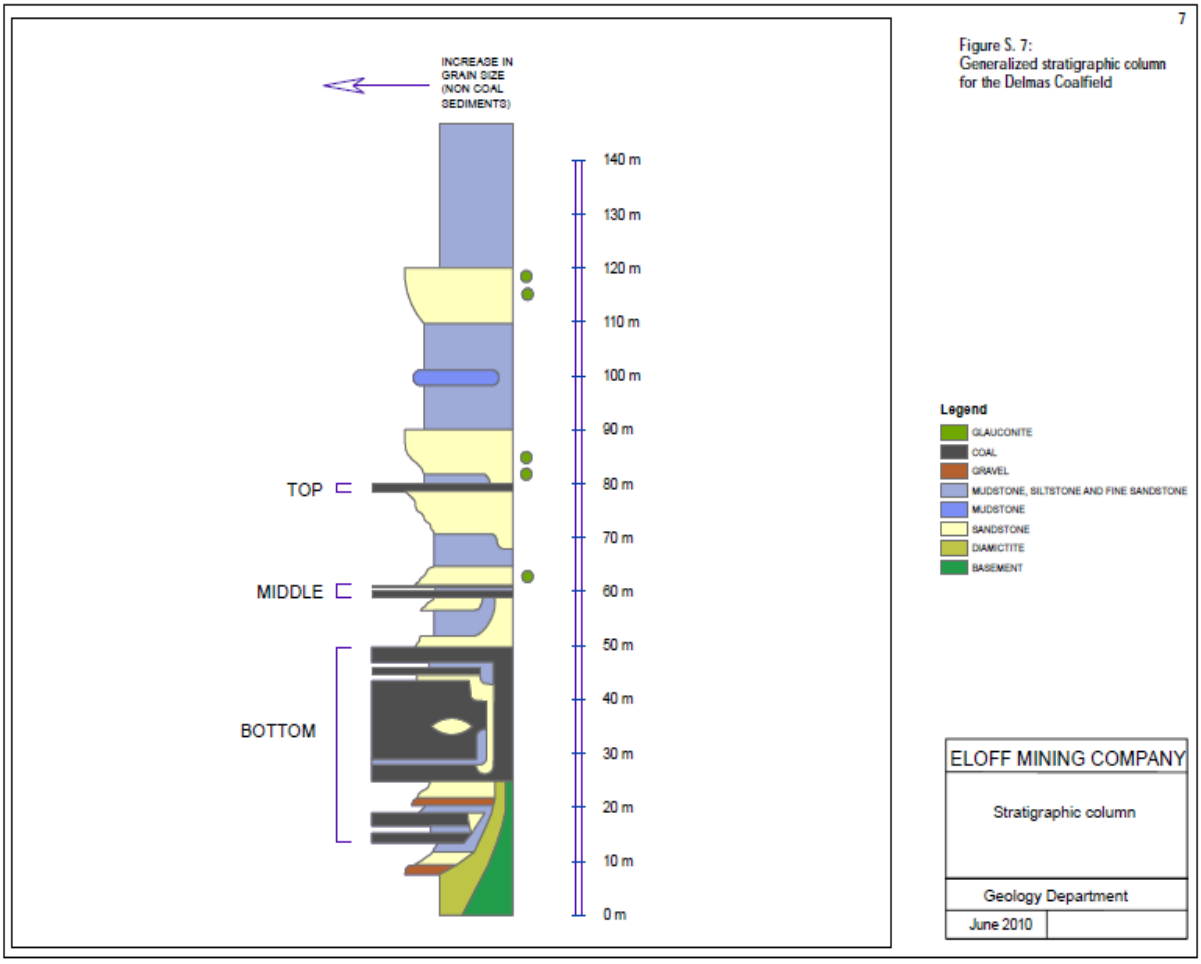

Figure 4: Stratigraphic Sequence and Coal Seams and Plies at the Eloff Project

3.2 DESCRIPTION OF ACTIVITIES TO BE UNDERTAKEN

The Eloff Phase 3 Project involves the development of an opencast mining pit. The other associated infrastructure which will be used is located at Kangala Colliery, i.e Discard dump, PCD, overburden, stockpiles and processing plant. Details of the activities associated with the Eloff Phase 3 Project are presented in the following sections and include existing Kangala Colliery infrastructure that will be utilised.

3.2.1 PROPOSED MINING METHOD

The opencast mining pit method proposed for the Eloff Phase 3 Project entails conventional open pit strip mining method. Based on the business philosophy of Eloff Mining Company, the opencast mining operations will be outsourced. All opencast mining contractors apply standard truck and shovel mining methods based on a strip mining design and layout.

The mining method that will be applied, and is similar to current operations at Kangala Colliery, is standard truck and shovel strip mining, whereby mining and rehabilitation will be undertaken concurrently as follows:

- The topsoil is removed by truck and shovel and stored at the designated area;
- Thereafter, the softs will be removed by truck and shovel and stored at the designated material stockpiles;
- Next, cast blasting of the hard overburden material will be employed;
- Roll-over dozing of the hard overburden material will follow, where practical;
- Truck and shovel mining techniques are then applied to remove the hard overburden material in order to expose the various coal seams;
- Finally, the coal seams will be excavated by truck and shovel mining techniques; and
- Any parting or interburden material between the coal seams will be drilled and blasted before being removed by the truck and shovel technique.

The process is repeated on a strip-by-strip basis. Stockpiled overburden material (apart from the soils) will then be rolled-over into the void created by the removal of the waste and coal in the previous bench, with the hard overburden and parting / interburden forming the base, followed by the softs, levelled, and finally topsoil will be placed and seeded.

Figure 5 indicates the typical opencast mining sequence which entails initial removal of the overburden which will then be stockpiled to ensure it can be replaced back in the initial box cut. The physical mining of the coal seam follows which is then transported to the crushing and screening facility towards processing. The raw coal resource statement, with the coal qualities indicated on an air-dried basis (adb), is indicated in Table 5.

Table 5: Coal Resource Quality

Eloff Phase 3 Project Resource Statement (Air Dried Qualities)									
Seam	GTIS (Mt)	Geo Loss (%)	TTIS (Mt)	CV (MJ/kg)	IM (%)	Ash (%)	VM (%)	TS (%)	FC (%)
Top Seam	16 988 670	10	15 289 803	21.89	4.39	26.19	25.37	1.62	44.06
M	68 305 050	10	61 474 545	21.36	4.02	27.53	24.42	1.90	44.06
MT	7 346 290	10	6 611 661	23.98	3.63	21.98	27.92	3.11	46.43
MB	8 336 030	10	7 502 427	17.90	3.66	35.77	21.05	1.53	38.38
BA	8 441 380	10	7 597 242	18.10	3.90	32.85	20.55	0.93	42.12
BB	74 371 460	10	66 934 314	17.49	4.11	35.38	20.71	0.84	39.79

Eloff Phase 3 Project Resource Statement (Air Dried Qualities)									
BC1	281 032 000	10	252 928 800	18.83	4.33	30.89	20.65	0.88	43.22
BC2	281 278 660	10	253 150 794	18.98	4.06	31.89	20.36	0.88	43.69
BD1	30 504 310	10	27 453 879	17.77	3.63	35.89	19.94	0.81	40.56
BD2	7 506 980	10	6 756 282	18.52	4.19	33.73	20.19	1.77	40.36
Eloff Phase 3 Project	**784 110 830**	-	**705 699 747**	-	-	-	-	-	-

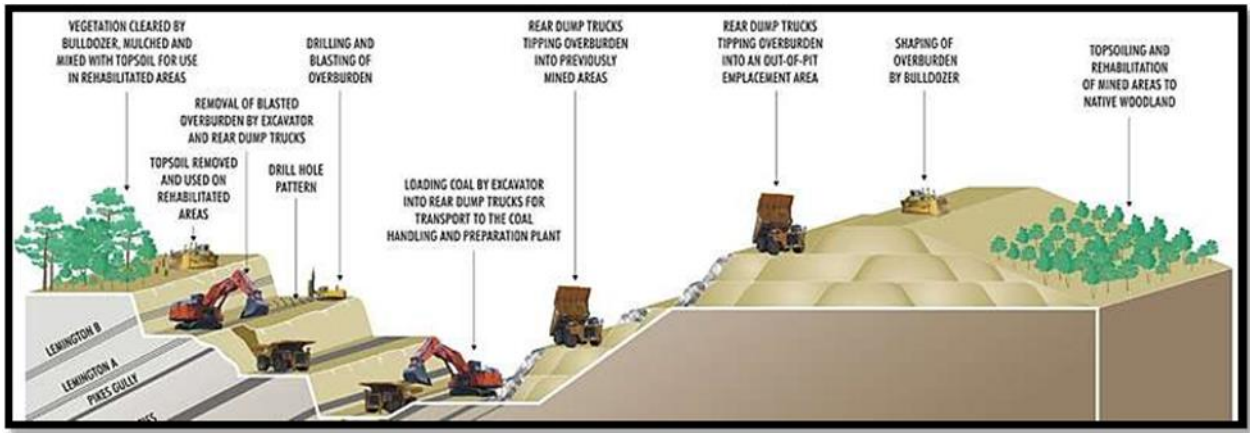

Figure 5: Typical coal surface opencast mining sequence indicating rollover backfill rehabilitation methodology (Surface Mining for Minerals & Metals: gaukartifact).

The mining method currently being undertaken at the existing Kangala Colliery and proposed for the Eloff Phase 3 Project is a conventional opencast pit bench mining method with the stripping operation removing topsoil and subsoil, thereby exposing the hard overburden of the next cut. Hard and soft overburden material will be separated and also hauled to a designated stockpile area during the initial state. When a steady state of mining is reached, overburden / waste rock will be backfilled and rehabilitation adequately addressed by means of a backfilling process. Once the overburden has been removed, the Run of Mine (ROM) coal will be transported to the existing Kangala Colliery Coal Handling and Processing Plant (CHPP).

The opencast mining pit area to include portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR located adjacent to the existing Kangala Colliery's portions 1 and RE of portion 2 of the farm Wolvenfontein 244 IR, will extend the mining area by approximately 251 ha. In this regard, the Eloff Phase 3 Project requires an EA following an EIA process for the extension area towards the assessment of any new impacts associated with extending the opencast mining pit and its associated infrastructure.

3.2.2 OPENCAST MINING AREAS

The Eloff resource area has a favourable strip ratio for opencast mining. The current opencast pit at Kangala Colliery will be mined up to until mining operations start at the Eloff Phase 3 Project. Eloff Phase 3 will start as soon as the required authorisations are in place, with the establishment of the box cut. With the ramping down of the production at Kangala Colliery, the production at the Eloff Phase 3 Project will ramp up and by the Financial Year 2020, the total production is anticipated to be from the Eloff Phase 3 Project. The broader Eloff Project, of which the Eloff Phase 3 Project is a small portion, has a ROM reserve of 41.17 Mt in the current planned mining area. The total Eloff Project area contains 784.11 GTIS. Currently only 44.95 Mt of the total GTIS have been converted to ROM reserves through a detailed mining plan with a balance of 739.16 Mt. The balance of the GTIS will be included in the next phase of mine.

Based on the ROM and product production schedule, Eskom and Kusile Power Station products can be produced for 10 years at approximately 430,000 tpm. The mining schedule for the opencast was designed to allow for a

continuation of the current steady-state production and a sharp ramp-down of production at the end of the Project life. The period required for mining of the coal in the current Eloff planned mining area reserves, which includes the Eloff Phase 3 Project, is 10 years.

3.2.3 EXISTING MINING INFRASTRUCTURE TO BE UTILISED FOR ELOFF PHASE 3 PROJECT

Mining infrastructure already exists at the neighbouring Kangala Colliery and it is anticipated that the Eloff Phase 3 Project will consist of the opencast mining pit and soil stockpiles only, thereby making use of the existing Kangala Colliery infrastructure and supplies. The following infrastructure has been established for the opencast mining operations at Kangala Colliery:

- Pit access ramps;
- Haul roads, at the existing opencast pit and to the CHPP;
- Waste dump areas for topsoil, soft overburden, and hard overburden (includes interburden);
- ROM stockpiles for each of the seams at the CHPP;
- Clean water cut-off canals around the:
    - ROM stockpile area, including crushing,
    - Contractors laydown area,
    - Along the haul roads,
    - Around the waste dumps;
- Dirty water catchment drains at the:
    - ROM stockpile area, including crushing,
    - Contractors laydown area,
    - Along the haul roads;
- In-pit sumps for water management;
- PCD ;
- Piping system for water management;
- Mining contractor's laydown area (compacted pads for the purpose of placing and / or assembling offices, workshops, diesel farm, etc.);
- Waste facility pad;
- Waste management area;
- Access road from the R42 road to the opencast mining area;
- Weighbridge facility;
- Potable water supply point;
- Bio-disc sewage plant; and
- A power supply point to the opencast contractor's laydown area.

Furthermore, the required surface infrastructure such as offices, stores facility, workshops, and change house also already exists at Kangala and thus does not need to be replicated for the operations at the Eloff Phase 3 Project area. The ROM coal will be transported by opencast haul trucks to the tipping point at the existing CHPP at Kangala Colliery. A surface and mine infrastructure layout at the current Kangala Colliery as well as the proposed Eloff Phase 3 Project is indicated in Figure 6.

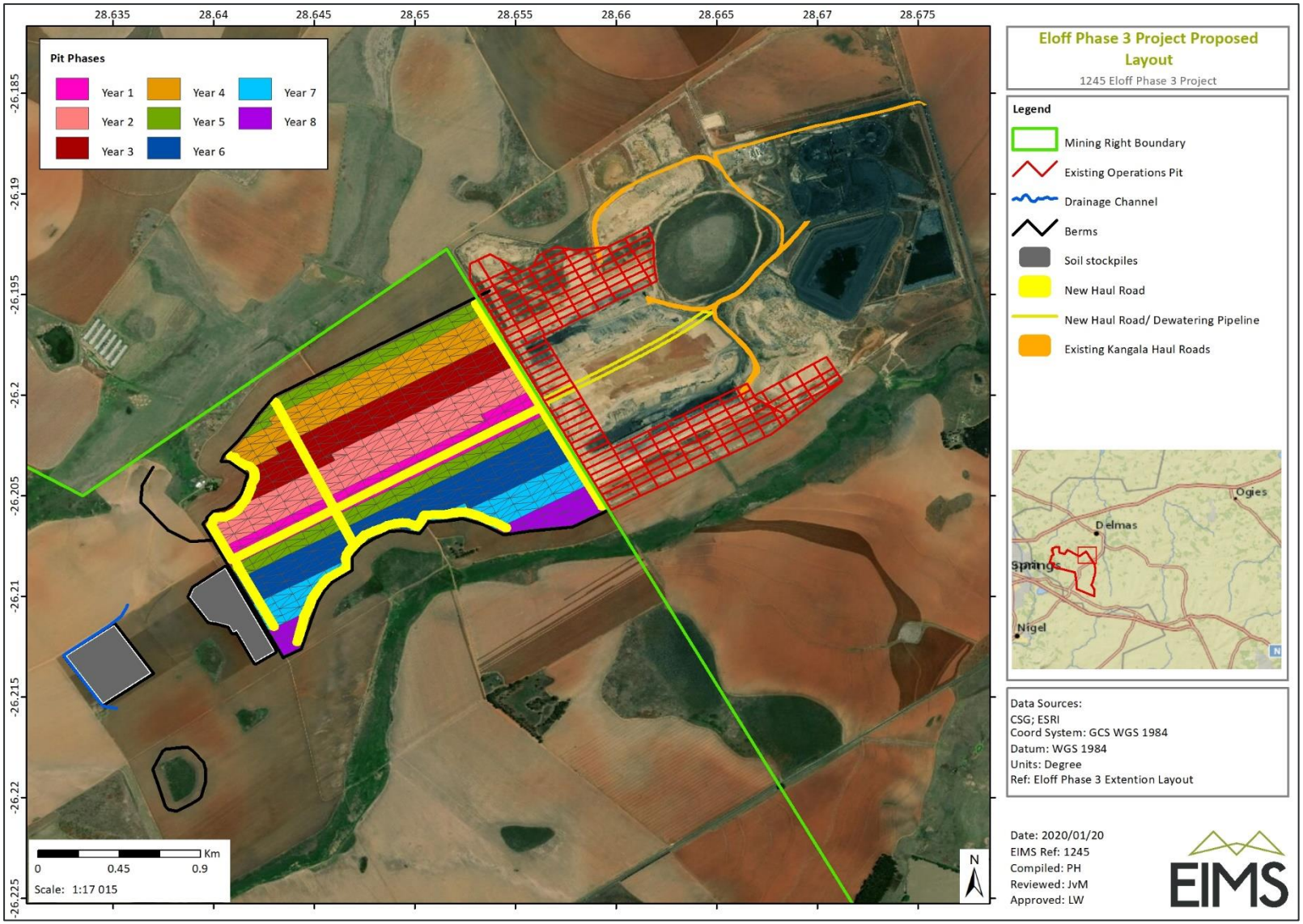

Figure 6: Layout of the current Kangala Colliery infrastructure and the proposed Eloff Phase 3 Project

3.2.4 POWER SUPPLY

There is an existing power supply of 3.5 megavolt amperes (MVA) from Eskom at Kangala Colliery. The power is supplied at 11 kilovolts (kV) and is transformed from 11 kV to 1,000 volts (V) and 400 V through the installation of a substation. No power supply will be required at the Eloff Phase 3 Project area, as only mining operations will be conducted there. When, and if, pumping of water is required, it will be performed by existing diesel pumps. The existing power supply is adequate for the life of the Eloff Phase 3 Project.

3.2.5 WATER SUPPLY

Potable water is also already supplied to the Kangala complex from a borehole and/ or the Rand Water Board. The existing opencast mining contractor's camp area is also supplied with water from a borehole and / or from the Rand Water Board. The CHPP raw make-up water supply is from the existing PCD, which in turn receives its water from the opencast mine, the co-disposal facility, and dirty run-off water.

3.2.6 WATER MANAGEMENT

The existing Kangala Colliery opencast mining areas and the CHPP area each have their own water management infrastructure. The Kangala opencast infrastructure area has canals and / or berms to prevent clean run-off water from reaching the areas classified as pollution areas. Within each operational area, haul roads, stockpile area, contractor's camp, and mining pit, existing dirty water capturing drains allow dirty water to be collected in sumps and either gravitated or pumped to the PCD at the existing CHPP.

The water captured in the PCD is used for dust suppression along the haul roads and at the current ROM stockpile area. Natural evaporation takes place, which also reduces the water contained in the PCD. No dirty water will be released from the opencast area into any natural waterway.

At the Eloff Phase 3 Project area, similar canals and / or berms will be constructed to prevent clean run-off water from reaching the areas classified as pollution or dirty areas. The PCD at Kangala Colliery will be utilised to deal with polluted water from the Eloff Phase 3 Project mining, stockpile dump, and haul road areas. Within each operational area (haul roads, stockpile dump area, contractor's camp, and mining pit), dirty water capturing drains will be constructed that will allow dirty water to be collected in sumps draining into the pit and either gravitated or pumped to the existing PCD.

The proposed project infrastructure is to be positioned such that the upstream clean and dirty water catchment occurs in a south easterly direction. All clean water channels are to be placed upstream of all infrastructure areas to ensure the runoff collected is diverted to the downstream clean water environment or the nearest watercourse. All dirty water channels are to be placed around the dirty area so that runoff is collected in a sump and then pumped to the existing Kangala Colliery PCD. It is proposed by the project hydrologist that all clean water channels be unlined vegetated trapezoidal channels, whilst all dirty water channels constructed and lined.

The water balance at the project site is such that average volumes pumped from the opencast mining pit will range around 21 122.67 m^3/month during the average and wet season, respectively. During the dry season it is anticipated that less water will be pumped to the Kangala Colliery PCD. A water flow diagram is shown in Figure 7.

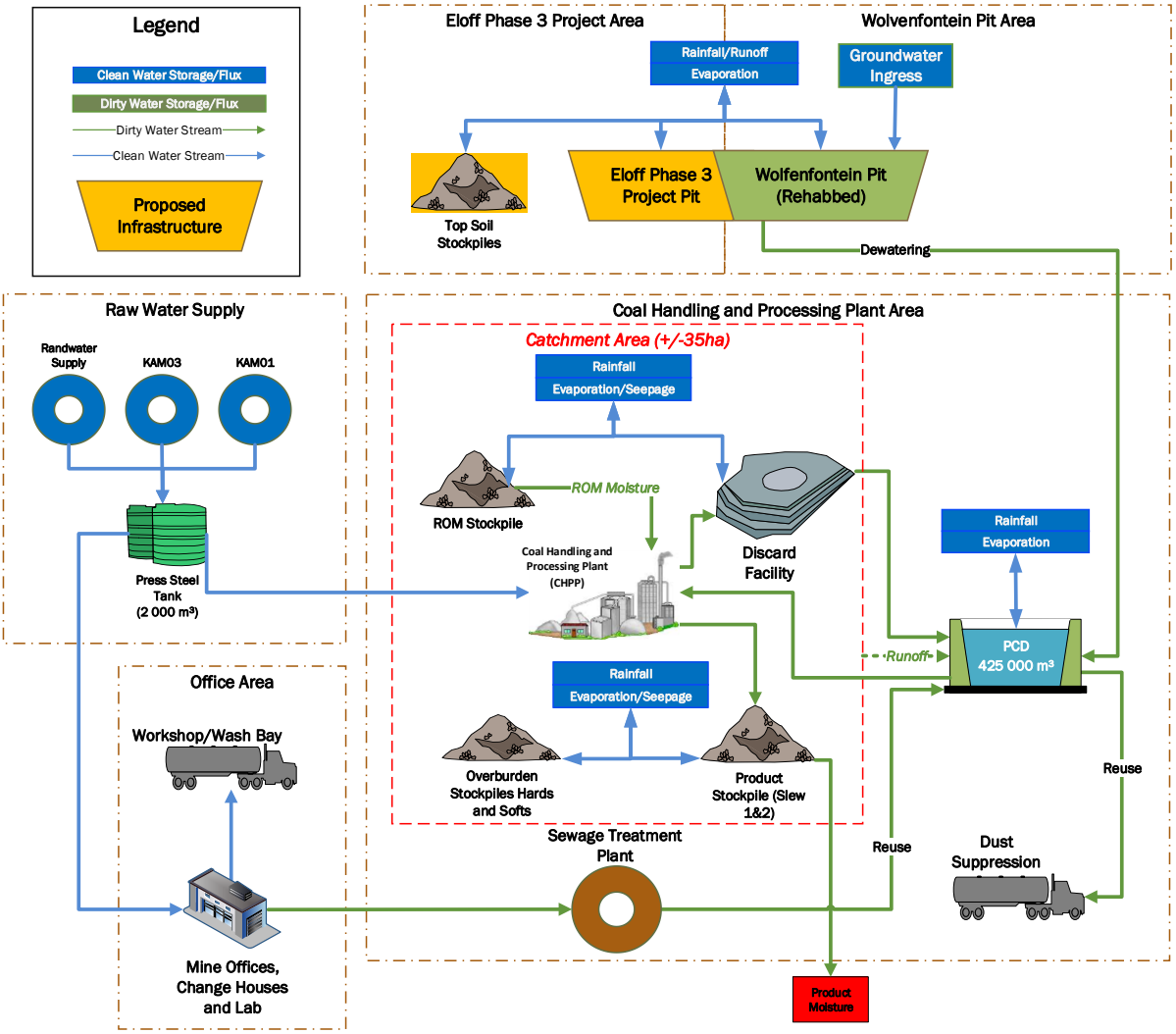

Figure 7: Process Water Flow Diagram (GCS; 2019)

Three (3) water balances were calculated for the Eloff Phase 3 Project for the operational phase at the beginning of the LOM (early mining period (2020)) and at the end of LOM (late mining period (2027)). This provides general insight into the overall total water use and consumption of the consolidated operations of Eloff Phase 3 Project and Kangala Colliery sections. The early mining period (2020) water balance determined the water balance when the opencast pit of the Eloff Phase 3 Project starts in 2020 and groundwater inflows are calculated at 464 m^3/d in 2020. There will be no backfilled and rehabilitated areas at this point of time. No excess water balance (excess term indicated under PCD section PCD outflow) and release from dirty water facilities were calculated and an average re-use from the Kangala PCD to the CHPP was determined at 907 m^3/d (CHPP requirement is 1 401 m^3/d). All return water from the opencast pit was able to be re-used for dust suppression and the CHPP. This shows that raw water supply import can be reduced to 495 m^3/d and the spare capacity of the licensed volumes (excess term indicated under Press Steel Tank section outflow) is 808 m^3/d. It is still recommended to maintain current licensed volumes in case of drought.

The late mining period water balance (2027) was based on groundwater inflows into the opencast pits in 2027, assuming a working area of 10% of the total opencast pit footprint area (+/-25 ha) and rehabilitation performed on the backfilled spoils on 225 ha (recharge assumed at 10% of MAP). This is an assumed infiltration rate of rehabilitated spoils according to Hodgson & Kranz (1998). An excess water balance was calculated of 97 m^3/d (excess term indicated under PCD section PCD outflow), despite water being re-used water for dust suppression

and the CHPP at maximum rates. This can be explained due to the high contribution from recharge rates onto backfilled spoils into the opencast pit workings. This low excess water balance can easily be mitigated by concurrent rehabilitation of the backfilled spoils and reduce recharge rates below 10% of annual rainfall.

The salt mass balance approach provides for Eloff Phase 3 Project a simple mechanism for tracking changes of volume of water and specific elements in the water system depending on the loads that are flowing between various storage areas. This approach provides a good indication of the general water quality in a water system.

Input mass loads were simulated by multiplying the assumed concentrations by the volumes of water generated in the water balance for those specific areas. The concentrations at the dam element outflows (C-end) were simulated and entails that load "in" would be equal to load "out" plus any changes in load due to rainfall, runoff, PCD return flows, seepage and evaporation:

Sulphate (SO4) was chosen as an indicated constituent because it is the main constituent in process water typically present in a coal mine. It is furthermore a relatively good tracer constituent with acceptable chemical losses/gains in the system, although not 100 percent conservative. The salt mass balance results were used to quantify the potential impacts of mining operations on the water quality. Highest salt loads emanate from the opencast pit, discard facility, Kangala PCD and CHPP.

3.2.7 FUEL AND LUBE FACILITIES

At the opencast contractor's laydown area at Kangala Colliery, the following facilities have been established by the contractor:

- Diesel bay area;
- Wash bay area with a silt trap and oil separator;
- Oil, gas, and chemical store; and
- Waste management area/slab for the placing of the necessary waste disposal bins.

Each facility is designed to ensure that water contaminated with hazardous fluids, diesel and other lubricants used on site, is captured and channelled to the oil separation plant for purification prior to being pumped to the PCD. The oil recovered from the purification process will be stored in oil containers and disposed of according to the existing Waste Management Plan. The Eloff Phase 3 Project will utilise the existing fuel and lubrication facilities at Kangala Colliery.

The facilities are maintained within the care and maintenance strategy of the Kangala complex to ensure operational readiness for when the Eloff opencast mining commences. At the CHPP area complex, the fuel and lubrication facilities have also been established.

3.2.8 ACCESS ROADS

The Phase 3 Project area is well served by paved provincial roads, as shown in Figure 6. The main road serving the area is the R42 which is paved and runs south-east of the project area. This road links to the towns of Delmas and Nigel and crosses the N17 highway with on and off ramps to this highway. The R42 also links with the N12 Johannesburg to Witbank highway.

With regards to road infrastructure to serve the Eloff Phase 3 Project area, no main access roads need to be constructed. There is an existing access road to Kangala Colliery and the existing CHPP area. The existing access road includes secondary roads to the various product stockpiles, the mine office complex, and to the contractors' laydown area. The existing access road is indicated in Figure 6 and will need to be upgraded. The road weighbridges required for weighing the product coal loaded for road transport to the respective markets have been installed at the main gate leading into the Kangala mine.

3.2.9 OFFICES, WORKSHOPS AND CHANGE HOUSES

As set out under Section 3.2.3, all the required general administrative buildings and facilities for Kangala Colliery and the CHPP exist at the respective areas. For the opencast laydown area, the mine has constructed the base area and water management facilities. The opencast mining contractor has made use of the existing facilities at

Kangala Colliery and established offices, stores, and workshops facilities. The sewage plant on the Kangala mine is operational and serves the Kangala complex as well as the needs of the opencast mining contractor.

3.2.10 STOCKPILES

It is anticipated that coal mined (ROM) in the Eloff Phase 3 Project opencast operation will be transported to the existing CHPP at Kangala Colliery via haul trucks, prior to processing and preparation to be transported out of the mine to the end user. It was initially anticipated that hard, soft as well as topsoil material will be stockpiled on site to the west of the proposed Eloff Phase 3 Project opencast mining pit area. However, various other stockpile area alternatives, such as utilising the existing Kangala Colliery stockpile area, have been proposed based on findings of the scoping studies and waste classification investigations. The stripped soils consisting of topsoil and subsoil will be stockpiled separately from the hard and soft overburden. This will ensure that the characteristics of the topsoil stockpile is suitable for the prevailing landscape and drainage conditions once they are replaced during rehabilitation.

The overall stockpile area alternatives considered for this project are as follows:

1. Locating the stockpiles of topsoil material from the proposed Eloff Phase 3 Project on site to the west of the proposed opencast mining pit;
2. Stockpiling the hards and softs from the proposed Eloff Phase 3 Project at the existing Kangala Colliery stockpile area;
3. Using the hard and soft overburden from the initial box cut of the proposed Eloff Phase 3 Project to fill the void at the existing Kangala Colliery pit; and
4. Locating the proposed Eloff Phase 3 Project stockpiles on the rehabilitated Kangala area – this may have long term benefits to the rehabilitation at Kangala Colliery as it will assist in the compacting of the mined-out areas, as well as the obvious reduction in greenfield areas.

The total volume for Eloff Discard over the LoM is approximately 12 Mt. The current approach in respect of mine residue stockpiles for Eloff Phase 3 is to exclude all stockpiles except for soils (topsoil) and place all hard and soft rock at the existing approved facilities at Kangala Mine or alternatively to backfill the existing Kangala Pit. Therefore there will be no requirement for waste residue deposits or stockpiles on the Eloff Phase 3 application area and these have been removed from the application. The footprint of the waste rock stockpile area approved in the current EMPr for Kangala is 32 ha in extent. The current footprint of this area is 16.5 ha. The final stockpile area footprint at Kangala is planned to be 20.6 ha and according to the Mine Works Programme this will provide sufficient space for the material generated from Eloff Phase 3. Therefore, there is sufficient capacity at the existing Kangala stockpile area for the new discard material generated from Eloff Phase 3. The stockpile area alternatives are further discussed in Section 6.2.2 of this report.

3.2.11 LIST OF MAIN MINING ACTIONS, ACTIVITIES AND PROCESSES OCCURRING ON SITE

The main mining actions, activities and processes that are planned to take place on site are listed in Table 6. All actions, activities and processes have been grouped into each of the relevant project phases namely: pre-construction (planning and design), construction, operation, decommissioning, rehabilitation, closure, and post closure. For the purpose of this EIA Report, the following broad definitions apply:

- Pre-construction refers to the phase in which planning takes place, namely: exploration, environmental studies, finalising designs, etc.;
- Construction refers to the phase in which the site is prepared and infrastructure is established (e.g. vegetation clearance, access road preparation, construction camp establishment, infrastructure placement, etc.);
- Operation refers to the phase in which physical mining and production takes place – this phase will include roll over mining and on-going progressive rehabilitation efforts;
- Decommissioning and rehabilitation refers to the inter-linked phases in which existing infrastructure is removed and final rehabilitation efforts are applied and their success monitored;

- The closure phase commences once the ore-extracting activities of a mine have ceased, and final decommissioning and mine rehabilitation is being completed. This phase usually ceases 3-5 years after physical closure activities and would align with the issuance of a closure certificate; and
- Post-closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mines closure objectives are met. Post-closure typically commences once a closure certificate has been received. The duration of the post-closure phase is defined by the duration of the applicable residual and latent environmental impacts.

Table 6: List of main action, activities or processes on site and per phase for the Phase 3 Project

Main Activity / Action / Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning and Rehabilitation	Closure	Post-Closure
Site preparation	Vegetation clearance		As required	As required	As required		
	Planned placement of infrastructure		At start of phase	As required			
	Establishment of construction contractor area		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		

Main Activity / Action / Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning and Rehabilitation	Closure	Post-Closure
Earthworks	Stripping and stockpiling of soils		At start of phase	As required	As required		
	Cleaning, grubbing and bulldozing		At start of phase	As required	As required		
	Digging trenches and foundations		At start of phase	As required	As required		
	Blasting		As required	As required	As required		
	Establishing stormwater management measures		At start of phase	As required	As required		
	Establishment of firebreak		At start of phase	As required	As required		
Civil Works	Establishment of infrastructure		At start of phase	As required			
	Mixing of concrete and concrete works		As required	As required			
	Establishment of dewatering pipelines		At start of phase	As required			
	Access control and security		At start of phase	As required	As required		
	General site management		On-going	On-going	On-going	On-going	
	Drilling		As required	As required			

Main Activity / Action / Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning and Rehabilitation	Closure	Post-Closure
Opencast mining	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			
	Pumping of water to existing Kangala Colliery PCD			On-going	On-going		
	Hard and soft overburden stockpiles for backfilling (Eloff Phase 3 will utilize existing stockpile areas at Kangala)			On-going	On-going		
	Soil management		On-going	On-going	On-going	On-going	
	Water management		On-going	On-going	On-going	On-going	
	Concurrent rehabilitation			On-going	On-going	On-going	
	Dismantling and demolition of infrastructure				As required		
	Blasting				As required		

Main Activity / Action / Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning and Rehabilitation	Closure	Post-Closure
Infrastructure removal	Safety control				On-going	On-going	
Rehabilitation	Backfilling of pits and voids			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	
	Initiate maintenance and aftercare program				At end of phase	On-going	Ongoing

Main Activity / Action / Process	Ancillary Activity	Pre-Construction	Construction	Operation	Decommissioning and Rehabilitation	Closure	Post-Closure
Maintenance	Environmental aspect monitoring			On-going	On-going	On-going	Ongoing
	Monitoring of rehabilitation					On-going	Ongoing
	Monitoring of residual and latent impacts						Ongoing

4 POLICY AND LEGISLATIVE CONTEXT

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 7 below. The primary legal requirement for this project stems from the need for 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 in order to assess the potential applicability of these for the proposed activity. More detail on the legislative framework is presented below.

Table 7: Applicable legislation and guidelines overview

Applicable Legislation and Guidelines	**Reference Where Applied**
(A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process).	
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 c) 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 environmental Scoping and Impact Assessment process.
<u>National Environmental Management Act (Act 107 of 1998 – NEMA); and the EIA Regulations (2014, as amended)</u>: The NEMA (1998) requires that a project of this nature (inclusive of a Mining Right) must undergo a Scoping and Environmental Impact Assessment (EIA); an Environmental Management Programme (EMPr) must also be compiled. Regulations applicable to this project include the following: • EIA Regulations GN R. 982 (2014, as amended) in terms of the NEMA;	Throughout the environmental Scoping and Impact Assessment process.

Applicable Legislation and Guidelines	Reference Where Applied
• EIA Regulations GN R. 983 (2014, as amended) in terms of the NEMA; • EIA Regulations GN R. 984 (2014, as amended) in terms of the NEMA; and • EIA Regulations GN R. 985 (2014, as amended) in terms of the NEMA.	
Minerals and Petroleum Resources Development Act (Act 28 of 2002 – MPRDA) as amended; and the Mineral and Petroleum Resources Development Regulations (2004, as amended): The MPRDA (2002) requires an applicant who wishes to proceed with a mining project to obtain a Mining Right, a pre-requisite of which requires the applicant to obtain Environmental Authorisation in terms of the NEMA.	Throughout the environmental Scoping and Impact Assessment process.
National Water Act (Act 36 of 1998 – NWA): The NWA recognises 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 Eloff Phase 3 Project and associated infrastructure, are required to be licensed by the Department of Water and Sanitation (DWS). An Integrated Water Use Licence Application (IWULA) has been lodged with the DWS in terms of Section 21 of the NWA and is currently in process. The water uses applied for that require authorisation are as follows: • Section 21 (a); • Section 21 (c) and (i); • Section 21 (g); and • Section 21 (j). Furthermore, an Integrated Water and Waste Management Plan (IWWMP) is being compiled and will be submitted in support of the IWULA after being made available to the public for comment.	A separate Water Use Licence Application for the applicable water uses is underway by GCS Water and Environmental Consultants.
National Heritage Resources Act (Act 25 of 1999 – NHRA): The NHRA 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 extent of the project, some heritage resources and palaeontological features are likely to occur within the Eloff Phase 3 Project boundary area, particularly the following:	Heritage and Palaeontology specialist studies, the environmental Scoping and Impact Assessment Reports, and the EMPr.

Applicable Legislation and Guidelines	Reference Where Applied
• Section 34(1); and • Section 38. 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 NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, and MPRDA legislation.	
Specific Environmental Management Acts (SEMAs): The SEMAs refer to specific portions of the environment where additional legislation over and above the NEMA (1998) as amended, is applicable. SEMAs likely to be relevant to this application include the following: • National Environmental Management: Biodiversity Act (Act 10 of 2004); • National Environmental Management: Air Quality Act (Act 39 of 2004); and • National Environmental Management: Waste Act (Act 59 of 2008). SEMAs likely to be applicable in this regard (if any) include the Threatened or Protected Species (TOPS) permit for the removal of any protected tree species from site, and Waste Management related licencing or registration.	Specialist studies, baseline description for the environmental Scoping and Impact Assessment process, as well as the EMPr.

Applicable Legislation and Guidelines	Reference Where Applied
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 for the Eloff Phase 3 Project include: • Guideline 5: Companion to NEMA EIA Regulations (October 2012); • Guideline 7: Public participation (October 2012); and • Guideline 9: Need and desirability (October 2014). Additional guidelines published in terms of the NEMA EIA Regulations, 2014 (as amended), in particular: • Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006; • Guideline 4: Public Participation in support of the EIA Regulations, 2006; and • Guideline 5: Assessment of alternatives and impacts in support of the EIA Regulations, 2006. Additionally, the Draft National Guideline on Minimum Information Requirements For Preparing Environmental Impact Assessments For Mining Activities that Require Environmental Authorisation (February 2018) may also find application however at the time of writing this report this is still a draft guideline.	The guidelines will be used throughout the environmental Scoping and Impact Assessment process.
Best Practise Guideline (BPG) Series: The BPG series refers to publications by the then Department of Water Affair and Forestry (now Department of Water and Sanitation – DWS) providing best practice principles and guidelines relevant to certain aspects of water management. Best practice guidelines relevant to the proposed Eloff Phase 3 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; and • BPG G4: Impact Prediction.	Surface water and groundwater specialist studies, as well as the environmental Scoping and Impact Assessment process.

4.1 APPLICABLE NATIONAL LEGISLATION

The legal framework within which the proposed Eloff Phase 3 Project 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) those discussed below.

4.1.1 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (MPRDA)

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 further governs the sustainable utilisation of South Africa's mineral resources. In the event that the proposed activities require material (e.g. sand, gravel, aggregate) for the purposes of construction then the provisions of the MPRDA may apply.

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment to Section 102 which concerns the amendment of rights, permits, programmes and plans, to requiring the written permission from 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 as was amended in April 2017. This EIA Report pertains to an EA application for the proposed Eloff Phase 3 Project involving the development of a new opencast mining pit within the Eloff Project mining right area.

In support of the EA application submitted for the Eloff Phase 3 Project, the applicant is required to conduct an EIA process comprising of the preparation of environmental Scoping and EIA Reports, an EMPr, as well as Interested and Affected Party (I&AP) consultations, all of which must be submitted to the DMR for adjudication. This report has been compiled in accordance with Regulation 49 of the MPRDA and Regulation 21 and Appendix 3 of the EIA Regulations (2014, as amended) in order to satisfy the criteria for a EIA Report. The public review and commenting period for the Scoping Report ran from 12th June 2019 until the 13th July 2019. The review and commenting periods for the EIA Report and associated EMPr is from the 11th February 2020 until 13th March 2020.

4.1.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NEMA)

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 EIA Regulations, the applicant is required to appoint an EAP to undertake the EIA process, as well as conduct the public participation process towards an application for EA. In South Africa, EIA's 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 EA. On 21 April 2006, the Minister of Environmental Affairs and Tourism (now DEA) 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 as well as April 2017. The 2014 NEMA EIA Regulations (as amended) are applicable to this project. Mining activities, including activities such as the proposed Eloff Phase 3 Project, officially became governable under the NEMA EIA Regulations (as amended) in December 2014.

The objective of the EIA Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the listed activities that have been identified to be triggered by the proposed development/ mining activity. 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 authorised, and that activities which are authorised 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 in order to apply for, and be

considered for, the issuing of an EA. These EIA 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 GN R. 985) and a more complete EIA process (activities listed in GN R. 984). In the case of the Eloff Phase 3 Project, there are activities triggered under GN R. 984 and as such a full EIA process is necessary. Table 8 presents all the anticipated listed activities under the NEMA 2014 EIA Regulations (as amended) that are applicable to this project.

An environmental Scoping and Impact Assessment process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and Impact Assessment studies accordingly provide 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.

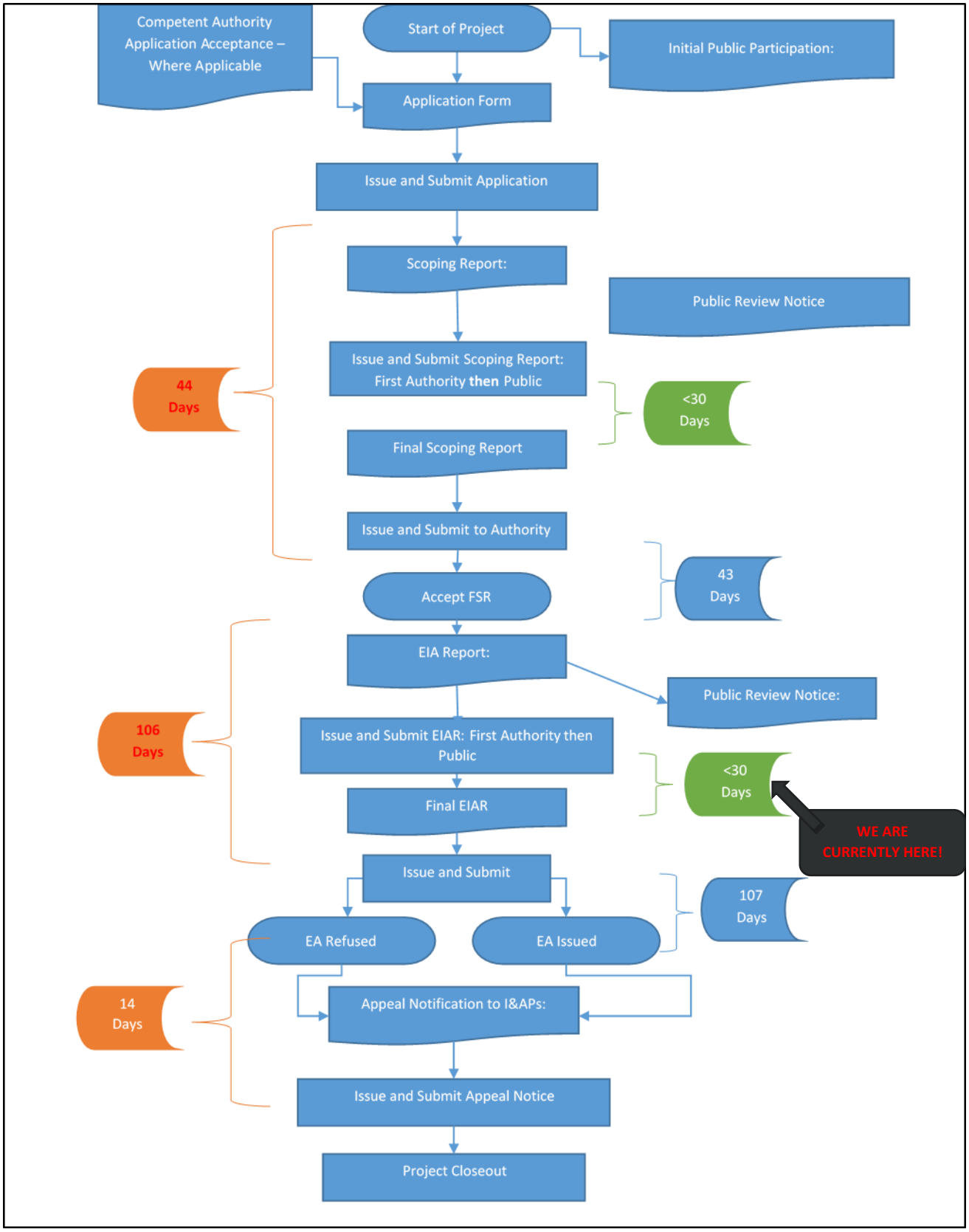

Figure 8: EIA process diagram

Section 24P 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 EA, 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 NEMA Financial Provision Regulations (2015) pertaining to the financial provision for prospecting exploration, mining and production. Table 8 below indicates the Listed activities in terms of the NEMA 2014 EIA Regulations (as amended) that are applicable to the proposed Eloff Phase 3 Project.

Table 8: Listed activities in terms of the NEMA EIA Regulations (2014) as amended.

Name of activity	Aerial extent of the activity	Listed Activity	Applicable listing notice	Waste management authorisation
Stormwater Infrastructure	<10 000 m^2	X	GNR 983: Activity 9	
Upgrading of road within the 100 m buffer of a watercourse	3620 m (length) x 10 m (width). Total extent of 36200 m^2	X	GNR 983: Activity 19	
Internal haul roads	3620 m (length) x 10 m (width). Total extent of 36200 m^2	X	GNR 983: Activity 24	
Change in land use	Approximately 183.5 ha	X	GNR 983: Activity 28	
Utilisation of existing pipelines for stormwater transportation	Approximately 200 mm in diameter and no longer than 1 km	X	GNR 983: Activity 45	
Upgrading of existing internal road for the transportation of RoM	3620 m (length) x 10 m (width). Total extent of 36200 m^2	X	GNR 983: Activity 56	
Clearance of vegetation	<50 ha of vegetation to be removed	X	GNR 984: Activity 15	
General mining activities	Approximately 183.5 ha	X	GNR 984: Activity 17	

4.1.3 THE NATIONAL WATER ACT (NWA)

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 NEMA 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 water use processes are described in Figure 9.

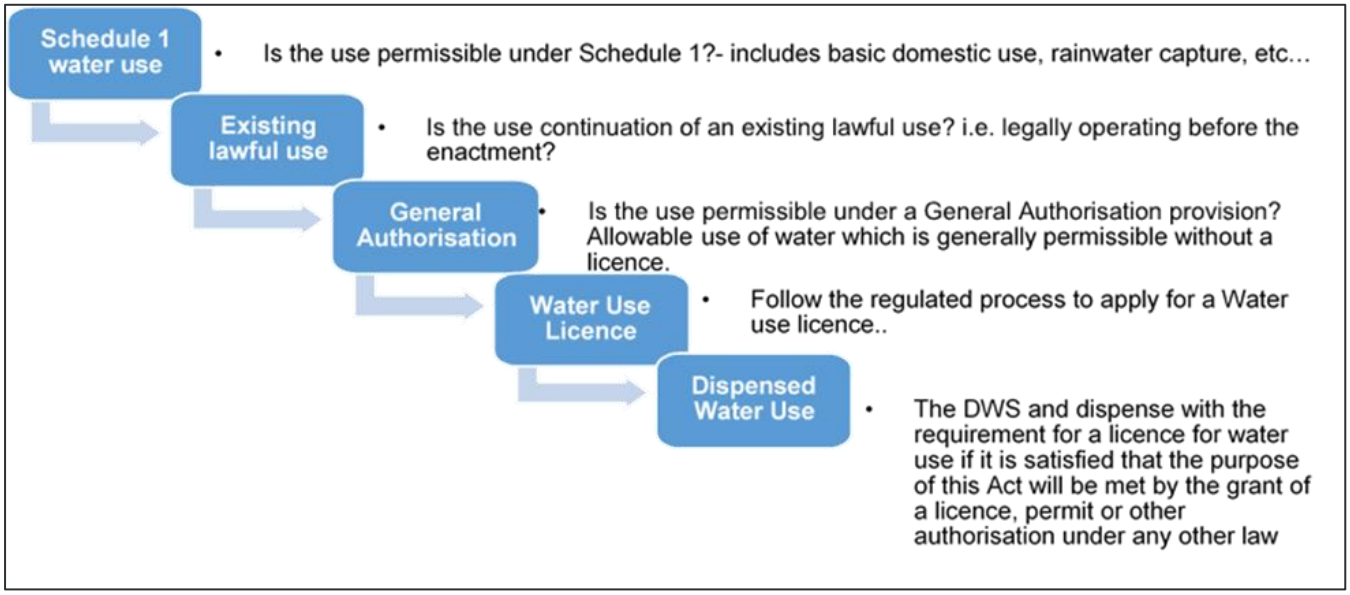

Figure 9: Authorisation processes for new water uses

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

- Taking water from a water resource;
- Storing water;
- Impeding or diverting the flow of water in a watercourse;
- Engaging in a stream flow reduction activity contemplated in section 36;
- Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);
- Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;
- Disposing of waste in a manner which may detrimentally impact on a water resource;
- Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;
- Altering the bed, banks, course or characteristics of a watercourse;
- 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
- Using water for recreational purposes.

Universal Coal Development was granted an Integrated Water Use Licence (IWUL) in May 2012 for the existing Kangala Colliery on Portion 1 and the Remaining Extent of Portion 2 of the farm Wolvenfontein 244 IR (Water Use Licence 04/B20A/ABCGIJ/1506), with the latest amendment issued in August 2016 (Water Use Licence 04/B20A/A/4683), for the following water uses:

- Section 21(a): Taking of water from a water resource (groundwater abstraction borehole and opencast workings);

- Section 21 (b): Storage of water (pressed steel tank for domestic use)
- Section 21 (c): Impeding or diverting the flow of water in a watercourse (upgrading of road crossing over a wetland and infrastructure with 500 m for the wetland);
- Section 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource (sewage treatment facility, pollution control dam, dirty water from stockpile areas and discard facility);
- Section 21 (i): Altering the bed, banks, course or characteristics of a watercourse (upgrading of road crossing over a wetland and infrastructure with 500 m for the wetland); and
- Section 21 (j): Removing, discharging or disposing of water found underground (dewatering from the opencast workings).

Further to the issued IWUL for Kangala Colliery and its amendments, Eloff Mining Company is currently in the process of applying for a new IWUL for the proposed Eloff Phase 3 Project . The new IWUL for the proposed Eloff Phase 3 Project pertains to the water uses described in Table 9.

Table 9: Water uses applicable to the proposed Eloff Phase 3 Project.

Activity #	Listed Activity Description	Reason for Inclusion
NWA Activities		
Section 21 (a)	Taking water from a water resource.	Dewatering of mining pit for use in mining activities and for dust suppression on portions 15, 16, 19 and 20 of the Farm Strydpan 243.
Section 21 (c)	Impeding or diverting the flow of water in a watercourse.	Activities within 500m of HGM 3 (Depression) on portion 22 of farm Strydpan 243; mining through HGM 4 (Seep) on portion 16 of farm Strydpan 243 as a result of the opencast mining pit; mining through HGM 3 (Depression) on portion 19 of farm Strydpan 243 as a result of the opencast mining pit; and a watercourse located within 500m of the opencast mining pit on portions 15, 24 and 59 of farm Strydpan 243.
Section 21 (g)	Disposing of waste in a manner which may detrimentally impact on a water resource.	Dust Suppression.

Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse.	Activities within 500m of HGM 3 (Depression) on portion 22 of farm Strydpan 243; mining through HGM 4 (Seep) on portion 16 of farm Strydpan 243 as a result of the opencast mining pit; mining through HGM 3 (Depression) on portion 19 of farm Strydpan 243 as a result of the opencast mining pit; and a watercourse located within 500m of the opencast mining pit on portions 15, 24 and 59 of farm Strydpan 243.
Section 21(j)	Removing, discharging or disposing of water found underground.	Removing, discharging or disposing of water found underground on portion 15, 16, 19 and 20 of the farm Strydpan 243 for the opencast mining pit.

4.1.4 NWA GOVERNMENT NOTICE 704 (GN 704)

GN 704 (Government Gazette 20118 of June 1999) was established to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. The five main principle conditions of GN 704 applicable to this project are:

- Condition 4 – which defines the area in which, mine workings or associated structures may be located, with reference to a watercourse and associated flooding. Any residue deposit, dam, reservoir together with any associated structure or any other facility should be situated outside the 1:100 year flood-line. Any underground or opencast mining, prospecting or any other operation or activity should be situated or undertaken outside of the 1:50 year flood-line. Where the flood-line is less than 100 metres away from the watercourse, then a minimum watercourse buffer distance of 100 metres is required for infrastructure and activities;
- Condition 5 – which indicates that no residue or substance which causes or is likely to cause pollution of a water resource may be used in the construction of any dams, impoundments or embankments or any other infrastructure which may cause pollution of a water resource;
- Condition 6 – which describes the capacity requirements of clean and dirty water systems. Clean and dirty water systems must be kept separate and must be designed, constructed, maintained and operated to ensure conveyance the 1:50 year peak flow. Clean and dirty water systems should not spill into each other more frequently than once in 50 years. Any dirty water dams should have a minimum freeboard of 0.8m above full supply level;
- Condition 7 – which describes the measures which must be taken to protect water resources. All dirty water or substances which may cause pollution should be prevented from entering a water resource

(by spillage, seepage, erosion, etc.) and ensure that water used in any process is recycled as far as practicable; and

- Condition 10 – which describes the requirements for operations involving extraction of material from the channel of a watercourse. Measures should be taken to prevent impacts on the stability of the watercourse, prevent scour and erosion resulting from operations, prevent damage to in-stream habitat through erosion, sedimentation, alteration of vegetation and flow characteristics, construct treatment facilities to treat water before returning it to the watercourse, and implement control measures to prevent pollution by oil, grease, fuel and chemicals.

These conditions above restrict the proposed Eloff Phase 3 Project opencast mining pit extension from being located within the 1:50 floodline, should the proposed location be less than 100m from the floodline, then a minimum watercourse buffer distance of 100 metres from said infrastructure and activities must be implemented. Furthermore, the clean and dirty water areas within the project are to be kept separate and the relevant infrastructure such as the proposed dirty water channels and sump at the stockpile dump areas and the pit must be designed, constructed, maintained and operated to ensure conveyance the 1:50 year peak flow. Pollution of water resources in the vicinity of the project area is to be prevented and mitigated against. Moreover, should any material be removed from the surrounding watercourses during the construction and operation of the proposed Eloff Phase 3 Project, mitigation measures to prevent instability, erosion, sedimentation, alteration and pollution of the watercourse.

4.1.5 CATCHMENT MANAGEMENT STRATEGIES

The country has been divided into nineteen Water Management Areas (WMAs). The delegation of water resource management from central government to catchment level will be achieved by establishing Catchment Management Agencies (CMAs) at WMA level. Each CMA will progressively develop a Catchment Management Strategy (CMS) for the protection, use, development, conservation, management and control of water resources within its WMA. 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 WMA 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, Eloff Mining Company's proposed the Eloff Phase 3 Project area falls within the Olifants WMA (WMA 2) (NWA, 2016), and the B20A quaternary catchment which falls within the Highveld lower Ecoregion. The B20A-1308 and B20A-1362 Sub Quaternary Reaches (SQR) of the Bronkhorstspruit are the primary drainage feature associated with the project area. The Olifants WMA is divided into 4 sub-areas, namely: Upper Olifants, Middle Olifants, Lower Olifants and Steelpoort Sub-areas, with the project area falling within the Upper Olifants sub-area.

According to the Olifants WMA Internal Strategic Perspective (2004), the water availability in this sub-area is impacted on by coal mining whereby the mining activities impact on the natural hydrological system by disturbing the integrity of the overlying rock and soil strata resulting in increased infiltration and recharge of the groundwater system. This 'additional' water, although of poor quality, represents extra water which can be utilised in the sub-area. The quantity of the "additional" water needs to be determined. The water volumes stored in the mine workings can also be utilised as dams during drought periods to augment the yield of the system.

The bulk of the water used in the Olifants WMA is by the irrigation sector, which represents 57% of the total requirements. Power generation represents 19% and urban, industrial and mining together a further 19%. Most of the water used in the Upper Olifants Sub-area is for cooling in the thermal power stations, which is a highly consumptive use of water and requires a relatively high quality of water. As a result of the large irrigation developments downstream of Loskop Dam, requirements for water in the Middle Olifants Sub-area are dominated by irrigation. Although the most populous sub-area, water use for urban and rural purposes is relatively low, because of the primary nature of the water use by these sectors. Irrigation and mining are the largest water use sectors in the Steelpoort and Lower Olifants Sub-areas, which reflect the nature of the land-use in these areas.

Based on the scenarios for population and economic growth, initial estimates of possible future water requirements were made for the period until 2025. In addition, provision was made for known and probable future developments with respect to power generation, irrigation, mining and bulk users. (Specific quantities, rather than a general annual growth rate, were allowed for in these sectors.)

The Broad Management Objectives within the Olifants WMA include:

- Water demands must be matched to available resources. Only if groundwater is proved to be inadequate should surface water be considered as a source;
- Groundwater resources form an integral part of integrated water resources development planning and management;
- The conjunctive use of surface and groundwater where feasible is to be encouraged to maximise the optimal use of available water resources;
- Develop local groundwater resources in preference to piping surface water long distances;
- Equitable availability of groundwater resources to all users;
- Management of available resources to ensure long term sustainability;
- Develop knowledge of the groundwater resources;
- Promote awareness of groundwater conservation; and
- Identification of applications for sole use, or conjunctive use, of groundwater.

The proposed Eloff Phase 3 Project has submitted an IWULA to ensure that any water resources (surface and groundwater as well as wetlands) affected by the proposed project activities are licensed and managed in accordance with the relevant water and environmental legislation.

4.1.6 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT (NEMWA)

The applicable waste act is no. 59 of 2008: National Environmental Management: Waste Act, 2008 (NEM:WA). On 2 June 2014 the National Environmental Management: Waste Amendment Act came into force. 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 holder's 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.

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*."

Furthermore, the NEMWA provides for specific waste management measures to be implemented, as well as providing for the licensing and control of waste management activities. It was determined that the initially proposed on site location of the overburden / residue stockpiles of hard, soft and topsoil material to the west of the new opencast mining pit may trigger waste management activities in terms of Category B of GN R. 921 which states that "*a person who wishes to commence, undertake or conduct an activity listed under this Category, must conduct an environmental impact assessment process, as stipulated in the environmental impact assessment regulations made under section 24(5) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) as part of a waste management licence application*."

However, findings of the scoping studies and waste classification investigations, as well as the applicant's efforts to avoid and / or minimise the project footprint and environmental disturbance, the location of the overburden stockpile area on site was scoped out. In this regard, the option to locate the stockpiles of hard and soft material from the Eloff Phase 3 Project at the existing Kangala Colliery stockpile area was selected as preferred, and will be further assessed during the EIA phase (refer to Section 6.2.2).

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

These regulations pertaining to waste classification and management, including the management and control of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation which is relevant to the proposed Eloff Phase 3 Project. The purpose of these Regulations is to –

- Regulate the classification and management of waste in a manner which supports and implements the provisions of the Act;
- Establish a mechanism and procedure for the listing of waste management activities that do not require a Waste Management Licence;
- Prescribe requirements for the disposal of waste to landfill;
- Prescribe requirements and timeframes for the management of certain wastes; and
- Prescribe general duties of waste generators, transporters and managers.

Waste generated from the Eloff Phase 3 Project will need to be classified and managed in accordance with the provisions of the Act, unless part of the waste listed as not requiring classification (Annexure 1 of these Regulations). Waste classification, as presented in Chapter 4 of these regulations, entails the following:

- Wastes listed in Annexure 1 of these Regulations do not require classification in terms of SANS 10234;
- Subject to sub regulation (1), all waste generators must ensure that the waste they generate is classified in accordance with SANS 10234 within one hundred and eighty (180) days of generation;
- Waste must be kept separate for the purposes of classification in terms of sub regulation (2), and must not be mixed prior to classification;
- Waste-must be re-classified in terms of sub regulation (2) every five (5) years, or within 30 days of modification to the process or activity that generated the waste, changes in raw materials or other inputs, or any other variation of relevant factors;
- Waste that has been subjected to any form of treatment must be re-classified in terms of sub regulation (2), including any waste from the treatment process.; and
- If the Minister reasonably believes that a waste has not been classified correctly in terms of sub regulation (2), he or she may require the waste generator to have the classification peer reviewed to confirm the classification.

Furthermore, Chapter 8 of the Regulations stipulates that unless otherwise directed by the Minister to ensure a better environmental outcome, or in response to an emergency so as to protect human health, property or the environment –

- Waste generators must ensure that their waste is assessed in accordance with the Norms and Standards for Assessment of Waste for Landfill Disposal set in terms of section 7(1) of the Act prior to the disposal of the waste to landfill;
- Waste generators must ensure that the disposal of their waste to landfill is done in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7(1) of the Act; and
- Waste managers disposing of waste to landfill must only do so in accordance with the Norms and Standards for Disposal of Waste to Landfill set in terms of section 7 (1) of the Act.

The waste generated from the proposed Phase 3 Project will be classified with this Regulation, if not exempt by Annexure 1. The classified waste must then be assessed in accordance with the National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN R. 635 of 2013) to determine its waste type, prior to disposal in terms of the Disposal of Waste to Landfill Regulations set in terms of section 7 (1) of the Act.

Moreover, Chapter 9 of this Regulation stipulates the requirements for motivation and consideration of listed Waste Management Activities that do not require a WML . 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.

The transitional provisions under Chapter 6 of this Regulation prescribes timeframes in which all waste must be classified within 18 months from the date of commencement of these Regulations (23 August 2013). Waste streams generated from the proposed Eloff Phase 3 Project activities and not listed under Annexure 1 of this Regulation, mainly the waste rock, will be classified accordingly to SANS 10234 and subsequently managed and disposed or stored in accordance with the relevant legislative requirements.

4.1.8 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 storage or 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. The waste generated at the proposed Eloff Phase 3 Project and not listed under Annexure 1 of the Waste Classification and Management Regulations, must be assessed in accordance to these Norms and Standards to determine the waste type. In terms of Regulation 12(1) of GN R 634 with regards to the classification of waste, the potential level of risk associated with disposal or downstream use of waste must be determined by following the prescribed and appropriate analysis protocol as detailed in these Norms and Standards. The assessment of the waste from the Eloff Phase 3 Project will:

- Identify the chemical substances present in the waste;
- Sampling and analysis to determine the total concentration (TC) and leachable concentration (LC) of the elements and chemical substances that have been identified within the waste according to section 6 of this regulation;
- Based on the TC and LC limits of the identified elements and chemical substances in the analysed waste exceeding the corresponding TC and LC thresholds respectively, the waste type will be determined (Type 0 Waste to Type 4 Waste); and
- The waste type will then be used determine to which landfill class site the waste must be disposed and / or the suitable containment barrier design for storage.

The waste classification and analysis for the Eloff Phase 3 Project was undertaken and the findings thereof were used to inform the groundwater study included in Appendix D.

4.1.9 NEMWA NATIONAL NORMS AND STANDARDS FOR THE DISPOSAL OF WASTE TO LANDFILL, 2013 (GN R. 636)

Once the waste has been assessed and waste type determined, these Norms and Standards can be used to determine the minimum requirements for the landfill and containment barrier design. This will distinguish between Class A, Class B, Class C, or Class D landfills and the associated containment barrier requirements. Although these Norms and Standards prescribe the containment barrier or liner design for each determined waste type, the recent amendments in chapter 3 of the regulations to the planning and management of residue stockpiles and residue deposits, a competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis as contemplated in regulations 4 and 5 of the regulations. The recommendation should be founded on a risk analysis based on the characteristics and classification in regulation 4 and 5 of these Regulations, towards determining the appropriate mitigation and management measures.

Note that the existing waste facilities at Kangala will be used so there is no requirement for further waste licensing for the Eloff Phase 3 project.

4.1.10 THE REGULATIONS REGARDING THE PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS AND ASSOCIATED AMENDMENT

These Regulations pertain to the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation were published in 2015 and were amended in 2018. The Regulations and associated amendment relate to the assessment of impacts and the analyses of risks relating to the management of residue stockpiles and residue deposits, and involve the following:

- The identification and assessment of environmental impacts arising from the establishment of residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998);
- A risk analysis based on the characteristics and the classification set out in regulation 4 (characterisation of residue stockpiles and residue deposits) and 5 (classification of residue stockpiles and residue deposits) of these regulations must be used to determine the appropriate mitigation and management measures; and

- A competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis as contemplated in regulations 4 and 5 of these Regulations.

As stated in Section 4.1.9, the Eloff Phase 3 Project will not have any residue stockpiles which will be subject to these regulations. Due to the findings of the scoping studies and waste classification investigations, as well as the applicant's efforts to avoid and / or minimise the project footprint and environmental disturbance, the location of the discard stockpile area on site was scoped out. In this regard, the option to locate the stockpiles of hard and softmaterial from the Eloff Phase 3 Project at the existing Kangala Colliery stockpile area was selected as preferred, is the only option assessed during the EIA phase.

4.1.11 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT (NEMAQA)

The National Environmental Management: Air Quality Act (Act No. 39 of 2004 as amended – 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 well-being of people.

The NEMAQA 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 November 2013 (Government Gazette No. 37054).

According to the NEMAQA, 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 (GHG) 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. All coal mines are required to account for the amount of pollutants discharged into the atmosphere (total emissions for one or more specific GHG pollutants) by 31 March each year.

The findings from the climate change study for the proposed Eloff Phase 3 Project indicate that while the GHG emissions from the project are low and will not likely result in a noteworthy contribution to the national climate change on their own, on a local scale the project will have some impact. However, the impacts identified have been allocated mitigation measures towards their management. Moreover, as from the next National Atmospheric Emissions Inventory System (NAEIS) reporting period Eloff Mining Company will have to start reporting on GHG emissions.

Moreover the Carbon Tax Policy Paper (CTPP) (Department of National Treasury, 2013) states consideration will be given to sectors where the potential for emissions reduction is limited. Certain production processes indicated in Annexure A of the notice (Government Gazette No. 40996 dated 21 July 2017) with GHG in excess of 0.1 Mt, measured as CO_2-eq, are required to submit a pollution prevention plan to the Minister for approval. The Eloff Phase 3 Project operations fall under "coal mining" production processes specified in Annexure A (Department Environmental Affairs, 2017b).

4.1.12 NATIONAL DUST CONTROL REGULATIONS

Dustfall is assessed for nuisance impact and not for inhalation health impact. The National Dust Control Regulations (Department of Environmental Affairs, 2013) prescribes measures for the control of dust in residential and non-residential areas. Acceptable dustfall rates are measured (using American Standard Testing Methodology (ASTM) D1739:1970 or equivalent) at and beyond the boundary of the premises where dust originates. In addition to the dustfall limits, the National Dust Control Regulations prescribe monitoring procedures and reporting requirements. Dust will be created from the proposed Eloff Phase 3 Project will be managed in accordance with these Regulations.

4.1.13 THE NATIONAL HERITAGE RESOURCES ACT (NHRA)

The National Heritage Resources Act (Act 25 of 1999 – NHRA) stipulates that cultural heritage resources may not be disturbed without authorisation 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 NHRA is utilised as the basis for the identification, evaluation and management of heritage resources and in the case of Cultural Resource Management (CRM) those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through the NEMA, MPRDA and the Development Facilitation Act (FDA) legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorisations are granted for a development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impact Processes required by the 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 into account of in the EIA Regulations under the NEMA relates to the Specialist Report requirements (Appendix 6 of EIA Regulations 2014, as amended) .

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 NHRA 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).

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible Heritage Report is compiled.

4.1.14 THE NATIONAL FORESTS ACT (NFA)

According to this Act, 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 Eloff Phase 3 Project area is not known at this stage however a biodiversity impact study will be conducted for the EIA phase of the project to verify findings of this EIA report as well as to assess in more detail the impacts identified to date and any additional ones.

4.1.15 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT (NEMBA) – ALIEN AND INVASIVE SPECIES LIST

This Act is applicable since is 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 have been considered and where relevant will be incorporated into the proposed mitigation measures and requirements of the EMPr.

4.1.16 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, and while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted.

4.1.17 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT

The law on Conservation of Agricultural Resources (Act 43 of 1983) aims to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants. In order to achieve the objectives of this Act, control measures related to the following may be prescribed to land users to whom they apply:

- The cultivation of virgin soil;
- The utilisation and protection of land which is cultivated;
- The irrigation of land;
- The prevention or control of waterlogging or salination of land;
- The utilisation and protection of vleis, marshes, water sponges, water courses and water sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of the vegetation;
- The grazing capacity of veld, expressed as an area of veld per large stock unit;
- The maximum number and the kind of animals which may be kept on veld; The prevention and control of veld fires;

- The utilisation and protection of veld which has burned;
- The control of weeds and invader plants;
- The restoration or reclamation of eroded land or land which is otherwise disturbed or denuded;
- The protection of water sources against pollution on account of farming practices;
- The construction, maintenance, alteration or removal of soil conservation works or other structures on land; and
- Any other matter which the Minister may deem necessary or expedient in order that the objects of this Act may be achieved.

Further, different control measures may be prescribed in respect of different classes of land users or different areas or in such other respects as the Minister may determine. Impacts on the soil, biodiversity and water resources have been identified with regards to the proposed Eloff Phase 3 Project, and mitigation and management measures recommended. The preliminary impacts identified in scoping have been updated during the EIA phase of this project and includes input from the detailed impact assessment studies by the various specialists, the EAP, commenting authorities and any related comments from I&APs.

4.1.18 THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (SPLUMA)

The Spatial Planning and Land Use Management (Act 16 of 2013 – SPLUMA) is set to aid effective and efficient planning and land use management, as well as to promote optimal exploitation of minerals and mineral resources. The SPLUMA was developed to legislate for a single, integrated planning system for the entire country. Therefore, the Act provides a framework for a planning system for the country and 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. Furthermore, the SPLUMA strengthens the position of mining right holders when land needs to be re-zoned for mining purposes. The Eloff Phase 3 Project area is currently zoned as agricultural and should the EA be granted to Eloff Mining Company, Eloff Mining Company will have to apply for the re-zonation of the project area from agriculture to mining, prior to commencement.

4.1.19 NOISE CONTROL REGULATIONS, 1992 (GN R.154)

In terms of section 25 of the ECA, the National Noise Control Regulations (GN R. 154 – NCRs) published in Government Gazette No. 13717 dated 10 January 1992, were promulgated. The NCRs 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 further promulgated Provincial Regulations (PN 24) in 1998.

The NCRs 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 NCRs 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 NCRs in essence 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 area.

The South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these Regulations. A detailed noise impact assessment has been undertaken as part of the EIA phase.

4.1.20 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. The noise assessment undertaken for the proposed Eloff Phase 3 Project considered these noise standards and the impacts were rated taking these standards into consideration.

4.1.21 ENVIRONMENT CONSERVATION ACT (ECA)

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 (GN R. 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.

4.1.22 OTHER APPLICABLE ACTS AND GUIDELINES

Other applicable acts and guidelines include The Mpumalanga Nature Conservation Act 10 of 1998; The National Veld and Forest Fire Act 101 of 1998; and The Delmas Local Municipality Town Planning Scheme, 2007. In additional the municipal planning documents such as The Victor Khanye Local Municipality Spatial Development Framework, January 2015 ("VKLM: SDF") and The Victor Khanye Local Municipality By-laws on Spatial Planning and Land Use Management are also applicable to the project.

4.2 PERIOD FOR WHICH AUTHORISATION IS REQUIRED

The authorisation will be required for the duration of the Mining Right.

5 NEED AND DESIRABILITY OF THE PROPOSED PROJECT

This section will examine the need and desirability of the proposed Eloff Phase 3 Project. This section will examine the role of coal as a resource and coal mines as a source of employment particularly with regards to the benefits of continuing and expanding on coal mining operations at the existing Kangala Colliery, whilst taking environmental aspects into consideration.

5.1 COAL AS A RESOURCE

Coal as a resource, is important in South Africa, as it remains the main source or fuel for energy generation. Eskom's existing coal-fired power stations are critical in terms of electricity production towards meeting the energy requirements of South Africa as a whole. As a result, coal mining beneficiation and supply is of paramount importance to South Africa for continued electricity generation in order to meet the current energy demands of the country in the short, medium and long term. Currently, coal provides for more than 70 % of the country's primary energy needs. About 53% of the coal that South Africa produces is used for electricity generation, 33% for petrochemical industries, 12% for metallurgical industries, and 2 % for domestic heating and cooking (Webb, 2015).

The National Development Plan (NDP) identifies the need for South Africa to invest in a strong network of economic infrastructure designed to support the country's medium and long-term economic and social objectives. Energy infrastructure is a critical component that underpins economic activity and growth across the country and therefore, it needs to be robust and extensive enough to meet industrial, commercial and household needs. The NDP envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, is socially equitable through expanded access to energy at affordable tariffs and environmentally sustainable through reduced pollution.

Therefore, although recent studies indicate a reduction in the demand for electricity, current electricity demands need to be met and to achieve this the existing supply of coal to Eskom power stations must be maintained, while other energy sources are being investigated and / or established. In this regard, the coal produced at the existing Kangala Colliery and the proposed Eloff Phase 3 Project is for local use within Emalahleni, where Eskom is the largest local buyer. About 25% of South Africa's coal production is also exported, with most of the coal being shipped to Asia. 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 main customer for the Eloff Phase 3 Project coal product will be Eskom and specifically the Majuba and Kendal Power Stations, as well as Kusile Power Station.

Other potential markets for coal within south Africa, as presented in the Eloff MWP, include the following:

- The coal sector in South Africa is set to receive a demand boost from the electricity sector in the form of South Africa's Coal Baseload IPP Procurement Programme, under which the Department of Energy is aiming to procure 2,500 megawatts (MW) of new electricity capacity. These projects will require significant coal supplies.
- After coal consumption for electricity generation, Sasol, which operates coal-to-liquid plants, is the next biggest consumer of coal in South Africa. Sasol's subsidiary, Sasol Mining, supplies the majority of the group's coal needs.
- Other coal consumers in South Africa include industries such as cement, chemicals and steelmaking, small businesses, and households. The largest consumer of metallurgical coal is steelmaker ArcelorMittal South Africa, which has for years sourced the material locally from Exxaro's Tshikondeni Mine in Limpopo. Exxaro closed the mine in September 2014 and the steel producer is importing coking coal from other countries, including neighbouring Mozambique.

5.2 ELOFF PHASE 3 PROJECT BENEFITS

The proposed Eloff Phase 3 opencast mining operations will allow the continued contribution of the mine to favourable economic impacts on both the local and regional economies. With the current mine infrastructure,

the RoM production at Kangala Colliery will continue to 2020 when the reserves will be depleted, which without any intervention will result in a loss of jobs and economy in the region. Therefore, the Eloff Phase 3 Project will extend the profitability and life of the Kangala coal operation by an additional 10 years and secure the jobs of the current 850 employees and approximately 50 new employees for the first year of the construction phase , due to the extension.

It should also be noted that a significant portion of the coal reserve will be sterilised if the area proposed for the Eloff Phase 3 Project is not mined. Therefore, if the project were not to proceed, the additional economic activity, skills development and available jobs would not be created, and the coal reserves would remain unutilised.

The proposed Eloff Phase 3 Project activities do fit in with the surrounding developments and land uses, which are largely farming and mining related. It is anticipated that if Eloff Mining Company were not to proceed with the proposed Eloff Phase 3 Project, mining of these coal reserves will not necessarily be avoided as another application in terms of the MPRDA can be made by another mining 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 where they have been identified such as within the proposed project area. In summary, the proposed Eloff Phase 3 Project will allow the applicant to continue producing a secure, steady supply of coal for another 10 years for use largely by Eskom as well as allow for the retention of the existing work force.

Moreover, the Eloff Phase 3 Project has taken into consideration environmental impacts that may be triggered by the proposed project activities as part of the EIA process being undertaken, and Eloff Mining Company has made efforts towards minimising the project footprint and potential environmental disturbance as follows:

- Changes to the project layout and size by excluding an area extending further south than the current proposed project area in (refer to Section 6.1.2);
- Reduction in the proposed extent of the pit area initially proposed based on sensitivities identified by the wetland and biodiversity specialists; and
- The scoping out of the location of the overburden stockpiles of hard and soft material on site and opting for all overburden stockpiles to be located at the existing Kangala Colliery stockpile areas thereby reducing the environmental disturbance and footprint of the proposed project. The current preferred approach is to utilize the Eloff waste rock to backfill the existing Kangala pit. Waste rock material at Kangala will then be used to backfill the Eloff Phase 3 pit. This approach will also reduce dust impacts.

5.3 FOOD SECURITY AND ENERGY SECURITY

Although this application is to convert a relatively small piece of land from farming to coal mining, and in effect the bigger debates are not significantly relevant to this pinpoint, the bigger issues have come into focus in the concerns and issues raised by stakeholders and civil society at large. These issues are briefly listed and discussed below.

The agricultural sector, through various research bodies and stakeholders, have argued that the decrease in availability of fertile land will have a negative impact on food prices in the long run. An interesting study by the Bureau of Food and Agricultural Policy (BFAP), evaluating the impact of coal mining on maize production in the wider study area, indicated that the increasing expansion of coal in the area could result in a 5% increase in maize prices in the long term in South Africa. The study area included Delmas, Ogies and Leandra. That report points out that South Africa only has 1.5% high potential arable soils, and 46.4% of this amount was in Mpumalanga. It states that 25.6% of South Africa’s high potential arable land is under threat owing to mining expansion in Mpumalanga. If the understanding is correct, Victor Khanye has 5.3% of South Africa’s high potential arable land.

By the same token, BFAP indicated that although the total maize area harvested in South Africa has declined in the last two decades, production has in fact increased strongly. It gives the reason for this that yields have increased consistently as new technology was adopted with respect to seed varieties (e.g. genetically modified technology) and farming practices (e.g. rotational cropping and conservation practices).

The above trend belies the argument that mines are threatening food security, because the agricultural sector itself can adapt to these threats. However, this is not an argument to state that farmland should not be protected, but merely a statement that agriculture can adapt, and that in a larger context new means of co-existence between the former and mining can be found. In addition, cognisance needs to be taken that in the case of this application, a relatively small number of hectares is affected, and as a proportion to all maize production in South Africa, the loss of maize production is minuscule.

The counterpoint to the above is that South Africa is mostly dependent on coal for its energy needs. The IRP of 2019 states: "In the foreseeable future and beyond Medupi and Kusile, coal will continue to play a significant role in the electricity generation in South Africa, as it is the largest base of the installed generation capacity and it makes up the largest share of energy generated. Due to the design life of the existing coal fleet and the abundance of coal resources, new investments will need to be made in more efficient coal technologies to comply with climate and environmental requirements.

Today 72% of South Africa's installed capacity comes from coal, and this may reduce to 43% by the year 2030. This is a compound negative growth rate of 1% over 11 years. The importance of this is that coal mine developments in the future, could not be guaranteed of a local off-take. What this also indicates is that developing coal mines indiscriminately is not desirable the to South Africa economy.

Regardless of the IRP statistics, in favour of the project at this point is the state in which Eskom finds itself. As the mine will sell a large portion of its coal to Eskom the below points are relevant:

- Eskom is the largest consumer of coal in South Africa, buying about 50 % of the coal produced locally. Domestic coal consumption, especially by Eskom, is expected to increase over the next few years. Eskom has stated over the years that it is facing a large supply deficit, owing to increased demand and under-investment in new mining projects.
- Coal export prices have increased substantially since 2017 and strong markets have developed for the export of Eskom grade coal. Eskom is therefore experiencing competition for its coal supplies. This has resulted in improved prices from Eskom.
- Eskom is forecasting a deficit for the period until 2026 of approximately 11 million tons pa.
- Eskom estimates it has to contract approximately about 2.17 billion tonnes of coal by 2051, of which an estimated 1.12 billion tonnes will be sourced from long-term supply contracts, including extensions of existing contracts. The balance is required from new supply contracts, which may include new mines in the Waterberg. Eskom's total coal demand will peak at about 140 Mtpa in 2033. Thereafter, demand will begin to decline in line with the country's Integrated Resources Plan, which aims to diversify energy sources.

It needs to be noted here that often these statistics are somewhat confusing, because on the one hand the IRP 2019 shows over time that there will be a decline in coal based energy, yet based on common desk-top information, Eskom is experiencing an acute shortage of coal supplies. Relevant to this study is that there seems to be strong demand for this project's coal.

5.4 NEED AND DESIRABILITY ANALYSIS

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 sites, opportunity costs, etc.). Table 10 below presents the needs and desirability analysis undertaken for the Eloff Phase 3 Project.

Table 10: Needs and desirability analysis for the Eloff Phase 3 Project

Ref No.	Question	Response
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 are being conducted for the proposed Eloff Phase 3 Project: • Biodiversity; • Noise; • Heritage; • Dolomitic Stability; • Blasting; • Soil; • Socio-economic; • Land use; • Wetlands; • Hydrology; • Hydrogeology; • Climate Change • Air quality; and • Visual. The conclusions of these studies, and the identified impacts and associated mitigation measures are included in the EIA Report and accompanying EMPr. The potential benefits and motivation for the Eloff Phase 3 project is presented in Section 5. Furthermore, considerations from the Nkangala District Municipality and Victor Khanye Local Municipality spatial structures, whereby mining activities in the south of the region especially in the Thembisile Municipality and around Delmas in the centre of the Victor Khanye municipal area are identified as economies to be enhanced, towards contributing to job creation for poor, unskilled workers.
1.2	How will this project disturb or enhance ecosystems and / or result in the loss or	Efforts will be made to avoid disturbance to sensitive biodiversity and mitigation measures

Ref No.	Question	Response
	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?	identified by the biodiversity specialist will be adhered to. These measures are discussed further in Section 9 of this EIA report
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 measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?	Refer to the alternatives considered for this project in Section 6, the baseline ecological information in Section 8, and the impact assessment and mitigation measures in Section 9 of this EIA Report.
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 Sections 3.2.6 and 3.2.10 of this EIA Report. These sections discuss the proposed methods to handle and manage waste-water as well as the waste rock or discard stockpile dumping areas. Section 6.2.2 describes the alternatives considered for the location and handling of discard stockpiles. The alternatives take into consideration options to minimise the amount of stockpile material on site and / or ways to reduce their impact on the receiving environment. The current approach in respect of mine residue stockpiles for Eloff Phase 3 is to exclude all stockpiles apart from topsoil and place all Hard and Soft rock at the existing approved facilities at Kangala Mine. Therefore there will be no requirement for waste residue deposits or stockpiles on the Eloff Phase 3 application area and these have been removed from the application. The proposed waste water management initiatives include the separation of clean and dirty water streams, as well as the use of dirty water channels

Ref No.	Question	Response
		towards a sump at the stockpile dumping areas, which will drain into the mining pit to be pumped to the existing PCD at Kangala Colliery. The use of existing infrastructure at Kangala for the project will further minimise the disturbance footprint at the project site.
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?	A Phase 1 Heritage impact assessment and a palaeontological study were undertaken as part of the EIA and the findings thereof as well as mitigation measures are presented in Section 9 of this EIA Report.
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report. 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. The project is located on currently farmed land and thus the project activities will lead to the loss of some agricultural land. However, the LOM is 10 years and the mining method to be used is opencast which entails progressive backfilling and rehabilitation of disturbed land. As such, at the end of the LOM the rehabilitated land can be utilised for agricultural purposes once more. Moreover, as mentioned above, the location of the Eloff Phase 3 Project adjacent to the existing Kangala Colliery pit, allows for the utilisation of

Ref No.	Question	Response
		existing mining infrastructure thereby reducing the disturbance footprint of the project on the receiving environment. Identified impacts from the proposed project have been identified and mitigation measures aimed at avoiding, reducing and / or managing the negative impacts as well as enhancing the positive impacts have been recommended (Section 9).
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 identified impacts, their assessment and recommended mitigation measures in Section of this EIA Report as well as the attached EMPr in Appendix E.
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 Eloff Phase 3 Project will rely on / depend on the extraction of a natural, non-renewable resource (coal) for selling to Eskom. This will contribute to the current coal resource dependency that the current energy policy is based on.
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	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 to Section 6 for the alternatives considered in this

Ref No.	Question	Response
	important priorities for which the resources should be used?	Scoping Report. These will be expanded on in the EIA Report.
1.7.3	Do the proposed location, type and scale of development promote a reduced dependency on resources?	The Kangala Colliery is already an existing mine and the proposed project will be an extension of the existing mine utilising mostly existing infrastructure.
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)?	In terms of the ecological impacts, the current limitations were cited by the specialist in Section 14.2.
1.8.2	What is the level of risk associated with the limits of current knowledge?	The level of risk is low.
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?**	
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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?	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).

Ref No.	Question	Response
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 baseline ecological information in Section 8, and the impact assessment and mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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 baseline ecological information in Section 8, and the impact assessment and mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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 6 for details of the alternatives considered, as well as this Section 5 of the EIA Report for the advantages and disadvantages of the proposed activity.
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 the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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:**	
2.1.1	The IDP (and its sector plans' vision, objectives, strategies, indicators and targets)	According to IHS Global Insight data (2015), the unemployment rate (i.e. the proportion of the population between 14 and 65 years of age who

Ref No.	Question	Response
	and any other strategic plans, frameworks or policies applicable to the area,	classify themselves as "not employed but looking for work") is around 21.6%. This represents a decrease of approximately 6.6% in the unemployment rate since Census 2011. It is further indicated in the Social Report that two most dominant economic sectors in the Victor Khanye Local Municipality (VKLM) are agriculture and mining. Agriculture is predominant in the rural areas around the VKLM, made up mostly of commercial farming (notably maize farming) and mining activities. Since the municipality is viewed as an agricultural area with high potential, the 2017 – 2021 VKLM Integrated Development Plan (IDP) states that agricultural land must be protected against urban sprawl and mining activities (presumably uncontrolled). Moreover, mining operations in the VKLM are made up of mostly coal (3 million metric tons per annum) and silica (2 million metric tons per annum). Given the fact that the mining industry continues to grow, the VKLM IDP identifies an urgent need to establish an "equitable and realistic trade-off that maximises provincial benefits from mining and energy sectors while mitigating any environmental impacts" (VKLM IDP, 2017 – 2021). The proposed Eloff Phase 3 Project will extend the Life of Mine of the Kangala coal mine by 10 years, thus allowing Eloff Mining Company to continue supplying jobs at that mine 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	The mine will make use of labourers from the local community as far as possible. According to the Nkangala District Municipality Spatial Development

Ref No.	Question	Response
	communities, need to upgrade informal settlements, need for densification, etc.),	Framework (SDF), there are existing mining activities located in the south of the region which should be enhanced, to contribute to job creation for poor, unskilled workers. It is added that the regeneration of power stations, as well as the new power station in the Victor Khanye area could serve as catalyst to increased demand for coal reserves in the Nkangala District Municipality area. The local economy is indicated in the Victor Khanye Local Municipality Integrated Development Plan (IDP) as 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. Both sectors contribute to the local economy. The project area is within the area currently characterised by both agriculture and mining activities. The IDP indicates main mining areas to be are around Delmas in the centre of the municipal area, and also in the far north-eastern corner of the Victor Khanye municipal area. It is also indicated in the IDP that the Delmas area is a “high potential” agricultural area, and that it is important that agricultural land is protected. However, there are no spatial planning restrictions on the proposed project area in terms of land use. The project has considered various ways to minimise the footprint of the mining activities thereby reducing the amount of agricultural land to be affected. A full comparative land use study was conducted and the findings and conclusions of this study are presented in this EIA report.

Ref No.	Question	Response
2.1.3	Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	Refer to the baseline environment in Section 8 of this EIA Report as well as the attached EMPr (Appendix E).
2.1.4	Municipal Economic Development Strategy ("LED Strategy").	The proposed project will promote and support the sustainability of existing business, as well as assist in increasing local beneficiation and shared economic growth, through extending the LOM by 10 years. The Eloff MWP indicates that LED investment focuses largely on the establishment of a renewable energy business that will create jobs with an investment of ZAR 6,500,000 over five years. Other programmes include education and skills development, social welfare initiatives, and enterprise development.
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.
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 of Kangala coal 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.
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 undertaken to date in Section 7 of this EIA Report. Furthermore, refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.
2.4	Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term?	Refer to the identified impacts, their assessment and recommended mitigation measures in Section

Ref No.	Question	Response
	Will the impact be socially and economically sustainable in the short- and long-term?	9 of this EIA Report as well as the attached EMPr (Appendix E).
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 6 for details of alternatives considered in this EIA Report.
2.5.2	Reduce the need for transport of people and goods.	Refer to Section 6 for details of alternatives considered in this Scoping Report. This aspect will be further explored in the EIA phase and findings thereof presented in the EIA Report and EMPr.
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 public transport),	Refer to Section 6 for details of alternatives considered in this EIA Report.
2.5.4	Compliment other uses in the area,	Refer to item 1.3 of this table (above). The proposed Eloff Phase 3 Project entails the mining of additional areas in the vicinity of the existing Kangala Colliery. The existing land use at the site is currently agricultural with the existing Kangala coal mine located adjacent to the site. A comparative land use assessment was conducted for the EIA phase.
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 Eloff Phase 3 Project area is outside an urban area.
2.5.7	Optimise the use of existing resources and infrastructure.	Refer to Section 3 of this EIA Report.
2.5.8	Opportunity costs in terms of bulk infrastructure expansions in non-priority	Refer to Section 3 of this EIA Report.

Ref No.	Question	Response
	areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement).	
2.5.9	Discourage "urban sprawl" and contribute to compaction / densification.	The new mining operation will ensure that 926 employees will continue employment (full time contractors: 851; full time employees: 75). More than 85 % of the employees at Kangala are sourced from local communities and surrounding labour-sending areas within the Nkangala District.
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 to 2.5.9 of this table (above).
2.5.11	Encourage environmentally sustainable land development practices and processes.	The proposed land use for the Eloff Phase 3 Project will be developed with effort made towards being environmentally sustainable in the long term. One of the key aspects to ensuring long terms land sustainability will be to ensure successful rehabilitation and post mining land-use capability.
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 Eloff Phase 3 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 to the local communities through continued employment of workers and local contractors, as well as other influences and community upliftment programmes that are undertaken by the mine through their SLP.

Ref No.	Question	Response
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.	Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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 area, as well as programmes implemented from the mine's SLP.
2.6	**How was a risk-averse and cautious approach applied in terms of socio-economic impacts**	
2.6.1	What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	In terms of the socio-economic impacts, the current knowledge gaps are included in Section 14.15.
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 impacts on socio-economic conditions should the recommended mitigation and management measures be implemented and adhered to.
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 applied.
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
2.7.2	Positive impacts. What measures were taken to enhance positive impacts?	Refer to the identified impacts, their assessment and recommended mitigation measures in Section

Ref No.	Question	Response
		9 of this EIA Report as well as the attached EMPr (Appendix E).
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E). Moreover, Eloff Mining Company will, in line with the regulatory requirements, provide financial provision to ensure that the mitigation measures proposed can be carried out. This aspect will also be further addressed in the EIA phase.
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	By conducting a Scoping and EIA process, the applicant ensures that equitable access to the environment has been considered. Refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report.

Ref No.	Question	Response
	of persons disadvantaged by unfair discrimination?	
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 identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).
2.13	**What measures were taken to:**	
2.13.1	Ensure the participation of all interested and affected parties.	Refer to the public participation process undertaken to date in Section 7 of this EIA Report.
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 the public participation process undertaken to date in Section 7 of this EIA Report. Advertisements as well as site notices were distributed in and around the project area in English and Afrikaans to assist in understanding the project. Public meetings are also planned to be undertaken in the Scoping and EIA phases of the project. Furthermore, translators will be available at the upcoming public meetings (if required) towards ensuring that Interested and Affected Parties can participate in a language they are able to understand as far as possible. Also, public meetings are undertaken such that women and youth are encouraged to participate and provide input which will then be recorded and submitted with the relevant reports to the competent authority.
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,	
2.13.5	Ensure openness and transparency, and access to information in terms of the process,	
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,	

Ref No.	Question	Response
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 the public participation process undertaken to date in Section 7 of this EIA report. Furthermore, refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report. Moreover, the current SLP is due for an update, as part of a separate undertaking.
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 at the mine are educated on a regular basis through toolbox talks on the environmental risks that may occur within their work environment, and adequate measures have been taken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work in as well as 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 anticipated that 50 new jobs will be created through the Eloff Phase 3 Project during construction. Also, the existing jobs at Kangala 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).	
2.16.3	The distance from where labourers will have to travel.	

Ref No.	Question	Response
2.16.4	The location of jobs opportunities versus the location of impacts.	
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 and key stakeholders have been notified about the project by the EAP and registered as Interested and Affected Parties who will continue to be notified and engaged with regarding the project throughout the EIA process.
2.17.2	That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures.	The Scoping and EIA process requires governmental departments to communicate regarding any application. In addition, all relevant Departments and key stakeholders have been notified about the project by the EAP and registered as Interested and Affected Parties who will continue to be notified and engaged with regarding the project throughout the EIA process.
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 the public participation process undertaken to date in Section 7 of this EIA Report. Furthermore, refer to the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report. Moreover, the mine must adhere to the SLP commitments.
2.19	Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	Refer to the identified impacts, their assessment and recommended mitigation measures in Section

Ref No.	Question	Response
		9 of this EIA Report as well as the attached EMPr (Appendix E).
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?	The Eloff Phase 3 Project represented by Eloff Mining Company will provide a bank guarantee to the DMR. Furthermore, in accordance with the NEMA Regulations Pertaining to the Financial Provision for Prospecting Exploration, Mining or Production Operations, an applicant or holder of a right or permit must determine and make financial provision to guarantee the availability of sufficient funds to undertake rehabilitation and remediation of the adverse environmental impacts of prospecting, exploration, mining or production operations. In this regard, Eloff Mining Company needs to include such financial provisions and this have been prepared and the findings thereof included in the closure and rehabilitation plan attached with the EMPr (Appendix E).
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 impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	Refer to Section 6 for details of alternatives considered in this EIA Report as well as nomination of preferred alternatives.
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 the identified impacts, their assessment and recommended mitigation measures in Section 9 of this EIA Report as well as the attached EMPr (Appendix E).

6 PROJECT ALTERNATIVES

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

- Location alternatives (including design and layout);
- Process alternatives;
- Technology 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 of this EIA Report, the need for the proposed project includes the following key drivers:

- The need to increase the LOM for the mine as the Run of Mine (ROM) at Kangala Colliery is anticipated to be depleted within the year 2020; and
- The need to meet and maintain supply obligations to Eskom, and other potential end users of the coal resource to be mined, thereby contributing to the local and national economy.

In this section the various alternatives considered are described and their advantages and disadvantages are presented where applicable. Furthermore, the feasibility of the considered alternatives, from both a technical as well as environmental perspective, is determined and the result thereof are the alternatives that will be investigated further in the EIA phase, towards the selection of preferred alternatives. Essentially, alternatives represent different means of meeting the general purpose and need of the proposed project through the identification of the most appropriate and feasible method of development, all of which are discussed below.

Alternatives can further be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process (DEAT, 2004). Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation and management measures and are not specifically identified as distinct alternatives. This section provides information on the Eloff Phase 3 Project's location, process, technology and activity alternatives under consideration and those that will be assessed further in the upcoming EIA phase.

6.1 LOCATION ALTERNATIVES

Location alternatives can apply to the entire Eloff Phase 3 Project (e.g. the strategic decision to locate the proposed development in Mpumalanga within the Victor Khanye Local Municipality, and adjacent to the existing Kangala Colliery), as well as more specific individual components of the project. The proposed location for the Eloff Phase 3 Project is largely due to its proximity to the existing operational Kangala Colliery adjacent to the proposed project area, and which is also owned by the applicant. Kangala Colliery adjacent to the project area presents the opportunity for the Eloff Phase 3 Project to utilise its existing opencast mining infrastructure which has already been subjected to environmental processes including alternative assessments. This proposed location will enable the proposed Eloff Phase 3 Project to reduce its environmental impact footprint, whereby only the opencast mining pit, , soil stockpiles, haul road and stormwater infrastructure will be required for the operation (details of the project in Section 3). The location of the Eloff Phase 3 Project is discussed further below in relation to the proposed development's properties and layout options.

6.1.1 DEVELOPMENT LOCATION

The land use in and around the proposed Eloff Phase 3 Project area predominantly consists of agricultural activities (crop farming) with mining related activities in its vicinity. Since the proposed project pertains only to the development of the opencast mining pit, whilst utilising existing Kangala Colliery infrastructure for the processing of the coal and transportation to the buyer as well as the use of existing stockpile areas, the project area footprint and impact on the receiving environment including land use will be largely reduced. The development of the Eloff Phase 3 Project on portions 14, 15, 16, 18, 19, 20, 22, 23, 24 and 59 of the farm Strydpan 243 IR in close proximity or adjacent to the existing Kangala Colliery on portion 1 and remaining extent of portion 2 of the farm Wolvenfontein 244 IR, therefore, is the preferred location alternative (Development Location Alternative S1a).

This development location will minimise the mining activities and infrastructure on site, thereby minimising the project footprint and potential impacts through the optimisation of existing infrastructure. Furthermore, the development location was selected based on the presence of the target coal resource within the Eloff mining right area, such that the identified coal resource can be mined economically utilising a mining method already in operation at the adjacent Kangala Colliery.

In this regard, no other location alternative is being considered for the Eloff Phase 3 Project. The environmental impacts associated with this location alternative are discussed in Section 9 of this EIA Report.

6.1.2 DESIGN OR LAYOUT

Numerous alternatives were evaluated with regard to the extent of the area to be mined for the Eloff Phase 3 Project, mostly linked to the presence of surface infrastructure within and adjacent to the target coal resource. The utilisation of existing infrastructure will minimise the impact of the proposed extension while allowing for the underlying coal to be accessed, thereby increasing the total coal resources that would be available for extraction over the LOM.

If any infrastructure is planned to be located in areas identified as being of high environmental sensitivity or if any other significant environmental concerns are noted with regards to the proposed design and / or layout, then the layout may require to be amended based on these findings.

The 3 layout alternatives that were considered based on the preliminary locations proposed for both the opencast mining pit extension area and the overburden stockpile dump areas, are described below:

- **Site Layout Alternative S2a** – The initially proposed mine layout had a wider footprint extending further south than the current proposed project area. The small portion on the extreme south of the project area was deemed not feasible due to its proximity to a watercourse and associated buffer zones.
- **Site Layout Alternative S2b – Maximum mining over entire area**: This alternative involves mining over the entire proposed opencast mining pit extension area. This option can only be considered if no high-sensitivity and / or no-go areas are identified within the proposed project area. In this site layout alternative, the mining and economically efficient production of coal is emphasised. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production. This approach has the potential to increase the financial viability of the proposed Phase 3 Project at the potential expense of any identified environmental features on site.
- **Site Layout Alternative S2c – Sensitivity-based approach:** This alternative aims to avoid no-go areas and highly sensitive areas and takes into account specialist recommendations regarding buffer distances from important environmental features. In this site layout alternative, environmental resource protection is emphasised and relies on the use and implementation of stringent mitigation and management measures to minimise identified adverse impacts. This development alternative will use environmental specialist planning and evaluation of opencast mining methodologies, mining footprint alteration, and infrastructure placement and logistic options in order to avoid consolidated sensitive environmental features and to locate the proposed development in the least sensitive area.

Layout alternative S2a has been scoped out and only the Process Alternatives S2b and S2c are addressed further in this EIA phase report. Overall, the sensitivity-based approached Process Alternative S2c is preferred.

6.2 PROCESS ALTERNATIVES

Process alternatives imply the investigation of alternative processes or methods to achieve the same goal for the proposed Eloff Phase 3 Project. This includes using environmentally friendly designs or materials and re-using scarce resources like water and non-renewable energy sources. Process alternatives will be defined and implemented as incremental alternatives during the EIA phase and in the EMPr. Specific process alternatives which will be considered for the Eloff Phase 3 Project are discussed below.

6.2.1 MINING METHOD

The opencast mining method (Process Alternative P1a) has several factors that make it more favourable when compared to other mining methods such as underground mining and these include the following:

- Economic and financial – higher productivity during the ROM and lower capital and operating costs to mine (i.e. more cost effecting as more coal can be extracted and more quickly);
- Technical – allows for improved geological certainty of reserves, and possible exposure of lower grade reserves because of the lower operational costs. Furthermore, there is increased recovery of ore / coal and fewer restrictions or limitations on mining equipment / machinery in terms of size and weight than there would be for underground mining; and
- Safety – working conditions are safer for the mine workers with regards to toxic gas and the risk of cave in or loose material which can be easily seen, removed or avoided.

Despite the factors mentioned above, there are environmental concerns regarding opencast mining due to the method's anticipated disturbance footprint on the receiving environment. However, the environmental impacts from the proposed Eloff Phase 3 Project are being addressed as part of this EIA process and the other related legal requirements that must be undertaken and authorisations obtained prior to approval. Further, the opencast mining method allows for progressive and concurrent backfilling and rehabilitation of affected land throughout the ROM, thereby limiting the affected receiving environment throughout operations. Additional mitigation measures to address all identified potential environmental impacts will be included in the EMPr towards ensuring that any environmental sensitivities and impacts are managed in accordance with the relevant legislation. The location of the proposed mining pits extension adjacent to the existing Kangala Colliery further supports the use of opencast mining as it allows for the opportunity to utilise the existing opencast mining infrastructure and services at Kangala Colliery, thereby minimising the amount of new disturbance within the project area.

In this regard, no other mining method has been considered as this would not only entail extensive amounts of new infrastructure on site to accommodate mining activities required by a new method such as underground mining in an area not previously equip for such activities. Lastly, the seam of the target coal reserves has a thickness of between 0.5m and 1.0m with an isolated maximum of 1.47m with a maximum depth of approximately 70m within the proposed project area. These characteristics of the shallow coal resource are better suited for opencast mining than underground mining which favours coal reserves at depths of over 100m.

The geological conditions and depth to coal are similar to that of the adjacent operation at Kangala Colliery. During our geological modelling and mine planning exercises, Eloff Mining Company explored various mining options before deciding on the most economically viable selection. These options take into consideration coal seam thicknesses, cover or overburden depth to coal, incremental stripping ratios to the different coal seam floors and some obvious economic considerations. There is clear overburden depth, rock strength and pillar width limits or restrictions when considering underground mining and all pointers out of the preliminary and feasibility studies suggest that stripping ratios and financial modelling evaluations of all economically mineable coal seams are appreciative of opencast mining.

6.2.2 WASTE HANDLING

The construction and mostly operation of the Eloff Phase 3 Project will result in the generation and accumulation of significant quantities of wastewater which may be defined as hazardous, from both the stockpile dumping areas and the mining pit extension area. All waste including wastewater and discard from the Eloff Phase 3 Project activities will be handled and managed in accordance with the relevant NEMWA legislation and as such an IWML application is part of this EIA process.

With regards to wastewater, the clean and dirty water will be separated at all times towards ensuring that the dirty water does not contaminate any clean water resources. The dirty water will be channelled through drains leading to a sump at the stockpile dump areas, which will then drain into the mining pit towards being pumped to the existing PCD at Kangala Colliery. There are no other alternatives being considered for the handling of wastewater as the proposed process has taken environmental sensitivities and technical constraints into consideration, the use of the existing PCD allows the Eloff Phase 3 Project footprint to be reduced. This alternative will not be assessed further in the EIA phase however, the impacts associated with the proposed wastewater process will be updated accordingly and the mitigation measures refined based on the detailed impact assessments to be undertaken during the EIA phase of the project.

There were 4 alternatives proposed for the handling and storage of the overburden in the form of residue stockpiles assessed in scoping. The current preferred approach in respect of mine residue stockpiles for Eloff Phase 3, will be to remove and use all hard and soft rock to backfill at the Kangala existing pit. Therefore there will be no requirement for waste residue deposits or stockpiles on the Eloff Phase 3 application area. As such no assessment of alternative stockpile locations is included in this EIA report.

6.2.3 DEWATERING

Water encountered in mining operations can be either from direct rainfall into mine workings and surface runoff from surrounding areas; or groundwater seepage from surrounding aquifers. Two alternatives were identified for addressing the dewatering of the proposed opencast mining pit, and these are:

- **Process Alternative P3a – Dewater-store-discharge**: This process would pump the water out of the mining pit workings, followed by storage in the PCD and discharge. The relevant discharge legislation will be adhered to and is part of lodged WULA for the Eloff Phase 3 Project; and
- **Process Alternative P3b – Pump-store-evaporate**: This process alternative involves the dewatering of the mine workings where the coal reserves are located. This would involve dewatering by pumping the water into the open void and allowing the water to evaporate gradually. The relevant water storage legislation will be adhered to, in this regard.

The alternative involving discharging the treated mine workings water (Process Alternative P3a) have been assessed further in this EIA report.

6.2.4 WATER SUPPLY (DUST SUPPRESSION)

Two alternatives for the supply of water for dust suppression were identified, namely:

- **Process Alternative P4a – Using water obtained from dirty water containment facilities**: This option involves utilising dirty water from the containment facilities (e.g. stockpile dump area sumps containing dirty runoff water, and Kangala Colliery PCD holding dirty water from the pit, etc.) for some of the mining activities such as dust suppression at the haul roads and coal beneficiation processes at the CHPP; and
- **Process Alternative P4b – Water from existing licensed water resources**: Potable water is already supplied to the Kangala complex from a borehole and / or the Rand Water Board, and similarly it is anticipated that the potable water for the Eloff Phase 3 Project will be sourced from existing licenced resource such as boreholes and / or municipal supply whereby the amount of water utilised for the project is to be within the allocated thresholds for the water source. The relevant abstraction legislation will be adhered to in this regard.

It is anticipated that a combination of the above-mentioned alternatives with regards to water supply to the Phase 3 Project will be implemented and these alternatives will not be assessed further in the EIA phase.

6.3 TECHNOLOGY ALTERNATIVES

The selection of the technology alternatives or techniques to be adopted for the construction and operation of the Eloff Phase 3 Project are described in this section. The technology alternative considered relate to transportation options to get the coal from the opencast mining pit extension area to the Kangala Colliery CHPP.

There are two potential coal product transport options or technology alternatives considered for taking the coal from the proposed opencast mining pit to the existing Kangala Colliery processing infrastructure and subsequently to the end buyer. The feasibility of these options hinges on the proximity of the existing transport infrastructure to the proposed extension area in order to be able to minimise the amount of new transportation infrastructure required. In this regard, the following transport alternatives have been considered:

- **Technology Alternative T1a – Transportation of the coal product by road:** This involves the transport of the coal product from the mining pit area via haul road to join existing road networks within the Kangala Colliery towards getting the coal to the existing CHPP. This option is most feasible as there is already an existing road network in close proximity to the proposed extension project area leading to the Kangala Colliery CHPP, and the coal product from the Eloff Phase 3 Project will be processed at the existing Kangala Colliery CHPP; and
- **Technology Alternative T1b – Transportation of coal product by conveyor**: This option involves the transport of the coal from the Eloff Phase 3 Project mining pit by conveyor to the existing Kangala Colliery CHPP. There is no existing coal conveyor network in close proximity to the proposed project area, therefore this option would require the establishment of new infrastructure covering a significant distance between the coal product collection point and l processing facility.

In this regard, the conveyor technology alternative was scoped in the scoping phase out and only the road transportation option is included in the EIA phase.

6.4 ACTIVITY ALTERNATIVES

The current land use within and around the Eloff Phase 3 Project area comprise largely of agriculture, as well as mining activities. Mining operations as a land use, are often viewed as directly competing and eventually replacing existing land uses. However, a mixed land use approach consisting of both mining and continued agriculture is possible. Current agricultural activities in the vicinity and within the proposed Eloff Phase 3 Project area will be able to continue where no mining infrastructure is located, particularly because the proposed project only involves the opencast mining pit and its associated soil stockpiles rather than a full new mining operation and its associated infrastructure. All other mining infrastructure required for the Eloff Phase 3 Project other than the new pit and possibly the stockpile areas, will be from the existing Kangala Colliery.

Furthermore, several alternatives towards further reducing the project area footprint have been proposed and are being assessed, and these included handling and location options of the overburden stockpile areas, as well as coal product transportation infrastructure. Furthermore, the mining method proposed for the project (opencast mining) is an extension of the existing operation at Kangala Colliery thereby reducing the need for all new mining infrastructure within the project area as many of the facilities required are already in place at the existing Kangala Colliery.

The EIA process being undertaken includes the assessment of potential impacts and the identification of environmental sensitivities within and in the vicinity of the proposed Eloff Phase 3 Project area thereby allowing for the recommendation of mitigation measures towards the avoidance, minimisation and / or management of the anticipated impacts.

Taking all the above into account, two activity alternatives have been considered in this EIA Report with regards to the Phase 3 Project, and these are:

- **Activity Alternative A1 – Mining**: This option relates to the land within the proposed project area being used for mining activities. The extent of the mining activities will be subject to the findings of the EIA process guided by the sensitivity-based approach; and
- **Activity Alternative A2 – Farming**: This option relates to continuing with the current land use within the project area which is farming (i.e. cultivation / livestock).

The current land uses in and around the project area indicate that local farming activities are already exposed to mining and the two land uses are able to co-exist.

Based on the two most basic decision-making criteria for an alternative land-use analysis, namely GDP and employment, Eloff Phase 3 is considered a better alternative land-use than agriculture in the study area. It has a net GDP benefit of R 5.06 billion over the 60-years comparison period, even though the life of this project was set at 10 years, meaning that for 50 years the land was considered as sterile and an agricultural loss to the economy was included. In an optimal year the total GDP for Victor Khanye today is estimated R10.5 billion, of which R601 million is agriculture and R1 568 million is mining.

From an employment perspective, Eloff Phase 3 is also more positive than agriculture. The employment comparisons are permanent employment at the mine of 926 employees over 10 years, amounting to a pro-rata number of 154 employees relative to the 60-year comparison period. Including a small amount of construction workers pro-rata to 60 years (2/60 years), and a potential loss of 101 agricultural workers, the net benefit amounts to 57 employees. The net benefit of 57 employees is, however, almost negligent compared to the estimated employment of 24102 people in Victor Khanye. The agricultural and mining industries today employ 3410 and 1789 people respectively in Victor Khanye. However, this employment net benefit increases substantially when the multiplier effects are included, and this is discussed below.

In conclusion the Eloff Phase 3 is a better alternative land use than the current farm operation on the affected land, and its need and desirability is acceptable. This alternative can be further optimised by implementing efforts to return the post mining rehabilitated land to productive farmland.

6.5 NO-GO ALTERNATIVE

The no-go option (Activity Alternative A3) means 'do nothing' or the option of not undertaking the proposed Eloff Phase 3 Project or any of its alternatives, and therefore links to the above activity alternative of continuing with the current farming land use. As such, the 'do nothing' alternative or keeping the current *status quo* of farming also provides the baseline against which the impacts of other alternatives should be compared.

The land use study indicates that both mining and agricultural activities are critical in the local municipality's economy. Assessments of the two activity alternatives (mining and agriculture) suggest that opencast mining as a land use will yield more economic benefits in the short-term than agriculture. Furthermore, farming practises are able to commence after the previously mined areas are suitably rehabilitated in accordance with the relevant legislation thereby allowing for the economic benefits from agriculture to continue. The projected mining benefits are mostly in relation to the project's strategic value of supplying coal to Eskom, whereby the Gross Geographic Product (GGP) addition will outstrip that of agriculture over an economic generation by a significant amount, and the mining alternative will add more jobs to the local municipality. Once again, these benefits are largely in the short-term (the proposed LOM for the Phase 3 Project being 10 years).

The net employment benefit to the economy which is estimated at 113 people and the net GGP addition for the life of the project must be taken into account. Cognisance must be taken that the gross new employment for the mine at steady state is 300 employees, but this is reduced by a factor of 9/25 years to adjust for its shorter life span whereby 25 years is a rule of thumb of an economic generation. A similar amount of people would need to be employed during the first two years of mining operation. In addition to this, it should be noted that the GGP for the project is discounted heavily to address the inherent risk in mine economic failure. In the case of the Phase 3 Project, once a bankable feasibility study is complete and a competent persons report has been undertaken, the inherent riskiness of mining viability reduces dramatically.

The implication of not undertaking the Phase 3 Project, whereby additional coal resources would be mined, would entail a reduction in the existing Kangala Colliery's overall LOM as well as compromising its ability to

ensure a consistent coal supply to its buyers including extended local and regional economic benefits. Moreover, since the area adjacent to the proposed Eloff Phase 3 Project site is currently largely agriculture, should the no-go alternative be preferred then most likely the Kangala Colliery will cease to operate and the existing mining areas will have to be rehabilitated. However, an opportunity for other mining applications for rights to access the coal reserves remaining in the area would persist which would likely require more infrastructure than the proposed Eloff Phase 3 Project.

The no-go alternative would mean that the benefits of local and regional employment at the mine would not be realised in the long term. The potential employment and economic benefits will therefore be foregone. The no-go alternative would maintain the current environmental *status quo* at the site thereby reducing the potential LOM at Kangala by approximately 10 years.

6.6 ALTERNATIVE ASSESSMENT

Based on the results from Scoping various alternatives were scoped out of the EIA phase for the project as follows:

- This development location will minimise the mining activities and infrastructure on site, thereby minimising the project footprint and potential impacts through the optimisation of existing infrastructure. Furthermore, the development location was selected based on the presence of the target coal resource within the Eloff mining right area, such that the identified coal resource can be mined economically utilising a mining method already in operation at the adjacent Kangala Colliery. In this regard, no other location alternative is being considered in this EIA report
- The conveyor technology alternative has been scoped out and only the road transportation option is included in the EIA phase.
- The geological conditions and depth to coal are similar to that of the adjacent operation at Kangala Colliery. During our geological modelling and mine planning exercises, Eloff Mining Company explored various mining options before deciding on the most economically viable selection. These options take into consideration coal seam thicknesses, cover or overburden depth to coal, incremental stripping ratios to the different coal seam floors and some obvious economic considerations. There is clear overburden depth, rock strength and pillar width limits or restrictions when considering underground mining and all pointers out of the preliminary and feasibility studies suggest that stripping ratios and financial modelling evaluations of all economically mineable coal seams are appreciative of opencast mining. Therefore, no assessment of mining method alternatives forms part of this EIA report.
- The current preferred approach in respect of mine residue stockpiles for Eloff Phase 3 will be to remove and place all hard and soft rock at the existing approved facilities at Kangala Mine. Therefore there will be no requirement for waste residue deposits or stockpiles on the Eloff Phase 3 application area. As such no assessment of alternative stockpile locations is included in this EIA report.

The following alternatives were assessed in detail in this EIA report:

- **Activity Alternative A1 – Mining**: This option relates to the land within the proposed project area being used for mining activities. The extent of the mining activities will be subject to the findings of the EIA process guided by the sensitivity-based approach; and
- **Activity Alternative A2 – Farming**: This option relates to continuing with the current land use within the project area which is farming (i.e. cultivation / livestock).
- **Site Layout Alternative S2b – Maximum mining over entire area**: This alternative involves mining over the entire proposed opencast mining pit extension area. This option can only be considered if no high-sensitivity and / or no-go areas are identified within the proposed project area.
- **Site Layout Alternative S2c – Sensitivity-based approach:** This alternative aims to avoid no-go areas and highly sensitive areas and takes into account specialist recommendations regarding buffer distances from important environmental features.

- **Process Alternative P3a – Dewater-store-discharge**: This process would pump the water out of the mining pit workings, followed by storage in the PCD and possible discharge.
- **Process Alternative P3b – Pump-store-evaporate**: This process alternative involves the dewatering of the mine workings where the coal reserves are located. This would involve dewatering by pumping the water into the open void and allowing the water to evaporate gradually. The relevant water storage legislation will be adhered to, in this regard.
- **Process Alternative P4a – Using water obtained from dirty water containment facilities**: This option involves utilising dirty water from the containment facilities (e.g. stockpile dump area sumps containing dirty runoff water, and Kangala Colliery PCD holding dirty water from the pit, etc.) for some of the mining activities such as dust suppression at the haul roads and coal beneficiation processes at the CHPP; and
- **Process Alternative P4b – Water from existing licensed water resources**: Potable water is already supplied to the Kangala complex from a borehole and / or the Rand Water Board, and similarly it is anticipated that the potable water for the Eloff Phase 3 Project will be sourced from existing licenced resource such as boreholes and / or municipal supply whereby the amount of water utilised for the project is to be within the allocated thresholds for the water source.

This section describes the advantages and disadvantages of the various alternatives described above. Input from specialists was obtained in order to complete this section, as presented in Table 11.

Table 11: Summary of alternative options for assessment in EIA phase

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
Process Alternatives	Dewatering	P3a	Pump-store-discharge.	• Reduce impact on groundwater system because smaller surface volumes to drive any pollution plumes. • Longer before post-mine floods; longer before decant treatment. • Positive impacts resulting from the discharge of good water quality allowing for the proliferation of more sensitive organisms downstream. • Discharge of water may also serve to support wetland areas associated with	• Need very large treatment system to permit timeous dewatering of workings. • No buffer facility for future water requirements. • Potential water quality impacts if discharge is of poor quality. In addition, water quantity impacts (altered flows) may also negatively affect local water resources. • River baseflows will increase. This may have negative consequence in the dry season as the river systems are designed for lower base flows. This may also temporarily	• Water quality impacts: *Significance: Moderate - High* *Duration: Long-term* *Probability: Moderate* *Reversibility: None* *Irreplaceable loss: Yes* • River baseflow increase: *Significance: Moderate* *Duration: Medium-term* *Probability: Moderate* *Reversibility: None* *Irreplaceable loss: Yes*		✓

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
				the discharge point. • Water will contribute to the catchment yield.	affect the river system *i.t.o*. river bank stability and hydrodynamics due to increased flow velocities.			
		P3b	Pump-store-evaporate.	• Penstock area gives a buffer capacity during peak pumping times. • Increased retention times can result in improved water quality of evaporating water. • Seasonal discharge variations and instream flow requirements could be accommodated if there is enough capacity in the existing penstock area.	• If storage gets too full, it will serve as driver for contaminant plume. • Potential risk in storage of large quantities of contaminated water (spillage). In addition, water quantity impacts (altered flows) may also negatively affect local water resources. • Greater surface area of disturbed land not rehabilitated.	• Potential groundwater contamination: *Significance: Moderate - High* *Duration: Long-term* *Probability: Moderate* *Reversibility: None* *Irreplaceable loss: Yes* • Water quality impacts (altered flows): *Significance: Moderate - High* *Duration: Long-term – Permanent* *Probability: Moderate* *Reversibility: Low* *Irreplaceable loss: Yes*		X

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
	Water supply	P4a	• Water for activities such as dust suppression obtained from dirty water containment facilities (e.g. Kangala Colliery PCD, etc.).	• Assist to reduce water to be treated. • Reduced use of clean water thus reducing overall water impact. • This will reduce the risk of surface water discharge.	• No significant disadvantages or impacts identified at this stage.			✓ A combination of Process Alternative P4a and P4b is considered the most suitable option. Make-up supply for the CHPP will be supplied from the existing Press Steel Tank that is fed by boreholes (KAM01 and KAM03) or from Rand Water. Dirty water will be re-used as a priority where possible from the Kangala PCD.
		P4b	• Water from licenced ground or surface water resources (e.g. borehole	• No additional application for permits or	• Clean groundwater resources to be used for potable water within the	• Impact on water resources through hydrological alteration: *Significance: High*		✓ A combination of Process

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
			abstraction, municipal water, etc.).	licensing required.	community and at the mine. • Groundwater resources availability. • Negative impacts to water resources in the catchment through hydrological alteration (reduction in water availability).	*Duration: Permanent* *Probability: Moderate* *Reversibility: Low* *Irreplaceable loss: Yes*		Alternative P4a and P4b is considered the most suitable option. Make-up supply for the CHPP will be supplied from the existing Press Steel Tank that is fed by boreholes (KAM01 and KAM03) or from Rand Water. Dirty water will be re-used as a priority where possible from the Kangala PCD.
Activity Alternatives	Land-use alternatives	A1	• Land used for mining.	• Economic advantages include continued employment for mine workers, as well as local	• Potential for hydrological and chemical modification in local soils, wetlands and aquatic ecosystems.	• Mining impacts identified above as well as in Section 9 of this report.	• Kangala Colliery is an already operational mine, continued mining at the adjacent	✓

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
				and regional economic benefits in the short term. • opportunity to return to farming lad use post-closure of the mining activities.			Phase 3 Project area is considered the most feasible land use going forward unless environmental impacts associated with the extension cannot be mitigated to acceptable levels.	
		A2	• Land used for farming (crop cultivation / livestock).	• Land will be restored to original use consisting of livestock grazing and crop cultivation. • Reduced risk for water contamination and subsequent wetland and aquatic ecological degradation.	• Potential water quality, hydrological and soil impacts associated with agriculture. This includes nutrient input from livestock and cultivation practices as well as the physical alteration of the watercourse banks.	• Soil impacts associated with farming: *Significance: Moderate – High* *Duration: Long-term – Permanent* *Probability: Moderate* *Reversibility: Moderate* *Irreplaceable loss: Yes*		X *Sub-optimal land use*

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
						• Hydrological impacts associated with farming (alteration of watercourses): *Significance: Moderate – High Duration: Long-term – Permanent Probability: Moderate Reversibility: Low Irreplaceable loss: Yes*		
		A3	• No-go alternative which is the equivalent of continuing with existing farming land use.	• Reduced risk for water contamination and subsequent wetland and aquatic ecological degradation. • Reduced risk to the health and safety of the local communities. • Reduced social and visual impacts.	• Agricultural and residential activities will likely take place if the no-go alternative is followed. This may result in potential impacts to soils, wetlands and aquatic ecology.	• Similar to impacts for farming activities above due to the fact that current agricultural and residential activities will likely take place if the no-go alternative is selected as preferred.		X

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
Location Alternatives	Micro-siting location alternatives	S1a	• Initially larger Phase 3 Project area extending further south of the currently proposed project area.	• Stand-alone coal basin. • Mining all coal in basin. • Access to more coal product. • Most of the mining infrastructure already exists at the Kangala Colliery.	• Increased disturbance footprint. • Direct impact on watercourse.	• Surface disturbance leading to impacts on biodiversity: *Significance: Moderate – High* *Duration: Medium-term* *Probability: High* *Reversibility: Moderate* *Irreplaceable loss: Yes* • Impact on water resources through hydrological alteration: *Significance: High* *Duration: Permanent* *Probability: Moderate* *Reversibility: Low* *Irreplaceable loss: Yes*		X
		S1b	• Maximum mining over entire proposed Phase 3 Project area.	• Stand-alone coal basin. • Mining all coal in basin. • Most of the mining infrastructure already exists at the Kangala Colliery.	• Unregulated, buffer insensitive mining can result in permanent impacts to soil, wetland habitats as well as downstream aquatic ecosystems.	• Ecological impacts due to surface disturbance, however this alternative will only be considered if the on-site investigations reveal no areas within the project area are of		X

Alternative Category		Ref	Alternative description	Advantages	Disadvantages / Impacts / Risks	Extent, Duration and Significance of potential impacts for each alternative	Additional Comments	Preferred Alternative
						particular environmental concern or sensitivity.		
		S1c	• Sensitivity-based approach (avoid / buffer environmentally sensitive areas).	• The avoidance of wetland and riverine areas and the preservation of a buffer zone can assist in the regulation of potential water quality impacts and reduce ecosystem degradation overall.	• Less mining area for the proposed extension therefore making the Phase 3 Project less economically viable and profitable.	• No significant impacts apart from the economic impact on the mine and loss of available resource.		✓

7 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 opinions are taken into account, and a record included in the reports submitted to relevant authorities. The process aims to ensure that all stakeholders are provided an 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 in order to ensure and promote:

- Compliance with international best practise options;
- Compliance with national legislation;
- Establish and manage relationships with key stakeholder groups; and
- Encourage involvement and participation in the environmental study and authorisation / approval process.

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

- Provide an opportunity for I&APs to obtain clear, accurate and comprehensible information about the proposed activity, its alternatives or the decision and the environmental impacts thereof;
- Provide I&APs with an opportunity to indicate their view-points, issues and concerns regarding the activity, alternatives and / or the decision;
- Provide I&APs with the opportunity to suggest ways of avoiding, reducing or mitigating negative impacts of an activity and enhancing positive impacts;
- Enable the applicant to incorporate the needs, preferences and values of I&APs into the activity;
- Provide opportunities to avoid and resolve disputes and reconcile conflicting interests;
- Enhance transparency and accountability in decision-making;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and / or prevent environmental impacts associated with the project.

The PPP for this project has been undertaken in accordance with the requirements of the MPRDA and NEMA, as well as 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.

7.1 LEGAL COMPLIANCE

The PPP must comply with several important sets of legislation that require public participation as part of an application for authorisation or approval, namely:

- The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002 – MPRDA);
- The National Environmental Management Act (Act No. 107 of 1998 – NEMA);
- The National Environmental Management Waste Act (Act No. 59 of 2008 – NEMWA); and
- The National Water Act (Act No. 36 o1998 – NWA).

Adherence to the requirements of the above-mentioned Acts will allow for an Integrated PPP to be conducted, and in so doing, satisfy the requirement for public participation referenced in the Acts. The details of the Integrated PPP followed are provided below.

7.2 GENERAL APPROACH TO PUBLIC PARTICIPATION

The PPP for the proposed Phase 3 Project has been undertaken in accordance with the requirements of the MPRDA, NWA and NEMA, as well as 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. The PPP for the proposed Phase 3 Project have been undertaken in accordance with Chapter 6 of the NEMA EIA Regulations (2014, as amended).

7.3 IDENTIFICATION OF INTERESTED AND AFFECTED PARTIES

The I&AP databases compiled for various past environmental authorisation processes in the vicinity of the proposed Phase 3 Project have been utilised towards compiling a pre-notification register of key I&APs to be notified of the Environmental Authorisation Application. The I&AP database includes amongst others: landowners, communities, regulatory authorities and other specialist interest groups. Additional I&APs have been registered during the initial notification and call to register period. The I&APs database will continue to be updated throughout the duration of the EIA process. A full list of I&APs is attached in Appendix C.

7.3.1 LIST OF AUTHORITIES IDENTIFIED AND NOTIFIED

The following Government Authorities were notified of the proposed project:

- Mpumalanga Department of Agriculture, Rural Development, and Land Administration
- Mpumalanga Department of Economic Development and Tourism
- Mpumalanga Department of Health
- Mpumalanga Department of Human Settlement
- 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 Environmental Affairs
- National Department of Mineral Resources
- National Department of Agriculture, Forestry and Fisheries
- National Department of Rural Development and Land Reform
- National Department of Water and Sanitation
- Cooperative Governance and Traditional Affairs (COGTA)
- Nkangala District Municipality
- Victor Khanye Local Municipality
- South African National Roads Agency Limited (SANRAL)
- Eskom Holdings SOC Limited
- Transnet SOC Limited
- South African National Parks (SanParks)
- South African Heritage Resources Agency (SAHRA)

7.3.2 OTHER KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

The following key stakeholders have been identified and notified of the proposed project:

- Mpumalanga Landbou / Agriculture
- Delmas Agricultural Council
- Birdlife South Africa
- Council for Geosciences
- Wildlife & Environmental Society of South Africa (WESSA)
- AFGRI
- Grain SA

- Agri Mpumalanga
- South African National Biodiversity Institute (SANBI)
- Mpumalanga Wetland Forum
- Endangered Wildlife Trust
- Adjacent landowners

7.4 INITIAL NOTIFICATION OF I&APS

The PPP commenced on the 10th August 2018 with an initial notification and call to register for a period of 30 days, ending on the 10th September 2018. Initial call to register notifications were conducted as presented below.

7.4.1 REGISTERED LETTERS, FAXES AND EMAILS

Registered letters, emails and facsimiles (faxes) were prepared and distributed to the identified relevant authorities, affected and adjacent landowners and legal occupiers, ward councillors and other pre-identified key stakeholders. The notification documents included the following information:

- The purpose of the proposed project;
- Details of the MPRDA, NEMA and NWA Regulations that are anticipated to be applicable and must be adhered to;
- List of anticipated activities to be authorised;
- Location and extent of activities to be authorised;
- Details of the affected properties (including a locality map or an indication of where the locality map may be viewed or obtained);
- Brief but sufficient detail of the intended operation to enable I&APs to assess / surmise what impact the project will have on them or on the use of their land (if any);
- Initial call to register duration; and
- Contact details of the EAP.

In addition, a registration form was included in the registered letters, emails and facsimiles distributed to I&APs and it included a request for the following information from I&APs:

- Provide information on current land uses and their location within the area under consideration;
- Provide information on the location of environmental features on site,
- State how and to what standard or extent they perceive these identified features are likely to be impacted upon by the proposed project;
- Provide information on how they consider that the proposed Phase 3 Project will impact on them or their socio-economic conditions;
- Make proposals as to how the potential impacts on identified environmental features, their infrastructure, and socio-economic concerns may be managed, avoided or mitigated;
- Details of the landowner and information on lawful occupiers;
- Details of any communities existing within the area;
- Details of any Tribal Authorities within the area;
- Details of any other I&APs that need to be notified;
- Details on any land developments proposed; and
- Any specific comments or concerns regarding the proposed Phase 3 Project application for environmental authorisation.

Proof of the registered letters, emails and facsimiles that were distributed during the initial notification and call to register period are attached in Appendix C.

7.4.2 SITE NOTICES AND POSTERS

14 Site notices were placed along the perimeter of the proposed project area and its surroundings on 3rd August 2018. Furthermore, A3 posters (English and Afrikaans) were placed at three public areas / venues in the vicinity of the proposed project area. The on-site notices and posters included the following information:

- Project name;
- Applicant name;
- Project location;
- Description of the environmental authorisation application process;
- Legislative requirements; and
- Relevant EAP contact person details for the project.

Please refer to Appendix C for proof of site notice and poster placement.

7.4.3 BACKGROUND INFORMATION DOCUMENT

Included in the I&AP notification letters, emails and facsimiles, was a Background Information Document (BID). The BID includes the following information:

- Project name;
- Applicant name;
- Project location;
- Map of affected project area;
- Description of the environmental authorisation application process;
- Information on document review; and
- Relevant EAP contact person details for the project.

Please refer to Appendix C for a copy of the BID issued to I&APs.

7.4.4 ONE-ON-ONE CONSULTATION

Further to the site notices and A3 poster placement, one-on-one consultations with the community were conducted where possible, whereby the EAP endeavoured to consult with as many I&APs (affected and surrounding landowners, farm workers and land occupiers within and adjacent to the proposed project area, as well as the community at large) during the site notice and poster placement site visit. Encountered I&APs were presented with an A4 size notification as well as a verbal explanation of the project and the EIA and public participation processes. The consultations were as far as possible undertaken in the language of choice of the community member (mostly in isiZulu and Afrikaans). Furthermore, the community members were given an opportunity to provide comment and / or express their concerns regarding the proposed project, as well as to sign the initial notification register towards being included in the I&AP database for future consultation. All comments received to date were recorded and are included in the Issues and Responses Report (Appendix C) and summarised in Table 15 under Section 7.8) .

7.4.5 NEWSPAPER ADVERTISEMENTS

Two advertisements (English and Afrikaans) were placed on the 10th August 2018 in the Streeknuus newspaper which was indicated to have the widest reach within the project area and its vicinity towards notifying the public regarding the proposed Eloff Phase 3 Project. An English notice was also published in the Mpumalanga Provincial Gazette on the 3rd August 2018. The details of the advertisements are presented in Table 12 below.

Table 12: Details of initial notification and call to registered advertisements

Newspaper	Language(s)	Date/ Issue
Mpumalanga Provincial Gazette	English	03 August 2018 (Provincial Notice 106 of 2018, Volume 25 No. 2953)
Streeknuus	English and Afrikaans	10 August 2018

The newspaper advertisements and the provincial e-gazette included the following information:

- Project name;
- Applicant name;
- Project location;
- Description of the environmental authorisation application process;
- Legislative requirements; and
- Relevant EAP contact person details for the project.

As stated in sections above, I&APs were provided a period from 10th August 2018 to 10th September 2018, to register for the proposed project. It is important to note however, that I&AP registration is on-going and will continue through the EIA process.

7.5 AVAILABILITY OF SCOPING REPORT

Notification regarding the availability of the Scoping Report for public review was given in the following manner:

- Registered letters with details on where the Scoping Report is available from, as well as the duration of the public review comment period, were distributed to all registered I&APs (which includes key stakeholders, affected and surrounding landowners, and registered occupiers);
- Facsimile notifications with information similar to that in the registered letter described above, were distributed to all registered I&APs; and
- Email notifications with a letter attachment containing the information described above were also distributed to all registered I&APs.

The Scoping Report was made available for public review at the Delmas Pubic Library from the 12th June 2019 until the 13th July 2019, for a period of 30 days.

Table 13: Details of Scoping Report adverts

Newspaper	Language(s)	Date/ Issue
Streeknuus	English and Afrikaans	13 June 2019

A public meeting as well as a Focus Group Meeting was held at the Delmas Afgri Hall during the Scoping Report public review period on 3 July 2019. The main objectives of the meetings were to share available information with the I&APs pertaining to the findings of the Scoping phase studies, as well as to provide the I&APs with the opportunity to ask questions, raise potential issues and concerns, and to make comments on the proposed project. Details of the venue, date and time of the public meeting were included in the Scoping Report availability notifications distributed to registered I&APs.

7.6 NOTIFICATION OF AVAILABILITY OF EIA REPORT

Notification regarding the availability of the EIA Report for public review has been given in the following manner:

- Registered letters with details on where the EIA Report is available from, as well as the duration of the public review comment period, were distributed to all registered I&APs (which includes key stakeholders, affected and surrounding landowners, and registered occupiers);
- Facsimile notifications with information similar to that in the registered letter described above, were distributed to all registered I&APs; and
- Email notifications with a letter attachment containing the information described above were also distributed to all registered I&APs.

The EIA Report was made available for public review at the Delmas Public Library from the 11th February 2020 to the 14th March 2020, for a period of 30 days.

Table 14: Details of EIA Report adverts

Newspaper	Language(s)	Date/ Issue
Streeknuus	English & Afrikaans	14 February 2020
Mpumalanga Provincial Gazette	English	14 February 2020

7.7 PUBLIC MEETING

A public meeting will be held during the review period of the EIA report on the 19th of February at 16:00 at the Agri Lapa in Delmas.

7.8 ISSUES AND RESPONSES

Issues raised to date have been addressed in a transparent manner and the full details (such as the comment received, the name of the I&AP who commented, the issue raised and the main aspect of the raised issue, as well as the response provided to the I&AP) included in the Public Participation Report (Appendix C). A summary of the key issues / comments raised and an indication of how and where these issues are addressed in this EIA Report, is presented in Table 15 below.

Table 15: Summary of issues raised by I&APs

Aspect	How it was addressed	Where issue is addressed
Air quality		
A concern was raised regarding the effect of coal dust and dust from blasting on air quality.	The EIA air quality impact assessment includes an assessment of the impact of dust from blasting on agricultural production and crops	Refer to section 9.3.8
Hydrology and Geohydrology		
Several concerns were raised regarding water related issues: - Location of the mine on a dolomitic aquifer used for groundwater supply to Delmas Town and for large scale irrigation farming - Potential Impacts on the groundwater supply - Pumping of water, if necessary, from open pits and associated authorisations. - Request for information regarding the water balance, salt balances and the capacity of the PCD. - Quaternary catchments associated with the current application and potential future projects. - Surface water uses in the in the affected catchment	- Inclusion of detailed assessment of potential impacts on the dolomitic aquifer. - Detailed assessment of groundwater impacts assessed in groundwater specialist study - Detailed assessment of hydrology impact assessed in hydrology specialist study	Refer to sections 9.3.5 and 9.3.4
Wetlands		
- Impact of dewatering on surrounding wetlands - Impact on the ESA wetlands and subsequent wetland offset strategy	- Further detail was provided in the EIA phase.	Refer to section 9.3.6 and wetland offset strategy included in Appendix D.
Plan of Study		
- Updates to the plan of study to include: a. Surface geophysical mapping to delineate dolerite structures and faults b. Site specific stratigraphic information	- Plan of study was updated to include these aspects	The Plan of Study in the final scoping report included these aspects.

Aspect	How it was addressed	Where issue is addressed
c. Inclusion of surface water users in the affected catchment d. Geohydrological conceptual modelling **e.** Impact assessment of wetlands for all life cycle phases		
Blasting and Vibrations		
- Impact of blasting and vibrations on the local surrounding community/ farmers - Potential impact of fly rock - Impact on agricultural production.	- Blasting and Vibration specialist report updated in the EIA phase. - Potential impact of fly rock has been identified and will be assessment in the EIA phase. - Air quality impact assessment includes an assessment of the impact of dust from blasting on agricultural production and crops. - Blasting repot will include assessment of blasting on farming infrastructure.	Refer to section 9.3.10.
Cumulative Assessment		
- Cumulative Impact of the current application for Eloff Phase 3 and the remaining 6 phases of future proposed mining, as well as any other application in the area. - Cumulative effect of the proposed project on the underlaying aquifer, ground water, surface water and other potential impacts	- The EIA report includes further detail on the cumulative impacts of the proposed project.	Refer to section 11
Registration		
- Various request for registrations were received for the project. The following I&APs requested to be added to the project (but not limited to): o – Various farmers/ landowners/ occupiers/ adjacent landowners o Kallie Mandel Trust o JMA Consulting o Delmas District Farmers Union o Boshoff Smuts Inc	- I&APs were registered to the project I&AP database and provided the opportunity to participate in the EIA process.	Refer to Appendix C: Public Participation

Aspect	How it was addressed	Where issue is addressed
○ BGM Trading ○ Agri Delmas ○ Mpumalanga Landbou		
Land Use and Zoning	-	
- Concerns were raised regarding the baseline description for the land use and zoning of the area.	- EIA report amended to provide clarity on the baseline description.	Refer to sections 8.5 and 9.3.12
Socio-Economic Impacts	-	
- Concerns regarding the effect of mining on the agricultural potential of the project area. - Concerns were raised regarding the job loss and loss of agricultural land as a result of the proposed mining. - Concerns were raised regarding the number of job opportunities to be created or lost by the proposed project.	- Land use study undertaken for EIA phase - A full land use study was undertaken in the EIA phase. - Socio-Economic Report was updated to address the social conditions of the affected communities and provide more detail on the socio-economic benefits and impacts of the proposed project.	Refer to section 9.3.12
Public Participation Process	-	
- Concerns regarding the PPP undertaken to date - Concerns regarding the focus group meeting held during the Scoping Phase that included other members of the public who were not able to attend the public meeting later that day.	- The PPP is being has been conducted and will continue to be conducted, in accordance with the NEMA requirements.	Refer to Appendix C: Public Participation
Agriculture and food security		
- Concerns regarding the assessment of the impact on the agricultural importance of the area	- Plan of study was revised to include the farming land use alternative assessment in the EIA phase.	Refer to section 9.3.12
Need and Desirability		
- Concerns were raised regarding adequacy of motivation for the need and desirability for the project.	- EIA report elaborates on the target resource for the mined coal. - Economic viability for Phase 3 pit will form part of the land use assessment study in the EIA phase. - The Need and Desirability section was updated in the EIA report based on the outcomes of the specialist reports.	Refer to section 5

Aspect	How it was addressed	Where issue is addressed
Legislation and EIA process		
- Exclusion of legislation relevant to the application - NEMA listed activities not applied for - Concerns were raised regarding the proposed time frames for the authorisation process.	- The list of legislation has been updated to include the relevant legislation. - If there is a need for additional activities to be applied for an amended application will be submitted to the DMR. This will be confirmed prior to the start of the EIA phase. - The proposed time frames are indicative. The EAP will ensure that all legal timeframes in the NEMA EIA process is adhered to.	Refer to section 4.1
Alternative Assessment		
- Concerns were raised regarding the alternative assessment conducted for the proposed project.	- Further detail regarding the suitability or restrictions of the site for the proposed project are provided in the EIA report.	Refer to section 6
Cultural and Heritage resources		
- Concerns were raised regarding existing tombs and graves located on the project area that have been historically exhumated with no consultation.	- Relocation permits for heritage sites will need to be applied for prior to mining commencing in that area - EIA phase HIA included field investigations.	Refer to section 9.3.1
Soils		
- Impact on soils and the loss of land capability.	- The Land use study considers the impact of soil and land capability. A soils study also investigated the available management and mitigation measures to attempt to reinstate a level of post mining agricultural functionality.	Refer to section 9.3.7
Closure and Rehabilitation		
- Concerns were raised regarding the proposed rehabilitation plans to be undertaken concurrently. - Costs for the provision of post closure mine water treatment to manage the anticipated decant volume and quality.	- Clarity was provided regarding the rehabilitation process to be undertaken. - A Financial Provisioning Quantum as per the requirements of GNR 1147 is included in the EMPr.	Refer to EMPr (Appendix D) and accompanying rehabilitation and closure report

8 ENVIRONMENTAL ATTRIBUTES AND BASELINE

This section of the EIA Report provides a description of the environment that may be affected by the proposed Phase 3 Project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed extension have been described. Baseline information sourced from the various specialist studies has been utilised to prepare the environmental attributes baseline below.

8.1 TOPOGRAPHY

A National Aeronautics and Space Administration (NASA) Shuttle Radar Topography Mission (SRTM) (V3.0, 1 arcsec resolution) Digital Elevation Model (DEM) was obtained from the United States Geological Survey (USGS) Earth Explorer website. Basic terrain analysis was performed on this DEM using the SAGA GIS software that encompassed slope and channel network analyses in order to detect catchment areas and potential drainage lines respectively. The following processes have been considered for the desktop assessment:

- The project area is gently sloping to the north east, with an elevation range from approximately 1570 meter above sea level (masl) to 1620 masl (Figure 10);
- The project area is dominated by flat / gentle slopes between 0% and 4% without any major height changes within the project boundaries (Figure 11); and
- The northern portion is north facing, with the remainder being east facing (Figure 12).

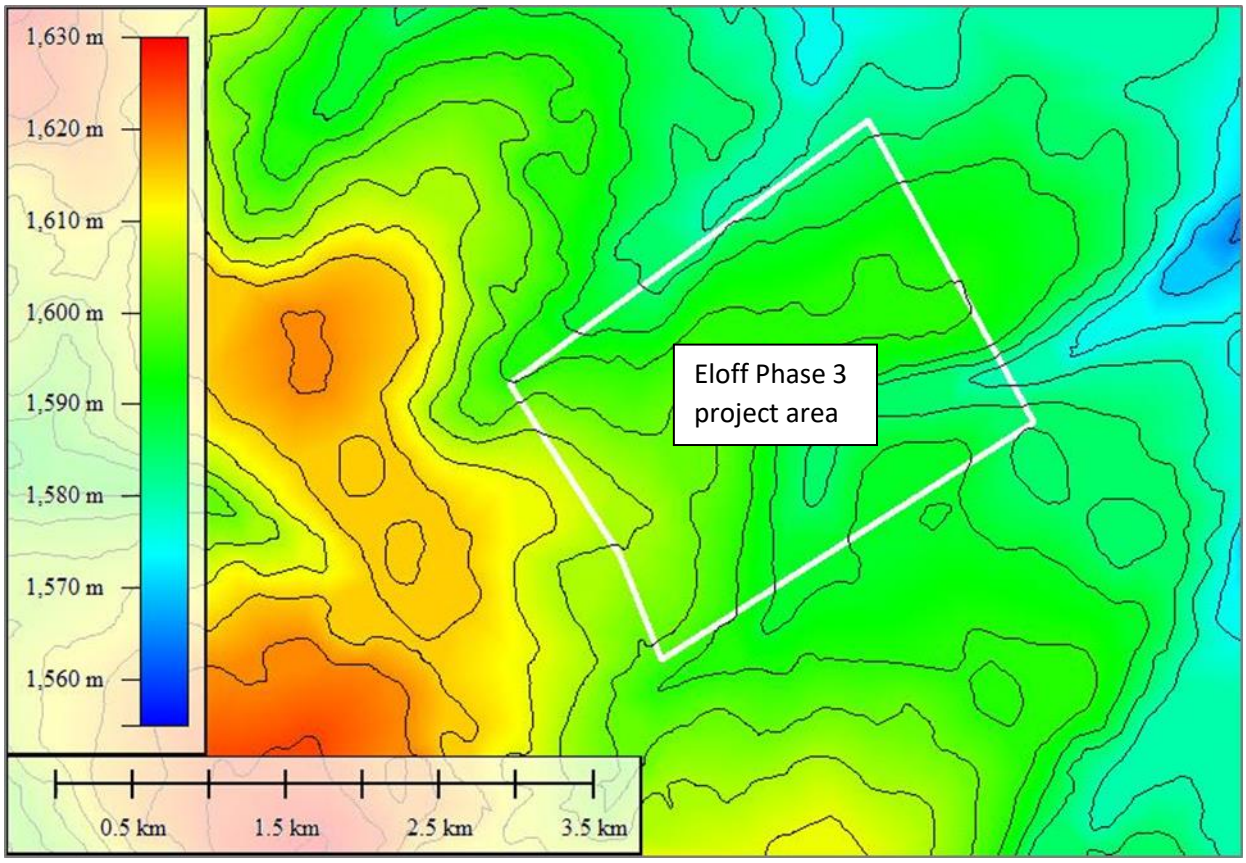

Figure 10: The Relief Map for the Eloff Phase 3 Project area

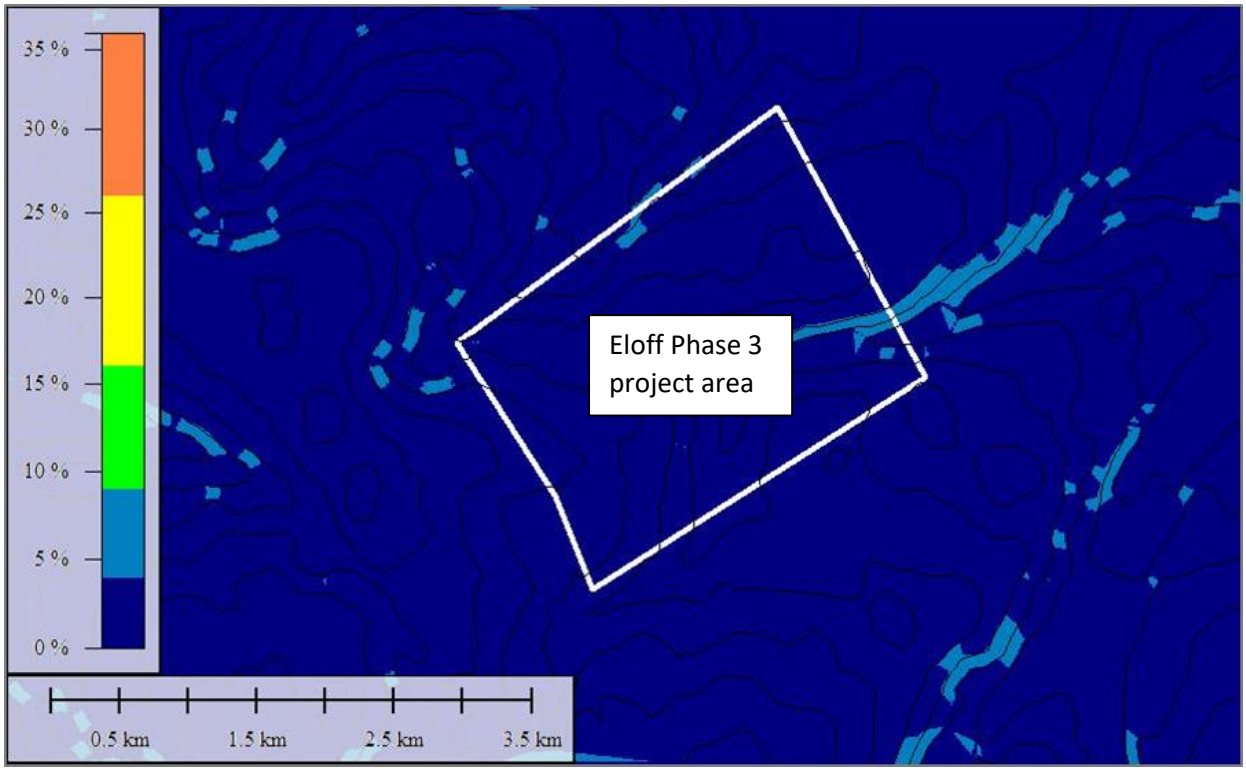

Figure 11: The Slope Percentage map for Eloff Phase 3 Project area

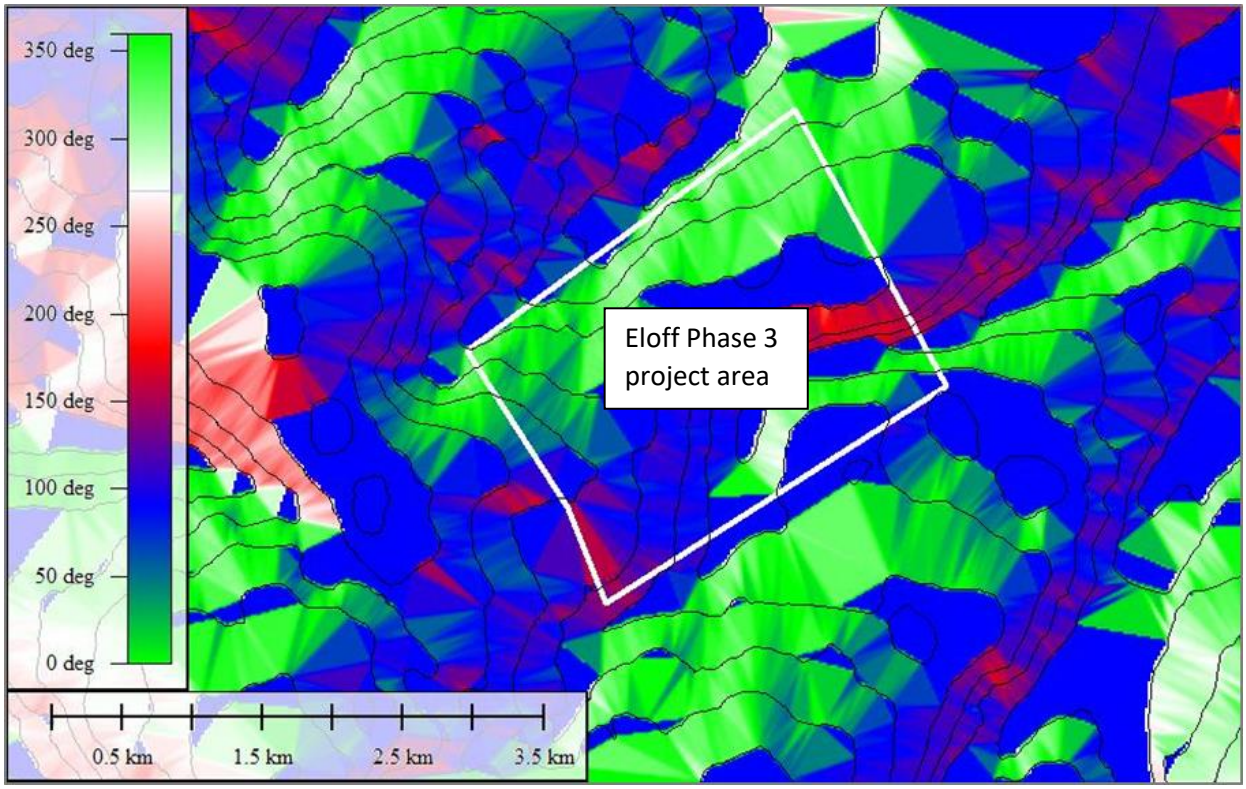

Figure 12: The Slope Aspect map for Phase 3 Project area

8.2 GEOLOGY

According to the geology excerpt from the Eloff MWP (Exxaro Coal Central, 2016), the region consists of the following pre-Karoo lithologies, i.e. granite basement rocks of Archean age, quartzite of the Witwatersrand Supergroup, lava of the Ventersdorp Supergroup, dolomite (Malmani Subgroup), chert, quartzite and shale from the Pretoria Group (Transvaal Supergroup). These are overlain in places by the Karoo Supergroup which consists of diamictite (tillite) of the Dwyka Group followed by sandstone, shale, mudstone and coal of the Vryheid Formation (Ecca Group).

Figure 13 and Figure 14 show the regional and local geology (respectively) of the project area, indicating that the site is underlain by lithologies of the Vryheid Formation (Ecca Group), localized dolerite intrusions and younger alluvium. The Vryheid Formation consists of beds of soft, dark grey sandy shale, which alternates with thick beds of yellow to white cross-bedded sandstone and grit with a few coal seams (GSSA, 1989). There are three major coal seams that occur in the project area namely the Bottom, Middle and Top seams (Exxaro Coal Central, 2016).

The 1:250 000 scale geological map indicates Malmani Subgroup dolomite (Transvaal Supergroup) to the north-east of the project area. A report by Saxum Mining in 2015 titled: "Highwall Profile Definition and Stability Assessment for the Eloff Project – June 2015", noted the following:

- A stratigraphic cross section drawn indicates geological complexity from north to south;
- The depth to the Bottom coal seam ranges from ~62 m on the northern side to ~96 m in the southern side, which is displaced due to a dolerite sill intrusion;
- The dolerite intrusion influences the resource significantly and has caused a reduction in the minable coal; and
- It is suggested that the dolerite intrusion has divided the resource into an eastern and western portion. The dolerite on the eastern side occurs below the Dwyka tillite and occurs as a flat transgressive sill-like body.

The Delmas Coal Field lies at the western extent of the Witbank Coal Field towards the northern edge of the main Karoo sedimentary basin. The area is underlain by sedimentary sequences (predominantly sandstone, shale and coal) of the Vryheid Formation deposited on tillite of the Dwyka Formation or directly on the glaciated basement topography (mostly Malmani dolomites).

The Witbank Coalfield is currently the most important coalfield in South Africa, supplying more than 50% of South Africa's sale of coal. It produces both metallurgical coal and A-grade to D-grade steam coal for the export and local markets and hosts most of the major coal-fired power stations in South Africa to which it supplies low grade coal. In the Witbank Coalfield proper, five coal seams are contained within a 70m thick succession of Vryheid Formation sediments. Dolerite intrusive (dykes and sills) are extensively developed south of the project area, with minor occurrences within the area of interest. The Vryheid Formation locally hosts up to four flat lying coal seams. The economically important No. 4 and No. 2 Seams are the best developed in the area, whereas the No. 1 and 3 Seams occur sporadically and/or joined to the No. 2 Seam.

The No. 4 Seam consists of a mixture of bright and dull coal with occasional shale-y coal intraseam partings. The No.2 Seam consists of alternating coal and carbonaceous shale layers.

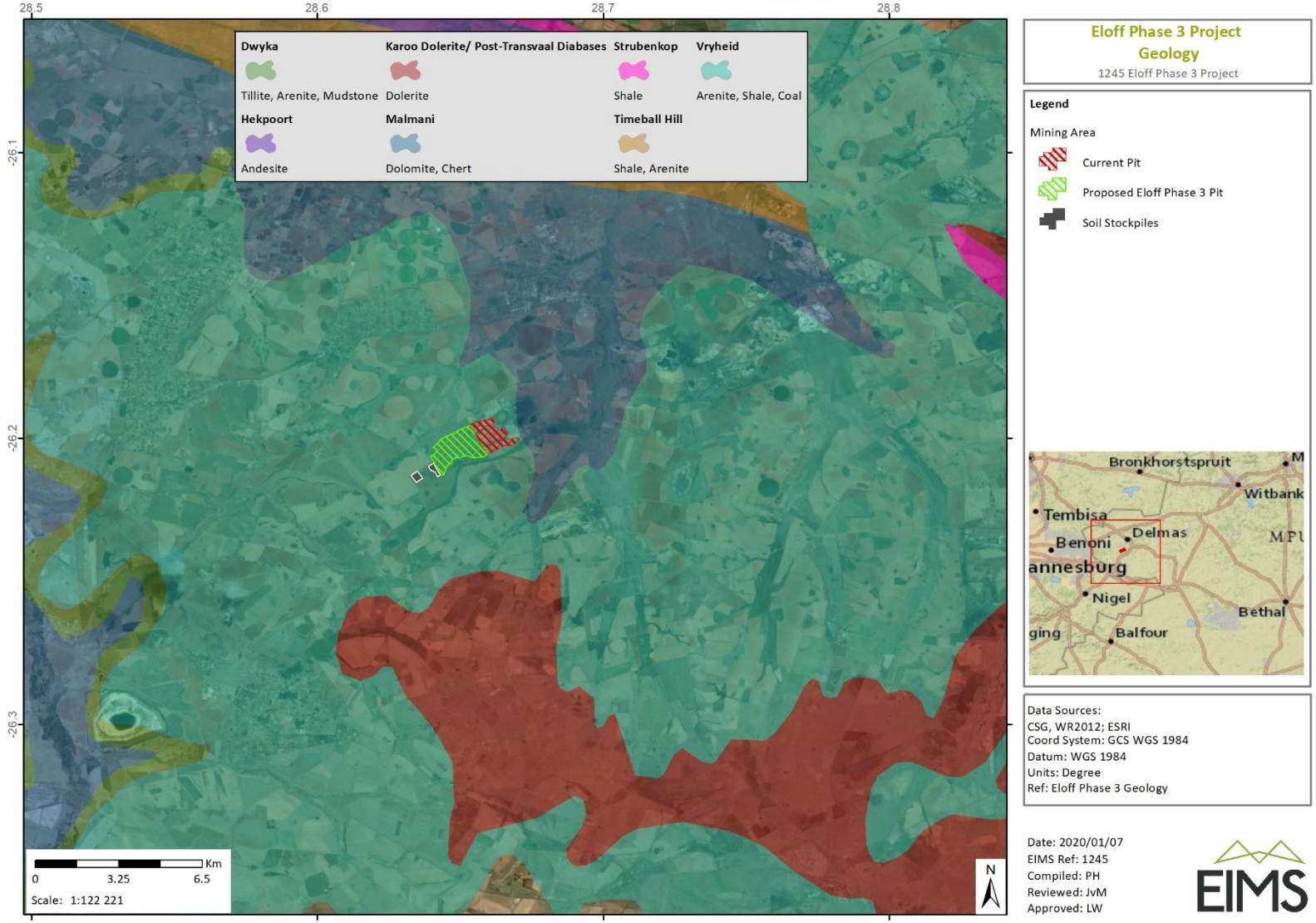

Figure 13: Regional geological map

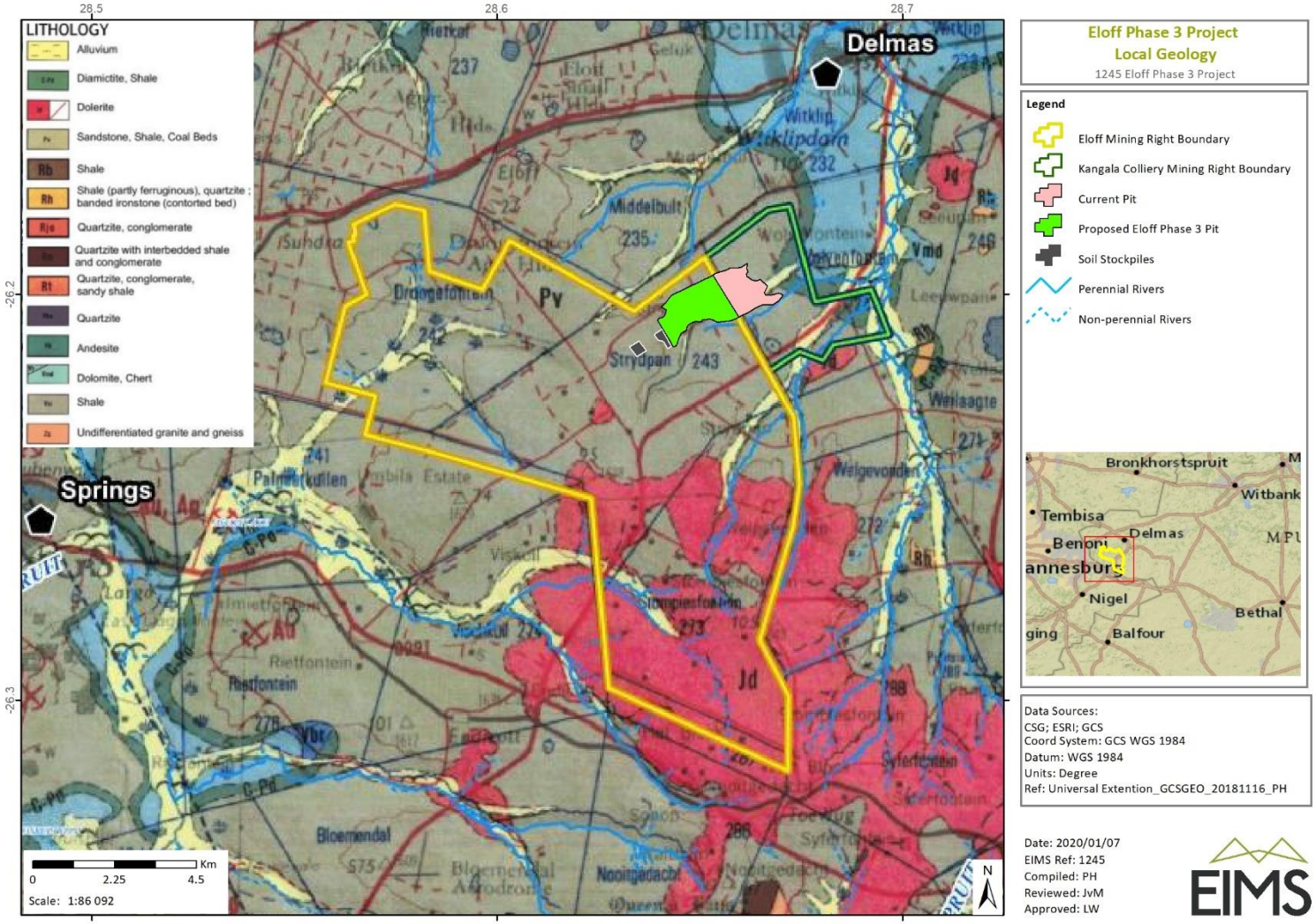

Figure 14: Local geology of the Eloff mining right area within which the Eloff Phase 3 project is located

The Eloff Project-area is mainly underlain by the coal-bearing Vryheid Formation, which is part of the Ecca Group. The area is characterised by undulating pre-Karoo palaeotopographic terrain. The basement elevation indicates two south-west trending valleys, which enter the Eloff Project area on the farm Droogefontein. The West Valley underlies Portions 20, 21, 22 and 25 of Droogefontein and crosses the boundary of the prospect on the southern boundary of Portion 25.

The second and more important Main Valley, enters the prospect on Portion 9 of Droogefontein and can be followed to Portion 25 and 34 of Strydpan. On last-mentioned portion, the Main Valley turns eastwards and drops into a basin, Stompiesfontein Basin. The general elevation of the floor of the West and Main Valley is about 1,520 mamsl.

The sides of the former two valleys are relatively steep and at some 20m high. Both valleys exhibit deep scours that have been cut some 30 m into the valley floor. These deep scours as well as others to be described below can be explained by the glacial action to which the area has been subjected. Glacial action is the only geological agent, bar locally a high waterfall, which can erode a landscape to a level well below its normal erosion base. The three morphological domains mentioned above are interpreted as forming part of the wider Vischkuil Valley.

The Stompiesfontein Basin covers part of Portion 46, 37 and 42 as well as the total of Portion 55, 56, 57, 39, 40, 38 and 41 of Strydpan as well as all the portions of Stompiesfontein located north of a gravel road which leaves the Eloff Project area through the south-eastern corner of Portion 15 of Stompiesfontein.

The floor of said basin is roughly at an elevation of 1 485 mamsl, i.e. some 35 m lower than the valley floors described above. This basin further exhibits scour-pools, that have been incised some 35 m into the basin floor.

In the basin three palaeo-drainage arms can be identified, namely: — A Southwestern Arm. This arm consists of two branches which run parallel to the Stompiesfontein extension of the Western Ridge. The northern branch represents the continuation of the Main Valley and also of the South Valley and this is substantiated by a plunge pool. The two branches join and run northwards to merge with the — Central Arm. This arm runs south-eastwards and is joined by the, — Northern Arm. The collective drainage of the Stompiesfontein Basin leaves the project area through a narrow valley (+ 400 m wide) in a position on the eastern boundary of Portion 15 of Stompiesfontein.

Whilst the earlier exploration holes were terminated on intersection of Dwyka sediments, the holes of the 2007-2008 and the 2008-2009 exploration campaigns were only terminated once basement was intersected. These younger data have been used to contour the basement surface and define the extent of the litho-types encountered.

The basement rocks sampled by the exploration drilling on the Eloff Project consist predominantly of quartzite and shale/schist, chert and subordinate dolomite. Last-mentioned two litho-types are correlated to the Malmani Subgroup of the Transvaal Supergroup.

The data reviewed indicated that the proposed Eloff project area is underlain by Dwyka tillite and sedimentary and chemical deposits associated with the Malmani Sub-group. It is commonly accepted that the Malmani Sub-group consist only of dolomite and chert, but this is not the case, towards the top of the sequence significant deposits of chert and shale are present. The exploration boreholes drilled during the 2008 drilling campaign to define the basement conditions to the Vryheid Formation, verifies this. The intersections of Malmani Sub-group rocks consisted of chert and shale with only a subordinate intersection of dolomite. Based on drilling results in the area underlaying the coal deposits the Malmani does consist predominantly of quartzite and shale/schist, chert and only subordinate dolomite.

The bottom contact of the lower coal seam generally dep in a south-westerly direction as seen in the contour elevations in Figure 3 2. The contact is the shallowest towards the north-western part of the area at an elevation of 1580mamsl and a depth of approximately 50 m below surface. In the south east, the depth of the bottom contact increases to approximately 180m. The thickness of the inter-burden lower Vryheid formation, consisting of shale and sandstone is generally up to 5m thick across the site with some local thicker zones associated with specific boreholes. The thickness of the Dwyka formation is variable but on average it ranges between 10 and

15m thick. Along the central East west axis there are a number of boreholes where the Dwyka intersection were up to 40m thick.

The geohydrological studies in the area show that there are three distinctly different aquifers: a perched aquifer occurring in the weathered and decomposed soils, a fractured rock aquifer associated with the Vryheid formation and a third aquifer associated with the dolomite. The Dwyka Tillite formation forms an effective aquiclude that separate the dolomite aquifer and the Karoo aquifer. Current monitoring at Kangala mine show no evidence that there is a connection between the two aquifers. This indicate that the mines strict drilling and blasting standards are working. The aim of the drill and blast strategy on the bottom seam is not to cause fracturing of the Dwyka to cause possible pollution of the dolomite aquifer.

The groundwater modelling around the mining area show only minimal drawdown of the Karoo aquifer due to mining. The drawdown due to mining on the dolomite aquifer is minimal. The regional drawdown of the dolomite aquifer water levels in the area is primarily attributed to pivot irrigation by farmers.

Based on the principal of maximum development space, it is theoretically possible for very large sinkholes (>15m) to develop in the 30m thick weathered soil profile, but the likelihood of sinkholes forming in these conditions is very low due to the nature of the bedrock. The competent bedrock is more than 20m thick and even though the maximum receptacle size is 3m, the bedrock will easily span any openings that form because the thickness of the stable beam is much thicker than the width of the span across the receptacle. Also, it is unlikely that the groundwater table will be drawn down to expose the dolomite rockhead under current conditions.

As a result of the geotechnical conditions, it is very unlikely that a sinkhole will form on undisturbed land. When considering a situation where the overburden and coal measures are stripped away and only a relative thin beam of competent sandstone and Dwyka tillite remains and the top of the beam is fractured due to mining induced blasting small to medium sized sinkholes (5-7m diameter) can develop in the exposed floor of the strip mine. The exposure of the open floor is limited due to the roll-over mining method and the final un-rehabilitated box-cut the impact will be negligible as the area will be fenced off and access will be restricted to a few years and therefore the exposure is limited.

8.3 CLIMATE

The Eloff Phase 3 Project area falls within the Eastern Highveld Grassland region (Gm12) (Mucina & Rutherford, 2006). Strongly seasonal summer rainfall, with very dry winters. The mean annual precipitation (MAP) is between 650–900 mm (overall average: 726 mm), whereby the MAP is relatively uniform across most of this unit, but increases significantly in the extreme southeast. The coefficient of variation in MAP is 25% across most of the unit, but drops to 21% in the east and southeast. There is an incidence of frost from 13–42 days, but this is higher at higher elevations. Figure 15 illustrates the climate summary for the Eastern Highveld Grassland.

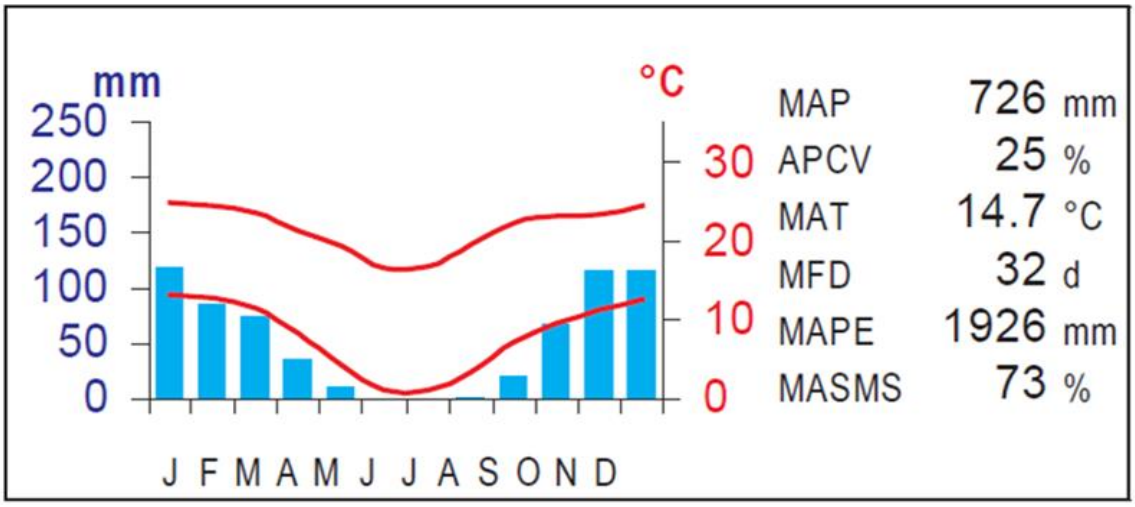

Figure 15: The climate summary for the Eastern Highveld Grassland (Gm 12) region (Mucina & Rutherford, 2006)

The regional average, maximum and minimum temperatures range between 16.5°C, 36.1°C and -2.1°C, respectively. The month of June experiences the lowest temperature of approximately -2.1°C whereas the maximum temperature of 36.1°C occurs in September. During the day, temperatures increase to reach maximum at around 14:00 in the afternoon. Ambient air temperature decreases to reach a minimum at around 06:00 (i.e. just before sunrise).

According to the rainfall data from the Delmas Vlakplaas Weather Station between 1979 and 2009, the mean annual precipitation, on a more local level of the project area, is 681 mm (Maartens, 2011). Precipitation occurs as showers and thunderstorms and falls mainly from October to March (about 58 days of measurable rain per year) with the maximum falls occurring in November, December and January. Rainstorms are often violent (up to 120 mm can occur in one day) with severe lightning and strong winds, sometimes accompanied by hail. The winter months are dry with the combined rainfall in June, July and August making up only 3.1 % of the annual total according to the data obtained from the Delmas Vlakplaas Weather Station.

Furthermore, wind data indicated that during the period of 2014 – 2016 the wind field was dominated by strong winds from the north, west-northwest, east and east-southeast. The strongest winds (more than 6 m/s) were recorded from the northwest and west-northwest, occurring mostly during the day (06:00 to 18:00). Calm conditions occurred 6.0% of the time. An increase in dominant winds from the east and east-southeast occurred at night (18:00 to 06:00). Seasonal wind fields vary considerably. During spring and winter months, the dominant winds are from the north, west-northwest and east. The summer season is dominated by winds from the east and southeast, whereas the autumn season is dominated by easterly, south-easterly, and north-westerly winds.

8.4 SOIL AND LAND CAPABILITY

The land type database (Land Type Survey Staff, 1972 – 2006) indicates that the project falls within the Bb3 land type (Figure 17). The Bb3 land type is dominated by the crest (1) and midslope (3) terrain units (Figure 16). These landscape positions are dominated by Avalon and Hutton soil forms. The valley bottom (5) positions are dominated by Rensburg, Katspruit, and Willowbrooke soil forms. The geology is dominated by shale, sandstone, clay, conglomerate, limestone and marl of the Ecca Group; shale and tillite of the Dwyka Formation, Karoo Sequence; dolerite; occasional Ventersdorp lava, Witwatersrand quartzite and slat; and dolomiteolis.

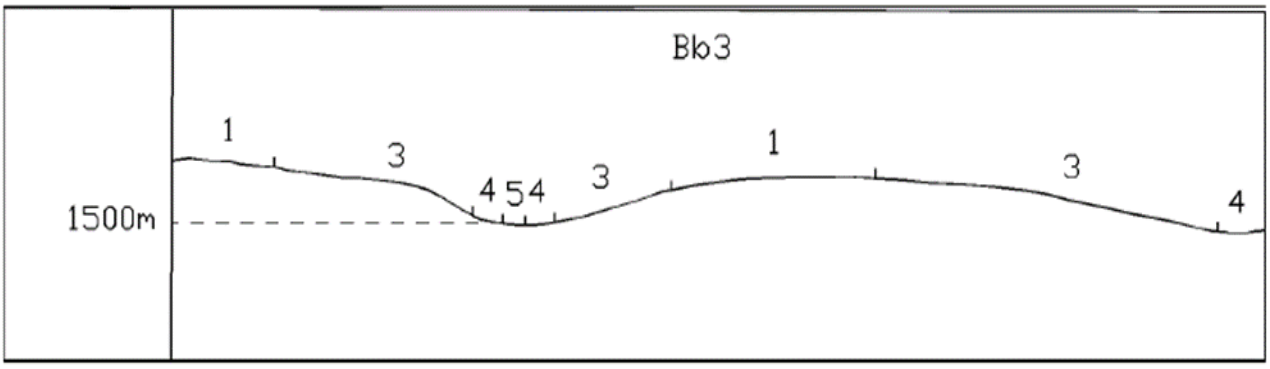

Figure 16: An illustration of the terrain units of the Bb3 land type

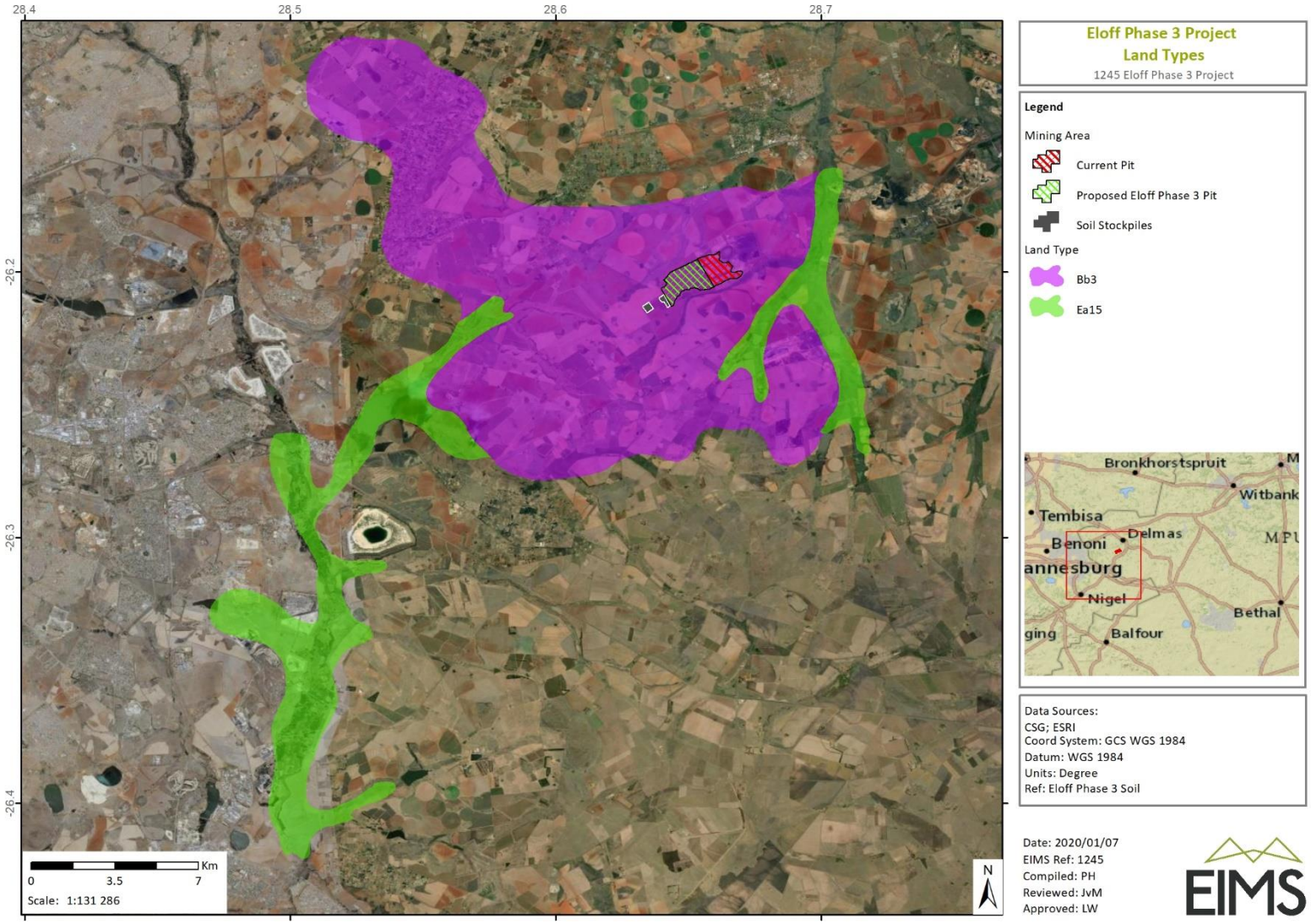

Figure 17: Land type map for the Eloff Phase 3 Project area

The project area is gentle in relief with slopes of less than 4%. The land type data suggest that soils of the Hutton and Avalon soil forms are present in the crest to midslope positions, with Rensburg, Katspruit, and Willowbrooke soil forms in the valley bottoms. The average land capability based on the land type data is that of a class III (moderate cultivation). Class III land would pose moderate limitations to agriculture with some erosion hazard potential and would require special conservation practice and tillage methods. The farming method for this land capability would require the rotation of crops and ley (50%).

Soil profiles were studied up to a depth of 1.5 m to identify specific diagnostic horizons which are vital in the soil classification process as well as determining the agricultural potential and land capability. During the site assessment, four major soil forms were identified, namely; The Oakleaf, Tukulu, Westleigh and Katspruit forms. These soil forms have been delineated and is illustrated in Figure 18. The project area is dominated by the Oakleaf and the Tukulu soil forms. The wetland soil forms of the Katspruit and Westleigh forms.

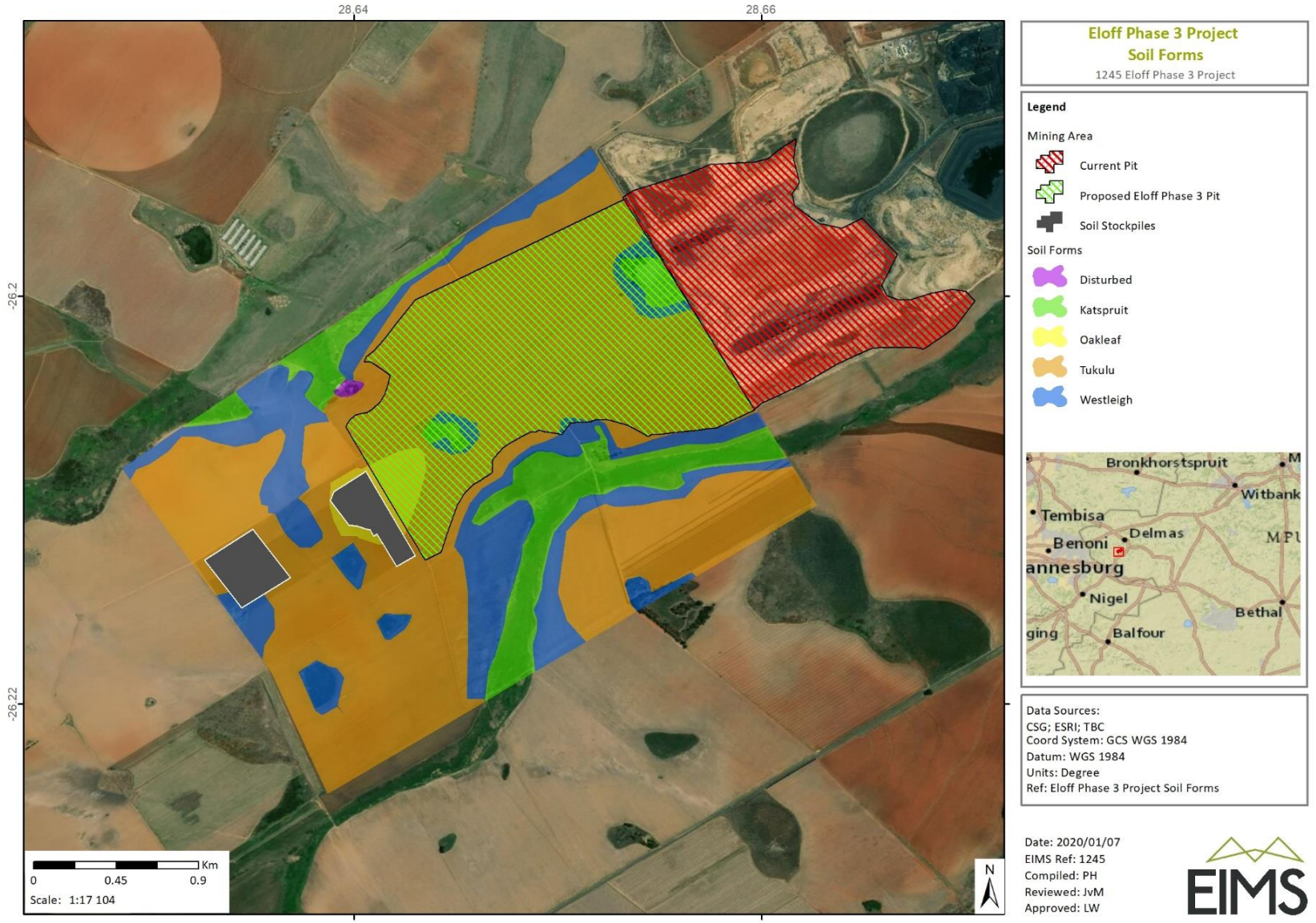

Figure 18: Soil Forms in the Study area

8.5 LAND USE

The land use study was conducted by Strategy for Good in November 2019 for the proposed Eloff Phase 3 Project, the full report is available in Appendix D. The current land use is mostly croplands with some depressions within the project boundary, the area to the east of the project area has been mined. In general however, the dominant land use of the surrounding area is cultivated land / agriculture, predominately maize cropping and to a lesser extent other crop plants such as soya. Remaining areas of natural vegetation are utilised for livestock grazing predominately by cattle. Other land uses nearby include extensive coal mining operations, most of which are opencast mines.

The District is predominantly a rural area, comprising extensive farming, nature reserves and mining areas. There are approximately 165 towns and villages distributed throughout the area. The Nkangala District has a dispersed spatial structure that can mainly be ascribed to the distribution of natural resources (e.g. coal) which determined the location of many settlements, and the former homeland areas to the north which are under Traditional Authority.

8.5.1 SALIENT ECONOMIC BASELINE ASPECTS

This distorted spatial structure makes the provision of community facilities costly and problematic. It results in the duplication of facilities and services, which is evident from the analysis of community facilities in the District. The threshold levels for the provision of community services are, however, low in rural areas due to vast distances and low population densities characterising these areas.

The spatial distribution of people reflects that there are three distinguishable groups of people affected by poverty, namely:

- Tribal Authority Areas: The main concentration of poor people is in the north west of the Nkangala District. The conglomeration of settlements in these areas present communities displaced. These areas have limited local economies, because expenditure until recently mainly occurred closer to employment centres;
- Informal Settlements: The second concentration of poor people is communities residing in informal settlements on the periphery of towns, specifically the informal settlements situated around main city centres. The population densities in these areas are very high, with poor access to basic infrastructure and community facilities. These areas also have no local economies and are reliant on the main centres for employment and business activities; and
- Farms and Mining Villages: The third category of poor people resides in the rural areas on small mining villages and on farms. The communities residing on farms are particularly vulnerable, as they do not have ownership of the land where they are staying and are affected by evictions and unfair labour practices. These communities must travel long distances to the major centres in the Nkangala District to access community facilities and economic activities and are highly reliant on public transport, which is generally poor.

The N4 and N11 freeways create economic opportunities for the Nkangala District through trade opportunities associated with the Maputo and Richards Bay harbours as well as tourism opportunities associated with some of the main tourism centres in South Africa. The inherent potential to this initiative is however not optimally utilised at this stage.

The R540, which runs from the N4 freeway through Emakhazeni and Dullstroom, provides a link with the tourist attractions located in the Graskop, Lydenburg, Sabie, Pilgrim's Rest and Hoedspruit areas (Tourism Triangle) which should be protected and further enhanced in future. The road network in southern parts of the district is frequently damaged due to high volumes of coal haulage.

The NDM Industrial Development Strategy identified significant potential for manufacturing in the District in other centres like Victor Khanye, Emakhazeni, KwaMhlanga, Kwaggafontein and Siyabuswa but most of this

potential is latent at this stage. Agriculture is very important to the economy of the district. The southern regions of Nkangala are suitable to crop farming, specifically for fresh produce such as maize and vegetables. The northern regions are suitable for cattle farming and game farms. Agri-processing and export opportunities in view of the linkages to two harbours are not fully utilised while agricultural activity in Thembisile Hani and Dr JS Moroka is at a very low (mainly subsistence) level.

The Nkangala District offers considerable tourism potential. The economy of the eastern areas of the District is already growing due to the increasing popularity of tourist destinations in the Emakhazeni Municipality. The north western areas of the District also offer opportunities for tourism, through the consolidation of the various nature reserves and open spaces in Dr JS Moroka and Thembisile Hani, but this potential is unexploited at this stage.

The agriculture and tourism sectors have the potential to employ large numbers of relatively unskilled workers. Hence, these sectors should be targeted in order to use indigenous resources to create jobs. The greatest challenge that Nkangala faces is in terms of the availability of water resources, as well as the distribution and management of water services in the former homeland areas.

The Phase 3 pit site is located on or near a dolomitic aquifer of regional importance – refer to Groundwater section 8.14 for further details.

8.5.2 GROSS GEOGRAPHIC ANALYSIS

Nkangala had a Gross Geographic Product (GGP) of R112.3 billion in 2015 and this made up 41.2% of the province's GGP. Nkangala's GGP is 3.1% of the national Gross domestic product (GDP) as at 2015, and this is, relatively speaking, a significant GGP in South Africa. Unfortunately, the average annual growth rate of the Nkangala economy between 2005 and 2015 was only 1.4% and did not match the increase in the population growth rate. The GGP of Victor Khanye at 2015 current prices was R9.6 billion which was 7.8% of the district municipality. Again, relatively speaking, R9.6 billion is a large economy for a local municipality.

The sectoral breakdown of Nkangala shows that agricultural and mining had respective GGP's of R2.1 billion and R45.9 billion. These made up 43% of Nkangala's total GGP of R112.3 billion in 2015. To put this in perspective, mining and agriculture today comprise ~ 10% of the South African economy. The total of coal mining and electricity production makes up 50% of the Nkangala economy, whereas the national equivalent comparison is 12%. This is an indication of how skewed the Nkangala economy is.

In the case of Victor Khanye, the agricultural sector is relatively higher as a proportion of its own GGP compared with the equivalent for Nkangala. In the latter, most of the mining takes place in Emalahleni and Steve Tshwete. The average annual growth rate of agriculture in Nkangala was 1.8% between 2005 and 2015, and for mining it was a relatively low growth rate of 0.9%. The construction and finance sectors had the highest growth rates of all the sectors in the economy.

The Tress index which measures the degree of concentration of an area's economy on a sectoral basis shows that Nkangala has a relatively high concentrated economy as was indicated above where mining and electricity made up more than 50% of the total production in the district. As is to be expected, when a Tress index is high, then one would expect the location quotient for a number of sectors will also be high. A location quotient measures the comparative advantages of one region over another. In the case of Nkangala, the location quotient for mining and electricity respectively is 5 and 2.5 times higher than that of South Africa. On the one hand, this simply corroborates that Nkangala is rich in coal resources, and subsequently power generation plants, which is an undoubted comparative advantage. On the other hand, it also indicates that unless these comparative advantages are widely used for economic diversification, Nkangala's economy may not be sustainable.

8.5.3 LABOUR AND POVERTY

In 2015, Nkangala had a working age population of 920 000 people. Of this amount, the economically-active population was only 573 000 people. The economically-active population had an average annual growth of 3.4%, which confirms that the influx of work seekers, given that the total population growth rate in SA is much lower. Therefore, the labour force participation rate which is the economically-active population, as a percentage of the total working age population in 2015, was 62.3%. This is 9% more than the national average of 57.9%.

Nkangala's employment as at the end of 2015, were 361 000 people, which is 63% of the economically-active people. That puts the unemployment rate at 37% in Nkangala. Using the same yardstick (please note that different commentators use different calculations), this unemployment rate is higher than the 26% for the whole of SA. The reason why Nkangala has such a high unemployment rate is because two of its rural municipalities, Thembisile Hani and Dr JS Moroka have high unemployment rates (around 50% on average), and this reduces the rate for the district. In addition, all the job seekers entering the local economy do not get formal employment.

The effective demand per job every year is on average a paltry 11 000 jobs per annum, whereas the effective supply of labour is 16 000 per annum. Thus, over a ten-year period, the net supply of labour, that did not get a job, amounted to 50 000 people. To understand the dire unemployment situation in Nkangala, and by extension the rest of SA, in the former's case it has 355 000 people employed, and 514 000 without a job. This is effective 59% of the working age population without a job, regardless of how the official statistics calculate the measures.

Due to the highly capital-intensive nature of mining and electricity, one now finds that the majority of Nkangala's employment is in wholesale, retail, and community and business services. It can be argued that these are in fact multiplier jobs created by agriculture, mining and power generation. A very high number of people (32 900) work for other households. Further, between agriculture, mining and electricity, there are respectively 16 000, 49 200 and 12 100 employees. This makes up only 21% of employment, compared to contributing over 60% to the GGP. In other words, the other economic sectors that contribute 40% to the Nkangala GGP provide 79% of the jobs.

The unemployment rate for Victor Khanye is 21.6%, being the second lowest of all the municipalities in the Nkangala district. Steve Tshwete had the lowest unemployment rate at 16.4%. The poverty rate in Victor Khanye stands at 34.1% which is higher than the 32.3% rate for the Nkangala District. The overall percentage of people in Nkangala living in poverty has decreased by a third between 2005 and 2015.

The Human Development Index, which is a composite index of three basic dimensions being life expectancy, adult literacy rate and GDP per capita, has improved by 20% in the last 10 years, and this is a significant improvement. The Emalahleni and Steve Tshwete municipalities have the highest of the human development indices, with Victor Khanye following in third position out of the 6 local municipalities.

In conclusion, the Nkangala economy is spear-headed by the coal and electricity production industries and, as a result, has attracted many job-seekers into the area. Over the last decade, the area has generated more jobs relative to the economic base than that of the whole of South Africa, but with the in-migration came increased poverty because the job-seekers were unable to find jobs. Nkangala has two rural and relatively poor municipalities, but Victor Khanye, the project labour area, is relatively wealthy compared with many other municipalities in South Africa. Witbank, Middelburg and Delmas areas are well developed, and are well-known for their competencies in coal mining and power generation. This is to the project's advantage as it is located in close proximity to these more prosperous areas.

8.6 TRANSPORTATION, INFRASTRUCTURE AND TRAFFIC

The local municipality within which the proposed Phase 3 project is located, is linked to major metropolitan areas like Johannesburg, the City of Tshwane and Emalahleni by the N12 freeway which is regarded as part of the "Maputo Corridor." The railway line running through VKLM also forms part of this corridor, which connects South Africa's northern provinces with the nearest deep-sea port at Maputo. The VKLM is regarded as a gateway to the inner Mpumalanga Province. Several provincial roads run through VKLM and converge at Delmas:

- R50 that links Tshwane with Standerton;
- R42 that links with Bronkhorstspruit;
- R555 that links Springs with Emalahleni;
- R548 that links with Balfour; and
- R42 that links with Nigel.

The total number of households across the VKLM amounts to 24,268 with an average occupancy rate of 3.5 persons per household. Of these, an estimated 3,300 households are living in informal settlements. The majority of households (84%) have access to piped water. Of these, 55% have piped water inside the house and a further 29% have piped water inside the yard. Almost all houses (92%) have electricity either in the form of a pre-paid meter (64%) or a conventional meter (28%). Only 1% of households have no access to any toilet facilities. Over two thirds (72%) refuse is removed at least once a week by the local authority.

The following infrastructure exists within the project area and its immediate surroundings:

- Various secondary farm roads;
- Opencast coal mines and related infrastructure and activities;
- Farm dams and at least one large man-made dam;
- Power lines;
- Telephone lines;
- Agricultural homesteads; and
- Dwellings.

8.7 DEMOGRAPHICS AND EMPLOYMENT STATISTICS

Nkangala District Municipality (Nkangala) is one of three district municipalities in the Mpumalanga Province. The headquarter of Nkangala is in Middelburg (Steve Tshwete Municipality). Nkangala is composed of 6 local municipalities, of which Victor Khanye is the one where the project is located. Economically, when one thinks of Nkangala, South Africa's coal and electricity nexus arises. Nkangala is well-known for powering much of South Africa and hence the project, at first glance, ought to be suitable for this area. Victor Khanye Local Municipality is situated on the Western Highveld of Mpumalanga Province covering a geographic area of approximately 1567 square kilometres. The prominent towns and settlements in the municipality include Arbor, Argent, Delmas and Lionelton.

The population size of VKLM was recorded by Statistics South Africa in 2016 as 84,150 (population density: 53.6 per km^2). This represents an annual growth rate of approximately 2.3% since the 2011 census, when the population size stood at 75,452. VKLM has had the third highest population growth rate in the province, according to the VKLM IDP (2017-2021) this is the result of economic growth and consequent increase in available job opportunities.

According to the Stats SA community Survey (2016), Black Africans account for 86% of the population, with the remaining 14% made up of White, Asian, Coloured and Indian population groups. The most prominent language spoken at home is isiZulu (44%) followed by isiNdebele (25%) and then Afrikaans (13%). Just over half (52%) of the population are male.

In terms of age distribution, the working-age population (aged between 15 and 64) accounts for 68.7% of the population of VKLM. Persons under the age of 14 make up 27.5% of the population. The fact that the majority of the population is of working age is in line with the conclusion made in the IDP – namely, that the population growth observed is as a result of migration in the hopes of economic development and job opportunities.

Out of the inhabitants of VKLM who are over the age of 15 years, 10.7% have no schooling or did not finish school, whereas 27.6% completed Matric. Persons with limited education tend to find themselves restricted to unskilled manual work (VKLM IDP, 2017-2021). According to IHS Global Insight data (2015), the unemployment rate (i.e. the proportion of the population between 14 and 65 years of age who classify themselves as "not employed but looking for work") is around 21.6% – this represents a decrease of approximately 6.6% in the unemployment rate since the 2011 Census.

On average, almost half (42.5%) of households in VKLM live in absolute poverty, which is defined as an annual household income of R 19 200 or less (or ≤ R 1 600 per month) for a family of 4, i.e. the family is unable to meet their basic food needs. A further third (37.7%) of households are considered lower middle-class (defined as a

household income of ≤ R 76 000 per annum). One in every five (19.8%) households fall into the higher income bracket (a household income of R 76 801 or more per annum).

The closest populations to the Project site are located on the farm Middelbult (approximately 3 km north - 138 people), the farm Droogefontein (approximately 3 km west - 723 people) and Eloff town (approximately 5 km northwest - 3,243 people).

Ward 7, in which the proposed project area is located, has a total estimated population of 10,230 people (2011 Census), at an average population density of 12.4 people per km^2 – indicative of the largely rural nature of the ward. This is indicative of a negative population growth rate of approximately -1% per annum between the period 2001 and 2011, which is likely attributable to agricultural land being purchased for mining developments and the resultant out-migration of farmers, their families and farm workers. More than two thirds (69.8%) of the current population in Ward 7 are Black African, followed by White (13,7%) population group. The most widely spoken languages in the ward are isiZulu (29.4%), Afrikaans (26.5%) and isiNdebele (18.4%).

8.8 SOCIAL

A social EIA assessment study was undertaken by NLN Consulting in November 2019 for the Phase 3 Project. The Phase 3 Project is within Nkangala District Municipality which is one of three districts of the Mpumalanga Province. It covers a geographical area of 16,758 km^2 and consists of 160 towns and villages. Despite the fact that Nkangala is the smallest of the three districts, it is the economic hub of Mpumalanga. The district is made up of six local municipalities, namely Emalahleni, Steve Tshwete, Emakhazeni, Thembisile Hani, Dr JS Moroka and Victor Khanye. The district has an average population density of 83.3 people per km^2.

The Phase 3 Projects falls within the Victor Khanye Local Municipality (VKLM), one of six local municipalities with the Nkangala District. Delmas and Eloff are two of the five major towns and settlements located in the VKLM which are in close proximity to the proposed project area. Delmas is also the "headquarters" for VKLM as it has well-developed infrastructure. The VKLM covers a geographic area of approximately 1,570 km^2. The other prominent settlements with the VKLM are Botleng, Sundra and Delpark.

A summary of VKLM socio-economic make-up is depicted in Figure 19. VKLM (spatial summary) is described in more detail in the ensuing subsections. Unless otherwise indicated, the VKLM profile is based on data obtained from the Statistics South Africa 2016 Community Survey. Further to the above, according to the Victor Khanye Local Municipality IDP the municipality is currently characterised by an increase in coal mining and related activities. Other important sectors in the municipal area are agriculture, agricultural product processing, industrial and manufacturing. Natural resources make a significant and direct contribution to the municipality's economy. The Spatial Development perspective of the Victor Khanye Local Municipality, through alignment with the district's SDF, translates the IDP of the municipality into spatial principles and strategies and thus constitutes the spatial implementation of the IDP. In this regard, Delmas, Botleng, Delpark, Eloff and Sundra are the main formal urban areas which are predominantly residential areas within the local municipality with Delmas incorporating a residential area, central business district and industrial area. The remainder of the municipal area is characterised by small settlements, several agricultural holding areas, commercial agriculture and mining.

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. The rural areas of the municipality predominantly consists of extensive commercial farming and mining activities. The municipality is a major maize producing area where commercial farming occurs primarily in the following areas: Union Forest Plantation Eloff, Rietkol, Springs, and Sundra Agricultural Holdings. These areas are primarily extensive residential with non-conforming land uses. As the Delmas area is a "high potential" agricultural area, it is important that agricultural land must be protected against urban sprawl and mining activity, etc. Mining activities are concentrated mainly on coal and silica. The main mining areas are around Delmas in the centre of the municipal area, and also in the far north-eastern corner of the municipal area. Importantly, there is a growing urgency to establish an equitable and realistic trade-off that maximises the provincial benefits from mining and energy sectors while mitigating any environmental impacts.

Unemployment level has been reduced from 28.2 to 21.6 in terms of Global insight figures this reduction is as a results of an increase in investments in our local economy. The employment situation is expected to improve

over the medium term with additional jobs expected in the mining sector (Victor Khanye Local Municipality IDP, 2017-2022). Leading industries in employment comprise of Trade (18.7%), Agriculture (18.2%) and Community Services contributing (14.3%). However, the former two sectors are experiencing a decline in employment in the last few years whilst Community Services has increased and Mining as an employer has grown and now contributes 12.7%. The current spatial summary in the Victor Khanye Local municipality IDP does not highlight any land use or development restrictions within the proposed project area except the need to protect agricultural land and the importance of mitigating environmental impacts from mining activities.

The following should be noted:

- Large portions of the land earmarked for the Eloff Project is currently used as agricultural land.
- The proposed site is surrounded by a number of social sensitive receptors within 5-10 km radius, which includes farmland, towns and individual homesteads.
- The Project is situated on agriculture land and the VKLM IDP (2017-2021) states that agricultural land must be protected against urban sprawl and mining activities. The SDF furthermore identifies Delmas as high potential agricultural area and notes the importance to protect the agricultural land. The SDF states as objective the responsible use and management of natural resources and the need to preserve high potential agricultural land for future generations and to enhance eco-tourism development and the food supply in the area.
- However, while maintaining the need to preserve agricultural land, the SDF in the same breath also recognises the continued growth of mining in the VLKM as well as the "urgent need to establish an equitable and realistic trade-off that maximises provincial benefits from and mining and energy sectors while mitigating any environmental impacts" (VKLM, 2018).
- There are no local spatial planning restrictions on the proposed project area. It could also be argued that the development is in line with the national Spatial Planning and Land Use Act (SPLUMA) of 2013 that aims for effective and efficient land use planning and land use management. The Project is compatible with other land uses in area as there also is a number of large coal mines in the vicinity – 3.2 km to east and 2.2 km south of extension. The project will furthermore use the existing mining infrastructure at Kangala Colliery.
- Delmas area became a small frontier for new coal field developments with around 15 new greenfield development joining existing 2 mines in the past 14 years. In the immediate vicinity of the Eloff project there are at least five coal mine operations (e.g. Stuart, Exxaro Leewpan, Mbuyelo, Keaten). The potential cumulative impacts of these mines on the rural character of VKLM, water availability and quality, declining agricultural land and post-closure issues need to be considered for future developments in Delmas.
- Non-governmental organisations (NGOs) are increasingly sounding the alarm against the unbridled expansion of mining activities in the province. Between 2004 and 2010 the Department of Mineral Resources (DMR) granted 4 700 prospecting and mining rights in Mpumalanga Province alone. In 2016 there were 122 operating coal mines in the province (Ground Work, 2018). Concerns of NGOs especially centre around the limited arable land available in South Africa (less than 2% of total land area), the high concentration of arable land in Mpumalanga Province (46% of total arable land) and the continued pressure on arable land in Mpumalanga from mining. Close to 26% of South Africa's limited arable land are, according to NGO sources, at risk of being transformed due to mining. Delmas has 5.3% of South Africa's arable land and this particular area is exceptional due to the fertile land in close proximity to an aquifer (BFAO, 2012).
- Figure 20 shows the large extent of farmland (27% of total land area) that was already affected by approved mining rights in VKLM in 2015. The majority of the land area was affected by granted mining prospecting rights. There were allegedly only two farms in VKLM that did not have mining prospecting rights in 2016 (Forrest et.al. 2017).

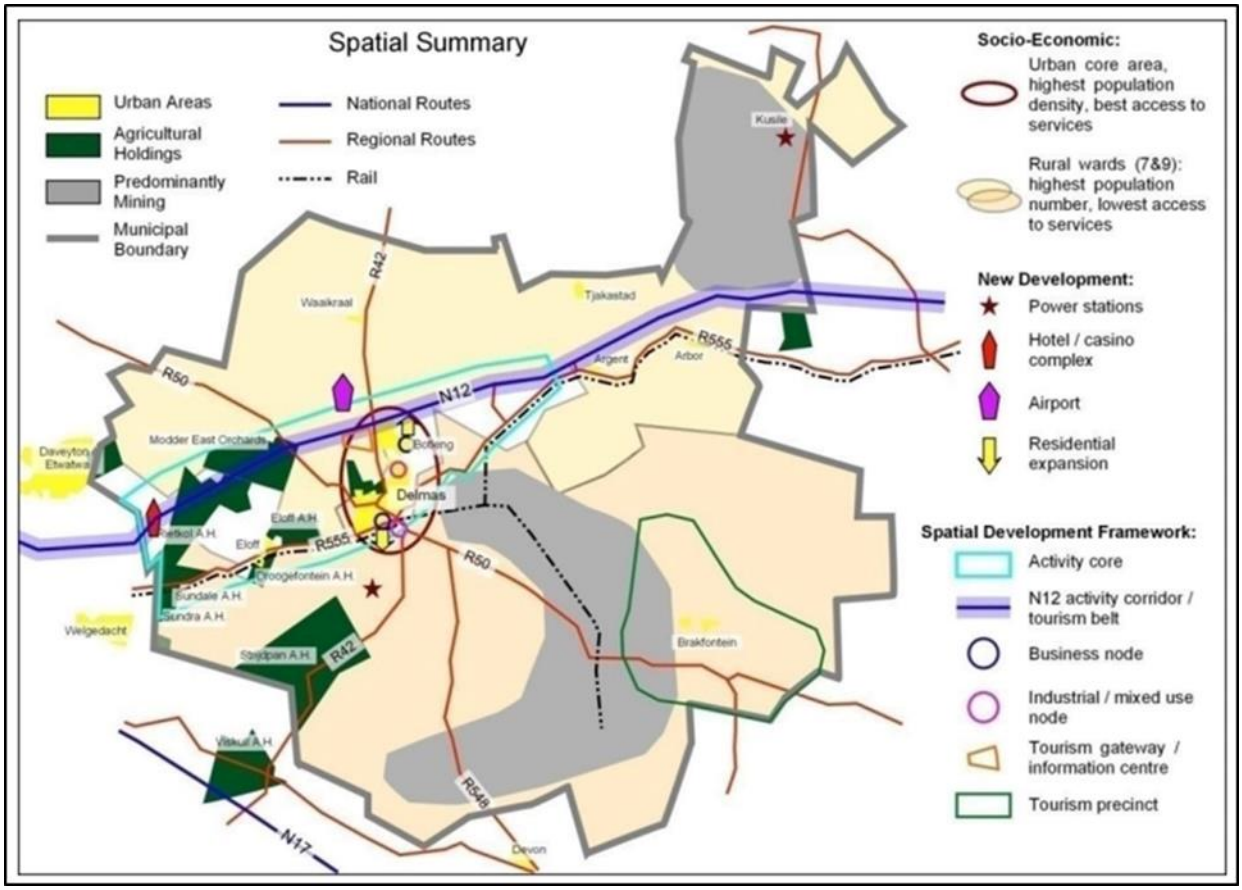

Figure 19: Victor Khanye local municipality spatial summary

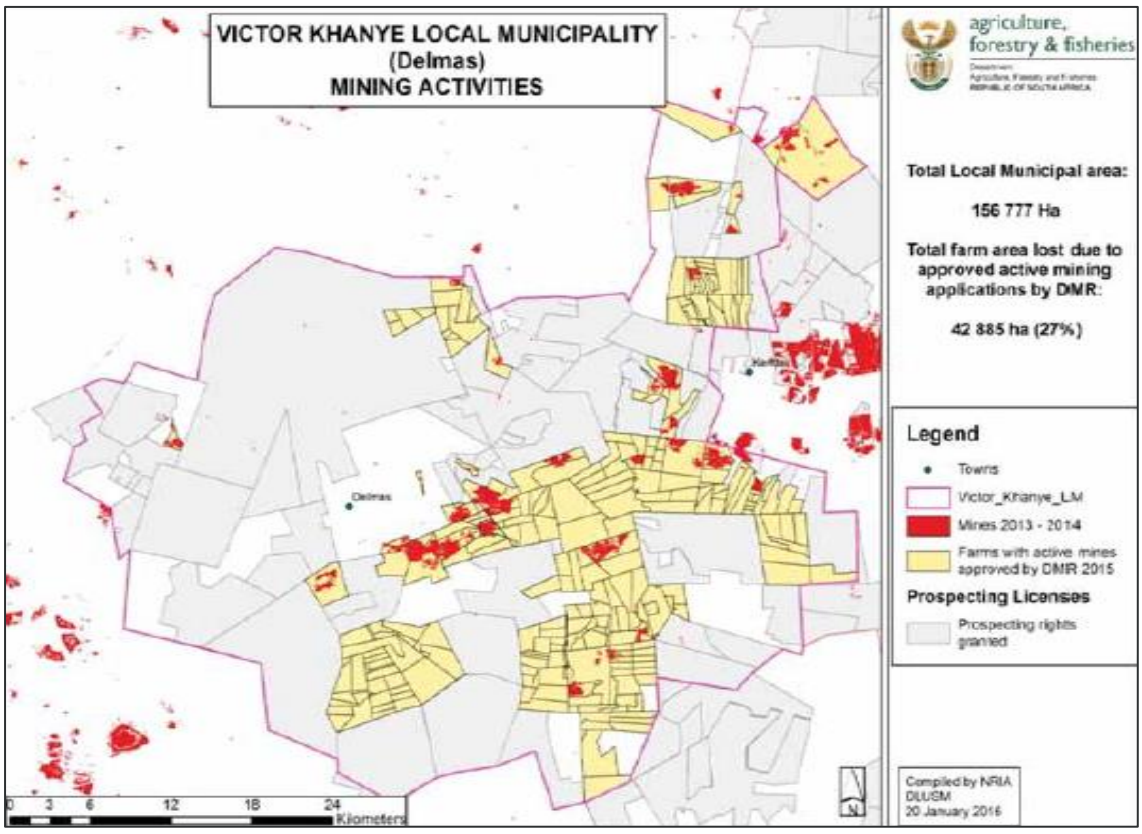

Figure 20: Mining activities in the VKLM

8.9 HERITAGE AND FOSSIL RESOURCES

During the field work a total of eight heritage resource were identified (Figure 21). These are listed below:

- KG1: The site consists of an informal cemetery. A number of headstones are present, but most are disturbed by burrowing animal activity. The cemetery is located in the middle of a cultivated maize field. A grave count revealed approximately 10 graves. These were relocated on 11 July 2019.
- KG2: The site is that of a recent historic farmstead. Only the foundations of a stone and brick built main house and some outbuilding are left. Remains of the garden layout can be seen in the planted shrubs and trees.
- KG3: The site is that of a recent historic farmstead. The ruined main house was constructed with fired and unfired clay bricks. The house consisted of three rooms including a kitchen and bathroom. The remains of some outbuildings, sheds and brick farm dam are in ruins.
- KG4: The site is that of a recent historic farmstead. The ruined main house was constructed with fired clay bricks. The house consisted of four rooms including a kitchen and bathroom. The remains of some outbuildings, sheds and brick farm dam are in ruins.
- KG5: The site consists of an informal cemetery. A number of headstones are present, but most are disturbed by burrowing animal activity. The cemetery is located in the middle of a cultivated maize field. A grave count revealed approximately 10 graves.
- KG6: The site is that of a recent historic farmstead. The main house is still inhabited by the current farm manager. house consisted of five rooms including a kitchen and bathroom, some outbuildings, sheds and brick farm dam are different stages of preservation.
- KG7: The site consists of a ruined earth bid dam wall in between eucalyptus trees. The layout of some trenches indicate that it was most probably used to drain a nearby pan.
- KG8: The site consists of an informal cemetery. A number of headstones are present, but most are disturbed by burrowing animal activity. The cemetery is located in the middle of a cultivated maize field. A grave count revealed approximately 3 graves.
- KG9: The site consists of a single formal grave with headstone. Headstone inscription reads, Johanna Mokoena, born 12-12-1922 died 25-03-1977. The grave was relocated on 11 July 2019.

Four burial grounds are present on the property. Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating. Four farmsteads (of which three are ruined) were identified. Structures older than 60 years are protected under Section 34 of the NHRA only KG6 will require a formal process of application for a destruction permit issued by the Mpumalanga Provincial Heritage Authority.

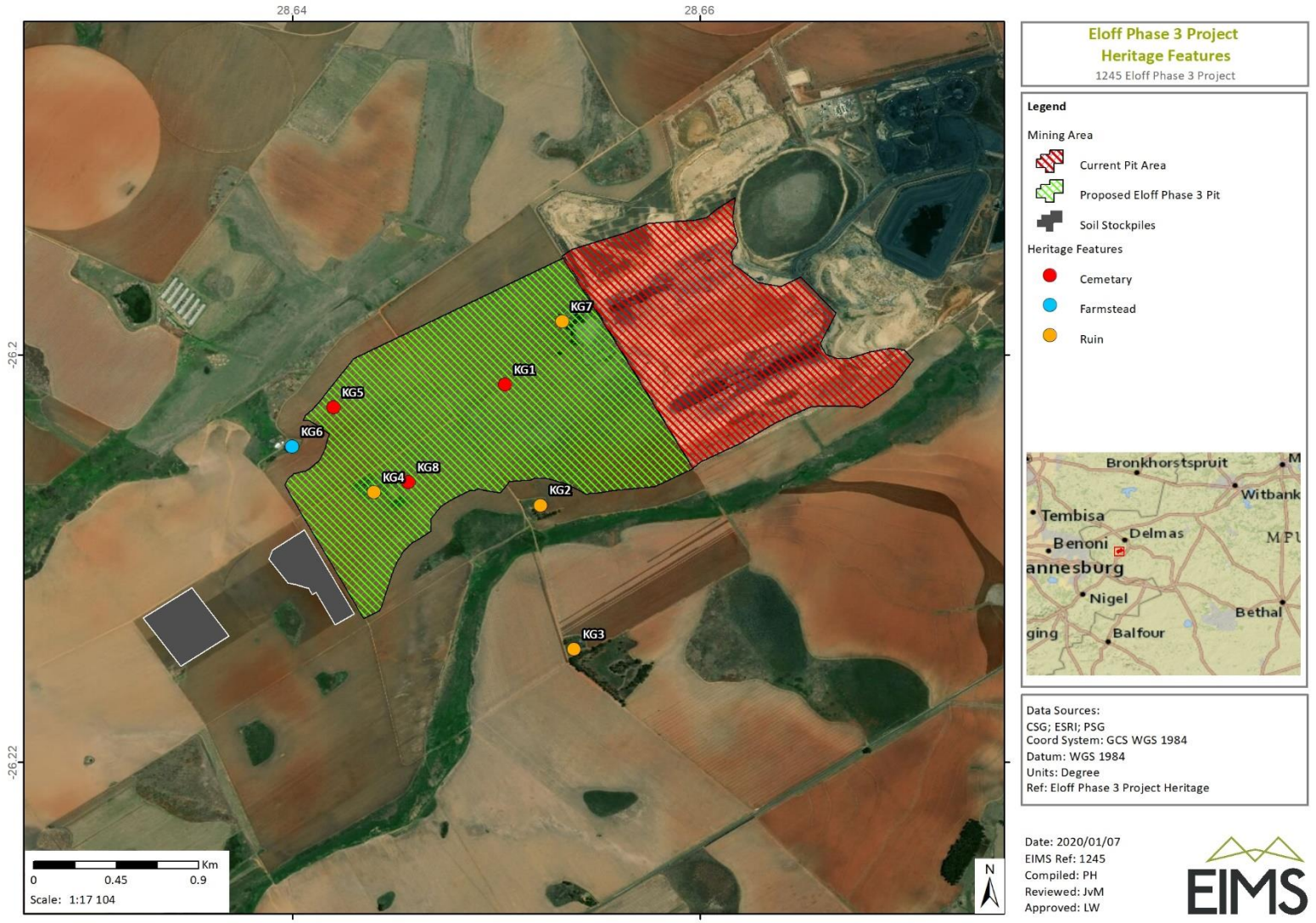

Figure 21: Locality of heritage resources in relation to the planned expansion

A site-specific field survey of the development footprint were conducted on foot and by motor vehicle on 27 April 2019. No visible evidence of fossiliferous outcrops were found. This area has also been extensively utilized by agriculture activities during the past. For this reason, an overall low palaeontological sensitivity is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of Eloff Phase 3 Project will be of a low significance in palaeontological terms.

8.10 FLORA

The findings of the Biodiversity study by the Biodiversity Company in April 2019 were utilised for the flora and fauna baseline assessment in this section, the full report is available in Appendix D. The Phase 3 Project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

- Seasonal precipitation; and
- The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level. Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees.

The grassland biome comprises many different vegetation types. The project area is situated within one vegetation type; namely the Eastern Highveld Grassland (GM12) according to the vegetation map of South Africa (Mucina & Rutherford, 2006) (Figure 22).

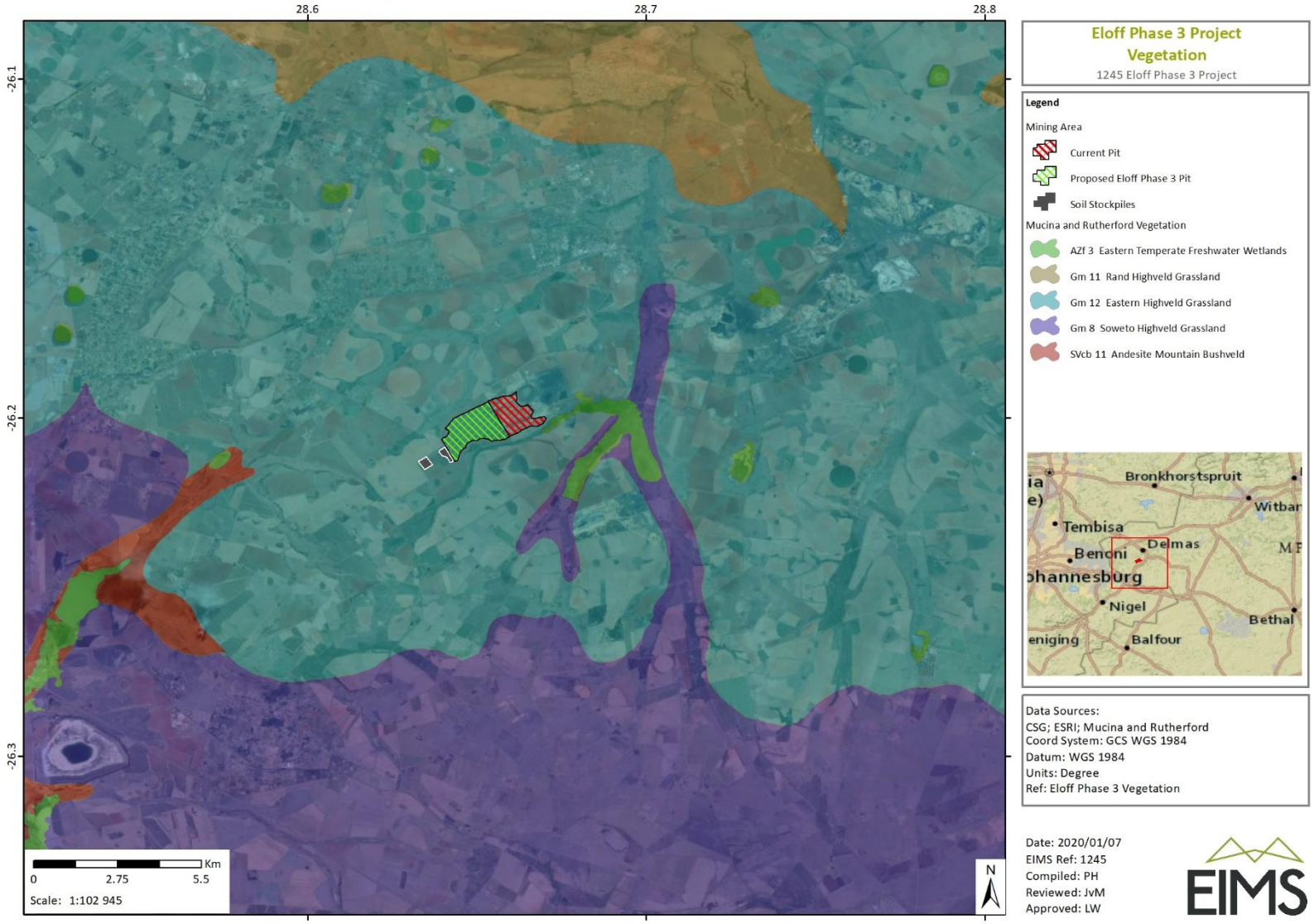

Figure 22: The Phase 3 Project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2017)

This vegetation type 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 (*Arsitida*, *Digitaria*, *Erafrostsis*, *Themeda*, *Tristachya*, etc.) with small scattered rocky outcrops with, wiry sour grasses and some woody species. Some 44% of the vegetation type is transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. No serious alien invasions are reported (Mucina & Rutherford, 2006).

8.10.1 IMPORTANT PLANT TAXA

Important plant taxa are those species that have a high abundance, a frequent occurrence or are prominent in the landscape within a particular vegetation type (Mucina & Rutherford, 2006). The following species are important in the Eastern Highveld Grassland vegetation type:

- **Graminoids**: *Aristida aequiglumis, A. congesta, A. junciformis subsp. Galpinii, Brachiaria serrata, Cynodon dactylon, Digitaria monodactyla, D. tricholaenoides, Elionurus muticus, Eragrostis chloromelas, E. curvula, E plana, E racemosa E sclerantha Heteropogon contortus, Loudetia simplex, Microchloa caffra, Monocymbium ceresiiforme, Setaria sphacelata, Sporobolus africanus, S. pectinatus, Themeda triandra, Trachypogon spicatus, Tristachya leucothrix, T. rehmanni, Alloteropsis semialata subsp. eckloniana, Andropogon appendiculatus, A schirensis, Bewsia biflora, Ctenium concinnum, Diheteropogon amplectens, Eragrostis capensis, E. gummiflua, E. patentissima, Harpochloa falx, Panicum natalense, Rendlia altera, Schizachyrium sanguineum, Setaria nigrirostris, Urelytrum agropyroides*;
- **Herbs**: *Berkheya setifera, Haplocarpha scaposa, Justicia anagalloides, Acalypha angusta, Chamaecrista mimosoides, Dicoma anomala, Euryops gilfillanii, E. transvalensis subsp. setilobus, Helichrysum aureonitens, H caespititium, H. callicomum, H. oreophilum, H. caespititium, H. oreophilum, H rugulosum, ipomoea crassipes, Pentanisia prunelloides subsp. latifolia, Selago densiflora, Senecio coronatus, Vernonia oligocephala, Wahlenbergia undulata*;
- **Geophytic herbs**: *Gladiolus crassifolius, Haemanthus humilis subsp. hirsutus, Hypoxis rigidula var. pilosissima, Ledebouria ovatifolia*;
- **Succulent herb**: *Aloe ecklonis*; and
- **Low shrubs**: *Anthospermum rigidum* subsp. *pumilum*, *Stoebe plumosa*.

8.10.2 CONSERVATION STATUS

According to Mucina & Rutherford (2006), the Eastern Highveld Grassland vegetation type is classified as Endangered on a regional level. The national target for conservation protection for this 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, however, already been transformed including at the proposed project area 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. Erosion is very low.

Based on the Plants of Southern Africa (BODATSA-POSA, 2016) database, 393 plant species have the potential to occur in the area. Of the 393-plant species associated with this region, five (5) species are listed as being Species of Conservation Concern (SCC), Table 16. On a local scale, however, the project area and its vicinity is highly transformed by agricultural activities and existing mining operations and thus no indigenous flora of conservation concern is likely to remain on site.

Table 16: Plant Species of Conservation Concern (SCC) expected to occur within the region of the project area (BODATSA-POSA, 2016)

Family	Scientific Name	Author	SANBI listing (2017)	Ecology
Aizoaceae	*Khadia beswickii*	(L.Bolus) N.E.Br.	VU	Indigenous; Endemic
Fabaceae	*Indigofera hybrida*	N.E.Br.	VU	Indigenous; Endemic
Apocynaceae	*Pachycarpus suaveolens*	(Schltr.) Nicholas & Goyder	VU	Indigenous
Aizoaceae	*Delosperma leendertziae*	N.E.Br.	NT	Indigenous; Endemic
Orchidaceae	*Habenaria bicolor*	Conrath & Kraenzl.	NT	Indigenous

8.11 FAUNA

Faunal assessment at the proposed project area included the scoping of the following faunal categories: avifauna, mammals as well as reptiles and amphibians. The regional species expected to occur on site for each faunal category are presented below. However, once again it should be noted that on a local level the area is highly transformed by agricultural activities and existing mining operations and as such it is unlikely that these species listed below are found on site.

8.11.1 AVIFAUNA

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 288 bird species are expected to occur in the vicinity of the project area (pentads 2605_2835, 2605_2480, 2605_2845, 2610_2835, 2610_2840, 2610_2845, 2615_2835, 2615_2840,2615_2845). Of the expected bird species, twenty-four (24) species (8.3%) are listed as SCC either on a regional (21) or global scale (15) (Table 17).

The SCC includes the following:

- Three (3) species that are listed as Endangered (EN) on a regional basis;
- Seven (7) species that are listed as Vulnerable (VU) on a regional basis; and
- Twelve (11) species that are listed as Near Threatened (NT) on a regional basis.

On a global scale, four (4) species are listed as VU and ten (10) species as NT (Table 17).

Table 17: List of bird species of regional or global conservation importance that are expected to occur in pentads 2605_2835, 2605_2480, 2605_2845, 2610_2835, 2610_2840, 2610_2845, 2615_2835, 2615_2840, 2615_2845 (SABAP2, 2017, Eskom, 2014; IUCN, 2017).

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Alcedo semitorquata	Kingfisher, Half-collared	NT	LC	Moderate
Anthropoides paradiseus	Crane, Blue	NT	VU	High
Calidris ferruginea	Sandpiper, Curlew	LC	NT	Moderate
Charadrius pallidus	Plover, Chestnut-banded	NT	NT	Moderate
Ciconia abdimii	Stork, Abdim's	NT	LC	High
Circus macrourus	Harrier, Pallid	NT	NT	Moderate
Circus maurus	Harrier, Black	EN	VU	Moderate

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Circus ranivorus	Marsh-harrier, African	EN	LC	High
Coracias garrulus	Roller, European	NT	LC	Moderate
Eupodotis caerulescens	Korhaan, Blue	LC	NT	Moderate
Eupodotis senegalensis	Korhaan, White-bellied	VU	LC	Moderate
Falco biarmicus	Falcon, Lanner	VU	LC	High
Falco vespertinus	Falcon, Red-footed	NT	NT	High
Geronticus calvus	Ibis, Southern Bald	VU	VU	High
Glareola nordmanni	Pratincole, Black-winged	NT	NT	Moderate
Mirafra cheniana	Lark, Melodious	LC	NT	Moderate
Mycteria ibis	Stork, Yellow-billed	EN	LC	High
Neotis denhami	Bustard, Denham's	VU	NT	Moderate
Oxyura maccoa	Duck, Maccoa	NT	NT	High
Phoeniconaias minor	Flamingo, Lesser	NT	NT	High
Phoenicopterus ruber	Flamingo, Greater	NT	LC	High
Podica senegalensis	Finfoot, African	VU	LC	Moderate
Sagittarius serpentarius	Secretarybird	VU	VU	High
Tyto capensis	Grass-owl, African	VU	LC	High

8.11.2 MAMMALS

The IUCN Red List Spatial Data (IUCN, 2017) lists 84 mammal species that could be expected to occur within the project area. Of these species, 12 are medium to large conservation dependant species, such *Ceratotherium simum* (Southern White Rhinoceros) and *Tragelaphus oryx* (Common Eland) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list.

Of the remaining 73 small to medium sized mammal species, twelve (12) (17.4%) are listed as being of conservation concern on a regional or global basis (Table 18).

The list of potential species includes:

- Two (2) that are listed as Endangered (EN) on a regional basis;
- Three (3) that are listed as Vulnerable (VU) on a regional basis; and
- Eight (8) that are listed as Near Threatened (NT) on a regional scale (Table 18).

On a global scale, 1 species is listed as EN, 2 are listed as VU and 2 as NT (Table 18).

Table 18: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016).

Species	Common name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2017)
Aonyx capensis	Cape Clawless Otter	NT	NT
Atelerix frontalis	South Africa Hedgehog	NT	LC
Cloeotis percivali	Short-eared Trident Bat	EN	LC
Crocidura mariquensis	Swamp Musk Shrew	NT	LC
Felis nigripes	Black-footed Cat	VU	VU
Leptailurus serval	Serval	NT	LC
Panthera pardus	Leopard	VU	VU
Parahyaena brunnea	Brown Hyaena	NT	NT
Pelea capreolus	Grey Rhebok	NT	LC
Poecilogale albinucha	African Striped Weasel	NT	LC
Redunca fulvorufula	Mountain Reedbuck	EN	LC
Smutsia temminckii	Temminck's Ground Pangolin	VU	VU

8.11.3 HERPETOFAUNA (REPTILES & AMPHIBIANS)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the Reptile Map database provided by the Animal Demography Unit (ADU, 2017) 17 reptile species are expected to occur in the project area. Of the expected reptile species, only one (1) is regarded as a SCC, namely *Crocodylus niloticus* (Nile Crocodile) which is listed as Near Threatened (NT) regionally (Table 19). Although this species is listed as expected to occur in the region, the lack of very large water bodies or rivers which this species requires, and the lack of recent records for the surrounding area, suggest that the likelihood of occurrence is low (Table 19).

Table 19: List of reptile species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; *Bates et al*., 2014)

Species	Common name	Conservation Status		Likelihood of Occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Crocodylus niloticus	Nile Crocodile	VU	LC	Low

8.12 HYDROLOGY (SURFACE WATER)

The hydrological study informing this hydrology baseline was conducted by SD Hydrological Services (Pty) Ltd on behalf of GCS (Pty) Ltd in August 2018. A follow up study was conducted in December 2019 by GCS and the full hydrology report is presented Appendix D. The project area falls within the Olifants WMA with the major rivers falling within the mentioned WMA being the Elands, Wilge, Steelpoort and the Olifants River. Majority of the runoff from the project area is eventually drained north into the Olifants River.

8.12.1 REGIONAL HYDROLOGY AND TOPOGRAPHY

The project area falls within the north western boundary of the B20A quaternary catchments. The quaternary catchment B20A has a net mean annual runoff (MAR) of 25.60 million cubic meters (mcm), and is based on the (WR2012, 2015).

The Bronkhorstspruit River has its headwaters at the B20A quaternary catchment, and eventually flows into the Wilge River further downstream, which joins the larger Olifants River. The Olifants River then flows eastwards into Mozambique beyond the Olifants WMA. The project area is located on the joint upstream boundary of the

Olifants WMA and quaternary catchment B20A. All runoff emanating from the upstream boundary of the project area contributes to flow in the downstream tributaries of the Bronkhorstspruit.

Average elevations at the upstream boundary of quaternary catchment B20A range from 1600 meters above mean sea level (mamsl) to 1690 mamsl, and decreases to between 1570 – 1590 mamsl further downstream at the banks of the downstream tributaries. Average slopes range between 1% and 3 % and is characterised as flat. The hydrological setting of the project site is indicated in Figure 23. The digital elevation model (DEM) was sourced from the USGS website (http://hydrosheds.cr.usgs.gov/dataavail.php).

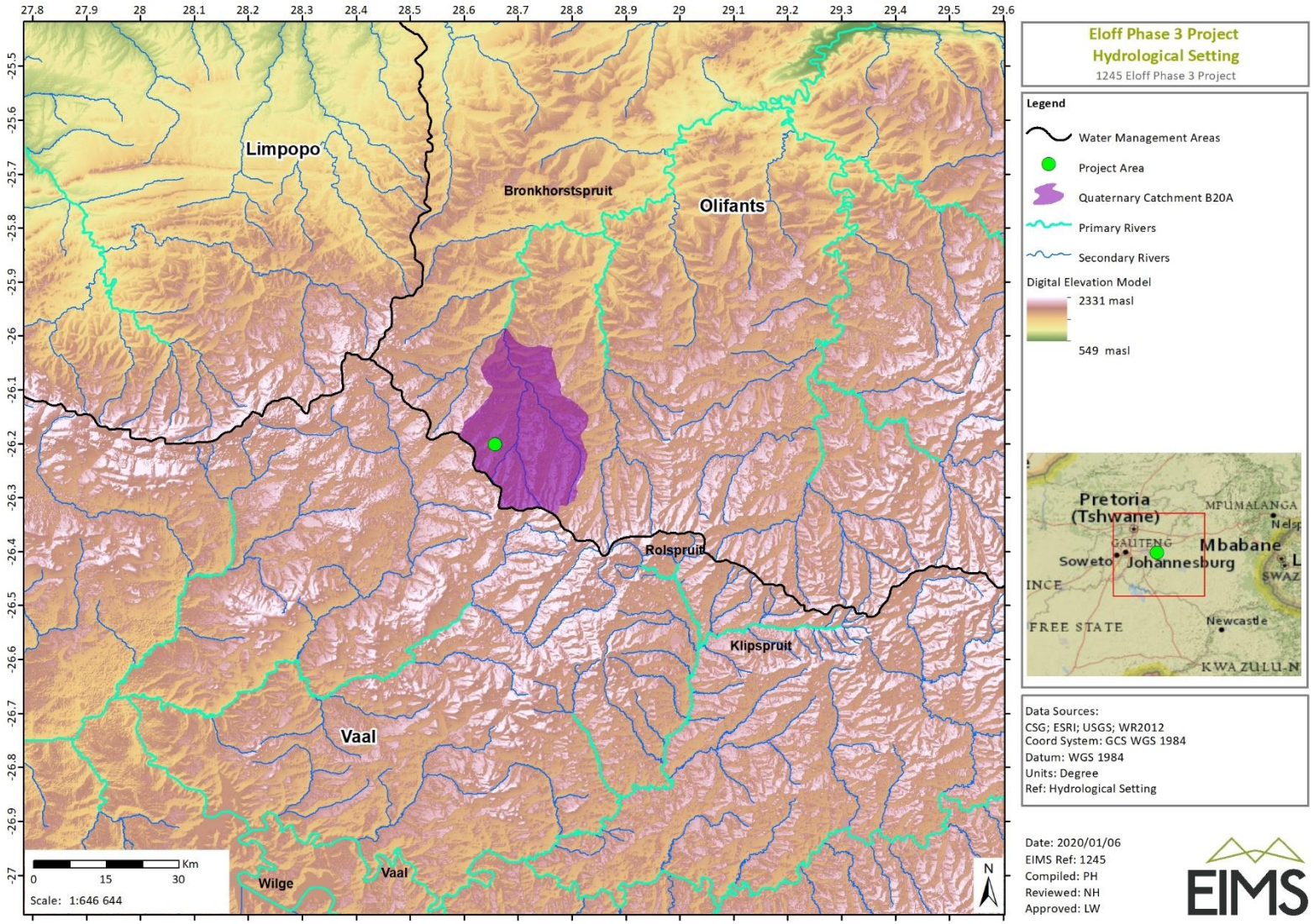

Figure 23: Summary of hydrological setting

8.12.2 RAINFALL

Rainfall data was extracted from two sources, these include:

- The Daily Rainfall Extraction Utility program; and
- Water Resources of South Africa 2005 Study (WR, 2005).

Summary of the six nearest rainfall stations as per the output from the design rainfall program, together with the monthly rainfall obtained from WR2005 is shown below in Table 20.

Table 20: Summary of monthly rainfall

Months	Rietfontein 0476737 W	Vlakplaas 0477494 W	Strydpan 0477224 W	Droogefontein 0477191 W	Delmas (POL) 0477309 W	Rietkuil 0477459 W	WR2005
January	114	118	117	111	118	114	118
February	94	90	101	100	96	86	90
March	81	76	82	81	85	90	84
April	42	34	44	40	41	41	40
May	19	16	17	15	19	18	17
June	6	5	6	6	6	7	7
July	7	5	7	6	6	6	5
August	7	8	11	7	8	6	6
September	24	21	24	21	22	20	19
October	57	61	60	63	67	63	66
November	106	104	106	102	102	103	105
December	117	98	108	112	106	117	109
MAP (mm)	**674**	**637**	**682**	**664**	**676**	**671**	**669**

Based on the above estimations it is observed that the MAP ranges between 637 mm to 669 mm, with the average MAP of the six nearest stations estimated to be 671 mm. The MAP obtained from the WR2005 study for quaternary catchment B20A is slightly conservative (669 mm) when compared to the six stations and is therefore selected as the adopted MAP for the project area.

Based on the rainfall pattern shown in Table 20, it is observed that the dry season extends between the months of April to September, with the wet season ranging from October to March. Majority of the total MAP falls within the wet (summer) season and accounts for greater than 85 percent of the MAP (Figure 24). The area generally receives high rainfall between November and February with July recording the lowest rainfall. Evaporation is notably higher than rainfall throughout the year, which results in prolonged dry conditions.

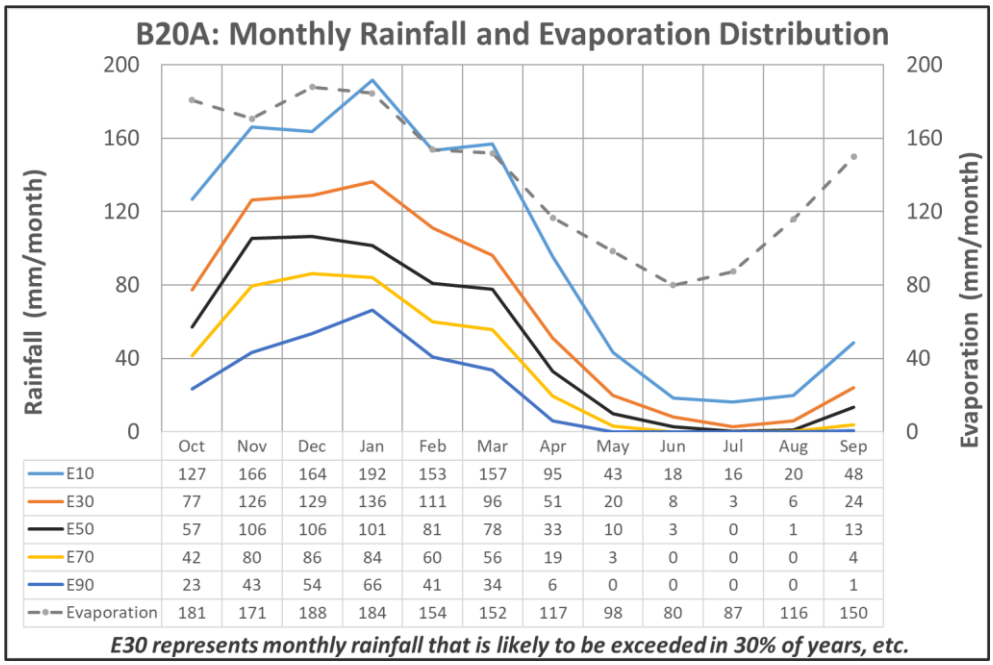

Figure 24: Summary of rainfall distribution

8.12.3 EVAPORATION

High evaporation rates are experienced between the months of October to March but decrease, with peak monthly evaporation of 153 mm occurring in December. Lower evaporation occurs between the months of May to August and range from 67 mm to 92 mm. It is observed that throughout the year evaporation rates exceeds the monthly rainfall, resulting in a negative climatic water balance.

8.12.4 STORM RAINFALL DEPTHS

The summary of the rainfall depths for the 5-minute duration up to the 1-day storm duration for various recurrence intervals are shown below in Table 21, and will be used in the calculation of peak flows for all catchments.

Table 21: Summary of storm rainfall depths

Duration	Rainfall Depth (mm)						
(m/h/d)	1:2 year	1:5 year	1:10 year	1:20 year	1:50 year	1:100 year	1:200 year
5 m	9.8	13	15.3	17.6	20.8	23.3	25.9
10 m	14.5	19.3	22.7	26.2	30.9	34.6	38.6
15 m	18.3	24.4	28.7	33	39	43.7	48.6
30 m	23.2	30.9	36.3	41.8	49.3	55.3	61.6
45 m	26.6	35.4	41.7	48	56.6	63.5	70.7
1 h	29.4	39.1	46	52.9	62.5	70	77.9
1.5 h	33.7	44.8	52.8	60.7	71.7	80.4	89.5
2 h	37.2	49.5	58.2	67	79.1	88.7	98.7
4 h	43.8	58.3	68.5	78.9	93.1	104.4	116.2
6 h	48.2	64.1	75.4	86.8	102.5	114.9	127.9
8 h	51.6	68.6	80.7	92.9	109.7	123	136.9
10 h	54.3	72.3	85.1	97.9	115.6	129.6	144.3
12 h	56.7	75.5	88.8	102.2	120.7	135.3	150.6
16 h	60.7	80.8	95	109.4	129.2	144.8	161.2
20 h	64	85.2	100.2	115.3	136.1	152.7	169.9
24 h	66.8	88.9	104.6	120.4	142.1	159.4	177.4

Duration	Rainfall Depth (mm)						
(m/h/d)	1:2 year	1:5 year	1:10 year	1:20 year	1:50 year	1:100 year	1:200 year
1 d	55.6	73.9	87	100.1	118.2	132.5	147.5

8.12.5 WATER QUALITY

Six surface water localities, as well as the three wastewater localities were sampled in April 2018 within the adjacent Kangala Colliery mining area, the majority of other potential sampling localities were dry or the water stagnant. A drinking water locality was also sampled and analysed. The physical and chemical water quality was assessed, whereby the physical water quality refers to the water quality properties such as temperature, electrical conductivity, pH and oxygen content that may be determined by physical method. The physical water quality focusses on three parameters, namely: pH – the scale of acidity (affects the corrosive effect and taste of water), EC – electrical conductivity or TDS – total dissolved solids (indicates the salinity and quantity of dissolved substances).

The chemical quality of the water refers to the nature and concentrations of dissolved substances such as organic or inorganic compounds, including metals, in the water body. Many chemicals in water are essential for the biotic community and may form an integral part of the nutritional requirements. However, elevated levels may be limiting for some of the downstream water users. Furthermore, for drinking water, the WRC Quality of Domestic Water Supplies guidelines are used for classification of the water qualities observed. The Department of Water and Forestry (now Department of Water and Sanitation – DWS) has developed a useful colour coding system for evaluating the prevailing water quality of water used for domestic purposes.

Sampling results for the 6 surface water localities at Kangala Colliery sampled in April 2018 were as follows:

- **Dam Upstream of Kangala Mine (INJ01)** – In April 2018, the water sampled at this locality could be described as **neutral, non-saline and moderately soft**. The WUL (groundwater) limits were exceeded by the recorded orthophosphate and iron concentration, while the SANS standard limits were exceeded by the concentrations of aluminium and iron. The water is classified as **marginal (class 2)** for domestic use (WRC, 1998).
- **Stream outflow from Kangala mine area (INJ02)** – In April 2018, the water sampled at this locality could be described as **neutral, non-saline and moderately soft**. Both the WUL limit and the SANS drinking water standard limit for manganese were exceeded in April 2018. Accordingly, the water is classified **as good (class 1)** for domestic use (WRC, 1998).
- **Stream upstream from Kangala mine (INJ06)** – In April 2018, the water sampled at this locality could be described as **neutral, non-saline and slightly hard**. The orthophosphate concentration exceeded the limit stipulated by the WUL while the SANS drinking water standard was not exceeded. In April 2018, the water quality from this locality is classified as **ideal (class 0)** for domestic use (WRC, 1998).
- **Stream upstream from Kangala mine (INJ07)** – In April 2018, the water sampled at this locality could be described as **neutral, non-saline and slightly hard**. Both the WUL limit and the SANS drinking water standard limit for manganese were exceeded in April 2018 and the WUL limits were further exceeded by the recorded concentration of orthophosphate. Accordingly, the water is classified as **good (class 1)** for domestic use (WRC, 1998).
- **Stream upstream from Kangala mine (INJ08)** – In April 2018, the water sampled at this locality could be described as **neutral, non-saline and slightly hard**. Both the WUL limit and the SANS drinking water standard limit for manganese were exceeded in April 2018 and the WUL limits were further exceeded by the recorded concentration of orthophosphate. Accordingly, the water is classified as **good (class 1)** for domestic use (WRC, 1998).
- **Stream downstream from mine (INJ10)** – The water sampled at locality INJ10 could be described as **neutral, non-saline and slightly hard** in April 2018. Both the WUL limit and the SANS drinking water standard limit for manganese were exceeded in April 2018 and the WUL limits were further exceeded

by the recorded concentration of orthophosphate. Accordingly, the water is classified as **good (class 1)** for domestic use (WRC, 1998).

Slight fluctuations in aluminium and iron in concentrations at all 6 sampled surface water localities are evident but are more profound in localities INJ01 and INJ06. There was an increase in the concentrations recorded for locality INJ01 while a slight decrease in concentration was recorded for locality INJ06 between March and April 2018. As the pH is neutral, it is likely that the concentration found in the water is present as particulate metals and not in the dissolved, more bioavailable (and thus more toxic) form. As these localities are situated upstream from Kangala Colliery, the increases are likely the result of upstream activities unrelated to the mining operations at Kangala Colliery.

Sampling results for the 3 waste water localities at Kangala Colliery sampled in April 2018 were as follows:

- **Discard Facility Effluent (DFE)** – The discard facility effluent could be described as **neutral, very saline and very hard** in April 2018. Both the Kangala WUL groundwater limits and the General Limit were exceeded by the (EC) value, as well as the concentration of manganese. The WUL groundwater limits were further **exceeded by the concentrations of sulphate, calcium and magnesium**.
- **Pollution Control Dam (PCD)** – The water from the pollution control dam could be described as **neutral, very saline and very hard**. Both the Kangala WUL groundwater limits and the General Limit were exceeded by the EC value, as well as the concentration of manganese. The WUL groundwater limits were further **exceeded by the concentrations of sulphate, calcium and magnesium**.
- **Sewage Treatment Plant Effluent (STPE)** – The water from the treatment plant could be described as **neutral, very saline and very hard**. Both the Kangala WUL groundwater limits and the General Limit were exceeded by the EC value while WUL groundwater limits were further exceeded by the concentrations of sulphate, calcium and magnesium.

The above wastewater qualities are expected in untreated process water and the WUL limits are simply used as a comparative guideline. As the General Limit is exceeded by EC and manganese, however, care should be taken to contain this water and prevent seepage / overflow / discharge into the environment. The re-use of this water in the plant may also have detrimental effects on processes / equipment.

Furthermore, the drinking water could be described as **neutral, non-saline and moderately soft**. None of the measured variables exceeded either the WRC Domestic Use guideline or the SANS 241 drinking water standard. Therefore, the water may be classified as **good (class 1)** for domestic use and consumption.

Two (2) additional surface water samples were taken on the 4th and 5th of October 2019 (INJ11 and INJ12) (Figure 8.4. It is recommended that these localities be added to the current monitoring network (Table 8.1). These two (2) additional monitoring localities will provide baseline water quality monitoring when the proposed project area is expanded.

Surface water quality samples are compared to the 2013 amended UC Water Use License (WUL), No 04/B20A/ABCGIJ/1506 of 2012, limits for groundwater and the SANS 241-1:2015 Drinking Water Standards for comparative purposes.

Locality INJ11 indicated good water quality with neutral pH, low electrical conductivity, low nitrate and sulphate concentrations and most metal concentrations were below detection limit. Locality INJ12 also indicated neutral pH with low electrical conductivity, but slightly higher sulphate concentration was recorded. The SANS drinking water chronic health limit for manganese and operational limit for aluminium concentration was exceeded in INJ12 and the SANS drinking water aesthetic limit was further exceeded by the recorded concentration of ammonium.

Bacterial analysis includes a faecal coliforms, total coliforms and Escherichia coli (E-coli) detection. Total coliforms are the indication of a broad range of different kinds of bacteria, of which faecal bacteria is a type of coliform. Faecal coliforms, and more specifically E.coli, are the most common bacterial indicators of faecal pollution (Department of Water Affairs and Forestry, 1996). Elevated counts of E.coli were detected in both

INJ11 and INJ12 indicating the presence of faecal pollution, which possibly can be attributed to agricultural activities.

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8.13 CATCHMENT HYDROLOGY

A summary of the catchment hydrology is shown below in Table 22.

Table 22: Summary of catchment hydrology

Name	Area (km^2)	Length of longest watercourse (m)	Height Difference (m)	Rainfall Intensity (Q50)	Tc (hours)	C-Factor
Clean water catchment	1.6951	3812	28.82	56	1.22	0.29
Dirty water catchment	0.2850	1676	13.5	86	0.63	0.54

Total runoff from natural (unmodified) catchments in this area is simulated in WR2012 as being equivalent to 44.6 mm/yr over the surface area (Bailey & Pitman, 2015). This represents approximately 6.6 % of the MAP. Total natural MAR at the most downstream point of quaternary catchment B20A is calculated at 40 million cubic metres (Mm3) (Bailey & Pitman, 2015).

The proposed Eloff Phase 3 Project will modify an estimated area of 1.844 km^2 of land, which will become an opencast pit. Approximately 1.244km^2 of the total opencast pit area includes the portion of the sub-catchment that drains towards the Koffiespruit (north) and 0.6 km^2 drains towards the southerly located unnamed tributary. Total reduction of natural MAR could therefore potentially be 82 262 cubic metres per year (m^3/yr) (0.2% of total quaternary catchment runoff).

The hydropedology survey (TBC, 2019) indicated that the opencast pit area is dominantly marked by interflow (soil/bedrock) soils from the crest to the lower midslope/foot slope positions towards the valley bottom of the northerly and southerly located water courses. Due to these soil conditions (owing to agricultural land use and activities), a larger percentage of rainfall could reach these water courses. Interception of this lateral fluxes through opencast mining is therefore likely to impact the water regimes of the valley bottom wetland as well as lateral fluxes into the stream.

8.14 WETLANDS

A wetlands scoping study was prepared by the Biodiversity Company in March 2018, the findings of the baseline assessment are presented in this section with the full report presented in Appendix D. According to the land type database (Land Type Survey Staff, 1972-2006) the project area is located within the Bb3 land type. The dominant soil forms on the upper and mid-slopes include the Hutton, Glencoe and Avalon forms, with pans also represented. The Rensburg and Katspruit soil forms are largely representative in the lower lying and valley bottom areas.

The geology of the land type is classified as:

- Shale, sandstone, clay, conglomerate, limestone and marl of the Ecca Group;
- Shale and tillite of the Dwyka Formation and Karoo Sequence;
- Occasional Ventersdorp lava, Witwatersrand quartzite and slate; and
- Dolomite.

8.14.1 WETLAND NATIONAL FRESHWATER PRIORITY AREAS

A total of five (5) Freshwater Ecological Priority Areas (FEPA) wetland types were identified within the assessment area of the project. The systems are either regarded as natural or artificial systems. There is a gap in the dataset, and no details pertaining to the wetland condition and rank for this area are available. Based on this, this desktop information is omitted from the study, and this study will place emphasis in the extent of the delineated wetland areas. The FEPA wetland systems are listed in Table 23.

Table 23: NFEPA description for the FEPA systems

Classification Levels				Wetland Vegetation Class
L1 (System)	**L2 (Ecoregion)**	**L3 Landscape Position**	**L4 Hydrogeomorphic (HGM) Classification**	
Inland System	Highveld	Slope	Seep	Mesic Highveld Grassland
Inland System	Highveld	Valley Floor	Channelled	Mesic Highveld Grassland
Inland System	Highveld	Valley Floor	Floodplain	Mesic Highveld Grassland
Inland System	Highveld	Bench	Flat	Mesic Highveld Grassland
Inland System	Highveld	Bench	Depression	Mesic Highveld Grassland

8.14.2 THE MPUMALANGA HIGHVELD WETLANDS

The Mpumalanga Highveld (MPHG) wetlands dataset was also considered for the proposed mining project, with numerous HGM types located within the assessment area. The dominant wetland type within the assessment area was channelled valley bottom systems, with depression and seepage areas comprising a lower extent of the assessment area (Figure 25 and Figure 26). The status of the wetlands within the project assessment area varies from Moderately Modified (Class C) to Largely / Heavily Modified (Class Z). From this desktop dataset it is likely that some wetland areas may be lost as a result of the project. In the event that these wetland areas (and associated buffers) cannot be avoided, a wetland offset strategy will be required and is included as part of the wetland assessment report (Appendix D).

Figure 25: The FEPA and MGHG wetland types within and around the Phase 3 Project area

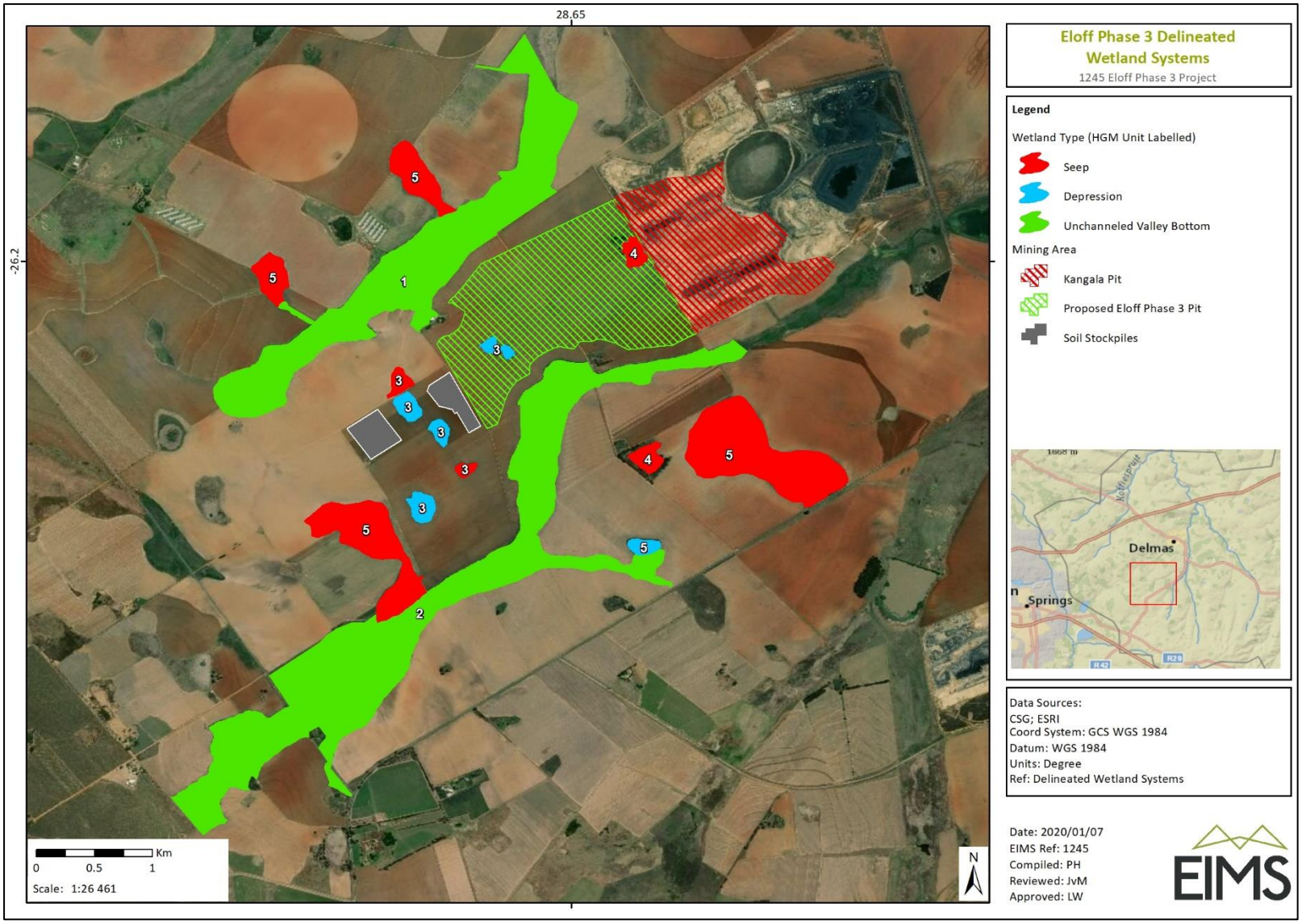


Figure 26: The delineated wetland systems within 500m of the Phase 3 Project area

8.15 HYDROGEOLOGY (GROUNDWATER)

A hydrogeology study was undertaken by GCS Water and Environmental Consultants in December 2019, the full report is presented in Appendix D. Based on their study of all groundwater related aspects and previous groundwater studies, they conceptualize the hydrogeological system underlying the proposed project as follows:

- The project area falls within the summer rainfall region of South Africa and receives on average ~ 669 mm of rainfall per year.
- The surface topography can be described as being undulating with a vertical difference of nearly 160 meters between the lowest and highest surface elevations.
- The non-perennial Dwars-in-die-wegvlei and tributaries of the Bronkhorstspruit cut through the western and eastern sections respectively of the Eloff mining right area, while the same Bronkhorstspruit tributaries also cut through the Kangala Colliery mining right area.
- According to the geological map, the vicinity of the subject area is characterised, in places, by outcropping dolerite (possibly dykes and sills). From a hydrogeological point, weathering around and fracturing within dolerite can lead to enhanced aquifer properties associated with groundwater flow and storage. In particular, long and thick low-permeability dykes act as barriers for much of the topography-driven groundwater flow (Kebede, 2013); therefore, they play a key role in the groundwater flow and storage in the karoo geology. The mapping (detection and delineation) of these hydraulic features can effectively be undertaken by geophysical techniques such as electrical resistivity surveys.
- The dolerite intrusions have a significant effect on the hydrogeology of the area. According to Vivier (1996) the two main advantages of intrusions are that they are easily located using geophysics and that they are usually surrounded by fracture zones. The disadvantages listed by Vivier (1996) are that due to the impermeable nature of the intrusion the aquifer is divided into compartments where little or no inter-compartmental flow can occur, and also the intrusion will act as a no-flow boundary resulting in drawdown and recovery rates of boreholes nearby being larger than desired for a production borehole.
- Three principal aquifers are identified in the conceptual geohydrological model for the Eloff Coal Resources: the weathered Karoo aquifer, the fractured Karoo aquifer and the underlying Transvaal karst aquifer. The aquifers associated with the proposed mining activities are classified as minor aquifers (low yielding) but of high importance. Transmissivity values are between 0.15 and 1.4 m^2/d which is typical of the Karoo type aquifers. The Dwyka Formation is considered a hydraulic barrier between the overlying mining activities and the Malmani dolomite formation.
- The weathered layer has a thickness of approximately 17 m and is comprised of residual soils and weathered shales and sandstone with hydraulic conductivity values in the order of 10^{-2} m/d. The underlying fractured units consist of shale, sandstone and coal seams in which groundwater movement is limited to secondary porosity, i.e. fractures. Fracturing mainly occurs in the top of this unit and decreasing with depth. Hydraulic conductivity will therefore decrease with depth and range between 10^{-1} m/d in the upper layers and 10^{-3} m/d for the lower layers.
- Groundwater levels generally follow topography and static groundwater levels are mostly within 17 m below ground level (median) with some deeper groundwater levels up 57 m below ground level. Groundwater in the surrounding area is used for domestic, stock watering and / or large-scale irrigation purposes. Groundwater quality is generally of good quality when compared to drinking water standards and there are no indications that historical mining activities (Kangala pit) are impacting on private or third-party groundwater sources. The total dissolved solids (TDS) of the groundwater range from ~ 50 to ~ 558 mg/l with pH values varying between ~ 6.5 and 8.2 (pH values), indicating slightly acidic to slightly alkaline conditions.

- No drawdown was recorded over the 72-hour constant-rate test period within the Karoo borehole, indicating / confirming no interconnectivity between the Malmani dolomite and mining Karoo Supergroup sediments (Vryheid Formation).
- The shallow weathered zone aquifer receives on average approximately 3% recharge from rainfall, while the fractured Karoo Supergroup aquifer/s receives between 1 and 3%. Where dolomite outcrop occurs, recharge is expected to vary between 2 and 6% of the mean annual rainfall.
- The interpretation of the geophysics (ERT) results indicated that the subject area is characterised by shallow (10-31m) decomposed and transition (low resistive) zones underlying resistive substratum. This implies that most of the groundwater will be found in the decomposed and transition zones while the underlying substratum will possibly act as a confining layer. As a result, the drill targets were recommended targeting the shallow decomposed and transition zones of the underlying lithology.
- Based on the borehole logs the site is mostly underlain by shale, and no major water strikes were found.
- Natural groundwater flow in the project area is towards the west/north-west and north-east at an average velocity/flux of approximately 3.5 m/y.
- Groundwater levels generally vary between ±2.4 and 58 m below surface (mbs) with the average being nearly 14 mbs.
- Water levels in excess of ±14 meters deep are considered to be affected by groundwater abstraction for domestic / other purposes, however impacts are largely restricted due to the generally low hydraulic properties of the aquifer host rock.
- Transmissivity values calculated from the aquifer testing ranged between 0.50 and 0.86 m^2/day and are typical for the encountered formations.
- The laboratory results showed a good water quality with all constituents compliant with the SANS 241-1: 2015 standard for drinking water.
- The saturated weathered zone and geological structures (dykes and faults) within the project area were identified as possible pathways along which groundwater and potential contamination may migrate at accelerated rates.
- Numerous groundwater user boreholes were located during the hydrocensus / user surveys, five of which are located within a one-kilometre radius of the proposed new opencast pit. Four of these boreholes are located in the pit and will be demolished during the life of mine (EF, EBA03, EBA30/KGA39 and KGA40) - note that only boreholes EBA30/KGA39 and KGA40 were in use at the time of the surveys. Borehole KGA41 is situated in the up-gradient groundwater flow direction.
- The potential decant points are located at the lowest topographical sections of the opencast mines. Based on the current groundwater levels at the Project site it is estimated that a moderate risk of decant exists for the rehabilitated opencasts. The most probable decant position is also indicated in Figure 27.
- The planned opencast pit is expected to intersect the groundwater table, at which point groundwater is expected to migrate towards and eventually flow into it. The rate of groundwater influx is determined by the hydraulic properties of the aquifer host rock as well as the groundwater hydraulic gradient (i.e. increase in mining depth will result in an increase in gradients and groundwater influx).

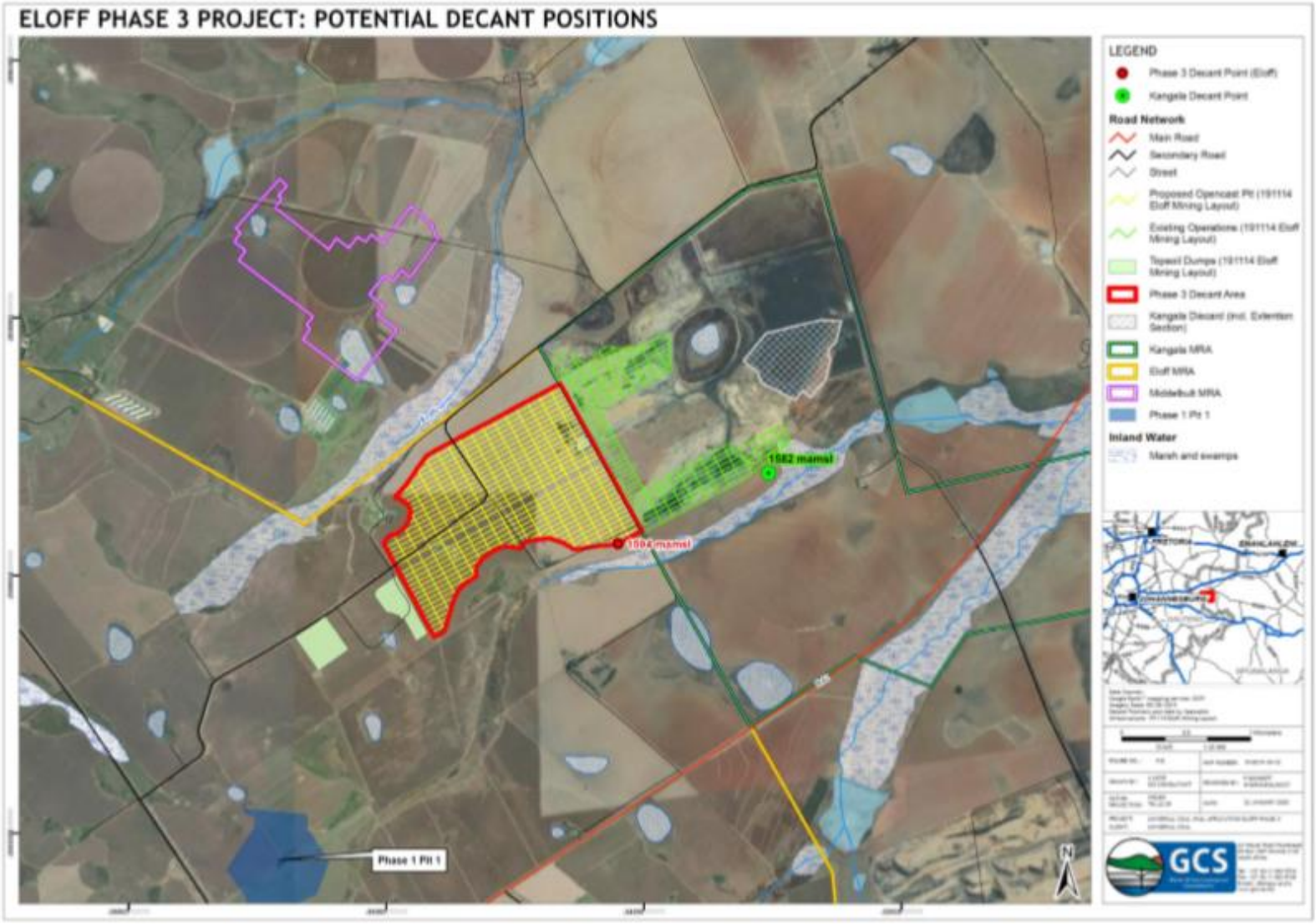


Figure 27: Potential Decant Positions

8.16 EXISTING INFRASTRUCTURE (BLASTING AND VIBRATION)

The blasting and vibrations scoping study was undertaken by Blast Management and Consulting in July 2019, the findings thereof make up this section and the full report presented in Appendix D. The receiving environment is considered the area expected to be influenced directly adjacent to the Phase 3 Project area and specifically the area adjacent to the proposed pit extension area. The different ranges of various potential Points of Interest (POI) and their ranges from the proposed pit area are indicated in Figure 28. These points are locations of receptors confirmed after on-site assessments.

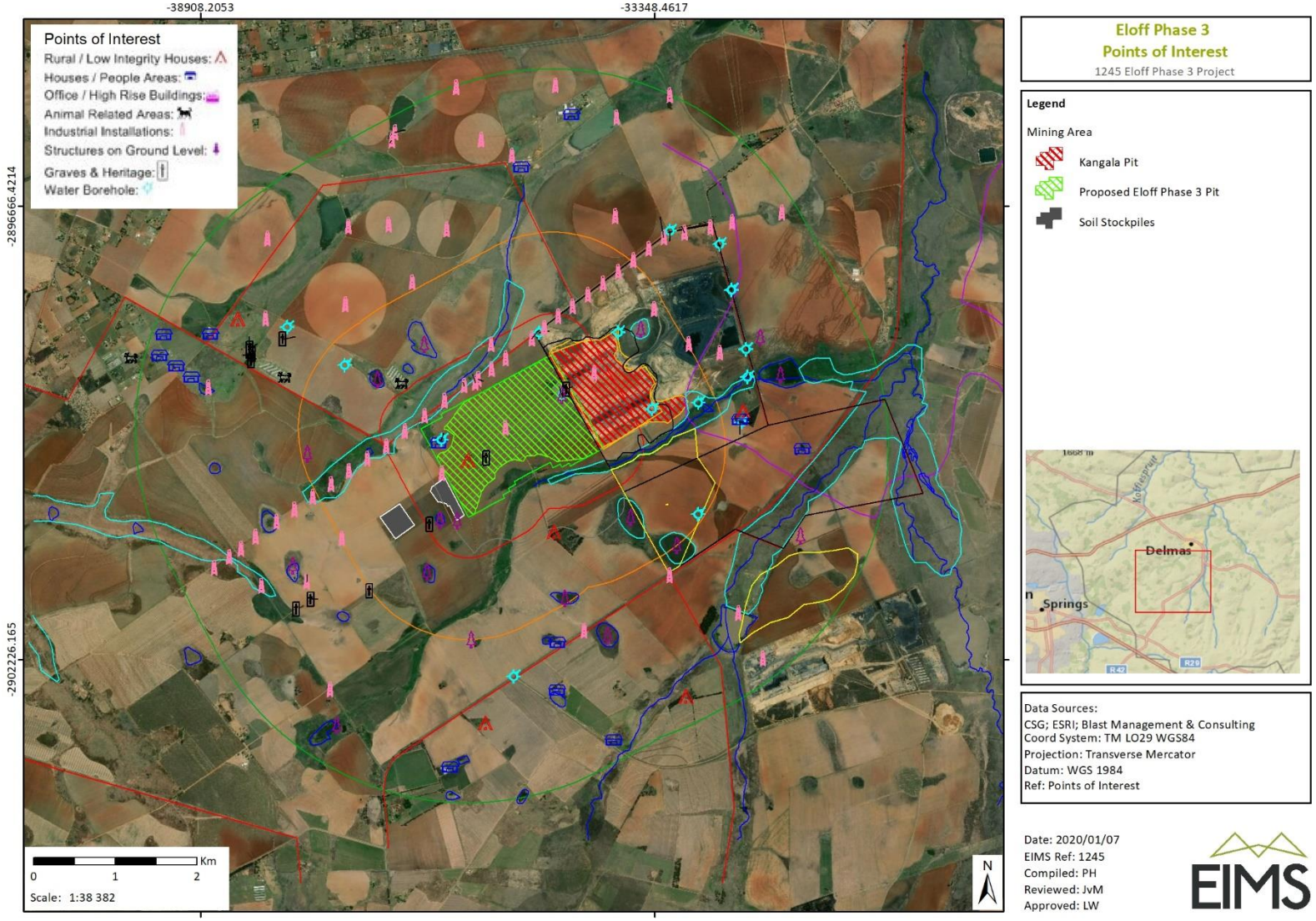


Figure 28: Points of Interest and their ranges from the proposed pit area

8.17 VISUAL RESOURCES

The visual study was conducted by Environmental Planning and Design in October 2019 and its findings are presented in this section, the full report is presented in Appendix D. The project area is defined by the limit of visibility of the proposed project. As an initial guide the limit has been set at 19.6km from the proposed site being the approximate limit of visibility of the stockpiles being the tallest items associated with the proposed development.

Landscape Character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another" (UK Guideline). Landscape Character is a composite of a number of influencing factors including:

- Landform and drainage;
- Nature and density of development; and
- Vegetation patterns.

8.17.1 LANDFORM AND DRAINAGE

The regional area generally falls from the south west to the north east. The general landform is comprised of low undulating ridgelines that are aligned with the general direction of fall. Ridgelines in the vicinity of the site are approximately 40-60m above valley floors. The non-perennial streams that drain the area flow to the north-west into the Olifants River. This system flows through the Kruger Park into Mozambique and then into the Indian Ocean. The proposed site is located on a shallow sloping broad ridgeline. The proposed mining extension falls from a mid-high point of approximately 1603mamsl to a low point at its eastern extremity of approximately 1582mamsl. This results in an approximate fall along the length of the site of approximately 1:45. This landform is likely to have a number of implications for visibility of the proposed development.

8.17.2 LANDCOVER

The site is located within an area that is predominantly under cultivation. These farm areas also have isolated farmsteads that are comprised of farm buildings including buildings used for residential and storage uses. There are also bands of natural vegetation in close proximity to the proposed mine extension. Other major landcover types include:

- Three large areas of settlement including Sundra, Eloff and Delmas that lie to the north, the closest being Delmas which is approximately 3.8km to the north of the proposed mine extension; and
- Two areas (Vischkuil and Droogfontein) that are indicated as urban are in fact areas of small holdings. Activities within these areas appear to include intensive / industrial agriculture such as agricultural tunnels as well as large individual private houses.

A number of other large coal mines including one approximately 3.2km to the east and one approximately 2.2km to the south of the proposed mine extension. There is only one protected area in the vicinity of the proposed site. This is the Marievale Bird Sanctuary which is a Provincial Nature Reserve which is approximately 16km from the proposed mine extension. Due to the distance and the fact that there are other existing mines in close proximity, it is highly unlikely that this protected area will be affected by the proposed mine extension. There are a number of regional roads in the area including the R42 which runs approximately 1.4km to the south and the R55 which runs approximately 3.8km to the north of the proposed mine extension.

There are a number of regional roads in the area including the R42 which runs approximately 1.4km to the south and the R55 which runs approximately 3.8km to the north of the proposed mine extension.

Existing landcover is likely to have the following visual implications for the proposed mine extension:

- Open cultivated areas in which the mine is set are unlikely to provide significant screening of the proposed mine extension and stockpiles;

- The occurrence of other large mining operations in the vicinity of the proposed site makes mine stockpiles a common landscape element within the region;
- It is possible that the adjacent natural areas could provide a degree of screening for the proposed mine and stockpiles, particularly if they include alien invasive tree species;
- Whilst there are regional routes close to the propose mine extension, due to the nature of the area which includes numerous mine sites, they are unlikely to have significant tourism or recreational importance and are therefore unlikely to be highly sensitive to visual changes associated with the proposed mine extension; and
- Settlement areas to the north as well as individual farmsteads could have greatest visual sensitivity to the proposed mine extension.

There are two additional mine developments currently proposed including:

- The Eloff Phase 1 project which is located immediately to the south west of the proposed Eloff Phase 3; and
- The Middelbult Mine which is proposed to the north of the proposed Eloff Phase 3.

The stockpiles associated with these projects are likely to be the main elements that will be visible to visual receptors.

8.17.3 VEGETATION PATTERNS

The main natural vegetation types as defined by Mucina and Rutherford in the vicinity of the proposed mine extension include:

- Eastern Highveld Grassland; and
- Soweto Highveld Grassland.

Whilst botanically these vegetation types may be very different, in visual terms they are both short dense grasslands which in themselves are unlikely to provide any screening. Existing areas of cultivation and settlement have been overlaid onto the vegetation types. From this it is apparent that the majority of natural vegetation in the vicinity of the site has been transformed. It is obvious that only small areas of natural vegetation exist in close proximity to the proposed mine extension. It is therefore obvious that natural vegetation patterns play a minimal role in defining landscape character. From the site visit conducted, it is also obvious that most natural areas have been invaded by alien tree species. These alien tree species are common within and around settlements, farmsteads, on roadsides, along stream lines and on agricultural property boundaries. A significant amount of localised screening is provided by this alien vegetation.

8.17.4 LANDSCAPE CHARACTER AREAS AND VISUAL ABSORPTION CAPACITY

Landscape Character Areas (LCAs) are defined as “single unique areas which are the discrete geographical areas of a particular landscape type”. Visual Absorption Capacity (VAC) is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. Where elements that contrast with existing landscape character are proposed, VAC is dependent on elements such as landform, vegetation and other development to provide screening of a new element. The scale and texture of a landscape is also critical in providing VAC, for example; a new large-scale industrial development located within a rural small-scale field pattern is likely to be all the more obvious due to its scale.

As the topography is very similar throughout the project area, landscape character is generally defined by the extent of development and transformation of vegetation types. The affected landscape can be broadly divided into the following LCAs:

- The Mining Urban LCA;
- The Rural Mining LCA;
- The Rural Natural LCA;

- The Small Holding LCA; and
- The Urban LCA.

The proposed mine extension will be located largely within the Rural Mining LCA.

8.17.5 LANDSCAPE QUALITY AND IMPORTANCE

The majority of the affected landscape appears to be largely transformed by a combination of mining activity, agriculture and settlement. The most natural and perhaps the most sensitive LCA to possible change associated with the proposed development is the Rural Natural LCA although views of mining activities are likely to be possible from the majority of this LCA (Figure 29). The proposed mine extension will extend marginally into this LCA. It seems unlikely that there are critical high quality landscapes in the vicinity of the proposed site that are worthy of preservation. It seems more likely that specific views associated with sensitive visual receptors will be the main concern. There is only one protected area that is close to the south western edge of the Approximate Limit of Visibility. This area is located close to other existing mines. Due to distance and the current visual setting, it is highly unlikely to be sensitive to the landscape change that could result from the proposed development.

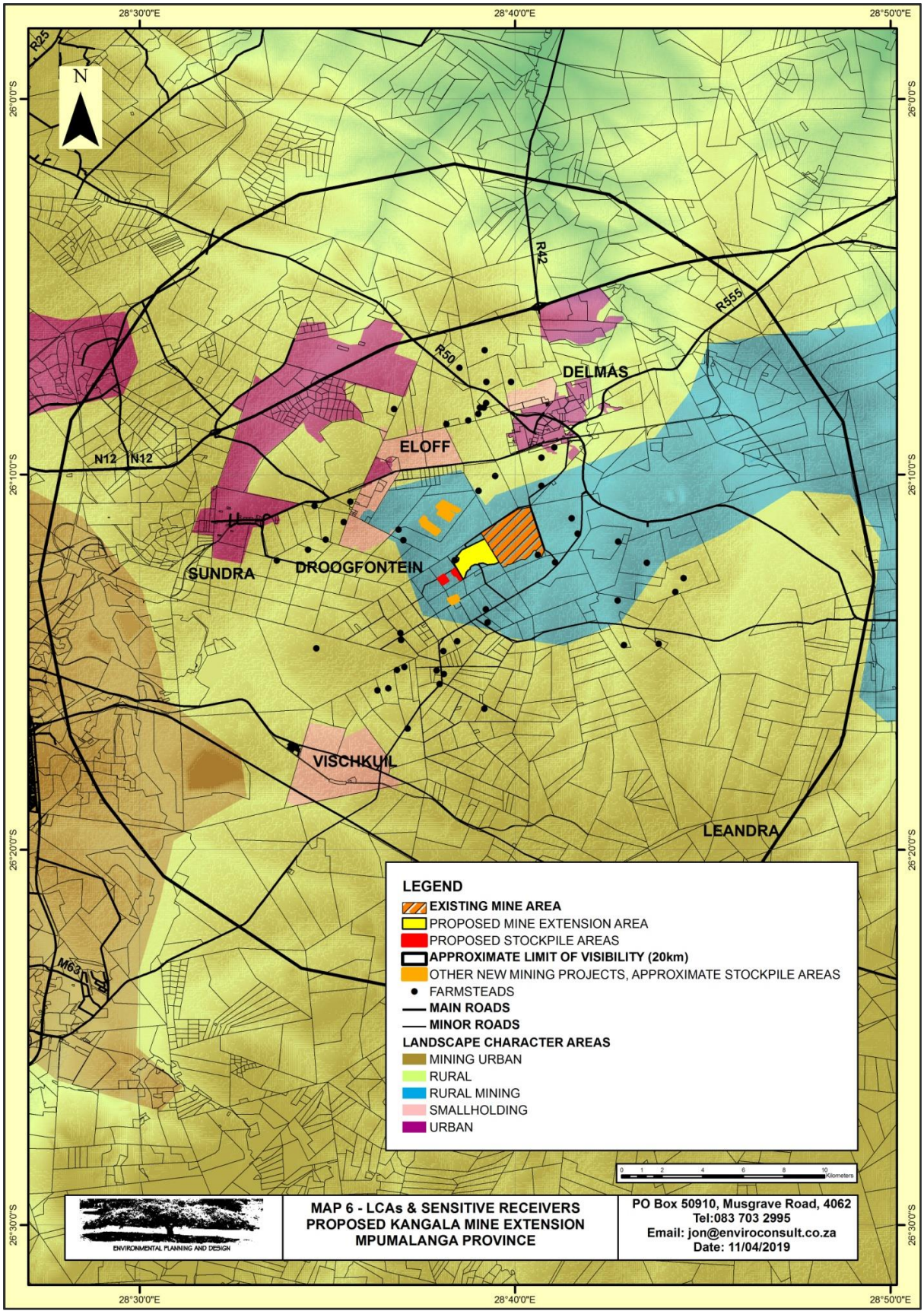


Figure 29: LCAs and sensitive receivers

8.17.6 VISUAL RECEPTORS

This section is intended to highlight possible Receptors within the landscape which due to use could be sensitive to landscape change. They include:

- Area Receptors –
    - The urban areas to the north and south of the project site including Delmas and Sundra. Areas associated with this use could be sensitive to possible changes in outlook associated with the proposed development. However it seems likely that due to distance, and the VAC of the landscape, the majority of these areas will be subject to minimal visual impact. These impacts are likely to be limited to the urban edge. It is the settlement component of urban areas that is likely to be sensitive to possible changes in view;
    - Areas of smallholdings including Droogfontein, Eloff, and Vischkuil. It is possible that closest properties could be affected and subject to use may be sensitive. It is the settlement component of these smallholdings that is likely to be sensitive to changes in view; and
    - The Marievale Bird Sanctuary, however due to distance and the fact that there are other mining activities in close proximity to this receptor, it is highly unlikely that it will be sensitive.
- Linear Receptors which include the R555 which runs approximately 3.7km to the north and the R42 which runs approximately 1.8km to the south of the proposed mine extension. There are also a number of other minor local roads, one of which runs adjacent to the northern boundary of the proposed mine extension. Given that these roads are likely to be used as local distributor routes and that they are unlikely to have significant recreational or tourism importance, these receptors are likely to have a low level of sensitivity to the likely landscape change.
- Point Receptors which include isolated homesteads and small rural settlements most of which are likely to be associated with agricultural uses of the surrounding rural area. It is possible but unlikely that a number may also be used for recreational and tourism activities. Subject to location and the degree of screening provided by vegetation around the homesteads, these could be sensitive to the landscape change.

8.18 NOISE

The noise study was conducted by Enviro Acoustic Research in October 2019. The findings related to the baseline noise environment are presented in this section.

Ambient sound levels were measured during August 2009 when the original EIA was compiled for Kangala Colliery (Digby Wells, 2014). These baseline measurements highlighted that both day- and night-time ambient sound levels are mostly typical of a rural noise district, with ambient sound levels being higher the closer the measurement location are to the provincial roads.

Additional measurements were collected to augment this data and to affirm or cede the findings of the 2009 sound measurements. As such the site was visited 7 and 13 August 2018, though no measurements were collected during these dates due to high winds (increasing wind induced noises).

The site was again visited 6 September 2018 with a number of short-term measurements collected 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". Wind-induced noises were unfortunately also significant during this period.

Considering the developmental character as well as the LAeq,f and LA90 sound level descriptors, ambient sound levels the area have sound levels typical of a urban noise district closer to the existing mining activities, with areas further from the existing mining activities having a soundscape more typical of a rural noise district. Certain agricultural activities, such poultry farming, do influence ambient sound levels closer to the activity. Traffic on the provincial roads could influence the ambient sound levels up to 500 m from these roads.

Potential receptors in and within approximately 2,000m around the proposed development activities were identified as 1 to 6 (Figure 30). Potentially sensitive receptors, also known as noise-sensitive developments (NSDs), located within or close to the MR area was identified using Google Earth. . The following was noted during the site visits:

- The house was demolished and is not used.
- NSD04 is an operating poultry operation with fans that generate a constant noise.
- NSD05 is a house used by Kangala as a training centre.

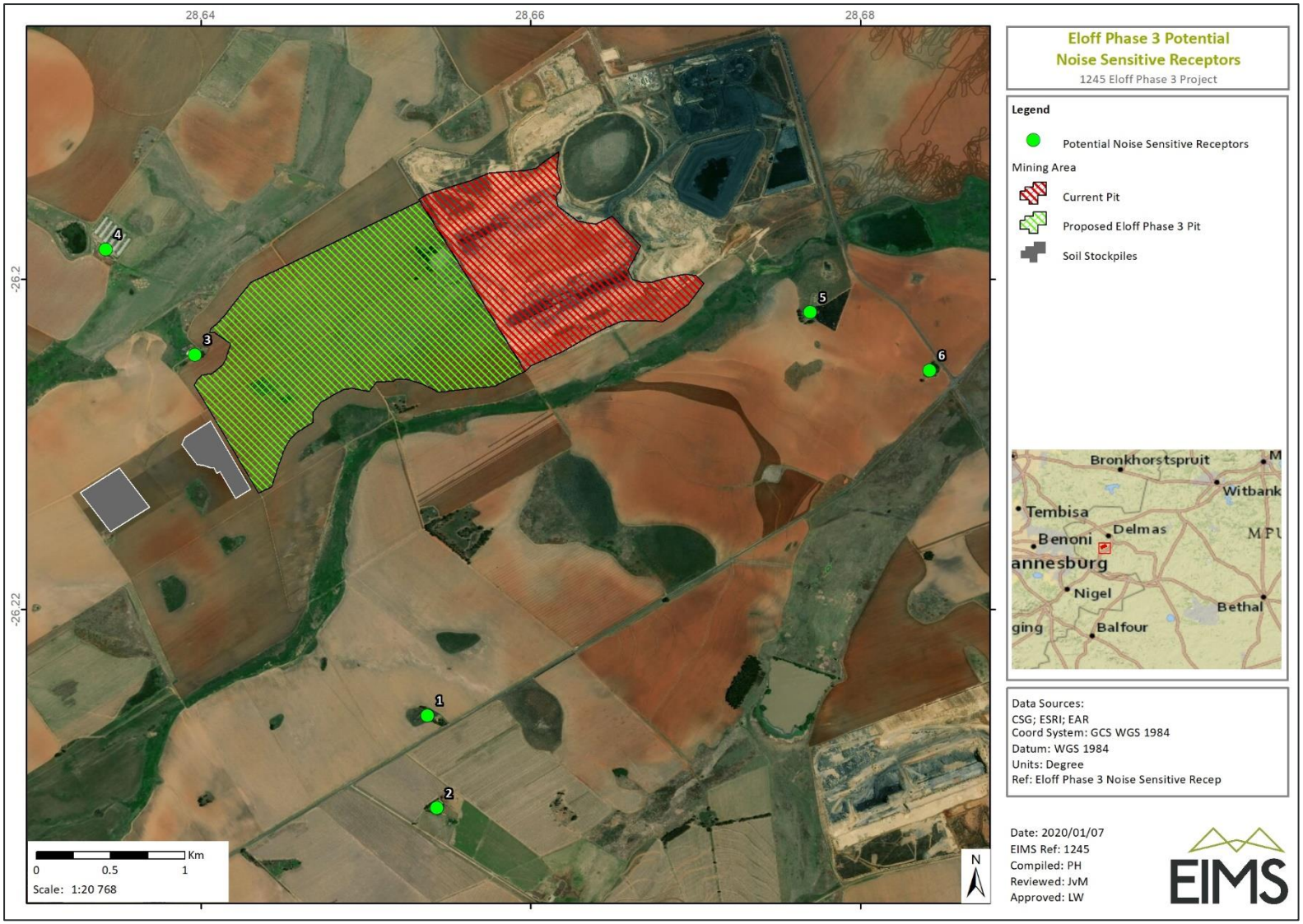


Figure 30: Aerial image indicating potentially noise-sensitive receptors

8.19 AIR QUALITY

The air quality study was undertaken by Airshed Planning Professionals in October 2019 and the findings of the study are presented in this section, full details are presented in Appendix D. Below are the findings of the EIA air quality assessment described in terms of the following:

- Local AQSRs;
- The atmospheric dispersion potential;
- Baseline or pre-development ambient air pollutant contributors; and
- Pre-development ambient air pollutant levels.

Readily available terrain and land cover data was obtained from the United States Geological Survey (USGS) via the Earth Explorer website (U.S. Department of the Interior, U.S. Geological Survey, 2016). Use was made of Shuttle Radar Topography Mission (SRTM) (90 m, 3 arc-sec) data and Global Land Cover Characterisation (GLCC) data for Africa. An understanding of the atmospheric dispersion potential of the area is essential to an air quality impact assessment. In the absence of on-site meteorological data (that is required for atmospheric dispersion modelling), use was made of MM5 modelled meteorological data for the study site for the period 2014-2016. There is available ambient monitoring data (PM10 concentrations and dust fallout levels) in the Project area for the period 2015-2018. Potential air quality sensitive receptors (AQSRs) were identified from Google Earth imagery.

8.19.1 AIR QUALITY SENSITIVE RECEPTORS

Air Quality Sensitive Receptors (AQSRs) generally include places of residence and areas where members of the public may be affected by atmospheric emissions generated by mining/industrial activities. The nearest receptors to the project location are farmsteads, residential areas, schools, a hospital and agricultural holdings (Figure 31).

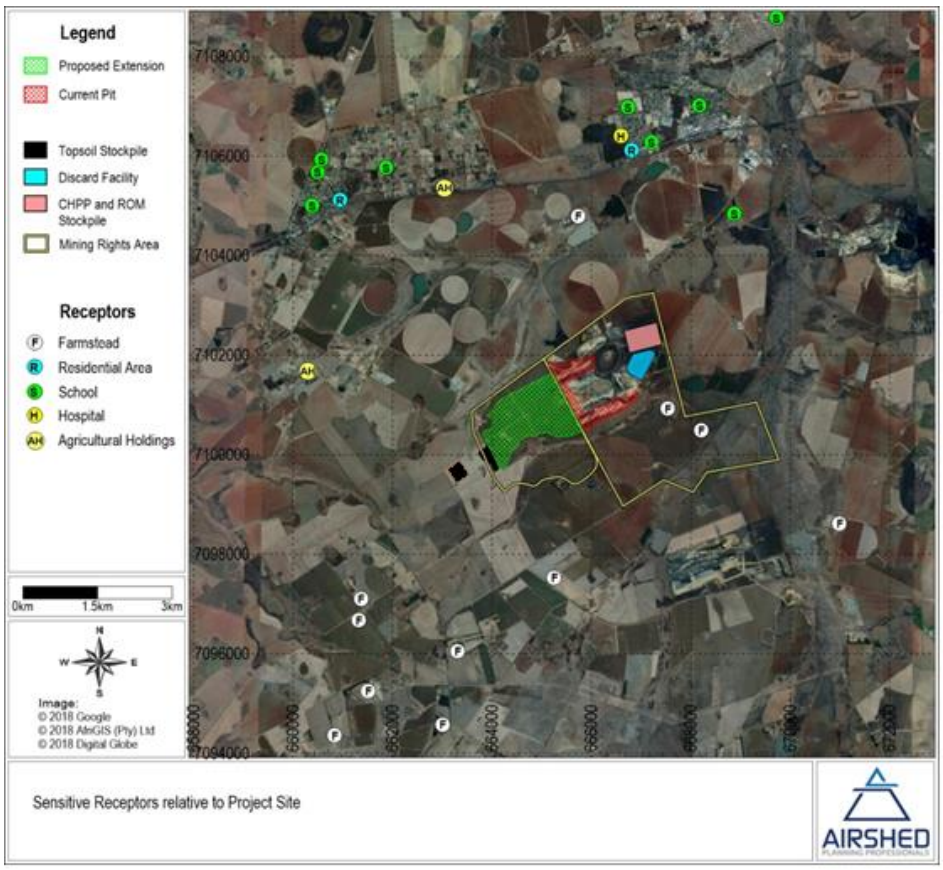


Figure 31: Location of air quality sensitive receptors relative to the project

8.19.2 ATMOSPHERIC STABILITY

The new generation air dispersion models differ from the models traditionally used in a number of aspects, the most important of which are the description of atmospheric stability as a continuum rather than discrete classes. The atmospheric boundary layer properties are therefore described by two parameters; the boundary layer depth and the Monin-Obukhov length, rather than in terms of the single parameter Pasquill Class.

The Monin-Obukhov length (LMo) provides a measure of the importance of buoyancy generated by the heating of the ground and mechanical mixing generated by the frictional effect of the earth's surface. Physically, it can be thought of as representing the depth of the boundary layer within which mechanical mixing is the dominant form of turbulence generation (CERC, 2004). The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. During daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface. Night-times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low wind speeds and lower dilution potential.

Diurnal variation in atmospheric stability, as calculated from on-site data, and described by the inverse Monin-Obukhov length and the boundary layer depth is provided in Figure 32. The highest concentrations for ground level, or near-ground level releases from non-wind dependent sources would occur during weak wind speeds and stable (night-time) atmospheric conditions.

For elevated releases, unstable conditions can result in very high concentrations of poorly diluted emissions close to the stack. This is called looping (Figure 32 (c)) and occurs mostly during daytime hours. Neutral conditions disperse the plume fairly equally in both the vertical and horizontal planes and the plume shape is referred to as coning (Figure 32 (b)). Stable conditions prevent the plume from mixing vertically, although it can still spread horizontally and is called fanning (Figure 32 (a)) (Tiwary & Colls, 2010).

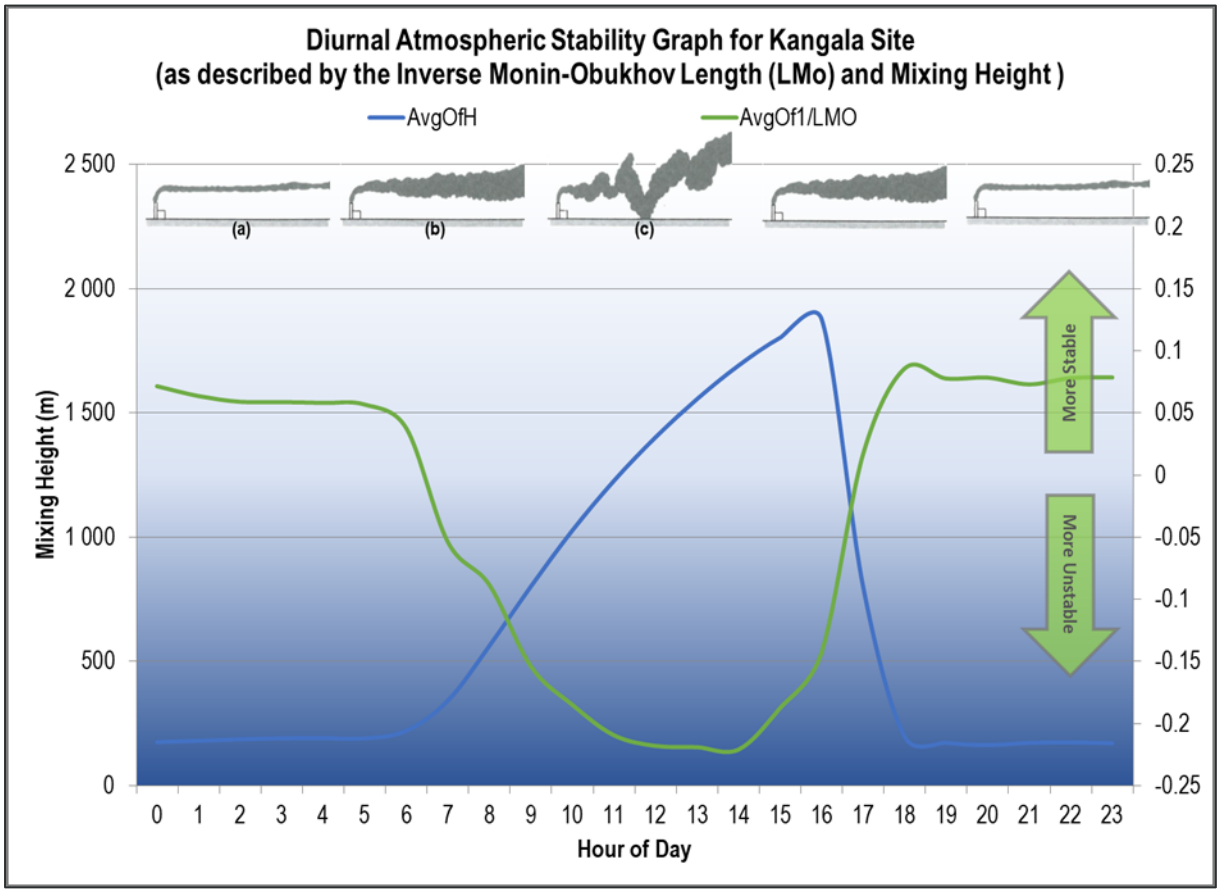


Figure 32: Diurnal atmospheric stability (MM5 modelled data for the study site, 2014 to 2016)

8.19.3 SURFACE WIND FIELD

The wind field determines both the distance of downward transport and the rate of dilution of pollutants. The generation of mechanical turbulence is a function of the wind speed, in combination with the surface roughness. The wind field for the study area is described with the use of wind roses. Wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds in between 4 and 5 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. Calm conditions are periods when the wind speed was below 1 m/s. These low values can be due to "meteorological" calm conditions when there is no air movement; or, when there may be wind but it is below the anemometer starting threshold. AERMET, the meteorological pre-processor to AERMOD, treats calm conditions (wind speeds <1 m/s) as missing data, which can result in overly conservative concentration estimates simulated in AERMOD. The Regulations regarding Air Dispersion Modelling (DEA, 2014) suggest that all wind speeds greater than or equal to the anemometer starting threshold and less than 1 m/s be replaced with the value of 1 m/s. This approach was been adopted.

The period wind field and diurnal variability in the wind field from the modelled MM5 data are shown in Figure 33 and Figure 34, while the seasonal variations in the wind field are provided in Figure 35. During the 2014 to 2016 period, the wind field was dominated by strong winds from the north, and north-northeast. The strongest winds (more than 6 m/s) were recorded from the north-northwest, north and north-northeast, occurring mostly during the day (06:00 to 18:00). An increase in dominant winds from the north-northeast occurred at night (18:00 to 06:00). Seasonal wind fields vary - during spring and summer the dominant winds are from the north and north-northeast, with very little wind from the south, whereas the autumn and winter seasons are dominated by northerly winds with an increase in winds from the south and the east.

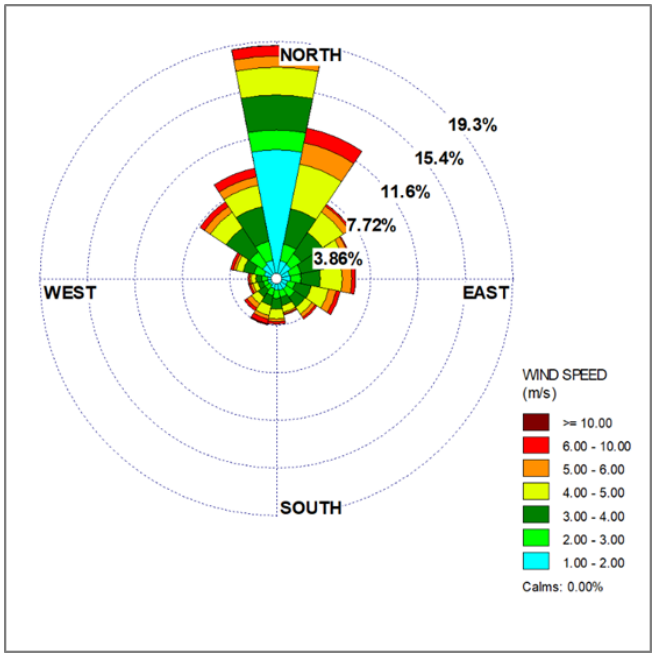


Figure 33: Period average wind rose (MM5 modelled data for the study site, 2014 to 2016)

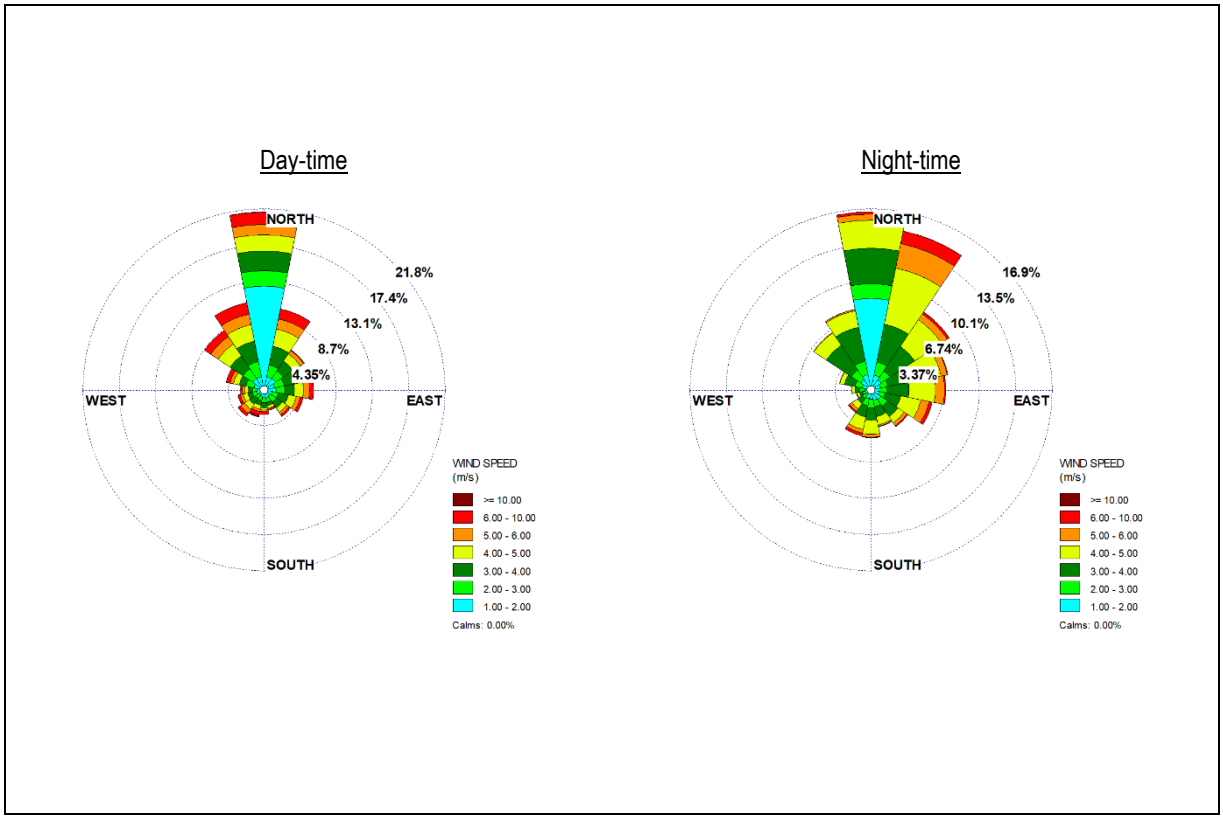
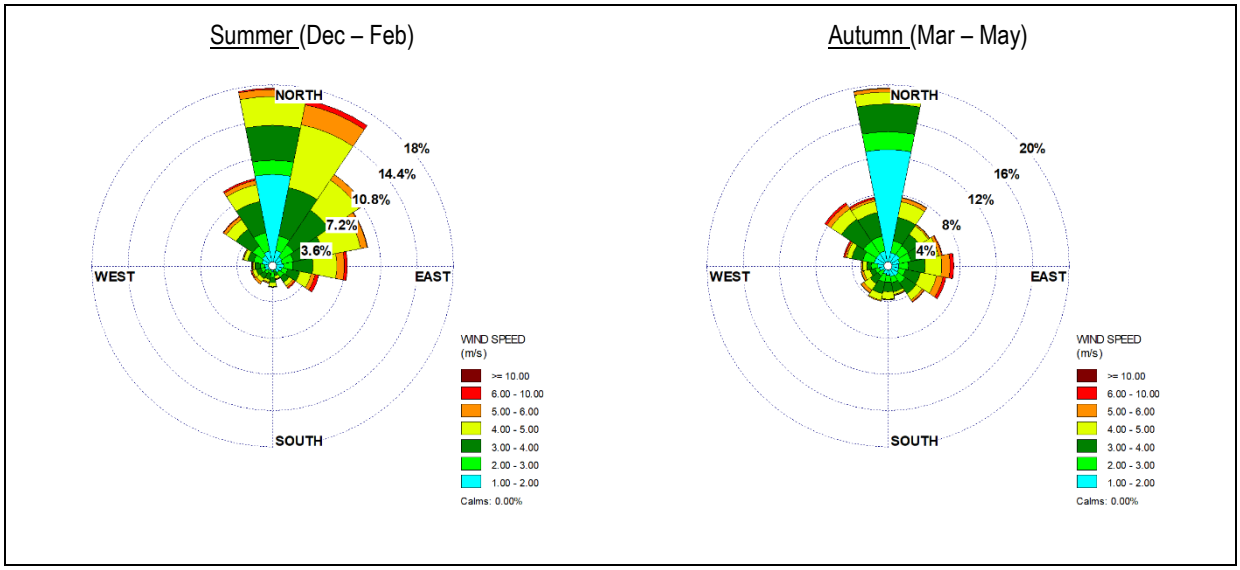


Figure 34: Day-time and night-time wind roses (MM5 modelled data for the study site, 2014 to 2016)



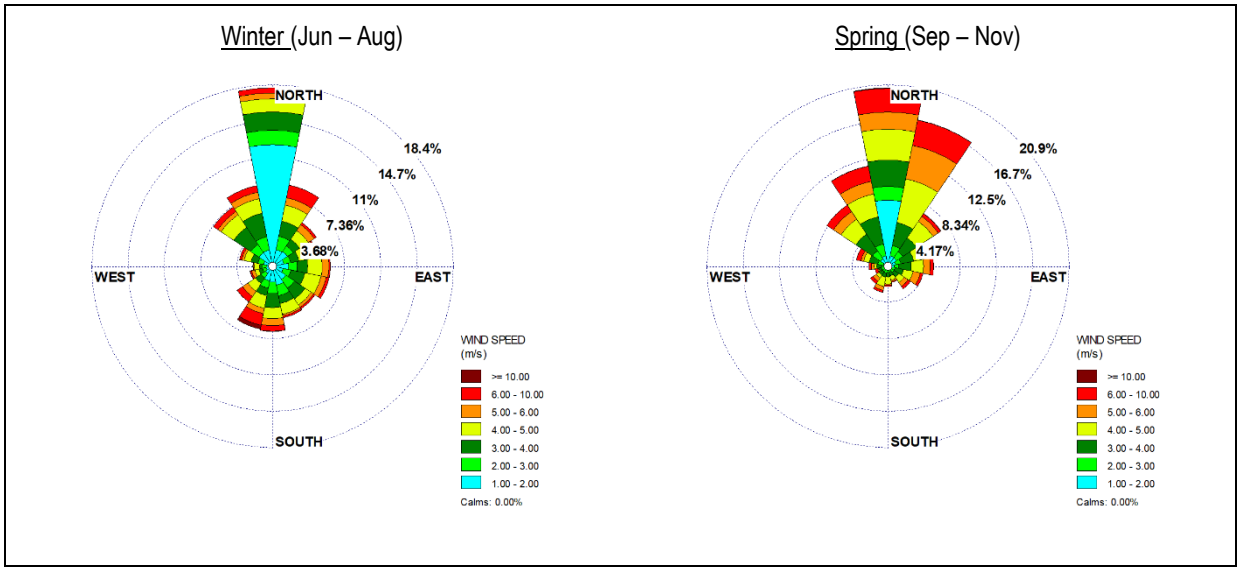


Figure 35: Seasonal wind roses (MM5 modelled data for the study site, 2014 to 2016)

8.19.4 EXISTING SOURCES OF EMISSIONS NEAR THE PROJECT SITE

Power generation, mining activities, farming and residential land-uses occur in the vicinity of the proposed Phase 3 Project. These land-uses contribute to baseline pollutant concentrations via vehicle tailpipe emissions, household fuel combustion, biomass burning and various fugitive dust sources. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute to background fine particulate concentrations within the South African boundary (Andreae*, et al*., 1996; Garstang, Tyson, Swap, & Edwards, 1996; Piketh, Annegarn, & Kneen, 1996; Swap *et al.*, 2003).

Power Generation

The closest power station is Kendal Power Station, situated approximately 32 km to the north-east of the Project site. Processing emissions and fugitive emission sources from these operations mainly comprise of boiler operations, materials handling operations (i.e. tipping, off-loading and loading, conveyor transfer points), vehicle entrainment from plant roads and windblown dust from open areas. These activities result in PM, NOx, CO, SO2, VOC and diesel particulate matter (DPM) releases.

Metallurgical Manufacturing

There are metallurgical manufacturing operations located in the vicinity of the Project. Processing emissions and fugitive emission sources from these operations mainly comprise of dryer and smelter operations, materials handling operations (i.e. tipping, off-loading and loading, conveyor transfer points), vehicle entrainment from plant roads and windblown dust from open areas. These activities result in PM, NOx, CO, SO2, VOC, DPM and trace metal releases.

Mining Operations

There are numerous existing and proposed mines located in the vicinity of the Project. Fugitive emissions sources from mining operations mainly comprise of land clearing operations (i.e. scraping, dozing and excavating), materials handling operations (i.e. tipping, off-loading and loading, conveyor transfer points), vehicle entrainment from haul roads, wind erosion from open areas and drilling and blasting. These activities mainly result in fugitive PM releases with NOx, CO, SO2, VOC and DPM being released during blasting operations as well as a result of diesel combustion and storage. The closest existing mines are Leeuwpan and Stuart opencast coal mines to the north-east at distances of 7km and 11.5 km, respectively.

Agricultural operations

Agriculture is a land-use within the area surrounding the site. Particulate matter is the main pollutant of concern from agricultural activities as particulate emissions are deriving from windblown dust, burning crop residue, and dust entrainment as a result of vehicles travelling along dirt roads. In addition, pollen grains, mould spores and plant and insect parts from agricultural activities all contribute to the particulate load. Should chemicals be used for crop spraying, they would typically result in odoriferous emissions. Crop residue burning is an additional source of particulate emissions and other toxins.

Miscellaneous Fugitive Dust Sources

Fugitive PM emissions are generated through entrainment from local paved and unpaved roads, and erosion of open or sparsely vegetated areas. The extent of particulate emissions from the main roads will depend on the number of vehicles using the roads, and on the silt loading on the roadways. The extent, nature and duration of road-use activity and the moisture and silt content of soils are required to be known in order to quantify fugitive emissions from this source. The quantity of windblown dust is similarly a function of the wind speed, the extent of exposed areas and the moisture and silt content of such areas.

Vehicle Tailpipe Emissions

Air pollution from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere, and secondary, those pollutants formed in the atmosphere as a result of chemical reactions, such as hydrolysis, oxidation, or photochemical reactions. Notable primary pollutants emitted by vehicles include CO2, CO, hydrocarbons (HCs), SO2, NOx, DPM and Pb. Secondary pollutants include: NO2, photochemical oxidants (e.g. ozone), HCs, sulphur acid, sulphates, nitric acid, nitric acid and nitrate aerosols. Hydrocarbons emitted include benzene, 1.2-butadiene, aldehydes and polycyclic aromatic hydrocarbons (PAH). Benzene represents an aromatic HC present in petrol, with 85% to 90% of benzene emissions emanating from the exhaust and the remainder from evaporative losses. Vehicle tailpipe emissions are localised sources and unlikely to impact far-field. The R555 and R42 provincial roads are in close proximity to the project area and are both busy roads. The R42 provincial road crosses through the centre of the Project area in a north-east to south-west direction. The R555 provincial road runs along the north western boundary of the Project area.

Household Fuel Burning

Energy use within the residential sector is given as falling within three main categories, viz.: (i) traditional - consisting of wood, dung and bagasse, (ii) transitional - consisting of coal, paraffin and liquefied petroleum gas (LPG), and (iii) modern – consisting of electricity (increasingly this includes the use of renewable energy). The typical universal trend is given as being from (i) through (ii) to (iii). Pollutants include products of combustion (CO, NOx, SO2 and VOC), unburned HC and PM.

8.19.5 MEASURED BASELINE AIR QUALITY

Particulates represent the main pollutant of concern in the assessment of mining operations. The particulates in the atmosphere may contribute to visibility reduction, pose a threat to human health, or simply be a nuisance due to their soiling potential.

Measured Ambient Air Pollutant Concentrations

A Met-One E-Sampler is used to measure PM10 concentrations at Kangala Colliery. The E-Sampler was installed on 22 April 2015 at the main truck entrance near a security booth on the border of the mine. On 12 April 2016, the E-sampler was relocated to the nearby training centre (-26.202342°S; 28.677159°E) which is located further away from the main truck entrance. The E-Sampler was relocated as per the request of the client due to its close proximity to the haul road (Rayten Engineering Solutions, Air Quality Monthly Monitoring Report, 14 October 2016). The PM10 concentrations that were measured between 22 April 2015 and 30 April 2016 regularly exceeded the daily NAAQS during the May to October period (65 exceedances). After the relocation of the monitoring station to UD-001 the frequency of exceedance was reduced to 13 exceedances between 1 May 2016 and 30 April 2017; 3 exceedances between 1 May 2017 and 30 April 2018; and 9 exceedances in the 3-month period 1 May 2018 to 31 July 2018. The annual average concentration was calculated from the monthly

concentrations over the measuring period and was estimated to be 46 µg/m³ (2015/2016); 23 µg/m³ (2016/2017); and 26 µg/m³ (2017/2018).

Modelled Ambient Air Pollutant Concentrations

The Project is located within the Highveld Priority Area, but outside the modelled ambient "hotspot" areas where annual concentrations due to industrial sources exceed the PM10 NAAQS. The modelled PM10 predictions as provided in the Highveld Priority Area Management Plan (which excluded the mining operations and domestic fuel burning operations) show that the project is located outside the areas where more than 4 days of exceedance per year may be expected.

8.19.6 DUSTFALL RATES

The dustfall monitoring network consists of five buckets located at the existing Kangala Colliery and its surroundings (Figure 36). Both dustfall and PM10 is measured at UD-001, which is located within the Kangala mining rights area. Dustfall rates are as measured during the period January 2015 to June 2018 (Figure 37). The residential limit of 600 mg/m^2/day was exceeded at UD-003 more than twice per year, and for sequential months, during the 2015/2016, 2016/2017, and 2017/2018 sampling periods. The only other monitoring stations where exceedances were recorded are UD-001 and UD-004; however, the exceedances were not in sequential months.

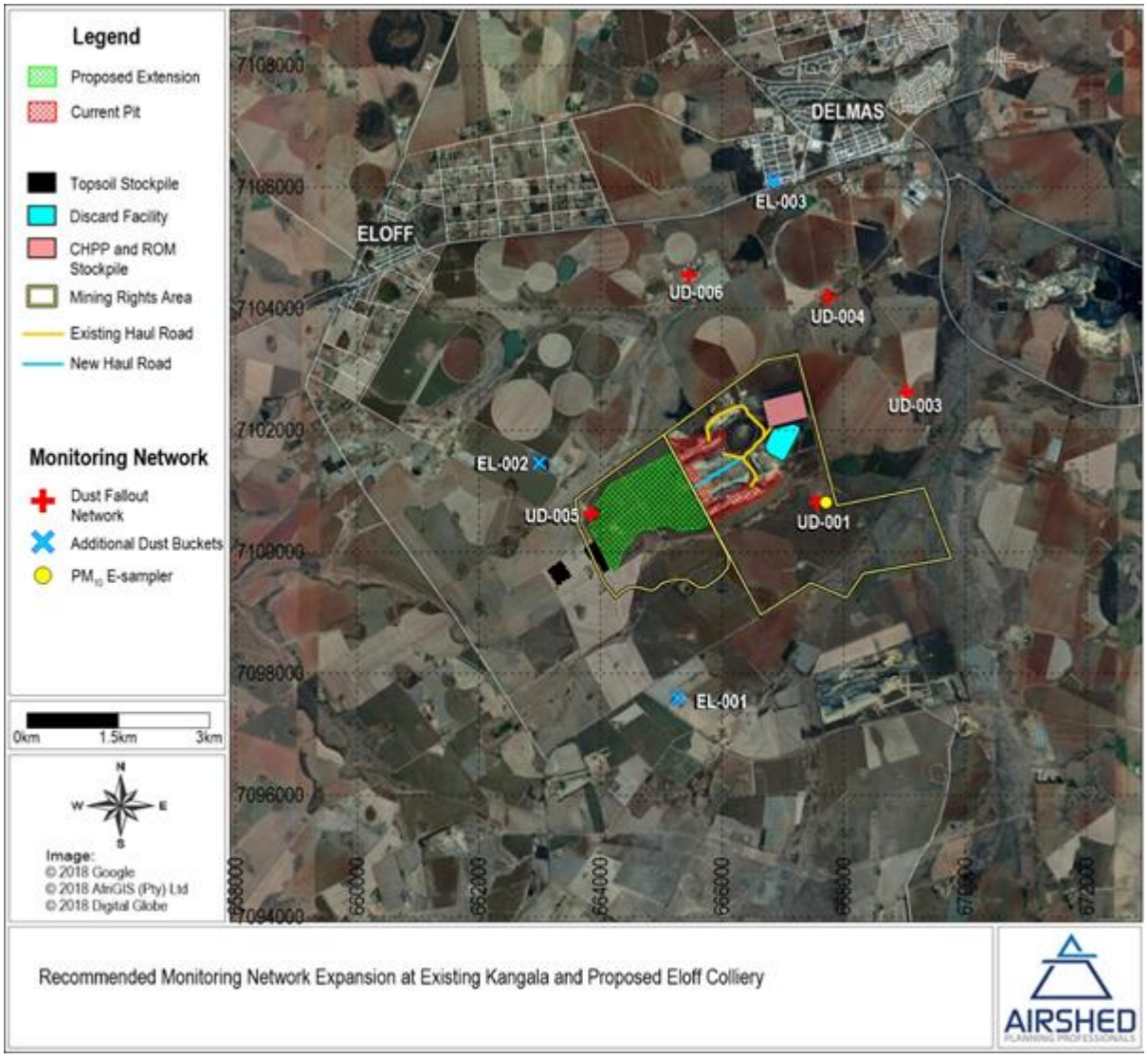


Figure 36: Dustfall out monitoring network locations (including recommended expansion of monitoring network)

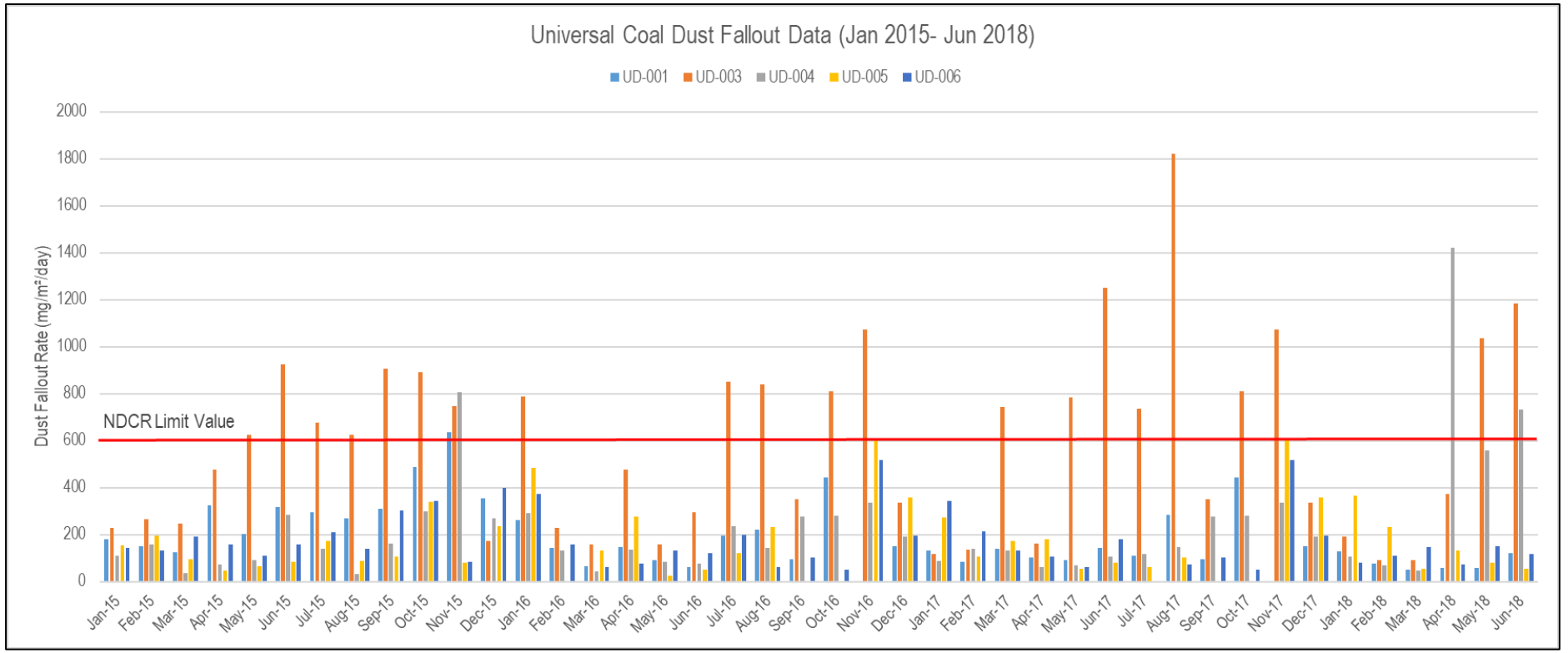


Figure 37: Monthly dustfall rates sampled at Kangala Colliery and its surroundings (January 2015 – June 2018)

8.20 CLIMATE CHANGE

The climate change study, pertaining to the calculation of the carbon footprint and determine the greenhouse gas (GHG) emissions arising from the operations of the Phase 3 Project, was undertaken by Airshed Planning Professionals in October 2018 and updated in October 2019 and the full details thereof are presented in Appendix D. Below are some of the findings regarding the climate and socio-economic environment of the project area, and how it may be affected by climate change. The proposed Phase 3 project activities are anticipated to result in greenhouse gas impacts in the project area. Carbon taxation must be considered. The carbon tax bill provides for the imposition of a tax on the carbon dioxide equivalent (CO_2eq) of GHG emissions. Similarly, as for carbon taxation, GHG emissions are also required to be reported for the National Greenhouse Gas Emissions Reporting Regulations (NGER) (Department of Environmental Affairs, 2017a). All coal mines are required to account for the amount of pollutants discharged into the atmosphere (total emissions for one or more specific GHG pollutants) by 31 March each year.

8.20.1 GREENHOUSE GAS EMISSIONS FROM COAL MINING ACTIVITIES

The opencast coal mining process starts with land clearing for the removal of vegetation and topsoil by using bulldozers and scrapers, which may create damage to soil quality and vegetation as well as release large amounts of dust (Ghose, 2007). After land clearing, drilling and blasting are performed to reach the coal seam. Vertical blast holes are drilled from the surface and vary in diameter from 25 to 100 cm. In some mines, horizontal holes are drilled into the overburden with the drill sitting on the coal surface. The holes are generally charged with explosives that are a mixture of ammonium nitrate and fuel oil in dry mix, slurry, or emulsion forms. Often in practice, large quantities of nitrogen dioxide (NO_2) are released from blasts, which are observed as intense orange plumes (Pandey and Gautam, 2017).

After drilling and blasting of hard overburden, when the coal seam is exposed, the block of coal may be drilled and blasted (if hard) which releases coal dust. Coal dust itself acts as a medium for transportation and dispersal of pollutants in the surface environment, and its chemical composition contains metals like Fe, Cu, Zn, Mn, Pb, Cd, Cr, Ni, Co, V, Ti, Br, Zr, etc., and organic pollutants (Pandey and Gautam, 2017). The sources of GHG emissions associated with coal mining activities are shown in Table 24.

Table 24: Typical sources of GHG emissions associated with coal mining (Pandey and Gautam, 2017)

Activity	Pollutants	Sources of GHG
Coal seam exploitation (mining emissions).	Coal dust, CO, NOx, CO2, methane (NH4)1[4] and noise from opencast activities.	Direct energy use (fuel combustion), indirect energy use (electricity consumption) and fugitive emissions.
Mechanical coal preparation (post-mining emissions).	Coal dust, CO, NOx, CO2, NH4 and noise from materials handling of ROM coal, coal preparation waste (stone, sludge, slime, sewage, flotation tailings) and used chemicals.	Fugitive emissions.
Transportation (post-mining emissions).	Noise and coal dust from electricity and diesel fuel.	Direct energy use.
Low temperature oxidation	Once coal is exposed to oxygen in air, the coal oxidises to produce CO2.	Fugitive emissions.
Spontaneous combustion	On occasions, when the heat produced by low temperature oxidation is trapped, the temperature rises and an active fire may result (with rapid CO2 formation).	Combustion emissions.

8.20.2 BASELINE AND FUTURE CLIMATE PROJECTED FOR THE DELMAS REGION

The project area falls within the Highveld climatic zone which is characterised by moderate summers, cold winters and summer rainfall (Digby Wells Environmental, 2014). The near-future and far-future climate in Southern Africa was projected and published in a Climate Change Reference Atlas (CCRA) by the South African

[4] Coal mine methane (CMM) is the term given to the gas trapped in coal seams. The gas is released once the seams are mined and can then escape to the atmosphere. Lloyd and Cook (2005) measured the release of methane from surface mining in South African collieries, through (1) the collection of samples from exposed seams, drill holes and interburden strata; (2) sealing the samples in gas tight containers for transport and crushing in the laboratory to release the methane content; and (3) analysing the results using the standard USBM graphical method to determine lost gas volumes. They found that the combination of low seam-gas contents in the coals mined from surface, and the low concentration of methane in the seam gases, means that the contribution from surface mining of coal to greenhouse gas releases by the industry can effectively be ignored. Even if the seam-gas content were as high as 0.1m3/t and the methane content were as high as 50% of the total seam gas, then the approximately 100Mt of coal plus intraburden mined annually would contribute <3000t (3Gg) CH4/annum.

Weather Service (SAWS) in 2017, based on Global Climate Change Models (GCMs) projections and the Rossby Centre Regional Model (RCA4). Projected changes are defined relative to a historical 30-year period (1976 to 2005). The design description of the methodology employed in the climate change projections are presented in the full Climate Change Report presented Appendix D. The findings are listed below:

Low mitigation scenario (RCP8.5)

- Near-future period (2036-2065) – This period is projected to be significantly warmer than the baseline period of 1976-2005. Most years are projected to be 2°C to 2.5°C warmer than the baseline average temperature. The seasonal average temperatures are expected to increase for all seasons, viz. 2°C to 2.5°C (summer and autumn) and 2.5°C to 3°C (winter and spring). The rainfall climatology is projected to remain variable, with some wet years projected to occur outside of that simulated for the baseline period (median change of 10 to 20mm more rainfall per year). The seasonal average rainfall is expected to increase in summer (10 to 20mm increase in rainfall) and decrease during the other seasons (5-10mm decrease in autumn, winter and spring); and
- Far-future period (2066-2095) – Further drastic warming is projected over the Delmas region for this period, with annual median temperature anomalies ranging between 4 and 4.5°C. The seasonal average temperatures are expected to increase for all seasons, viz. 3.5°C to 4°C (summer), 4°C to 4.5°C (autumn), and 4.5°C to 5°C (winter and spring). The region is also projected to become systematically drier (median change of 5 to 10mm less rainfall per year). The drastically higher temperatures may impact negatively on water availability from local dams due to higher evaporation rates. The seasonal average rainfall is expected to increase in summer 20 to 30mm increase in rainfall) and decrease during the other seasons (5-10mm decrease in autumn and winter, and 30 to 50mm decrease in spring).

Modest to high mitigation scenario (RCP4.5)

- Near-future period (2036-2065) – Similar to that projected for the case of low mitigation in that most years are projected to be 1.5 °C to 2 °C warmer than the baseline average temperature. The seasonal average temperatures are expected to increase for all seasons, viz. 1.5°C to 2°C (summer and autumn) and 2°C to 2.5°C (winter and spring). The climate is projected to become drier (median change of 5 to 10mm less rainfall per year), with likely fewer dry years than projected for the low mitigation scenario. The seasonal average rainfall is expected to increase in summer (5 to 10mm increase in rainfall) and decrease during the other seasons (0-5mm decrease in autumn and winter, and 10 to 20mm decrease in spring); and
- Far-future period (2066-2095) – Temperature changes in the Delmas region under modest- high mitigation are projected to range between 2.5°C and 3°C above that of the baseline climatology. The seasonal average temperatures are expected to increase for all seasons, viz. 2°C to 2.5°C (summer and autumn) and 2.5°C to 3°C (winter and spring). The climate is projected to become drier (median change of 0 to 5mm less rainfall per year), but with likely fewer dry years occurring when compared to the case of low mitigation. The seasonal average rainfall is expected to increase in summer (median increase of 20 to 30mm) and decrease during the other seasons (5-10mm decrease in autumn and winter, and 10 to 20mm decrease in spring).

9 ENVIRONMENTAL IMPACT ASSESSMENT

This section aims to identify and assess the potential environmental impacts associated with the proposed Phase 3 Project. This impact assessment will be used to guide the identification and selection of preferred alternatives, and management and mitigation measures, applicable to the proposed activities.

9.1 APPROACH AND METHODOLOGY

This section presents the proposed approach to assessing the identified potential environmental impacts with the aim of determining the relevant environmental significance.

9.1.1 METHOD OF ASSESSING IMPACTS

The impact assessment 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:

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 25.

Table 25: Criteria for determining 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)

Aspect	Score	Definition
	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 or natural process will reduce the impact after construction).
Magnitude/ Intensity	1	Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected),
	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 26.

Table 26: Probability scoring

Aspect	Score	Definition
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:

ER= C x P

Table 27: 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 28.

Table 28: Significance classes

Environmental Risk Score	
Value	Description
< 9	Low (i.e. where this impact is unlikely to be a significant environmental risk),

Environmental Risk Score	
≥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.

9.1.2 IMPACT PRIORITISATION

In accordance with the requirements of Appendix 3(3)(j) of the NEMA 2014 EIA Regulations (GN R. 982), and further to the assessment criteria presented in the Section 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 29: Criteria for determining prioritisation

	Value	Description
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.

	Value	Description
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.
Irreplaceable loss of resources (LR)	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.
	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 in Table 30. 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 (Table 30).

Table 30: 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).

Table 31: Final environmental significance rating

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

9.2 IDENTIFICATION OF IMPACTS

Potential environmental impacts were identified during the scoping and EIA phase. These impacts were identified by the EAP, the appointed specialists, as well as information sort or received from the public. Table 32 provides the list of impacts identified. 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 suggested. 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 impact 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 32: Identified environmental impacts

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
Site Preparation (Planning)	• Vegetation clearance • Removal of any existing on site infrastructure • Planned placement of infrastructure • Establishment of construction contractor area	• Loss of land capability and agricultural potential through poor planning	• Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles		
Human Resources Management (Planning)	• Employment / recruitment • I&AP consultations (where necessary) • Corporate Social Investment initiatives • Skills development programmes • Environmental awareness training • HIV/AIDS awareness programmes • Integration with municipalities' strategic long-term planning			• GDP and monetary impacts • Net employment impacts • Need and desirability impacts	
Earthworks (Construction)	• Stripping and stockpiling of soils • Cleaning, grubbing and bulldozing • Removal of building waste and cleared vegetation	• Impact on wetlands due to upgrade and use of access routes • Impact on wetlands due to due to creation of laydown areas and offices / ablutions / camp	• Loss and fragmentation of the vegetation community as well the destruction of a portion of a	• Visual impact on urban edge • Increase in noise levels at surrounding receptors due to construction activities	• Impact on burial grounds and graves • Impact on structures older than 60 years • Impact on chance finds heritage resources

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
	• Digging trenches and foundations • Blasting • Establishing stormwater management measures • Establishment of firebreak	• Impact on wetlands due to removal of top and sub-soil layers • Impact on wetlands due to stockpiling of soils • Change in topography and slope • Impact on wetlands due to spills, leaks and dust precipitation (heavy vehicle) • Impact on wetlands due to spread of alien vegetation • Impact on wetlands due to spills, leaks and dust precipitation (light vehicle) • Impact on wetlands due to haulage of material • Impact on wetlands due to ablutions • Impact on wetlands due to poor waste management • Impact on wetlands due to storage of materials and solutions • Impact on wetlands due to spills and leaks • Impact on wetlands due to untreated run-off • Decline in air quality • Permanent loss of agricultural land • Groundwater impacts • Inputs of toxic organic contaminants	Vulnerable vegetation type • Loss of certain areas regarded as having a Moderate Risk to Mining according to the Mining and Biodiversity Guidelines • Loss of semi-natural areas • Habitat fragmentation and edge effects • Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance • Alien infestation	• GDP and monetary impacts • Net employment impacts • Impact on agricultural sector • Project induced in-migration • Displacement of households • Employment and income creation • Labour draw-down • Defiant social behaviour • Increase in crime • Increased demand for housing • Increased resource use • Social disintegration and conflict	• Impacts on fossil resources

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
		• Erosion • Loss of surface roughness • Loss of seepage (infiltration) areas • Runoff Reduction • Impact on surface water quality – dust generation • Decline in water quality – silts & sediments • Impact on surface water quality – Spill from transport, handling and storage of fuels, chemicals construction materials and waste during construction phase • Impact on surface water quality – high saline runoff/seepage from defined dirty water areas during operational phase Decline in water quality – silts and sediments			
Civil Works (Construction)	• Establishment of infrastructure and services • Mixing of concrete and concrete works • Establishment of dewatering infrastructure • Establishment of chemical storage area	• Decline in air quality • Runoff Reduction • Impact on surface water quality – dust generation • Decline in water quality – silts & sediments • Impact on surface water quality – Spill from transport, handling and storage of fuels, chemicals construction materials and waste during construction phase	• Habitat fragmentation and edge effects	• Visual impact on urban edge • Visual impact on farmsteads • Visual impact on roads • Increase in noise levels at surrounding receptors due to construction activities • GDP and monetary impacts	• Change in landscape character • Change in sense of place

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
	• Establishment of general waste area • Access control and security • General site management	• Impact on surface water quality – high saline runoff/seepage from defined dirty water areas during operational phase • Decline in water quality – silts and sediments		• Net employment impacts • Need and desirability impacts • Project induced in-migration • Displacement of households • Employment and income creation • Labour draw-down • Increase in crime • Increased demand for housing • Increased resource use • Social disintegration and conflict	
Opencast Mining (Operation)	• Drilling • Blasting • Excavations • Removal of overburden by dozing and load haul • Establishment of internal haul roads from pit to existing processing plant at Kangala Colliery • Removal of ore • Dewatering of pit • Pumping of water to PCD	• Fracturing of aquifers • Coal precipitation • Dust precipitation • Dewatering / loss of wetlands • Change in topography • Impact on wetlands due to haulage and light vehicles • Impact on wetlands due to spread of alien vegetation • Impact on wetlands due to spills, leaks and dust precipitation • Impact on wetlands due to ablutions	• Habitat fragmentation and edge effects • Spread and/or establishment of alien and/or invasive species • Disturbance to wildlife • Infringement by humans into the few remaining natural grassland and wetlands areas • Introduction of feral species	• Visual impact on urban edge • Visual impact on farmsteads • Visual impact on roads • Increase in noise levels at surrounding receptors • GDP and monetary impacts • Net employment impacts • Need and desirability impacts	• Change in landscape character • Change in sense of place

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
	• Waste rock dumps for backfilling • Soil management • Water management • Concurrent rehabilitation • Water treatment	• Impact on wetlands due to poor waste management • Impact on wetlands due to storage of materials and solutions • Impact on wetlands due to spills and leaks • Impact on wetlands due to untreated run-off • Sinkhole formation • Damage to infrastructure from flooding • Lowering of the local groundwater levels (i.e. dewatering of the aquifer) • Ground vibration impact on houses • Ground vibration impact on roads • Ground vibration, air blast and fly rock impact on boreholes • Ground vibration, air blast and fly rock impact on heritage sites • Ground vibration, air blast and fly rock impact on power lines • Ground vibration, air blast and fly rock impact on broilers • Groundwater impacts • Runoff Reduction • Impact on surface water quality – dust generation • Impact on surface water quality – Spill from transport,	• Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance	• Impact on agricultural sector • Employment and income creation • Poverty reduction • Defiant social behaviour • Impact on Income Distribution • Tax income • Social investment in the local community • Food security impacts • Impact on property prices • Use of Existing Capital • Increased economic concentration of local economy • Industry competitiveness • Increased resource use • Nuisance factors • Social disintegration and conflict	

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
		handling and storage of fuels, chemicals construction materials and waste during construction phase • Impact on surface water quality – high saline runoff/seepage from defined dirty water areas during operational phase Decline in water quality – silts and sediments			
Infrastructure Removal (Decommissioning)	• Blasting • Safety control • Backfilling of pits and voids	• Change in topography and slope • Impact on wetlands due to spills, leaks and dust precipitation (light vehicle) • Loss in re-charge to wetlands • Impact on wetlands due to haulage of material • Impact on wetlands due to ablutions • Impact on wetlands due to poor waste management • Impact on wetlands due to storage of materials and solutions • Impact on wetlands due to spills and leaks • Impact on wetlands due to untreated run-off	• Loss of certain areas regarded as having a Moderate Risk to Mining according to the Mining and Biodiversity Guidelines • Loss of semi-natural areas • Habitat fragmentation and edge effects • Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance • Alien vegetation infestation	• Reduction in visual impacts • Increase in noise levels at surrounding receptors • GDP and monetary impacts • Net employment impacts • Need and desirability impacts • Job and income loss • Termination of social funds	

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
Rehabilitation (Closure)	• 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 • Initiate maintenance and aftercare program	• Migration of residual contamination after rehabilitation • Decanting of poor-quality water from rehabilitated pit • Change in topography • AMD impacts on wetlands	• Loss of semi-natural areas • Habitat fragmentation and edge effects • Spread and/or establishment of alien and/or invasive species • Infringement by humans into the few remaining natural grassland and wetlands areas • Introduction of feral species • Erosion • Possible re-establishment of indigenous vegetation and return of faunal species • Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance	• GDP and monetary impacts • Net employment impacts • Need and desirability impacts • Job and income loss • Termination of social funds	
Maintenance (Post-closure)	• Environmental aspect monitoring • Monitoring of rehabilitation	• Decanting of poor-quality water from rehabilitated pit • Migration of residual contamination after rehabilitation			

Main Activity/ Action/ Process	Ancillary Activity	Geo-physical (geology, topography, air, water, etc.)	Biological	Socio-economic	Heritage and Cultural
		• Impact on surface water quality - contaminated runoff and seepage/decant from opencast pit during post-closure.			

9.3 DESCRIPTION AND ASSESSMENT OF IMPACTS

The following potential impacts were identified during the EIA phase assessment. These impact significance ratings will be subject to amendment based on the detailed impact assessment to be undertaken by the project specialists, input from the EAP, as well as results of public and key stakeholder consultations to be undertaken during the EIA phase.

9.3.1 IMPACTS ON HERITAGE AND FOSSIL RESOURCES

The following impacts on the heritage resources within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No impacts on the heritage resources have been identified that will occur during the Planning and Design Phase, Operational Phase, Decommissioning Phase, Rehabilitation and Closure Phase, as well as Post-Closure Phase. Below are the construction phase impacts on heritage resources identified during the EIA phase, as well as their impact rating.

A. Impact on burial grounds and graves

Four burial grounds are present on the property. Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on burial grounds and graves	Construction	--20.00	-3.25	-3.25

Proposed Mitigation

- Any affected burial grounds that cannot be avoided must be relocated after completion of a detailed grave relocation process, that includes a thorough stakeholder engagement component, adhering to the requirements of s36 of the NHRA and its regulations as well as the National Health Act ad its regulation.

B. Impact on structures older than 60 years

Four farmsteads (of which three are ruined) were identified. Structures older than 60 years are protected under Section 34 of the NHRA only KG6 will require a formal process of application for a destruction permit issued by the Mpumalanga Provincial Heritage Authority as required by S34 of the NHRA.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on structures older than 60 years	Construction	-17.50	-3.25	-3.79

Proposed Mitigation

- Assess and grade structure during HIA and propose mitigation measures.

C. Impact on chance find heritage resources

There may be chance findings of material of heritage significance during construction.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on chance find heritage resources	Construction	-6.50	-3.00	-3.50

Proposed Mitigation

- Implement motoring by the ECO during construction activities as well as management of handling such chance finds.

D. Impact on palaeontological resources

The development footprint is completely underlain by the Vryheid Formation. The Palaeontological Sensitivity of this formation is rated Very High. The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be permanent. Impacts on palaeontological heritage during the mining phase could potentially occur but are regarded as having a low impact with the implementation of a chance finds protocol.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on fossil remains	Construction	-12.00	-3.25	-3.79

Proposed Mitigation

- In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments.

9.3.2 IMPACTS ON BIODIVERSITY

The following impacts on the biodiversity within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No impacts on the ecological receiving environment have been identified that will occur during the Post-closure Phase. Below are the impacts on biodiversity identified during the EIA for the planning, construction, operation, decommissioning and rehabilitation as well as closure phases, including their impact rating.

A. Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles

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.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Temporary disturbance of wildlife due to increased human presence and possible use of machinery and/or vehicles	Planning	-3.00	-2.00	-2.00

Proposed Mitigation

- During surveys avoid creating parking areas for surveyors by ensuring that they stay on existing roads and do not move onto adjacent vegetation; and
- Reduce the impact on the fauna by limiting the amount of time spend on the site by the surveyors.

B. Further loss and fragmentation of the vegetation community as well the destruction of a portion of a Vulnerable vegetation type

The proposed project activities will result in some direct loss of habitats, direct mortalities and displacement of flora. The removal of natural vegetation to accommodate the opencast mining pit is likely to fragment remaining vegetation communities and impact on vegetation types of significant importance. However, a large portion of the project area is already transformed or modified by agricultural activities and existing mining operations. Therefore, this will probably be minimal relative to existing impacts on site and will be localised at any one point in time.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Further loss and fragmentation of the vegetation community as well the destruction of a portion of a Vulnerable vegetation type	Construction	-21.25	-13.00	-21.67

Proposed Mitigation

- Apart from the pit area to be mined, areas rated as “very high” sensitivity in the biodiversity report, should be declared as ‘no-go’ areas during all phases of the project and all efforts must be made to prevent access to this area from construction workers and machinery; and
- A pre-construction survey of mining footprint should be carried out to identify endangered floral species that will be directly disturbed and to relocate flora (this specifically includes any floral SCC).

C. Loss of certain areas regarded as having a Moderate Risk to Mining according to the Mining and Biodiversity Guidelines

Land clearing will result in loss to various areas regarded as having a moderate risk according to the current Mining and Biodiversity guidelines.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Loss of certain areas regarded as having a Moderate Risk to Mining according to the Mining and Biodiversity Guidelines	Construction Operation Decommissioning Rehabilitation and Closure	-18.75	-4.00	-6.67

Proposed Mitigation

- The new mining area must be accessed through the old mining area to decrease the amount of vegetation disturbed outside of the open case area;
- It is recommended that areas to be mined be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All working areas inside the new pit must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances. Specifically, for the proposed project, the wetlands to the south and north of the project area along with their buffers should be protected from human interference;
- All disturbances must be within the mine footprint area, and all waste rock is taken to the existing Kangala Colliery as to not increase the footprint of the new mine; and
- A pre-construction survey of mining footprint should be carried out to identify endangered floral species that will be directly disturbed and to relocate flora (this specifically includes any floral SCC).

D. Loss of semi-natural areas defined as Other Natural Areas (ONAs) (MTPA, 2014).

Land clearing will result in loss of semi-natural areas.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Loss of semi-natural areas	Construction Operation Decommissioning Rehabilitation and Closure	-20.00	-13.00	-21.67

Proposed Mitigation

- The new mining area must be accessed through the old mining area to decrease the amount of vegetation disturbed outside of the open case area;

- It is recommended that areas to be mined be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All working areas inside the new pit must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances. Specifically, for the proposed project, the wetlands to the south and north of the project area along with their buffers should be protected from human interference;
- All disturbances must be within the mine footprint area, and all waste rock is taken to the existing Kangala Colliery as to not increase the footprint of the new mine;
- Apart from the pit area to be mined, areas rated as "very high" sensitivity in this report, should be declared as 'no-go' areas during all phases of the project and all efforts must be made to prevent access to this area from construction workers and machinery;
- The sensitive areas (very high and high) in the project area that will be mined through must be rehabilitated as soon as the mining has been concluded. As the mining will take place in phases, the rehabilitation needs to commence as soon as the second phase is to start. Areas that area not directly part of the mining must be avoided to minimise the impact; and
- An experienced, qualified environmental control officer must be on site when construction begins to identify floral species that will be directly disturbed and to relocate flora that are found during construction (this specifically includes any floral SCC).

E. Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance

Land clearing destroys local wildlife habitat and can lead to the loss of local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Displacement, direct mortalities and disturbance of faunal community due to habitat loss and disturbance	Construction Decommissioning	-21.25	-13.00	-21.67
	Operation	-20.00	-12.00	-18.00
	Rehabilitation and Closure	-20.00	-6.75	-10.13

Proposed Mitigation

- Faunal species should be given the chance to escape or move away from disturbances during construction. If any faunal species do not move off naturally then the ECO should be consulted to identify the correct course of action;
    - This is particularly relevant to the presence of African Grass Owls (*Tyto capensis*) which were recorded in the project area. If environmental authorisation is granted for the current wetlands to be mined, then the mining of these areas must be done outside of the breeding season of this species;

- African Grass Owls chicks' critical fledging period is from March to May and wetlands in the project area should not be mined during this period and/or a relevant specialist should thoroughly inspect any wetlands that are to be mined for the presence of this species;

- 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 all the phases going forward. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; and
- All livestock must be kept out of the wetland and grassland areas in order to prevent overgrazing of potential SCC avifauna habitat.

F. Spread and/or establishment of alien and/or invasive species.

The significance of encroachment of alien invasive plant species on the vegetation community was rated as high prior to mitigation. Implementation of mitigation measures in the form an alien invasive plant management plan and rehabilitation of project footprint after completion of construction reduced the significance of the impact to a lower significance.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Spread and/or establishment of alien and/or invasive species.	Operation	-17.00	-9.00	-15.00
	Closure and Rehabilitation	-17.00	-7.50	-12.50

Proposed Mitigation

- Compilation of and implementation of an alien vegetation management plan for the entire site, including the surrounding project area and especially the wetland areas;
- Areas that are denuded during construction and does not form a part of the mining footprint 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; and
- It should be made an offence for any staff to intentionally bring any plant species into any portion of the project area, in order to prevent the spread of exotic or invasive species.

G. Significant disturbances to remaining wildlife and vegetation (from impacts such as dust, noise, road traffic and land-clearing).

Land clearing and associated activities can lead to the loss of vegetation, local breeding grounds, nesting sites and wildlife movement corridors such as rivers, streams and drainage lines, or other locally important features. Due to the known occurrence of some species of conservation importance in the secondary grassland and wetland areas the significance was generally rated as moderate to high prior to mitigation.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Disturbance to wildlife	Operation	-16.00	-12.00	-16.00

Proposed Mitigation

- It is recommended that areas to be mined be specifically demarcated so that during the construction phase and operational phase, only the demarcated areas be impacted upon. All working areas inside the new pit must be clearly demarcated from surrounding natural areas and no persons should be allowed to enter these areas under any circumstances. Specifically, for the proposed project, the wetlands to the south and north of the project area along with their buffers should be protected from human interference.

H. Infringement by humans into the few remaining natural grassland and wetlands areas, with associated impacts such as poaching and litter.

Infringement by humans into the few remaining natural grassland and wetlands areas could lead to impacts on fauna and flora.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Infringement by humans into the few remaining natural grassland and wetlands areas	Operation	-17.00	-9.00	-15.00
	Closure	-14.00	-12.00	-18.00

Proposed Mitigation

- 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 all the phases going forward. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; and
- All livestock must be kept out of the wetland and grassland areas in order to prevent overgrazing of potential SCC avifauna habitat.

I. Possible introduction of feral species such as cats.

Feral species could be introduced to the area due to human interference or disturbance.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Introduction of feral species	Operation Closure	-13.00	-6.75	-10.13

Proposed Mitigation

- 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; and
- Pest control plan must be put in place and implemented.

J. Soil erosion

Opencast coal mining alters landscapes and habitats at the site of the mine when trees, plants, and topsoil are cleared from the mining area. This in turn can lead to soil erosion and destruction of agricultural land.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Erosion	Rehabilitation	-17.00	-7.50	-12.50

Proposed Mitigation

- Voids needs to be backfilled followed by topsoil following the natural topography and must be revegetated with indigenous vegetation;
- Alien vegetation plan needs to be kept in place and implemented for rehabilitation to be successful; and
- Rehabilitated areas needs to be demarcated to prevent trampling and access to the area and ultimately decrease the likelihood of erosion.

K. Possible re-establishment of indigenous vegetation and return of faunal species.

The possible re-establishment of indigenous vegetation and return of faunal species to the area once rehabilitation is complete is viewed as having a low impact once relevant revegetation techniques (as mitigation) have been applied. The area was in a relatively natural state before mining and as such had a high diversity of flora, rehabilitating the area will improve the state of the project area but it will not return to its original natural state.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Possible re-establishment of indigenous vegetation and return of faunal species.	Rehabilitation	-17.00	-7.50	-12.50

Proposed Mitigation

- It is recommended that a comprehensive rehabilitation plan, including a comprehensive alien vegetation management plan, be compiled and implemented for the project;
- It is recommended that a project area specific but also species-specific biodiversity monitoring and action plan be compiled once the EA is received. The monitoring and action plan must inform and guide the proposed project and prescribed clear goals and objectives that can be practically implemented and easily monitored using appropriate variables. The key aspects must include the following:
    - The collation and generation of data for selected species, ecosystems and/or habitats;
    - Assess and determine the conservation status of species within specified ecosystems;
    - Prescribe aims, objectives and targets for conservation and restoration; and

- Establish and assign budgets, timelines, reporting structures and partnerships for implementing the action plan.

9.3.3 IMPACTS ON DOLOMITIC STABILITY

The Geotechnical impact study to define the likelihood and potential hazard the formation of sinkhole will have on the operation of the mine and surrounding landowners and affected parties were conducted based on available information supplied by the mine and information available in the public domain.

Based on the geological information, three different geological profiles were identified:

- Profile 1: The profile consists of a transported soil and residual soils grading into weathered sandstone and shale overlying competent coal measures and footwall sandstone (Karoo Sediments) overlying Dwyka Tillite deposited in a scour valley consisting of chemical and sedimentary deposits of the Malmani Subgroup. The chemical deposits consist of Dolomite and chert. The total thickness of the profile is between 50 and 60m thick. For the Profile 1 area the blanketing layer is thick, but it consists of competent layered sequence of Dwyka Tillite and Karoo sedimentary deposits underlying weathered shale and sandstone as well as transported soil.
- Profile 2: The Profile 2 area occurs where the Karoo sediments are thinner and the intersection of competent bedrock, apart from Dwyka tillite will be very thin. The profile consists mostly of transported soils, weathered shale and sandstone overlying tillite and dolomite bedrock the total thickness of the profile varies between 10 and 30m thick. Due to the angle of repose of the weathered sediments and transported soils the maximum development space allows for the potential formation of large sinkholes up to 15m in diameter. The area is also underlain by the perched aquifer in the transported soils as well as the Karoo aquifer, both of which fluctuates due to pumping and seasonal variation. The dolomite aquifer is generally not affected by mining but on a regional scale it is affected by pumping for irrigation. The inherent risk classification for the profile 2 area is medium risk of all sizes of sinkholes due to the ingress of water and is classed as Class 2.
- Profile 3: the profile consists of transported soils and weathered sediments overlying the suboutcrop of Malmanie Subgroup deposits. The Profile 3 Area where the thickness of overburden is between 5 and 15m and the top of the dolomite is exposed above the regional water table due to groundwater abstraction for agriculture and rural development. It is unlikely that mining will impact or trigger sinkhole formation without the cumulative effect of regional groundwater drawdown.

The risk classification for the development of sinkholes is based on five parameters, recent occurrence of sinkholes in the area, the maximum development space, the receptacle size, the mobilization potential of the overburden and the bedrock morphology. Considering these parameters, the three profiles were assessed and the Inherent Risk Classes (IRC) with respect to the formation of sinkholes, defined.

For profile 1 two scenario's, were considered: a mining scenario where the overburden and the coal seams were removed and a non-mining scenario where the potential of sinkhole formation through the whole sequence of deposits were considered. For the non-mining scenario, the inherent risk is very low, and it is classed as class 1. For the mining scenario the risk class is Class 4 (areas characterized as reflecting a medium Inherent Risk of large size sinkhole and doline formation with respect to ingress of water). The risk classes for profile 2 and profile 3 is classified as Class 2 (areas characterized as reflecting a medium Inherent Risk sinkhole and doline formation with respect to ingress of water) and Class 5 (areas characterized as reflecting a high inherent Risk of small sinkhole and doline formation with respect to ingress of water) respectively. In terms of the risk for urban development classes 1-5 is generally considered developable with precautions.

A. Sinkhole Formation

The mining activities will impact mostly on the Profile 1 Area and to a lesser extent on the Profile 2 area. The Profile 3 areas where the dolomite sub-outcrop will primarily be impacted by farming and rural development practices such as drawdown of the regional aquifer for irrigation and point ingress of water due to leaking pipes.

Within the profile 1 are two different scenarios of sinkhole formation is possible. Scenario 1 considers the formation of sinkholes or dolines on the surface within the Profile 1 area. Although very large sinkholes can possibly form due to the thickness of the overburden and the resultant maximum development space, the kinematics and mechanical properties of the rock mass makes this scenario very unlikely.

Considering the same condition in the final void at the end of mining the development of a sinkhole in the floor of an abandoned box-cut is also low because mitigation measures will be in place to limit exposure. However, it can have a cumulative effect where water will pond in the excavation and the increased pH of the mine water percolating through the fractured rock mass, can cause accelerated local solution of the dolomite. This is however a process that will take a few hundred years to create a significant cavity that can impact the area outside the final box-cut. Backfilling the box-cut is an effective solution to limit the surface impact. Mining activities and farming practices and dewatering of the Karoo aquifer may act as triggers to cause the formation of sinkholes .

The Environmental impact of sinkhole formation within the profile 2 and Profile 3 areas where dewatering and possible point ingress of water will be related to agriculture and rural development rather than mining have been assessed as well. The impact of smaller sinkholes forming in the Profile 3 area as a result of agricultural and rural development is higher than the impact of sinkholes forming due to mining activities.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Sinkhole Formation Mining Profile 1	Operation	-2.00	-2.00	-2.67
Sinkhole Formation Mining Profile 1 (Non-mining)	N/A	-2.25	-2.25	-2.25
Sinkhole Formation Mining Profile 2 (Non-mining)	N/A	-2.00	-1.25	-1.67
Sinkhole Formation Mining Profile 3 (Non-mining)	N/A	-5.00	-2.50	-3.33

Proposed Mitigation

Groundwater level monitoring must take place to ensure the groundwater level does not extend below the dolomite rockhead. If it does active measures must be put in place in consultation with a geotechnical specialist. The mine should, through their monitoring positions and program demonstrate that they do not impact the dolomite aquifer. In the case that they do, the mine must change their abstraction or dewatering plan to stop dewatering the dolomite aquifer.

9.3.4 IMPACTS ON HYDROGEOLOGY

The following impacts on the hydrogeological resources within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No impacts on the hydrogeological receiving environment have been identified that will occur during the Planning and Design Phase, Construction Phase and Decommissioning Phase. Below

are the impacts on hydrogeological resources identified during scoping for the operational, rehabilitation and closure, as well as post-closure phases, including their impact rating.

A. Lowering of the local groundwater levels – i.e. dewatering of the aquifer

The model simulated contaminant plume (TDS) at mine closure is indicated in Figure 9-4 in the accompanying Groundwater report (Appendix D). The overall low hydraulic properties of the Karoo aquifer underlying the MRA are expected to restrict contaminant migration and groundwater quality impacts in the downgradient direction/s. The groundwater depression cone will affect the local groundwater flow directions and cause groundwater and any potential contamination within its reaches to flow towards the pit. The pit effectively acts as a sink for both groundwater and contamination and will continue to do so until water levels have recovered from the impacts of pit dewatering. By dropping the groundwater levels the contribution to baseflows to the rives and wetlands will also be compromised

No contamination was simulated to have penetrated the Dwyka aquiclude at mine closure. The water quality in the underlying dolomite aquifer was consequently simulated to remain unaffected during the life of mine.

An area of approximately 12 km^2 (Middelbult including) was simulated to be affected by the pit dewatering activities, i.e. area simulated to experience decreases in groundwater levels during the life of mine (Figure 38). Nine (9) boreholes are located within this model simulated affected area. Four (4) of these boreholes (EBA30, EF, KGA39 and JOZ1) are user boreholes that were located during the hydrocensus/user surveys, while the remaining five (KAM04, KAM05, KAM07, KAM09 and KHBH03) are dedicated monitoring boreholes for the Kangala Colliery. Boreholes EF, EBA30 and KGA39 are located within the proposed pit footprint area and will be demolished at some point during the life of mine.

The groundwater depression cone (i.e. water level impacts) was simulated to affect the two nonperennial Bronkhorstspruit tributaries located to the north and south of the proposed opencast pit. The groundwater baseflow volume towards the affected portions of the tributaries was simulated with the numerical groundwater flow model to be in the region of 60 m3/d. In other words, at times when the tributaries do receive groundwater baseflow, the total reduction in groundwater discharge is expected to be approximately 60 m3/d.

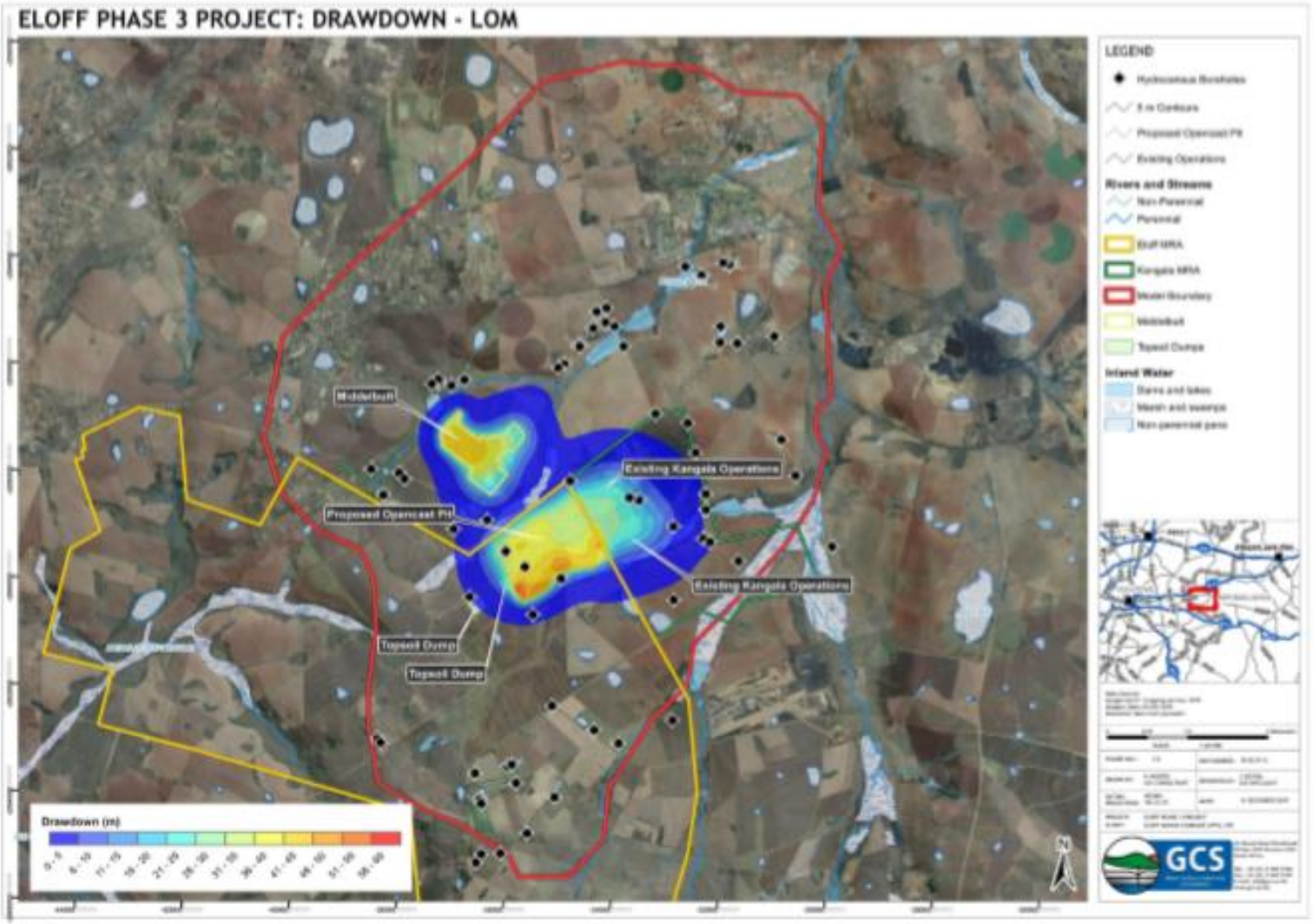


Figure 38: The simulated groundwater depression cone at mine closure

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Lowering of the local groundwater levels (i.e. dewatering of the aquifer)	Operation	-15.00	-15.00	-22.50

Proposed Mitigation

- Monitor the surrounding boreholes and if the water availability is compromised then alternative sources must be provided.

B. Migration of residual contamination after rehabilitation

The groundwater depression cone will affect local groundwater flow directions and cause groundwater and any potential contamination within this affected area to move inwards towards the pit (i.e. the pit effectively acts as a sink for both groundwater and contamination and will continue to do so until water levels have recovered from the impacts of pit dewatering). Any migration of contamination away from the opencast pit will only occur after groundwater levels have recovered (Figure 39). No contamination was simulated to have penetrated the Dwyka aquiclude at mine closure. The water quality in the underlying dolomite aquifer was consequently simulated to remain unaffected during the life of mine

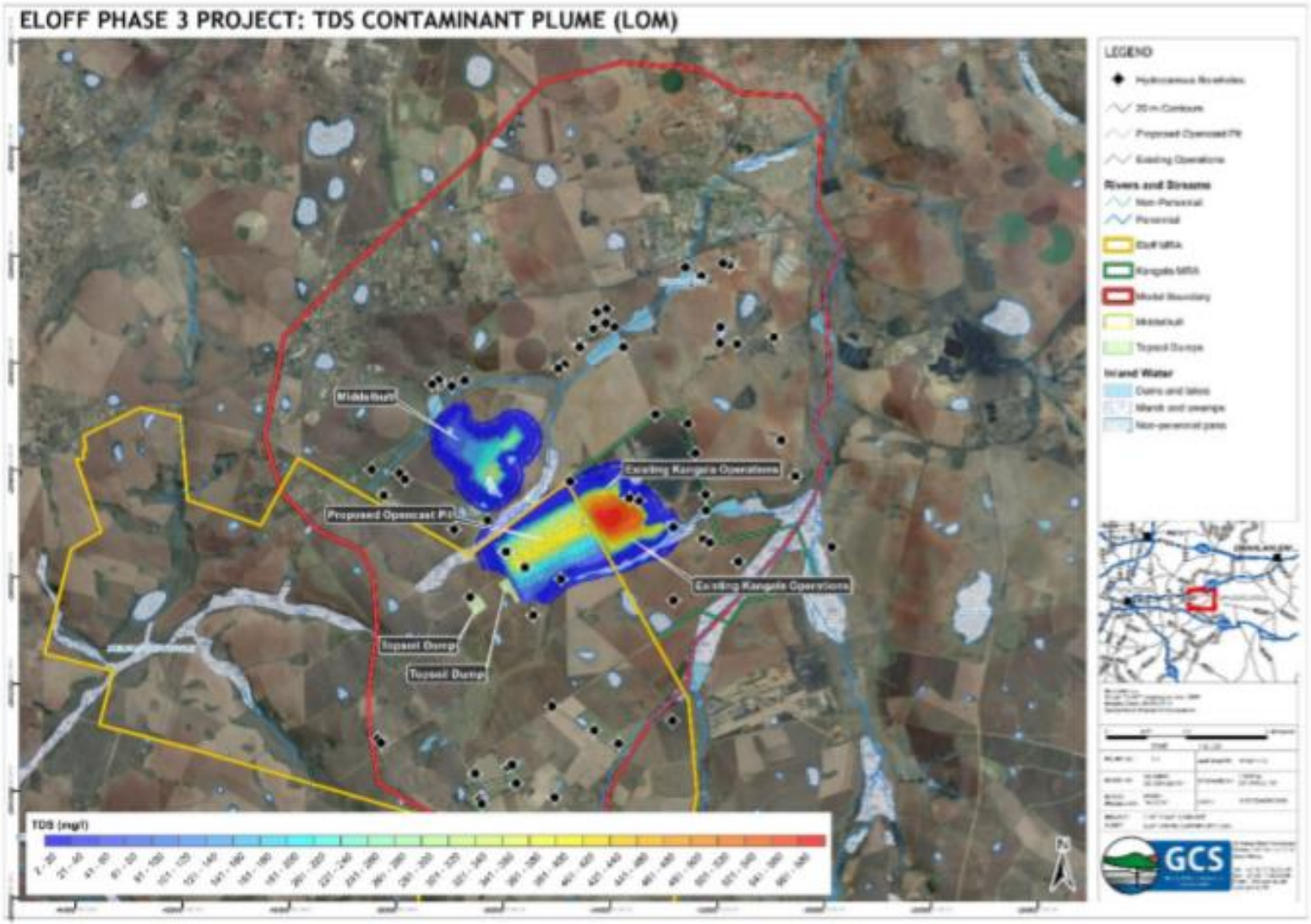


Figure 39: Simulated Plume Migration (at Mine Closure)

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Migration of residual contamination after rehabilitation	Rehabilitation and Closure Post-closure	-12.00	-5.50	-8.25

Proposed Mitigation

- Dedicated plume monitoring boreholes should be drilled in the down gradient groundwater flow direction and sampled at quarterly intervals to monitor plume migration; and
- Should the monitoring program indicate significant plume migration, interception trenches and/or rehabilitation boreholes may be considered.

C. Decanting of poor-quality water from rehabilitated pit

Decanting of a mine void generally occurs because of an excess volume of water that cannot be "absorbed" by the aquifer system. This excess water is generated by the increase in recharge over the disturbed backfilled mining area and the increase in transmissivity in the pit due to the brokenup rock.

Decanting can however be prevented by simply controlling the water level. This is done by drilling a borehole into the deepest part of the rehabilitated pit, and when necessary, abstracting water from it to lower the water level and thus keeping it below the decant elevation. This pumped water will have to be treated or used in other mining-type applications since it will be of unacceptable quality to release into the environment.

The groundwater gradient within a rehabilitated opencast pit is generally very close to being zero because of the high permeability of the backfill material. Decanting of an opencast pit is therefore most likely to occur wherever the pit intersects the lowest surface elevation. Refer to Figure 26 for the potential decant positions.

The decant water is expected to be of marginal quality but should be treated as potentially hazardous due to the oxidation of metal sulphide minerals (i.e. acid mine drainage). The decant water will seep vertically through the unsaturated zone until reaching the water table, from where it will follow the groundwater hydraulic gradient towards the north-west and north-east in the direction of two tributaries of the Bronkhorstspruit.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Decanting of poor-quality water from rehabilitated pit	Rehabilitation and Closure Post-closure	-20.00	-5.50	-8.25

Proposed Mitigation

- A monitoring borehole should be drilled into the rehabilitated opencast pit to monitor the rate at which it fills with water;
- This same monitoring borehole can also be used to manage the water levels and prevent the pit from decanting (the simulated decant point is indicated in Figure 27); and

- The pit should be flooded as quickly as possible to minimise the oxidation of metal sulphides (Acid Mine Drainage – AMD). Once the pit is flooded, surface water should be diverted away from it.

9.3.5 IMPACTS ON HYDROLOGY

The following impacts on the hydrological resources within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, and post-closure). No impacts on hydrology have been identified that will occur during the Planning and Design Phase, and Post-closure Phase. Below are the impacts on hydrological resources for the construction, operation, decommissioning as well as rehabilitation and closure phases identified during scoping, including their impact rating.

A. Runoff Reduction - Footprint area of all infrastructure will reduce the surface area for potential clean water runoff

The construction of haul roads and mining infrastructure in the vicinity of the opencast pit at the Eloff Phase 3 Project area will potentially reduce the local runoff and water availability for downstream flow. No additional measures, apart from a fully compliant SWMP and water quality monitoring are proposed to mitigate this impact.

During operation potential runoff reduction will occur due to the capturing and re-use of dirty runoff over the mine infrastructure areas at the Eloff Phase 3 Project area. No natural runoff from the defined dirty water areas will flow to downstream rivers or streams, runoff from these areas will be captured, stored and re-used which will lead to reduced local runoff.

During the decommissioning phase it is assumed that active mining has ceased, and all surface contaminant sources have been removed/rehabilitated and no longer pose a threat to the surface water resources. The activities are therefore centred around the rehabilitation of areas that were affected or altered during the LOM. The only remaining source of contamination post-closure is the rehabilitated opencast pit area and top soil dumps.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Runoff Reduction	Construction	-5.25	-5.25	-7.88
	Operation	-9.00	-8.00	-12.00
	Decommissioning	-20.00	-8.00	-12.00

Proposed Mitigation

- No additional measures, apart from a fully compliant SWMP and water quality monitoring are proposed to mitigate this impact; and
- Rehabilitation of all infrastructure will be implemented and will include re-vegetating, capping and shaping. As understood the opencast pit will be backfilled with overburden and topsoil dump material, shaped and rehabilitated to promote clean runoff.

B. Decline in water quality – silts and sediments

During construction blasting of surfaces, footprint clearance on the sites of the proposed Eloff Phase 3 Project (opencast pit) and other excavations in the project area are likely to lead to increased sediment in runoff water.

Silt and other sediments originating from the Eloff Phase 3 Project area could contaminate local surface water resources during operation. Sedimentation will also reduce effective PCD storage capacity and increase downstream silt loads. SWMP measures will include measures to prevent soil erosion and limit activities that generate sediments. Sediments that do occur will be captured in silt traps at the Kangala PCD.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Surface Water Quality - Silt and sediment in runoff due to blasting of surfaces	Construction	-10.00	-8.00	-10.67
	Operation	-10.00	-9.00	-12.00

Proposed Mitigation

- Measures such as berms and drains to mitigate this potential impact are contained in a SWMP included with the EMPr (Appendix E) and the opencast pit SWMP will be implemented as early as possible;
- SWMP measures will include measures to prevent soil erosion and limit activities that generate sediments. Sediments that do occur will be captured in silt traps at the Kangala PCD. Measures such as berms and drains to mitigate this potential impact are contained in a SWMP in the EMPr (Appendix E) and the opencast pit SWMP will be implemented at the Eloff Phase 3 Project. Sediments from areas within the mined pit will be captured in the sump. Dewatering of the sump will pump water to a (temporary) settling pond before it will be pumped to the Kangala PCD for re-use; and
- It is recommended that both berms and the drainage channels should be grass-lined to reduce erosion potential.

C. Impact on surface water quality – dust generation

Dust generated by construction activities could both impact on air quality and also settle in areas where it would be taken up in surface runoff and contribute to sediment loads in local river systems. Dust generated by operational mining activities on the opencast pit area could both impact on air quality and also settle in areas where it would be taken up in surface runoff and contribute to sediment loads in local river systems

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Dust generation impact on water quality	Construction	-10.00	-3.00	-4.50
	Operation	-11.00	-3.00	4.50

Proposed Mitigation

- Dust suppression activities will become part of a WMP and implemented as early as possible.

D. Impact on surface water quality – Spill from transport, handling and storage of fuels, chemicals construction materials and waste during construction phase

The transport, handling and storage of fuels, chemicals construction materials and waste could lead to contamination of soil surfaces and water resources. Measures will be undertaken to ensure safe handling and

storage of hazardous substances and prevent contamination of soil and water resources at Eloff Phase 3 Project including Kangala Colliery.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on surface water quality – Spill from transport, handling and storage of fuels, chemicals construction materials and waste	Construction Operation	-8.00	-4.00	-5.33

Proposed Mitigation

- Measures will be undertaken to ensure safe handling and storage of hazardous substances and prevent contamination of soil and water resources. These measures are included in the attached EMPr (Appendix E).

E. Impact on surface water quality – high saline runoff/seepage from defined dirty water areas during operational phase

Surface water runoff from defined dirty water areas, which include the opencast pit at the Eloff Phase 3 Project area, but also the CHPP, mine infrastructure area, discard facility, stockpile areas a Kangala Colliery could pollute local surface water resources. Seepage with a higher salt content may emanate, especially from these dirty water areas. A SWMP for the Eloff Phase 3 Project and a water balance update as part of a WMP was therefore developed. This stipulates measures to divert clean water and capture dirty water and make provision for this dirty water to be controlled in the Kangala PCD and/or re-used in the CHPP process and for dust suppression.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on surface water quality – high saline runoff/seepage from defined dirty water areas	Operation	-17.50	-9.00	-15.00

Proposed Mitigation

- Adherence to the proposed surface water quality monitoring programme is recommended to be able to verify water quality results with South African legislation and issued IWUL.

F. Impact on surface water quality – flood risk at opencast pit during operational phase

A flood risk will be present if any of the proposed topsoil dumps or opencast pit extent is placed too close to the Koffiespruit and southern water course (unnamed tributary). This can cause a potential impact on downstream water quality as sediments will be washed away by these water courses.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance

Impact on surface water quality – flood risk at opencast pit during operational phase	Operation	-11.00	-4.00	-6.00

Proposed Mitigation

- A flood line investigation was undertaken and the location of the opencast pit and topsoil dumps have been placed outside the exclusion zone and this potential impact has been mitigated to a low significance.

G. Impact on surface water quality - contaminated runoff and seepage/decant from opencast pit during post-closure.

Post-closure decant is expected (GCS, 2020) at the rehabilitated opencast pit after approximately 130 years (in most probable case) at a surface elevation of 1 589 mamsl and at an estimated rate of approximately 119 728 m^3/yr (3.8 litres per second (l/s)). Decant water is expected to be of marginal quality (GCS, 2020) with high sulphate concentrations expected. Decant water will seep vertically through the unsaturated zone until reaching the water table, from where it will follow the groundwater hydraulic gradient in north-eastern direction towards the Bronkhorstspruit.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on surface water quality - contaminated runoff and seepage/decant from opencast pit during post-closure	Post-closure	-20.00	-9.00	-15.00

Proposed Mitigation

- Recharge from rainfall onto backfilled spoils of the rehabilitated opencast is the main driver of large inflows into the opencast pit working and potential decant post closure. More detailed investigations are recommended to reduce recharge rates below 10% of annual rainfall.
- In line with the GCS groundwater assessment (2020), high sulphate generating material should be placed in the deepest parts of the pit, or at least below the pre-mining groundwater elevation to minimise the oxidation of metal sulphides (pyrite). Furthermore, the pit should be flooded as quickly as possible. Once the pit is flooded, surface water should be diverted away from it; and
- Treating of decanting mine water to acceptable water quality levels should be achieved by the installation of a treatment plant or alternative treatment solution. Investigations should continue to establish the most effective way to treat water on site if needed at the end of LOM. The level and volume of treatment depends on the use of water after treatment but should be determined in consultation with the Department of Water and Sanitation (DWS).

9.3.6 IMPACTS ON WETLANDS

The following impacts on the wetlands within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, and post-closure). No impacts on wetlands have been identified that will occur during the Planning and Design Phase, Decommissioning Phase, Rehabilitation and Closure Phase, or Post-closure Phase. Below are the impacts on wetland resources for the construction and operation phases identified during scoping, as well as their impact rating. The most notable impact is the expectant loss of some water resources, the delineated wetlands in particular.

A. Impact on wetlands during construction and decommissioning

A number of aspects were considered for the construction and decommissioning phase of the project. The majority of these aspects are not expected to have a direct impact (or risk) on the delineated wetland areas. Unmitigated moderate risks identified include management of waste and the release of untreated run-off into the catchment during the construction phase of the project. The longevity of these risks is considered to be short (for the construction phase), but these risks will continue into the operational phase of the project. The significance of the risks associated with the management of waste and the release of untreated run-off during the construction and decommissioning phases will be reduced to a low risk if the prescribed mitigation measures are implemented.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on wetlands due to upgrade and use of access routes	Construction	-5.50	-4.50	-4.50
Impact on wetlands due to due to creation of laydown areas and offices / ablutions / camp	Construction	-2.00	-1.75	-1.75
Impact on wetlands due to removal of top and sub-soil layers	Construction	-9.00	-8.25	-9.63
Impact on wetlands due to stockpiling of soils	Construction	-5.00	-4.50	-6.00
Change in topography and slope	Construction	-6.50	-6.00	-7.00
	Decommissioning	-11.25	-9.75	-17.88
Impact on wetlands due to spills, leaks and dust precipitation (heavy vehicle)	Construction	-8.25	-5.00	-5.00
Impact on wetlands due to spread of alien vegetation	Construction	-5.50	-5.00	-5.00
Impact on wetlands due to spills, leaks and dust precipitation (light vehicle)	Construction	-8.25	-5.00	-5.00
	Decommissioning	-5.50	-5.50	-7.33

Loss in re-charge to wetlands	Decommissioning	-20.00	-20.00	-40.00
Impact on wetlands due to haulage of material	Decommissioning	-2.25	-2.25	-2.50
Impact on wetlands due to ablutions	Construction	-2.00	-2.00	-2.00
	Decommissioning	-2.50	-2.00	-2.00
Impact on wetlands due to poor waste management	Construction	-7.50	-4.00	-4.00
	Decommissioning	-3.00	-2.25	-2.25
Impact on wetlands due to storage of materials and solutions	Construction	-2.25	-2.25	-2.25
	Decommissioning	-2.50	-2.25	-2.25
Impact on wetlands due to spills and leaks	Construction	-5.50	-5.50	-5.50
	Decommissioning	-3.00	-2.50	-2.50
Impact on wetlands due to untreated run-off	Construction	-8.25	-8.25	-9.63
	Decommissioning	-2.75	-2.75	-3.67

Proposed Mitigation

- Separate clean and dirty water. Clean water must be diverted and directed around working areas, and measures or structures created to manage the discharge to avoid scouring and erosion;
- Dirty water must be contained in control dams. This water may be recycled through the operation, but may not be released into the environment. In the event that water is required to be released, it is advisable that the water quality be within the target requirements for aquatic ecosystems;
- The Contractor should inform all site staff to the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. A minimum of one toilet must be provided per 10 persons;
- The Contractor should supply sealable and properly marked waste collection bins and all solid waste collected shall be disposed of at a licensed waste disposal facility;
- Where a registered waste site is not available close to the project area, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may solid waste be burned on site;
- Refuse bins will be emptied and secured;
- Temporary storage of waste shall be in covered waste skips; and
- Maximum waste storage period will be 10 days.

B. Impact on wetlands during operation

A number of moderate risks are expected for the operational phase of the project, with the significance of the majority of these risks being reduced to a low risk should the prescribed mitigation measures be implemented. A number of these risks are carried through from the construction phase of the project, and this emphasises the need and importance to have these risks managed and mitigated from the onset of the project. The fracturing of aquifers caused by blasting and coal (dust) precipitate are considered to pose a moderate risk with-mitigation, these is largely attributed to the nature and depth (+/- 70m) of mining proposed, and the proximity and extent of wetland area in relation to the opencast area. The most notable risks posed during the operational phase of the project area the actual opencast mining methods which will result in the loss of wetlands area, and the altered topography which will have an effect on the hydrology of the catchment. Not only will wetlands be mined, but the loss of wetlands will also be an indirect result of impacts to the structural integrity of the aquifers resulting in the dewatering of the perched aquifers. These two aspects are considered to pose a high risk, and there is no mitigation available for the mining of wetlands. Similarly, owing to the fact that the opencast mining footprint area is located on a watershed, there are also limited possibilities to mitigate the altered topography.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fracturing of aquifers	Operation	-13.50	-9.00	-16.50
Coal precipitation	Operation	-10.50	-6.50	-8.67
Dust precipitation	Operation	-10.50	-6.50	-8.67
Dewatering / loss of wetlands	Operation	-21.25	-21.25	-42.50
Change in topography	Operation	-20.00	-14.00	-25.67
Impact on wetlands due to haulage and light vehicles	Operation	-3.25	-2.75	-2.75
Impact on wetlands due to spread of alien vegetation	Operation	-9.75	-6.00	-8.00
Impact on wetlands due to spills, leaks and dust precipitation	Operation	-9.75	-6.00	-7.00
Impact on wetlands due to ablutions	Operation	-6.00	-5.50	-5.50
Impact on wetlands due to poor waste management	Operation	-8.25	-5.50	-5.50

Impact on wetlands due to storage of materials and solutions	Operation	-3.25	-3.00	-3.00
Impact on wetlands due to spills and leaks	Operation	-9.75	-6.00	-7.00
Impact on wetlands due to untreated run-off	Operation	-9.00	-9.00	-12.00

Proposed Mitigation

- Transport routes must prioritise existing routes, and the upgrade of these routes before any new routes are considered;
- Any possible contamination of topsoil by hydrocarbons, concrete or concrete water must be avoided. Spill kits must be available and on hand to clean these spills;
- Where applicable, materials must be stored in leak-proof, sealable containers or packaging. Materials must also be stored in bunded areas which can accommodate the required volumes;
- Drip trays or any form of oil absorbent material must be placed underneath mining vehicles/machinery and equipment (in operation and not storage) when not in use;
- No servicing of equipment on site unless absolutely necessary;
- Leaking equipment shall be repaired immediately or be removed from site to facilitate repair;
- All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages;
- All contaminated soil / yard stone shall be removed and be placed in containers;
- A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise is not available on site. Alternatively, the mine may undertake or contract the disposal of contaminated soil at a licenced and registered facility if necessary.;
- All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area, with particular reference to the wetland systems;
- Prior to construction, fences or other effective barriers should be erected in such a manner to prevent access and damage to the wetland and associated buffer areas. Where fences cannot be erected, these sensitive areas must be clearly demarcated, and sign posted;
- An alien invasive plant management plan needs to be compiled and implemented prior to construction and continued through the life of the mine, to control and prevent the spread of invasive aliens. Clean mining vehicles on-site, and prioritise the cleaning of mining vehicles gaining access from surrounding areas;
- Compile a suitable stormwater management plan, which must be implemented from the onset of the project, and continued for the life of the project;
- Construct cut-off berms downslope of working areas;
- Demarcate footprint areas to be cleared to avoid unnecessary clearing. Exposed areas which are not going to be utilised in the future must be ripped and vegetated to increase surface roughness; and

- 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.

C. Impact on wetlands during closure and rehabilitation

Due to the nature of opencast mining and the total disruption to the hydrogeology of the area, there will be a loss of wetland re-charge from any perched aquifers in the area, resulting in the loss of these wetland areas. The restoration of these geohydrological features is unlikely and the risk remains high with mitigation. The change in slope is expected to pose a moderate level of risk (without mitigation) during the decommissioning phase of the project. The relatively low level of risk posed by the remaining aspects may be attributed to the fact that wetland areas would already be lost and degraded at this stage of the mining project, as a result of the local activities. The rehabilitation of the area must by no means be regarded as a positive impact, but in accordance with the mitigation hierarchy, rehabilitation of the area does provide some level of mitigation, albeit limited due to the nature of opencast mining. The topography of the area is expected to change and may not resemble a slope, but a void will be present.

The post-closure impacts are considerable and could be mitigated to a moderate level of impact with some level of mitigation. Mitigation would require the in-sourcing of material to prevent a void in the landscape, returning the topography to a close to natural slope. It is unsure at this stage of the certainty of acid mine drainage (AMD) decant, but it has been assumed decant is likely. In order to address this, a passive treatment system is required to allow for the expected volumes and water quality emanating from the decant area.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Change in topography	Closure and rehabilitation	-16.00	-14.00	-25.67
Acid mine drainage	Closure and rehabilitation	-16.00	-15.00	-30.00

Proposed Mitigation

- Limited the extent (or size) of the void, rehabilitation must be concurrent. All voids must be backfilled;
- Compacted areas which are not going to be utilised in the future must be ripped (perpendicularly) to a depth of 300mm. A seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled. The area must be shaped to a natural topography. No grazing must be permitted to allow for the recovery of the area;
- Determine the likelihood of AMD, and proactively implement measures to prevent or reduce this. Priority would be to ensure the treatment of this water to suitable standards for aquatic ecology;
- Rehabilitation of the area and shaping of the topography must minimise the ingress of water into the mining area. Additionally, measures must also be considered to implement constructed wetlands at likely decant areas;
- Groundwater models of the mining activities must be updated following the completion of the mining activities;
- Following the completion of the mining activities, groundwater studies must redetermine whether mine water decant will occur and the quality of the potential decants;

- Should groundwater decant occur, the quality of the water should be determined and the effect upon the surface water determined. If the water quality is outside of the parameters stipulated in the resource quality objectives (RQO's) a water management and treatment process should be implemented; and
- Decommission cut-off berms and drains last. Debris must be placed in preferential flow paths.

9.3.7 IMPACTS ON SOILS

The following impacts on the soils within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No impacts on soils have been identified for the Rehabilitation and Closure Phase, and the Post-closure Phase. Below are the impacts on soil features during the planning and design, construction, operational and decommissioning phases, as well as their impact rating.

A. Loss of land capability through poor planning

Poor planning of soil stripping stockpiling and rehabilitation will result in losses of land capability and soil as a valuable and irreplaceable resource. Proper planning prior to construction would reduce the level of impacts from a Medium to a Low impact. A detailed Soil Stripping Guideline and Rehabilitation Plan has been completed and forms part of the soil study included in Appendix D

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Loss of land capability	Planning and Design	-17.50	-4.00	-6.00

Proposed Mitigation

- Proper planning of project sequences must be undertaken particularly in relation to vegetation clearing and the removal and separation of topsoil and subsoil; and
- Soil Stripping Guideline and Rehabilitation Plan measures included in the soils report and EMPr must be adhered to.

B. Loss of land capability during construction and operation

The impacts to consider are those relating to the disturbance of the natural soil state. When soil is stripped the physical properties are changed and this impacts on the soils' health. When the soil is stockpiled, the soils chemical properties will deteriorate unless properly managed. These all lead to the loss of the topsoil layer as a natural resource. Soil is considered a slowly regenerating resource due to the fact that it takes hundreds of years for a soil profile to gain 10cm of additional soil through natural processes. During a single rainfall event on unprotected bare soil, erosion could remove that same amount of soil if not more.

Whilst the construction takes place, vehicles will drive on the soil surface compacting it. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This then reduces vegetative cover and increases runoff potential. The increased runoff potential then leads to increased erosion hazards.

If the topsoil and subsoil are stripped and stockpiled as one unit, the topsoil's seed bank and natural fertility balance is diluted. This will affect the regrowth of vegetation on the stockpiles as well as the regrowth of vegetation when the soils have been replaced during the rehabilitation process, therefore soils should be handled with care from the construction phase through to the decommissioning phase.

During the operational phase, similar impact scores are expected regarding the extent of the impacts as those scored for the construction phase. It is of vital importance that the correct procedures be adhered to during this activity and that the different soil horizons be kept separate.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Loss of land capability	Construction Operation	-20.00	-15.00	-20.00

Proposed Mitigation

- Ensure proper storm water management designs are in place;
- If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;
- If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;
- Only the designated access routes are to be used to reduce any unnecessary compaction;
- Compacted areas are to be ripped to loosen the soil structure;
- The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks;
- A soil fertility and post-mining land capability assessment must be done to address any compaction or fertility issues that may arise from the stockpiling (Post-rehabilitation).
- Topsoil is to be stripped when the soil is dry, as to reduce compaction;
- Soil Stripping Guideline and Rehabilitation Plan measures included in the soils report and EMPr must be adhered to;
- The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate significantly;
- Compaction of the removed topsoil must be avoided by prohibiting traffic on stockpiles;
- Stockpiles should only be sued for their designated final purposes; and
- The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.
- Prevent any spills from occurring. Machines must be parked within hard park areas and must be checked daily for fluid leaks;
- If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities;
- All vehicles are to be serviced in a correctly bunded area or at an off-site location;
- Leaking vehicles will have drip trays place under them where the leak is occurring;
- Pipelines must be maintained;
- Pipeline must be checked regularly for leaks; and
- If there are leaks the pipelines must be repaired immediately.

C. Loss of land capability during closure

During decommissioning, vehicle activity is likely to compact soils even further due to the necessary activities. The infrastructure established during the construction phase is subsequently destroyed to ensure as little as possible is left after the relevant operations.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Loss of land capability	Closure Decommissioning	-20.00	-8.25	-11.00

Proposed Mitigation

- The rehabilitated area must be assessed once a year for compaction, fertility, and erosion. The soils fertility must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) as to correct any nutrient deficiencies;
- Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated;
- If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place;
- If erosion has occurred, topsoil should be sourced and replaced and shaped to reduce the recurrence of erosion;
- Only the designated access routes are to be used to reduce any unnecessary compaction; and
- Areas of subsidence must be reported and remediated as soon as possible with the best practises at the time of occurrence.

9.3.8 IMPACTS ON AIR QUALITY

The following impacts on the air quality within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No impacts on air quality have been identified that will occur during the Planning and Design Phase, Rehabilitation and Closure Phase, and the Post-closure Phase. Below are the impacts on air quality for the construction, operation, and decommissioning phases identified during scoping, as well as their impact rating.

A. Decline in air quality

The main pollutant of concern from construction operations is particulate matter, including PM10, PM2.5 and TSP. PM10 and PM2.5 concentrations are associated with potential health impacts due to the size of the particulates being small enough to be inhaled. Nuisance effects are caused by the TSP fraction (20 µm to 75 µm in diameter) resulting in soiling of materials and visibility reductions. This could in effect also have financial implications due to the requirement for more cleaning materials. Since the required surface infrastructure such as offices, stores facility, workshops, and change house already exists at Kangala Colliery and only limited construction activities are required at the site, the impacts due to construction activities are likely to be localised and of low magnitude. This impacts therefore, applies mainly to PM2.5 and PM10 concentrations and dustfall rates. The simulated dustfall rates indicate that, under unmitigated circumstances, the crops at the on-site farmsteads (AQSRs No 16 and 17) may be exposed to dustfall rates greater than 400 mg/m²/day . With mitigation

applied the simulated dustfall rates at both farmsteads fall below 400 mg/m²/day. At these dustfall levels the crops are not expected to be adversely affected by project activities.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Decline in air quality	Construction	-6.75	-5.25	-6.13

Proposed Mitigation

- Regular water sprays and chemical suppression on unpaved roads to ensure at least 90% control efficiency (CE);
- Monthly physical inspection of road surface, daily visual observation of entrained dust emissions from unpaved road surfaces;
- Controlled blasting techniques to be used to ensure minimal dust generation;
- Blasting only to be conducted on cloudless days, if possible;
- Water sprays on drilling activities;
- Addition of chemical surfactants to water sprays to lower water surface tension and increase binding properties;
- Drilling to be controlled through water sprays or vacuum packs;
- Increase in-pit material moisture content;
- Drop height from excavator into haul trucks to be kept at a minimum for ore and waste rock;
- Tipping onto ROM storage piles to be controlled through water sprays, should significant amounts of dust be generated;
- Keep material handled by dozers and wheeled loaders moist to achieve a control efficiency of 50%, especially during dry periods;
- Regular clean-up at loading areas;
- Water sprays at the crushers to achieve at least 50% CE;
- Water sprays at ROM stockpile can achieve 50% CE. Increase in moisture content provides higher threshold friction velocity and ensures that particulates are not as easily entrained due to high surface winds;
- Reshape all disturbed areas to their natural contours, in accordance with the landform design;
- Cover disturbed areas with previously collected topsoil and replant native species;
- Rock cladding with larger pieces of waste rock is recommended to reduce wind erosion emissions from the overburden storage piles; and
- Design mitigated activities include: 75% CE on unpaved haul roads, 50% CE on materials handling, 50% CE on crushing and screening, 50% CE on grading activities, 70% CE on covered conveyor tipping points and 65% on windblown dust from conveyor belt with enclosed side and roof.

B. Decline in air quality – Kangala operations (baseline)

The highest impacts are mainly due to unpaved roads (both in-pit and surface roads).

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Decline in air quality – Kangala operations (baseline)	Operation	-14.00	-9.00	-13.50

Proposed Mitigation

- Water sprays on haul roads assuming 75% CE due to continuous water sprays (Scenario 1b) and 90% CE on haul roads assuming water sprays and chemical suppression;
- Materials handling (loading and unloading of waste rock, ROM and discard) assuming 50% CE due to water sprays at tip points;
- Control efficiency on covered conveyor tipping points (materials handling) of 70%; and
- Control efficiency on wind erosion due to conveyor belt (enclosed side and roof) of 65%.

C. Decline in air quality (design mitigation)

The main source of impact for design mitigated PM10 due to the proposed Phase 3 Project operations is vehicle entrained dust from unpaved roads, ranging in contribution to total simulated GLCs between 37% and 96%. The secondary source of impact for design mitigated PM10 is in-pit operations, ranging in contribution to total simulated GLCs between 2% and 52%. For design mitigated PM2.5, in-pit operations were the main source of impact at 14 AQSRs, ranging in contribution between 5% and 61%, followed by crushing operations, ranging in contribution between 6% and 42%. Similar to Scenario 1 the main source of impact for design mitigated dust fallout is windblown dust from the discard stockpile and topsoil stockpile, ranging in contribution to total simulated GLCs between 11% and 84%. The secondary source of impact for dust fallout is vehicle entrained dust from unpaved roads, ranging in contribution between 5% and 89%. This impact is, therefore, mainly due to unpaved roads and in-pit activities.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Decline in air quality (design mitigation)	Operation	-15.00	-14.00	-21.00

Proposed Mitigation

- Regular water sprays and chemical suppression on unpaved roads to ensure at least 90% control efficiency;
- Monthly physical inspection of road surface, daily visual observation of entrained dust emissions from unpaved road surfaces;
- Controlled blasting techniques to be used to ensure minimal dust generation;
- Blasting only to be conducted on cloudless days, if possible;
- Water sprays on drilling activities;

- Addition of chemical surfactants to water sprays to lower water surface tension and increase binding properties;
- Drilling to be controlled through water sprays or vacuum packs;
- Increase in-pit material moisture content;
- Drop height from excavator into haul trucks to be kept at a minimum for ore and waste rock;
- Tipping onto ROM storage piles to be controlled through water sprays, should significant amounts of dust be generated;
- Keep material handled by dozers and wheeled loaders moist to achieve a control efficiency of 50%, especially during dry periods;
- Regular clean-up at loading areas;
- Water sprays at the crushers to achieve at least 50% control efficiency;
- Water sprays at RoM stockpile can achieve 50% control efficiency. Increase in moisture content provides higher threshold friction velocity and ensures that particulates are not as easily entrained due to high surface winds;
- Reshape all disturbed areas to their natural contours;
- Cover disturbed areas with previously collected topsoil and replant native species;
- Rock cladding with larger pieces of waste rock is recommended to reduce wind erosion emissions from the overburden storage piles;
- Design mitigated activities include: 75% CE on unpaved haul roads, 50% CE on materials handling, 50% CE on crushing and screening, 50% CE on grading activities, 70% CE on covered conveyor tipping points and 65% on windblown dust from conveyor belt with enclosed side and roof; and
- In the light of the Project being in the Highveld Priority Area, and close to various mining and power generation activities, it is recommended that air quality management planning forms part of the operational phase and decommissioning of the Project. The air quality management plan provides options on the control of dust at the main sources with the monitoring network designed as such to track the effectiveness of the mitigation measures. The sources need to be ranked according to sources strengths (emissions) and impacts. Once the main sources have been identified, target control efficiencies for each source can be defined to ensure acceptable cumulative ground level concentrations. The main objective of the proposed air quality management measures for the project is to ensure that operations result in ambient air concentrations (specifically PM2.5 and PM10) and dustfall rates that are within the relevant ambient air quality standards and regulations outside the mining area and at the relevant AQSRs. In order to define site specific management objectives, the main sources of pollution need to be identified. Once the main sources have been identified, target control efficiencies for each source can be defined to ensure acceptable cumulative ground level concentrations.

D. Decline in Air Quality – Phase 3 Project (added mitigation applied on haul roads to achieve a control efficiency of 90% the area of exceedance of the daily PM10 NAAQS extended well beyond the mining rights boundary.)

The highest impacts are mainly due to unpaved roads (both in-pit and surface roads).

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance

Decline in air quality (added mitigation)	Operation	-15.00	-9.75	-14.63

Proposed Mitigation

- Regular water sprays and chemical suppression on unpaved roads to ensure at least 90% control efficiency;
- Monthly physical inspection of road surface, daily visual observation of entrained dust emissions from unpaved road surfaces;
- Controlled blasting techniques to be used to ensure minimal dust generation;
- Blasting only to be conducted on cloudless days, if possible;
- Water sprays on drilling activities;
- Addition of chemical surfactants to water sprays to lower water surface tension and increase binding properties;
- Drilling to be controlled through water sprays or vacuum packs;
- Increase in-pit material moisture content;
- Drop height from excavator into haul trucks to be kept at a minimum for ore and waste rock;
- Tipping onto RoM storage piles to be controlled through water sprays, should significant amounts of dust be generated;
- Keep material handled by dozers and wheeled loaders moist to achieve a control efficiency of 50%, especially during dry periods;
- Regular clean-up at loading areas;
- Water sprays at the crushers to achieve at least 50% control efficiency;
- Water sprays at ROM stockpile can achieve 50% control efficiency. Increase in moisture content provides higher threshold friction velocity and ensures that particulates are not as easily entrained due to high surface winds;
- Reshape all disturbed areas to their natural contours;
- Cover disturbed areas with previously collected topsoil and replant native species;
- Rock cladding with larger pieces of waste rock is recommended to reduce wind erosion emissions from the overburden storage piles;
- Revegetation of overburden stockpile is recommended; and
- Additional mitigation includes design mitigation and 90% CE on unpaved haul roads.

E. Decline in air quality – Phase 3 Project

It is assumed that all the operations will have ceased by the decommissioning and closure phases of the project. The potential for impacts during this phase will depend on the extent of rehabilitation efforts during decommissioning and closure phases. Aspects and activities associated with the decommissioning and closure phases of the proposed operations include: Generation of PM2.5 and PM10 from stockpiles and the mining pit (dust generated during rehabilitation activities); Generation of PM2.5 and PM10 from the mining infrastructure (demolition of the mining infrastructure); and Gas emissions from vehicles (tailpipe emissions from vehicles utilised during the decommissioning and closure phases). Therefore, this impact applies to PM2.5 and PM10 concentrations and dustfall rates. Likely activities to result in dust impacts during closure are: infrastructure

removal/demolition; topsoil recovered from stockpiles for rehabilitation and re-vegetation of surroundings; and vehicle entrainment on unpaved road surfaces during rehabilitation – once that is done, vehicle activity associated with the mining operations should cease.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Decline in air quality	Closure Rehabilitation	-6.75	--6.75	-7.88

Proposed Mitigation

- Demolition of infrastructure to have water sprays where vehicle activity is high; and
- Rehabilitation and vegetation of mined area.

9.3.9 VISUAL IMPACTS

The following impacts on the visual environment within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No visual impacts have been identified for the Planning and Design Phase, Rehabilitation and Closure Phase, and the Post-closure Phase. Below are the visual impacts during the construction, operational and decommissioning phases, as well as their impact rating.

A. Change of landscape character

In general terms the proposed mine extension will be visible to the same settlement areas and from a similar distance as the existing mine. The one exception to this is the rural area to the west of the extension area. It is likely that mining operations will become more obvious from this currently largely rural area.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Change in character	Construction	-2.50	-2.50	-2.50
	Operation	-2.50	-4.00	-6.00
	Decommissioning	2.00	2.00	2.00

Proposed Mitigation

- General mining activities around the mine extension are unlikely to cause a major change in the current level of impact. Good housekeeping measures will all help to ensure that visual impacts are not exacerbated. These include:

- Minimising the disturbed area (i.e. ensuring mining activities are localised or kept together as far as possible) so as to reduce the amount of areas with potential visual obstructions or impacts,
- Retention of as much existing vegetation as possible,
- Dust suppression, and
- Progressive rehabilitation.

B. Impact on urban areas and smallholdings

In general terms the proposed mine extension will be visible to the same settlement areas and from a similar distance as the existing mine. The one exception to this is Droogfontein which appears to be an area of smallholdings that have been developed with varying uses including large private houses and semi industrial agriculture.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on urban edge	Construction	-1.00	-1.00	-1.00
	Operation	-6.75	-6.75	-6.75
	Decommissioning	2.00	2.00	2.00

Proposed Mitigation

- In a relatively flat landscape, the scale and nature of the stockpiles will be impossible to screen. The only possible mitigation measure is to locate them to the east of the extension area as far from Droogfontein as possible; and
- General mining activities around the mine extension are unlikely to cause a major change in the current level of impact. Good housekeeping measures will all help to ensure that visual impacts are not exacerbated. These include:
  - Minimising the disturbed area (i.e. ensuring mining activities are localised or kept together as far as possible) so as to reduce the amount of areas with potential visual obstructions or impacts,
  - Retention of as much existing vegetation as possible,
  - Dust suppression, and
  - Progressive rehabilitation.

C. Impact on farmsteads

In general terms the proposed mine extension is likely to be visible to the same farmsteads and from a similar distance as the existing mine. However, there are likely to be the following exceptions:

- There is one farmstead that appears to be located in close proximity to existing mine stockpiles. As these stockpiles are removed for backfilling and rehabilitation, the visual impact on this receptor is likely to reduce significantly; and
- There is one farmstead that appears to be within the proposed mine extension area (NW corner). It has to be assumed that this farmstead will be removed if authorisation for the mine extension is granted.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on farmsteads	Construction	-1.00	-1.00	-1.00
	Operation	-6.75	-6.75	-6.75
	Decommissioning	2.00	2.00	2.00

Proposed Mitigation

- General mining activities around the mine extension are unlikely to cause a major change in the current level of impact. Good housekeeping measures will all help to ensure that visual impacts are not exacerbated. These include:
    - Minimising the disturbed area (i.e. ensuring mining activities are localised or kept together as far as possible) so as to reduce the amount of areas with potential visual obstructions or impacts,
    - Retention of as much existing vegetation as possible,
    - Dust suppression, and
    - Progressive rehabilitation.

D. Impact on local roads

In general terms the proposed mine extension is likely to be visible to the same roads and from a similar distance as the existing mine. Visual impacts associated with the proposed mine extension are therefore unlikely to create significant new areas or different types of visual impact.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on local roads	Construction	-1.00	-1.00	-1.00
	Operation	-2.00	-2.00	-2.00
	Decommissioning	1.00	1.00	1.00

Proposed Mitigation

- General mining activities around the mine extension are unlikely to cause a major change in the current level of impact. Good housekeeping measures will help to ensure that visual impacts are not exacerbated. These include:
    - Minimising the disturbed area (i.e. ensuring mining activities are localised or kept together as far as possible) so as to reduce the amount of areas with potential visual obstructions or impacts,
    - Retention of as much existing vegetation as possible,
    - Dust suppression,
    - Progressive rehabilitation.

9.3.10 BLASTING AND VIBRATION IMPACTS

Blasting operations primary objective is producing rock for crushing to be used in construction. 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 following impacts from blasting and vibration within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No impacts from blasting and vibration have been identified for the Planning and Design Phase, Construction Phase, Decommissioning Phase, Rehabilitation and Closure Phase, and Post-closure Phase. Below are the blasting and vibration impacts during the operational phase, as well as their impact rating.

A. Ground vibration impact on houses

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 influence zones for maximum charge are indicated in Figure 40.

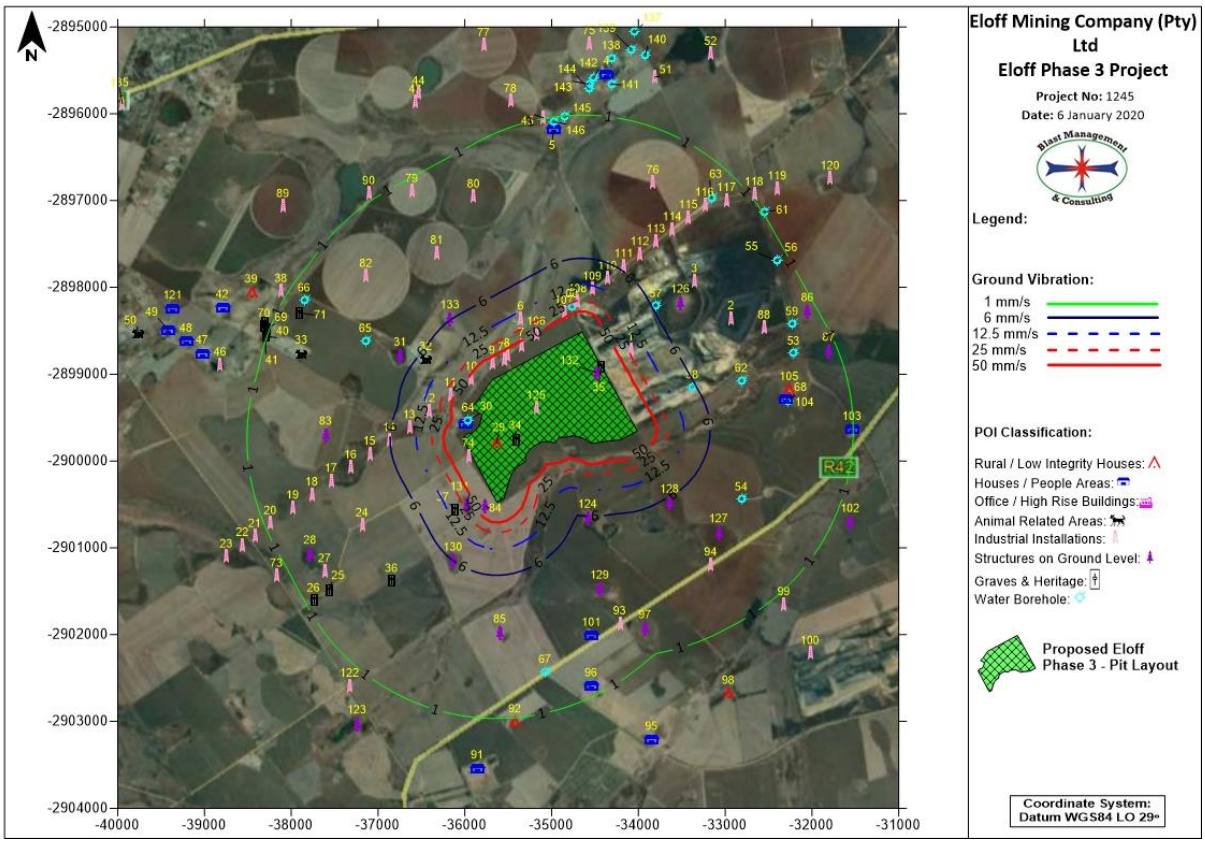


Figure 40: Ground vibration influence from maximum charge for Opencast Area

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Ground vibration impact on houses	Operation	-3.00	-2.75	-4.58

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hole) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range

between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;

- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

B. Ground vibration impact on roads

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.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Ground vibration impact on roads	Operation	-9.50	-9.00	-13.50

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

C. Ground vibration impact on boreholes

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.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Ground vibration impact on boreholes	Operation	-9.00	-8.25	-13.75

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
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- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating

systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;

- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

D. Ground vibration impact on heritage sites

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.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Ground vibration impact on heritage sites	Operation	-5.50	-5.50	-8.25

Proposed Mitigation

- Heritage infrastructure was identified for the project. 11 Heritage Sites which include graves, Historical Farmstead/Buildings/Structures were identified by the Heritage Specialist. Nine of these sites fall at closest distance of 463 m from the pit boundary and two graveyards (POI's 34 & 35) fall within the pit area. The heritage specialist advice on the process and mitigations required for all identified heritage sites must be adhered to.

E. Ground vibration impact on power lines

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.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Ground vibration impact on power lines	Operation	-14.00	-9.75	-14.63

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube

system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;

- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

Ground vibration impact on broilers

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.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Ground vibration impact on broilers	Operation	-9.00	-8.25	-13.75

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;

- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

F. Air blast impact on houses

In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and lead to upsetting people.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Air blast impact on houses	Operation	-9.00	-8.25	-13.75

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;

- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
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- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

G. Air blast impact on roads

In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and lead to upsetting people.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Air blast impact on roads	Operation	-2.75	-2.75	-4.13

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;

H. Air blast impact on boreholes

In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and lead to upsetting people.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Air blast impact on boreholes	Operation	-2.75	-2.75	-4.58

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
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- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;

- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
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- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
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- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

I. Air blast impact on heritage sites

In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and lead to upsetting people.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Air blast impact on heritage sites	Operation	-2.75	-2.75	-4.13

Proposed Mitigation

- Heritage infrastructure was identified for the project. 11 Heritage Sites which include graves, Historical Farmstead/Buildings/Structures were identified by the Heritage Specialist. Nine of these sites fall at closest distance of 463 m from the pit boundary and two graveyards (POI's 34 & 35) fall

within the pit area. The heritage specialist advice on the process and mitigations required for all identified heritage sites must be adhered to.

J. Air blast impact on power lines

In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and lead to upsetting people.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Air blast impact on power lines	Operation	-2.75	-2.75	-4.13

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
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- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;

- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

K. Air blast impact on broilers

In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and lead to upsetting people.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Air blast impact on broilers	Operation	-13.00	-9.00	-15.00

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;

- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

L. Fly rock impact on houses

Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when pit is located in close proximity of houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fly rock impact on houses	Operation	-5.50	-5.50	-8.25

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will

take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;

- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

M. Fly rock impact on roads

Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when pit is located in close proximity of houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fly rock impact on roads	Operation	-17.50	-9.75	-14.63

Proposed Mitigation

- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;

N. Fly rock impact on boreholes

Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when pit is located in close proximity of houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fly rock impact on boreholes	Operation	-15.00	-8.25	-12.38

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;

- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

O. Fly rock impact on heritage sites

Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when pit is located in close proximity of houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fly rock impact on heritage sites	Operation	-6.00	-5.50	-8.25

Proposed Mitigation

- Heritage infrastructure was identified for the project. 11 Heritage Sites which include graves, Historical Farmstead/Buildings/Structures were identified by the Heritage Specialist. Nine of these sites fall at closest distance of 463 m from the pit boundary and two graveyards (POI's 34 & 35) fall

within the pit area. The heritage specialist advice on the process and mitigations required for all identified heritage sites must be adhered to.

P. Fly rock impact on power lines

Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when pit is located in close proximity of houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fly rock impact on power lines	Operation	-17.50	-9.75	-14.63

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;
- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;

- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

Q. Fly rock impact on broilers

Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control on fly rock will also control the effects of air blast. Fly rock is greater concern when pit is located in close proximity of houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Fly rock impact on broilers	Operation	-6.00	-5.50	-8.25

Proposed Mitigation

- Blast design – Changes in the blast design involve a change in drill diameter or depth of the holes to be drilled whereby a smaller diameter blast hole will use less explosives. A shallower blast hole will also use less explosives. Blast designs should be reviewed prior to first blast planned and done. The geology for the pit area and the required drill depths should be confirmed. Due to stripping of topsoil that will take place there may be variances in required final depths and thus design applied to be confirmed. Both reductions will facilitate less explosives. However, this must be read with changes in the initiation system. If the initiation system for the two blast designs (smaller or shallower hoe) are kept the same then it will reduce the explosive charge mass per delay;
- It is always good to conduct a first test blast to confirm levels and ground vibration and air blast. It is recommended that such a blast be done and detail monitoring done and used to help define blasting operations going forward. This test blast can be based on the existing design and only after this blast it may be necessary to define if changes are required or not;
- The current proposed stemming lengths used provides for some control on fly rock. Consideration can be given to increase this length for better control. Specific designs where distances between blast and point of concern are known should be considered. Recommended stemming length should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range between 30 and 34 times the blast holes diameter. Increased stemming lengths will also contribute to more acceptable air blast levels;

- Calculated minimum safe distance is 266 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance;
- Do blast design that considers the actual blasting and the ground vibration levels to be adhered too. Only apply electronic initiation systems to facilitate single hole firing. Do design for smaller diameter blast holes that will use fewer explosives per blasthole;
- The R42 is in the nearest provincial road to the project area and needs to be considered. This provincial road is at closest point at 1757 m in the vicinity of the project area. No specific actions are required for this road. There are gravel roads that link the different farming areas and running through the pit area. These routes are specifically of concern when blasting is done. There may be people and animals on these routes and will require careful planning to main safe blasting radius. Road closures will be required when blasting closer than 500 m from these roads;
- Change initiation systems – Changes in the initiation systems refers to using different initiating systems for initiating the blast. It involves the detonating cord, shock tube systems and electronic initiating systems. Generally, the mine would use shock tube systems as the normal product as it is relatively cheap. The use of shock tube systems on the other hand, can have (depending on the timing layout on the blast and delays used) at least 1 to 6 holes detonating simultaneously. This contributes to the ground vibration effects. If electronic initiation is used and the blast is timed to give only one hole firing at a time, then there is more certainty that only one blast hole's explosive is contributing to the ground vibration. However, electronic initiation can also be setup to use the same timing as a shock tube system whereby there can be multiple blast holes firing. The advantage of electronic initiation is that it can be programmed accordingly whereas shock tube systems have fixed delay time periods;
- A monitoring programme for recording blasting operations is recommended (refer to specialist study in Appendix D for details and monitoring positions). Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Video of each blast will help to define if fly rock occurred and from where. Immediate mitigation measure can then be applied if necessary. The video will also be a record of blast conditions; and
- The option of photographic survey of all structures up to 1500 m from the pit areas is recommended.

9.3.11 NOISE IMPACTS

The following noise impacts within the study area and its surrounding were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No noise impacts have been identified that will occur during the Planning and Design Phase and the Post-closure Phase. Below are the construction and operation phase impacts identified during scoping, as well as their impact rating. Final decommissioning activities will have a noise impact lower than either the construction or operational phases. This is because decommissioning (final rehabilitation) and closure activities normally take place during the day using minimal equipment (due to the decreased urgency of the project). While there may be various activities, there is a very small risk for any additional noise impact.

A. Increase in noise levels at surrounding receptors due to construction and operational mining activities in the day

Day time noise levels are likely to increase as a result of the construction and operational activities thereby disturbing the surrounding communities.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Increase in noise levels at surrounding receptors due to mining activities in the day	Construction Decommissioning	-1.75	-1.75	-2.04
	Operation	-2.25	-2.25	-2.63

Proposed Mitigation during construction

- All employees and contractors should receive induction that includes an environmental awareness component (noise). This is to allow employees and contractors to realize the potential noise risks that activities (especially night-time activities) pose to the surrounding environment;
- Ensure a good working relationship between mine management and all potentially noise-sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them (especially if work is to take place within 300 m from them at night). Information that should be provided to potentially sensitive receptor(s) includes:
    - Proposed working dates, the duration that work will take place in an area and working times;
    - The reason why the activity is taking place;
    - The construction methods that will be used; and
    - Contact details of a responsible person where any complaints can be lodged should there be an issue of concern.
- Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised; and
- The operation should investigate the use of white-noise alarms instead of tonal reverse alarms on heavy vehicles operating on roads, within the mining area and at stockpile areas. The advantages of white noise alarms above tonal alarms are:
    - It is as safe as a tonal alarm;
    - Highly audible close to the alarm (or reversing truck);
    - It generates a more uniform sound field behind a reversing vehicle;
    - Greater directional information, workers can locate the source faster;
    - Significantly less environmental noise and it creates significantly less annoyance far away; and
    - When properly installed, white noise alarms of a similar sound power emission level are more likely to comply with the ISO 9533 standard.

Proposed Mitigation during operation

- Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures;
- All employees and contractors should receive induction that includes an environmental awareness component (noise). This is to allow employees and contractors to realize the potential noise risks that activities (especially night-time activities) pose to the surrounding environment.

- The mine should investigate the use of white-noise alarms instead of tonal reverse alarms on heavy vehicles operating on roads and at stockpile areas;
- Compliance with the Noise conditions of the Environmental Management Plan that covers:
  - Potential mitigation measures as defined in this report;
  - Formal register where receptors can lodge any noise complaints;
  - Noise measurement protocol to investigate any noise complaints; and
  - The commitment from the mine to consider reasonable mitigation if the noise complaint investigation indicate the validity of a noise complaint. These measures could include steps ranging from process changes, development of barriers or enclosure of the noise source and even relocation (if no other feasible alternatives exist).

B. Increase in noise levels at surrounding receptors due to construction and operational mining activities at night (worst-case)

Night-time noise levels are likely to increase as a result of the construction and operational activities thereby disturbing the surrounding communities.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Increase in noise levels at surrounding receptors due to mining activities at night	Construction Decommissioning	-4.50	-4.50	-5.25
	Operation	-5.50	-5.50	-6.42

Proposed Mitigation during construction

- All employees and contractors should receive induction that includes an environmental awareness component (noise). This is to allow employees and contractors to realize the potential noise risks that activities (especially night-time activities) pose to the surrounding environment.
- Ensure a good working relationship between mine management and all potentially noise-sensitive receptors. Communication channels should be established to ensure prior notice to the sensitive receptor if work is to take place close to them (especially if work is to take place within 300 m from them at night). Information that should be provided to potentially sensitive receptor(s) includes:
  - Proposed working dates, the duration that work will take place in an area and working times;
  - The reason why the activity is taking place;
  - The construction methods that will be used; and
  - Contact details of a responsible person where any complaints can be lodged should there be an issue of concern.
- Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. Engine bay covers over heavy equipment could be pre-fitted with sound absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised.

- The operation should investigate the use of white-noise alarms instead of tonal reverse alarms on heavy vehicles operating on roads, within the mining area and at stockpile areas. The advantages of white noise alarms above tonal alarms are:
    - It is as safe as a tonal alarm;
    - Highly audible close to the alarm (or reversing truck);
    - It generates a more uniform sound field behind a reversing vehicle;
    - Greater directional information, workers can locate the source faster;
    - Significantly less environmental noise and it creates significantly less annoyance far away; and
    - When properly installed, white noise alarms of a similar sound power emission level are more likely to comply with the ISO 9533 standard.

Proposed Mitigation during operation

- Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures;
- All employees and contractors should receive induction that includes an environmental awareness component (noise). This is to allow employees and contractors to realize the potential noise risks that activities (especially night-time activities) pose to the surrounding environment.
- The mine should investigate the use of white-noise alarms instead of tonal reverse alarms on heavy vehicles operating on roads and at stockpile areas;
- Compliance with the Noise conditions of the Environmental Management Plan that covers:
    - Potential mitigation measures as defined in this report;
    - Formal register where receptors can lodge any noise complaints;
    - Noise measurement protocol to investigate any noise complaints; and
    - The commitment from the mine to consider reasonable mitigation if the noise complaint investigation indicate the validity of a noise complaint. These measures could include steps ranging from process changes, development of barriers or enclosure of the noise source and even relocation (if no other feasible alternatives exist).

9.3.12 LAND USE IMPACTS

The following land use impacts within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No land use impacts have been identified that will occur during the Planning and Design Phase and the Post-closure Phase. Below are the construction, operation, decommissioning as well as rehabilitation and closure phases impacts identified, as well as their impact rating.

A. GDP and monetary impacts

There will be Gross Geographic Product (GGP) creation in the form of investments made in the duration of the project. From a GDP and employment perspective, the land use study shows that in all scenarios mining is a better alternative land use than farming, either over the life of mine, or over a 60-year period.

It also shows the considerable economic advantages that a capital-intensive industry such as coal mining can bring to an economy. The mining GDP values, which is an indicator for most other monetary values, for example household income, taxes, operating profits, procurement and others, simply dwarfs that of farming in this study. This is to be expected given the high GDP per employee and GDP per hectare created by mining. Over a 60-year period the economic benefit of R23.29 billion is significant considering that the cumulative projects spans less

than half this period. The rest of the period the land is considered as sterile in this study, however, the probability that the land, or portions thereof, could be used again is moderate-high.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
GDP and monetary impacts	Construction	+16.25	+16.25	+32.50
	Operation	20.00	20.00	40.00
	Decommissioning	-10.00	-10.00	-20.00
	Rehabilitation Closure	-17.50	-17.50	-35.00

Proposed Mitigation

- No mitigation possible apart from implementing all measures listed in the Rehabilitation and Closure report included as part of the EMPr (Appendix E).

B. Net employment impacts

Due to the high formal and informal job multiplier for coal mining, the number of jobs to be created becomes exponentially high relative to jobs lost in the agricultural sector for the life of mine. Over the 60-year period, these benefits dilute considerably, but remains of a net benefit to the economy.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Net employment impacts	Construction	+16.25	+16.25	+32.50
	Operation	+13.00	+13.00	+26.00
	Decommissioning	-8.75	-8.75	-17.50
	Rehabilitation Closure	-16.75	-16.75	-32.50

Proposed Mitigation

- Where possible, the mine needs to engage with stakeholders to ensure the permanently employed farmworkers on the substituted farmland for Eloff Phase 3, be given assistance to travel to the Department of Labour to register for unemployment, if these workers are to be retrenched; and
- It is recommended that the mine facilitates and participates in a formal entity to implement the farming post-mining land uses

C. Need and desirability (excluding GDP and Employment)

Moving beyond the quantifiable GDP and employment statistics, the need and desirability of Eloff Phase 3 includes a much wider array of factors for consideration, and a qualitative rating system was used to determine the need and desirability. These criteria include investment and land use values, forex and exports, alignment with IDP and LED plans, human wellbeing, spatial development priorities, climate change, food and energy security, community development, sense of place impacts, fiscal income and urban sprawl.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Need and desirability (excluding GDP and Employment)	Construction	+11.25	+11.25	+22.50
	Operation	-13.75	-13.75	-27.50
	Decommissioning	+7.50	+7.50	+15.00

	Rehabilitation Closure	+18.75	+18.75	+37.50

Proposed Mitigation

- An independent competent person needs to review the mine's bankable feasibility study and sign off on the feasibility.

9.3.13 SOCIAL IMPACTS

The following impacts on the social environment within the project area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, rehabilitation and closure, as well as post-closure). No social impacts have been identified that will occur during the Planning and Design Phase, Rehabilitation and the Post-closure Phase. Below are the construction and operational phase social impacts identified, as well as their impact rating.

A. Impacts on the local agricultural sector

Close to 53% of land in the VKLM is used for agricultural purposes with 72% classified as high potential agricultural land and 26% as moderate potential agricultural land (BFAP, 2012). Delmas is regarded as a maize basket for Johannesburg. White and yellow maize is used for human and animal consumption. The area also produces soya, white beans, vegetables, poultry, livestock and diary.

The Eloff project could potentially impact on the Delmas agricultural sector in the following ways:

- The expansion of mining activities will encroach on high and moderate potential agricultural land;
- Mine dust could reduce harvest yields on farms immediately surrounding the mining area. Studies found that mine dust could potentially reduce maize crop yields with close to 20% (BFAP, 2012);
- Mining activities could compromise the availability and quality of the borehole water of farmers. Delmas is a dolomitic area. The Botleng dolomitic aquifer provides clean water to town and farm boreholes. After a typhoid break-out in 2005, reliance on borehole water as drinking source was to a large extent replaced by Rand water within Delmas town (BFAP, 2012). Farmers however still largely rely on boreholes for irrigation and household purposes. There is a risk that leachate from the coal and waste material stockpile could contaminate the ground water. Fly rock from blasting activities could also cause damage to infrastructure (boreholes, residential assets, power lines); and
- Recruiting informally skilled workers from the local area could increase the training and recruiting costs of labour especially in the agricultural sector.

6 full time equivalent (FTE) unskilled farm jobs and another 6 flow-on jobs in the local economy will most likely be lost due to the expansion of mining activities on farmland. In addition, if mine dust negative impacts on crop yields on farms adjacent to the mine it could lead to another 4 jobs lost in the local economy.

A more dramatic impact on farm income and employment would result if mining activities negatively impact on ground and surface water altogether putting a stop to all further agricultural activities within close proximity to the mine. This could result in more than 180 job losses (direct and flow-on) in the local economy. The majority of these jobs would be unskilled jobs.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance

Impact on agricultural sector	Construction Operation	-11.25	-10.50	-19.25

Proposed Mitigation

- Set up a communication forum with local farmers where representatives could voice concerns related to the mining activities;
- Communicate the mine's grievance mechanism (that forms part of the mine's Stakeholder Engagement Plan) to local stakeholders (e.g. through the local media), including how to access the grievance mechanism and the mine's commitment to address grievances lodged through this system;
- Adhere to the management measures of the ground and surface water reports of this EIA;
- Prioritise recruiting unskilled workers among the unemployed; and
- Align unskilled wages to wages in the agricultural sector.

B. Permanent loss of agricultural land

The mine will be opencast, which entails progressive backfilling and rehabilitation of disturbed land. The rehabilitation plan suggests that the rehabilitated land type data would be Class III land (moderate cultivation). Rotation of crops would be required for this land capability. The land capability will however not be rehabilitated back to its full potential for agricultural use after mining.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Permanent loss of agricultural land	Construction Operation	-15.00	-13.00	-17.33

Proposed Mitigation

- All recommendations in the rehabilitation plan must be adhered to.

C. Project induced in-migration

The in-migration of people associated with development is a common phenomenon. It usually occurs on two levels: formal in-migration as a result of the arrival of the construction and operational workforce and informal in-migration due to job seekers.

The first group can be controlled as the size of the construction and operational workforces are limited to a set number of people and, in the case of the construction workforce, only occupy the area for a certain time before they leave the area. Unlike the regulated circumstances surrounding the construction and operational workforce, the influx of job seekers is unregulated and often very difficult to control. In terms of project-induced in-migration, the following should be noted:

- The construction phase will last for approximately 18-24 months and could lead to the employment of 50 people in the first year and 40 during the second year. An additional 50 people in the ward will increase the ward's population by around 0.5% for a limited period of up to 2 years;
- Kangala Mine currently employs 608 people. The mine indicated that this workforce will be transferred to the mine extension and that no new positions will be created at the extension. Therefore, no new in-migration is expected due to the formal employment of a new workforce. The mine expansion will

also allow the current Kangala processing plant to continue its operations, employing 104 workers. Again, this will not result in a new influx of people to the area; and

- It is difficult to predict with accuracy how many job seekers could be expected. However, given the negative population growth rate in the direct Project area, it is safe to assume that the number of job seekers from outside the area would be limited. Job seekers are likely to be residents of the area already and come from areas such as nearby Botleng (which is supported by the high unemployment rate of around 40% in this area).

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Project induced in-migration	Construction	-3.50	-2.00	-2.23

Proposed Mitigation

- No employment at the gate. Rather establish a formal process for employing casual day labour (if required) and communicate this process in the local newspaper, including contact details and employment requirements;
- Enter into formal employment contracts with casual labour and the construction staff to ensure that they are aware that employment is for a limited period only and that it is unlikely that the mine will employ construction staff on the mine when in operation; and
- Communicate redeployment with current operational staff and in the media to prevent word spreading of new job opportunities at the mine.

D. Displacement of households

The displacement and relocation of households causes social disruption. The responsibility for a transparent negotiation process and fair compensation lies with the Project proponent to ensure that the affected individuals and/or families do not bear the brunt of a project that will benefit others. This means that the affected individuals should enjoy the same standard of living that they have enjoyed before the project.

Where multiple households are physically or economically displaced, this would require a formal Resettlement Action Plan (RAP) but in the case of this Project, only a single homestead was observed within the extension area boundary. The mine has confirmed that, by law, houses within a 500 m boundary of an open pit must be relocated to ensure the safety of the residents and that they would make the appropriate arrangements with any affected individuals.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Displacement of households	Construction	-10.00	-6.00	-7.00

Proposed Mitigation

- The household should be sufficiently compensated and assisted with the relocation process; and

- A form of compensation should also be considered for individuals who are residing at the affected homestead but who do not form part of the formal household (e.g. farm workers who may reside in a separate homestead but who will lose their employment if the households were to relocate).

E. Employment and income creation

Employment opportunities for various levels of labour will arise during construction from the proposed Phase 3 project which will lead to the creation of income for those employed. The duration of the construction works is expected to be 18 to 24 months and could lead to the employment of 50 people during the first year and 40 people in the second year. During the 9-year Life of Mine (LoM) the annual on-going capital spending could be in the region of R10.5 million per annum (2018 prices) that could, in turn, result in full time employment of some 6 workers.

Based on the skills distribution in the construction sector the majority of these workers could be semi-skilled (45%) and unskilled (35%). The flow-on impacts (indirect and induced) could result in additional employment between 95 (maximum) and 12 people over the longer term. The incidence of the flow-on impacts would largely fall outside the Delmas area mainly in the larger Gauteng region.

Kangala mine already has a total workforce of 608 people, including its direct workforce (71 workers) and employees of mining and processing contractors (537 workers). It is anticipated that the Eloff project will extend the life of current mine and that all personnel will be transferred to the mine extension of the Eloff project extending their employment contracts with nine years. The mine expansion also will allow the current Kangala processing plant to continue its operations.

In terms of flow-on impacts through supply and induced spending, Universal Coal will serve to provide an additional source of revenue for the local economy through its procurement of goods and services. However, most procurement will likely come from large towns and there will likely be limited local procurement, especially in Delmas. In the case of the current Kangala mine, only 5.75% of supply spending is spent on local (VKLM) suppliers.

Based on the skills distribution in the SLP, some 49% of the mining jobs could be unskilled (requiring less than matric); 38% semi-skilled (requiring matric or equivalent) and 13% skilled (requiring post matric qualifications). Supply-based and induced employment opportunities could be more than double the direct opportunities at the mine.

The total employment impact on VKLM could however be substantially less even if 85% of the direct labour force is sourced from the local area (as is the case with the current Kangala mine). This is due to the limited flow-on impact anticipated for the local economy. The total employment (direct and flow-on) for VKLM is expected to be in the region of 630 jobs over nine years or 52% of total employment (direct and flow-on) expected from the mine. The total income to VKLM is expected to be lower (less than 20% of total income) due to the large portion that the mine profits from the total income generated and the likelihood that these profits will be expatriated from VKLM.

Apart from the employment opportunities created above, the mine is also legally obligated to commit towards training of its labour force as per skills development legislation for the industry. The mine will make provision for a skills development plan of its local workforce through the programmes required by legislation that regulates Social and Labour Plans (SLPs) of mines. Required training includes functional literacy and numeracy programmes, career progression plans, up-skilling for hard to fill vacancies and management positions, bursary and internships and portable skills training. The current five-year SLP (2017-2021) for Kangala also makes provision for business training for contractors and permanent employees. The Mine Works Plan for the Eloff Project makes provision for human resource development of an average R 470 000 per annum for the 9 years of the LoM. In addition, the mine is legally required to make a contribution of 1% of their wage bill as part of the national skills levy, i.e. approximately R 1.4 million on average per annum.

Impact	Project Phase	Pre-Enhancement Score	Post-Enhancement Score	Final Significance
Employment and income creation	Construction	+6.00	+8.00	+9.33
	Operation	+9.75	+13.00	+19.50

Proposed Mitigation

- Prioritise local labour in the recruitment process;
- Upskill unskilled labour where possible; and
- Keep a register of local suppliers.

F. Increase in Labour Costs for other Sectors due to Labour Draw-down

Recruiting informally skilled workers from the local area could increase the training and recruiting costs of labour especially in the agricultural sector.

Impact	Project Phase	Pre-Enhancement Score	Post-Enhancement Score	Final Significance
Labour draw-down	Construction	-6.75	-4.00	-4.67

Proposed Mitigation

- Establish a forum where adjacent farmers are met on regular basis (monthly) to discuss issues related to construction phase;
- Prioritise recruiting unskilled workers among the unemployed; and
- Align unskilled wages to other sectors (tourism, agriculture, forestry) in the local economy.

G. Poverty reduction

Approximately 50% of the workers employed directly by the mine or its contractors are currently unskilled. If the skills distribution stays the same, the Eloff project could continue to provide employment for approximately 300 low-income (unskilled) workers. Flow-on opportunities could add another 100-179 jobs for unskilled workers of which about 6 to 11 unskilled jobs could be in VKLM.

Impact	Project Phase	Pre-Enhancement Score	Post-Enhancement Score	Final Significance

Poverty reduction	Operation	+9.00	+12.00	+18.00

Proposed Mitigation

- Prioritise local labour in the recruitment process as part of the company's own recruitment policy or as part of contractor management plan; and
- The objective should be to 100% recruitment of additional/ new unskilled labour from local communities.

H. Impact on Income Distribution

The portion of income to profits (62%) is higher for the mining project than profit's share in flow-on activities (55%). Low income households will however earn a slightly higher share of total income generated from the project (8%) than in the economy in general as represented through the flow-on activities (7%). The strong income bias of the project towards profit is not singular to this mining project and is one of the reasons why mining activities are subject to additional requirements in terms of social funds and taxation (including the payment of royalties).

Impact	Project Phase	Pre-Enhancement Score	Post-Enhancement Score	Final Significance
Impact on Income Distribution	Operation	-13.00	-13.00	-15.17

Proposed Mitigation

- Contribute social funds to local communities through the Social and Labour Plan, Environmental Management Plan and national tax laws.

I. Tax income

The mining operations will incur income tax, a tax levied on income and profit received. The income tax from the project's operations will contributes to the local economy. Over the nine-year LoM, the Eloff project is expected to generate a total of R 3.6 billion in tax income, i.e. an average of more than R 400 million per annum. This is a significant portion of the total project Gross Value Added (GVA) (direct and flow-on) over the nine years of operations, representing more than 40% of its GVA. This contribution is high compared to the average tax: GVA ratio for the national economy was 26% in 2018 – a ratio that is already considered high compared to a global average of 16%.

Impact	Project Phase	Pre-Enhancement Score	Post-Enhancement Score	Final Significance
Tax income	Operation	+14.00	+14.00	+14.00

Proposed Mitigation

- There are no recommended mitigation measures for this impact.

J. Social investment in the local community

The project will include a social and labour plan (SLP) that will identify community upliftment opportunities in and around the vicinity of the study area. The MPRDA through the Mining Charter 2018 specifies that mining

operations should contribute to the economic development of their mine communities as per a SLP. The mine community development plan should be aligned to the local, provincial and national development priorities. The local communities should furthermore be consulted. Both income generating activities and social infrastructure should be implemented as part of the plan.

While the old (2010) mining guidelines did not specify a specific portion of turnover or profit to be allocated to such a fund, a generally good practice among mining companies was to set aside 1% of net profits after tax. The 2018 Mining Charter targets an equity equivalent benefit to the minimum of 5% to be allocated to the socio-economic development of local communities. Mining legislation furthermore specifies that 0.5% of income that multinational suppliers receive from the mining operations must be contributed to a social development fund.

The MWP for this project make provision for some R 8.4 million (2019 prices) to the local community for local economic development over the lifetime of the project, i.e. on average close to R 1 million per annum.

Impact	Project Phase	Pre-Enhancement Score	Post-Enhancement Score	Final Significance
Social investment in the local community	Operation	+11.00	+14.00	+18.67

Proposed Mitigation

- Develop an updated Local Economic Plan as part of an updated SLP for the project in consultation with the local community;
- Ensure that the current allocation as per the Mine Works Programme for the updated SLP is in line with the targets of the Mining Charter of 2018; and
- Monitor and manage the social contribution of multinational suppliers (in-house as well as suppliers to contractor and direct service providers).

K. Impact on food security

The use of limited arable land for mining purposes poses a long-term risk for South Africa in terms of self-sufficiency in food production. Internationally production for local consumption still plays a major role in terms of food value chains (BFAQ, 2012). There are concerns about the limited arable land available in South Africa (less than 2% of total land area) and the rapid transformation of arable land for mining purposes in Mpumalanga Province in general and VKLM in particular.

A study done for the Maize Trust (BFAP, 2012) found that over the long run the total loss of crop land in VKLM could result in a 14% increase in the price of maize which in turn could cause maize meal prizes to rise with 5%. Low income households, as main consumers of maize meal, would be hardest hit by this increase.

The availability and cost of staple food is, however, only one of the determinants of food security. In the market economy, income through employment is a major factor that determines households' ability to acquire food.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance

Impact on food security	Operation	-8.50	-8.00	-13.33

Proposed Mitigation

- Recommended that production methods should be considered to minimise impacts on the agricultural sector as far as possible in dialogue with the local agricultural community.

L. Impact on property prices

Based on interviews with local valuers and property agents during September 2019, the Eloff Project is not expected to have a significant impact on the prices of adjacent agricultural properties. While some might argue that nuisance factors (dust and noise) could potentially lower the market value of properties close to the complex, others argue that proximity of the mine to property increase the value of the property due to perceptions of potential buy-out of the property for mining purposes. In general, however, property agents active in the area believe that agricultural property prices in VKLM already have incorporated mining activities in the local area.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Impact on property prices	Operation	-2.50	-2.50	-2.50

Proposed Mitigation

- There are no recommended mitigation measures for this impact.

M. Use of Existing Capital

The Project will make use of the Kangala Colliery's existing CHPP and no new surface infrastructure (such as offices, dams, workshops or houses) will be required.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Use of Existing Capital	Operation	+13.75	+13.75	+13.75

Proposed Mitigation

- There are no recommended mitigation measures for this impact.

N. Increased economic concentration of local economy

For the stability of local output in an economy, it makes sense to have a more diversified economic base, thereby mitigating the effect of exposure to external variables usually influencing a specific sector, e.g. international commodity prices in the case of the mining sector. Due to the large exposure of the local economy towards mining output however, one could expect the mining sector cumulatively to have some destabilising influence on local output levels. Another mine will increase the concentration of economic activities in the mining sector and could restrict the local adjustment process towards a post-mining economy.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Increased economic concentration of local economy	Operation	-12.00	-9.00	-13.50

Proposed Mitigation

- Focus on the support of non-mining related activities in community development programmes and business support programmes;
- Focus the local procurement programme on non-core mining inputs (e.g. catering, accommodation) Focus on the support of non-mining related activities in community development programmes and business support programmes; and
- Focus the local procurement programme on non-core mining inputs (e.g. catering, accommodation).

O. Industry competitiveness

The project will provide approximately 17.3 million tonnes of coal annually, the majority (95% plus) to be used for domestic electricity consumption by the national energy supplier Eskom. The project will ensure the continued supply of relatively cheaper non-renewable coal that is still the dominant energy source for the South African economy.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Industry competitiveness	Operation	+13.00	+13.00	+19.50

Proposed Mitigation

- There are no recommended mitigation measures for this impact.

P. Job and income loss

The decommissioning and mine closure will lead to loss of direct and flow-on jobs.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Job and income loss	Decommissioning Closure	-15.00	-14.00	-16.33

Proposed Mitigation

- As per SLP requirements, develop mechanisms to assist employees, prior to retrenchment date, in the transition phase after closure of the operations. This includes offering portable skilled development

programmes during the operational phase of the mine, providing assistance in accessing available and suitable jobs with other local mines or companies, etc; and

- Focus on non-core related local supply links during the operational phases of the mine to facilitate easier transitioning of local suppliers to other industries.

Q. Decrease in Local Economic Development Funds

The proponent's regulatory commitment with regards to social and economic development is expected to decrease during the decommissioning and closure of the mine. The risk exists that projects, most notably infrastructure projects, are dependent on the funding that they receive from the proponent and that such projects will fail or cease to exist due to the decrease in funding.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Termination of social funds	Decommissioning Closure	-13.00	-11.00	-12.83

Proposed Mitigation

- Mine community development forms part of the requirements of the SLP and as such, any investment in the local community should be done in agreement with the VKLM and the mine community in question;
- Ensure that all stakeholders are aware of the mine's limitations in terms of funding and that funding will cease upon mine closure; and
- Select development projects that can become self-sufficient by generating its own income, e.g. agricultural support programmes that train subsistence farmers in more advance agricultural practices. Investments in infrastructure projects should be done in coordination with the relevant authority, e.g. classrooms at local schools should be undertaken along with the Department of Education who can take over maintenance once the mine ceases to exist.

R. Increase in crime

An influx of job seekers could result in an increase in criminal activities. It is also possible that, during the construction phase of the project, an opportunistic criminal element may take advantage of increased activities in certain areas around construction sites. Due to the widely publicised countrywide spike in violent crimes on farms, isolated households on farmlands around the mine could feel especially vulnerable to crime

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Increase in crime	Construction	-4.50	-4.00	-4.67

Proposed Mitigation

- Liaise with and support local community policing groups / forums to aid proactive policing.

S. Increased demand for housing

It is unlikely that the project would lead to an increased demand for housing. The reason for this is twofold: 1) the project will utilise existing staff who are already housed in the area, and 2) the mine is required, as part of its SLP commitments, to address its workers' housing and living conditions to phase out hostel living. The latter is often associated with overcrowding and slum-like conditions that leads to unhealthy living conditions and an increase in crime. Mines therefore opt to rather pay living out allowances or housing subsidies to allow their employees to purchase their own homes. Currently there is not a housing shortage in the Project area. As of November 2019, there were approximately 200 properties for sale in the Delmas area, ranging in price from R 350 000 for a 2-bedroom townhouse in Eloff to R 14.5 million for a smallholding in Delmas consisting of a 11 separate residential units.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Increased demand for housing	Construction	-5.00	-4.00	-4.67

Proposed Mitigation

- Set requirements in construction tender documents for companies to house their workers and employees during construction; and
- Implement the undertakings of the mine in its SLP to improve housing and living conditions of employees.

T. Increased resource use

The mining sector is highly energy intensive relative to its economic output. While water consumption at mines are relatively low compared to its output and compared to, say, the consumption of the agricultural sector, the scale of the operation is a factor in terms of its water consumption (Stats SA, 2000). The latter is especially a factor considering water constraints in the local area.

As mentioned in the baseline municipal profile, a third of the households within the Ward 7 rely on borehole (groundwater), while one fifth rely on rivers and streams (surface water). Therefore, half the households within the ward rely on natural resources as their main water source with the supply and quality of services diminishing towards the rural areas.

Concerns regarding the quantity and quality of the water resources in the area were highlighted by the surrounding landowners. According to the hydrogeological survey conducted as part of the EIA process, the development is likely to reduce natural outflow from the slope with approximately 50%. This will negatively impact the wetland / streamflow in the bottom of the valley. As mentioned above, a great majority of the communities utilise the water (surface and ground). Contamination of ground and surface water can cause health impacts to households who rely on these resources for their water. Separate Ground and Surface water assessment specialist studies provide additional detail regarding the possible contamination of water resources by the project.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance

Increased resource use	Construction Operation	-12.00	-11.00	-16.50

Proposed Mitigation

- Develop a resource use plan with the specific objective to minimize the project's energy and water use as far practical.

U. Nuisance factors

An increase in nuisance factors such as noise and dust pollution impact on nearby households and communities' health and wellbeing. Possible health effects of mining operations include air / dust pollution, noise pollution, and light pollution.

Health and well-being remains a large concern with the findings of the Air Quality Impact Assessment models indicating that un-mitigated mining operations at the Kangala colliery do not meet Air Quality Standards at 13 out of the 25 identified air quality sensitive receptors (AQSR) within the study area which includes farmsteads, residential areas, schools, a hospital and agricultural holdings. Mitigated impacts reduce this number to only two of the 25 AQSRs.

According to the results in the Environmental Noise Impact Assessment, projected noise levels associated with the project will of low significance. While the noise impacts are projected to be low, according to the Air Quality Impact Assessment, the AQSR are at risk of PM10 above the legal limits as has been the case for the period from May 2016 to July 2018 at the Kangala monitoring station. Excessive dust fall has been recorded to be above the residential limits of 600 mg/m2/day more than twice per year, and for sequential months, during the 2015/2016, 2016/2017, and 2017/2018 sampling periods.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Nuisance factors	Operation	-14.00	-4.50	-6.75

Proposed Mitigation

- Water down the site to curb blowing dust;
- Alert the area when activities that will increase noise levels will take place; and
- Communicate the mine's grievance mechanism through the local media. Ensure that stakeholders know how to access the grievance mechanism. Address grievances timeously.

V. Social disintegration and conflict

Social conflict can play out on two levels:

- During the key stakeholder workshop held in July 2019 it was evident that two community groups had different viewpoints regarding the coal mining industry in the area. It was also hinted at during this workshop that the community of Botleng would be willing to mobilise against other communities if they hindered the Eloff Project; and
- The other level of conflict can play out between the communities, neighbouring landowners and the mine. Landowners have raised concerns about the rapid development of mining activities and the negative impacts associated with unmitigated impacts of mining operations. The simultaneous

development and expansion of various coal mines in the area could make local residents feel further disempowered, which could increase the risk for social conflict.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Social disintegration and conflict	Construction Operation	-8.25	-4.00	-6.00

Proposed Mitigation

- Acknowledge and remedy past grievances and act on outstanding commitments;
- Establish meaningful avenues of two-way communication;
- Build relationships through goodwill and understanding. Be upfront and straightforward about potential issues and difficulties, including environmental risks and limited job opportunities;
- Be responsive and adaptive to complaints and other issues;
- Listen to and act on community concerns; and
- Design and implement a grievance mechanism. Monitor grievances to allow for eventual proactive actions instead of reactive addressing of complaints.

W. Defiant social behaviour

Defiant social behaviour can develop when there is a marked dissimilarity in social practices between groups of people. Mining operations, and also the Eloff Project, are mostly operated by contractors who make use of migrant workers. Some of these might be from the local area while others could be from labour sending areas further afield. However, the Eloff Project will be operated by the existing staff with little to no new positions being created and therefore a very limited influx of new people with new social standards and practices will enter the area. Existing incidents of social defiant behaviour are isolated and infrequent and does not seem to impact on the larger community's sense of safety and security. To date there has been no public violent protests against the mining industry in Delmas. It is expected that this trend will continue with the operation of the Eloff Project.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Defiant social behavior	Construction	-5.00	-4.00	-6.00

Proposed Mitigation

- Discourage drug taking and excessive alcohol consumption by implementing a zero tolerance to workers being under the influence when reporting for duty or while on the job;
- Run periodic awareness campaigns to make workers aware of the risks associated with drug taking, excessive alcohol consumption and indiscriminate relationships; and
- Offer voluntary counselling and testing services at the mine clinic.

X. Change in sense of place

Sense of place is largely influenced by place attachment, which is the sense of connectedness a person/community feels towards certain places. Place attachment may be evident at different geographic levels, i.e. site specific (e.g. a house, burial site, or tree where religious gatherings take place), area specific (e.g. a residential area), and/or physiographic specific (e.g. an attachment to the look and feel of an area). The concept of sense of place therefore attempts to integrate the character of a particular setting with the personal emotions, memories and cultural activities associated with such a setting.

Much of what is valuable in a culture is embedded in place, which cannot be measured in monetary terms. It is because of a sense of place and belonging that some people loath to be moved from their dwelling place, despite the fact that they will be compensated for the inconvenience and impact on their lives.

The potential impact on socio-cultural behaviour and the related perception of environmental changes can have either a positive or a negative impact on sense of place (e.g. peace of mind vs. frustration/anger). The introduction of a new project to the area can be viewed as a positive impact if people perceive the project as infrastructural and/or economic development that is not intrusive on their lives and do not cause them immediate danger. Potential negative impacts include the visual impact and the resultant intrusion on sense of place.

The coal mining industry has been gradually changing the visual landscape of the Delmas area over the past decade, slowly eroding people's sense of place in terms of visual impacts – it is therefore expected that the Eloff Project will not add to an intrusion on sense of place in this regard. It is more likely that the larger community will view the mine as a positive impact as it is perceived to bring economic development to the area and does not impose on people's lives who live far away from the mine.

Impact	Project Phase	Pre-Mitigation Score	Post-Mitigation Score	Final Significance
Change in sense of place	Construction Operation	+4.00	+5.50	+6.42

Proposed Mitigation

- Water down construction site to curb dust;
- Erect notice boards to inform neighbouring properties of construction processes and timeframes - notably to alert them to activities such as blasting; and
- Implement a grievance mechanism.

10 CLOSURE COSTING

Eloff Mining Company (Pty) Ltd (EMC) has lodged an application for Environmental Authorisation (EA) to the Department of Mineral Resources (DMR), in support of plans to mine the Phase 3 Pit within the Eloff Coal Resource – the Eloff Project (MP30/5/1/2/2/10169MR). A determination of the cost associated with final rehabilitation, decommissioning and closure was carried out. This assessment was done using both the DMR Guideline as well as the NEMA Financial provision Regulations, and the findings of these are presented in the subsequent sub-sections. Please refer to Appendix E (sub-appendix B) for the full report.

10.1 CLOSURE COST ESTIMATION SUMMARY- DMR GUIDELINES

The quantum of financial provisions required for un-scheduled closure using the DMR Master Rates and the Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision' provided by a Mine (DMR Guidelines) was also calculated. For the purposes of the quantum using the DMR guidelines it is assumed that un-scheduled closure represents the state of the mine 12 months into commencement. The following parameters and weighting characteristics were applied:

Project Details:		
Project Risk Class:	A	Coal
Project Area Sensitivity:	High	Located in an area on which the local people make a living.
Weighting Factor 1:	1	Flat topography
Weighting Factor 2:	1.05	Peri-urban: Less than 150 km from a developed urban area

The nature of the closure activities is defined in the DMR Guidelines and excluded specific long term water treatment. The estimated cost for long term water treatment is R 123 060 585.00 (Excl VAT), as per the determination in Appendix E.

The total DMR Master Rates based quantum was calculated as R 14 069 364.64 (Excl VAT and long term water treatment).

10.2 CLOSURE COST ESTIMATION SUMMARY- NEMA FINANCIAL PROVISION REGULATIONS

The Final Rehabilitation, Decommissioning and Closure Plan (FRDCP)(refer to Appendix E) aims to meet this requirement and has been prepared in accordance with the requirements of the NEMA Financial Provisioning Regulations (2015) (NEMA GNR 1147).

The closure vision for the Eloff Phase 3 Project is, 'to conduct the mining operations and manage the environmental impacts in such a manner that the long term, post closure, land capability and environmental goods and services can continue and be utilised in a sustainable manner'. In support of this closure vision various objectives, targets and actions have been identified. In addition, various alternatives for rehabilitation and closure have been identified and assessed.

Table 33 presents the estimated cost of implementing the defined closure actions, on the basis of scheduled closure and in accordance with the requirements of the regulations (GNR 1147):

Table 33: Summary of estimate closure costs for preferred closure option as at January 2020.

Eloff Phase 3 Final Rehabilitation Decommissioning and Closure Costs, as at January 2020			
Closure components			
1	Infrastructural Areas	R	11 362 933.23
2	Mining Areas	R	295 561 916.49
3	P&Gs, Contingencies and Additional Allowances	R	67 523 466.94
4	Pre-site Relinquishment Monitoring and Aftercare	R	7 491 689.01
5	Post Closure Phase	R	123 060 585.00
Total (Excl VAT)		**R**	**505 000 590.66**

More detail is provided in the attached FRDCP in Appendix E.

11 CUMULATIVE IMPACT ASSESSMENT

Cumulative impacts are impacts that arise from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts. Cumulative impact, in relation to an activity, refers to the impact of an activity that in itself may not be significant but may become significant when added to the existing and potential impacts eventuating from similar or diverse activities or undertakings in the area. Cumulative impacts associated with the existing Kangala operation as well as pending and approved environmental authorizations (namely the approved Eloff Phase 1 project and pending Middelbult applications) in the areas close to, or adjacent to the Phase 3 pit have been assessed in this EIA report. Cumulative impact assessments relevant to each study are discussed in more detail below.

11.1 CUMULATIVE HERITAGE IMPACTS

The cumulative impact on heritage resources evaluated a 50-kilometer radius. The evaluation is based on available heritage studies in the area and cannot take the findings of outstanding studies on current ongoing EIA's in consideration. The overall findings of the 6 studies assessed all concur that the area is characterised by numerous burial grounds and farmsteads. With regards to the historical resources, in most cases given a low-medium heritage significance on a local scale and in the majority of the cases were recommended as being easily mitigated or avoidable. Burial grounds in all cases were given a high heritage significance on a local scale and in the majority of the cases were recommended as being no-go areas or extensive mitigation in the form of relocation.

11.2 CUMULATIVE BIODIVERSITY IMPACTS

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system.

The area has previously and presently is, being predominantly impacted by mining practises along with agricultural practices. Iin the future, should mining be authorised, the area will be completely changed, and the surrounding areas will experience further stress. The existing Kangala mine which is in close proximity to the pending Middelbult applications and approved Eloff Phase 1 project will contribute the cumulative impact to the area. These mining activities, and the surround agricultural activities and development all contribute to the cumulative impact of the larger area.

Currently there is still some viable habitat associated with the project area. Especially the habitats associated with the wetlands which have already been fragmented to a large extent, with some wetland areas expected to be lost and greater fragmentation incurred should mining be authorised.

As a result of current land agricultural use and the adjoining Kangala mining operation, the impact significance posed to habitat quality is Moderate. In the event the mining operation is authorised and taking into consideration the remaining mining applications and expectant loss of habitat for the larger area, the cumulative impact is expected to be moderately high.

11.3 CUMULATIVE DOLOMITIC STABILITY IMPACTS

The cumulative impact that the proposed mining activities of the proposed Eloff Phase 3 Project and other existing and planned mining activities in the area will have on the formation of sinkholes is limited as the proposed open pit mining will occur in areas similar to the Profile 1 areas. The formation of sinkholes is spatially separate and there is not a cumulative or domino effect where the formation of one sinkhole triggers the formation of the next one.

The lowering of the regional groundwater table is however one of the major triggering mechanisms for the formation of sinkholes and here the cumulative effect of groundwater abstraction can cause an increase in the likelihood of sinkhole formation. This is important for the Profile 2 and Profile 3 areas where abstraction of groundwater mostly occur for agricultural and rural use. It has been determined that groundwater level drawdown of more than 10m on areas underlain by shallow dolomite bedrock has resulted in an increased occurrence of sinkholes. This risk can however be mitigated by limiting the abstraction of groundwater to maintain the regional groundwater table. The Profile 2 and Profile 3 areas are most likely to be impacted by regional groundwater drawdown. In Profile 1 are the cumulative impact will be low because the thickness of the overburden mitigates the formation of sinkholes.

11.4 CUMULATIVE GROUNDWATER IMPACTS

With the Eloff Phase 3 project being an expansion of the existing Kangala open pit mining operations, the cumulative impacts during the Eloff Phase 3 project's construction, operation, decommissioning and closure and post-closure phases have been assessed. The potential impacts associated with the proposed Middelbult and Eloff Phase 1 Pit 1 mining operations on the Eloff Phase 3 project were assessed using the calibrated numerical flow and contaminant transport models. The model simulated cumulative impacts is shown in the following figures: Based on these model predictions, there will be no / insignificant cumulative impacts, on the Eloff Phase 3 project, from the proposed mining activities associated with the Middelbult and Eloff Phase 1 Pit 1 projects.

Cumulative Surface Water Impacts

Proposed coal mining at Eloff Phase 3 and surrounding coal mining activities (existing Kangala Colliery and proposed Middelbult and Eloff Phase 1 Project) impose potential negative water quality impacts and runoff/stream flow reductions. In the long term it can result in deterioration and alterations of natural wetlands, risk to aquatic life, plants, livestock and health risks to humans too.

Most significant impacts relate to the contamination of surface water in the catchment during the operational activities and reduction of stream flows through opencast mining resulting from blasting activities. There can be an additional impact of 0.2% of streamflow reduction at quaternary scale due to Eloff Phase 3 Project. If the other surrounding coal mining activities operate (existing Kangala Colliery and proposed Middelbult and Eloff Phase 1 Project) at the same time, this could lead to 1% streamflow reduction at quaternary scale during operations. Minimisation of the dirty area will limit the impacts and subsequent contaminated volume of runoff. Concurrent rehabilitation by backfilling, grading, contouring vegetating should be implemented to prevent runoff damming and to ensure that the surface runoff reports to the catchment.

In terms of water quality, water resources in the vicinity of the proposed Eloff Phase 3 Project area have not (yet) been negatively impacted by the operations of the existing Kangala Colliery. In order to reduce the deterioration of surrounding water quality in streams, execution of the water management plan included in the Hydrology report including implementation of suggested mitigation measures should be undertaken. Similar water management plans should be implemented for the other surrounding coal mining activities.

11.5 CUMULATIVE WETLAND IMPACTS

The watercourses associated with project are located within the quaternary catchment B20A in the Olifants Water Management Area (WMA 2) (NWA, 2016) in the Highveld Ecoregion (Dallas, 2007). The B20A-1308 and B20A-1362 Sub Quaternary Reaches (SQR), reaches of the Bronkhorstspruit, are the primary drainage feature considered for the cumulative impact assessment. The existing Kangala Colliery and the proposed mining area (or project area) are situated on the watershed of the two SQRs. The proposed Middelbult mining project is located in the B20A-1308 SQR. The Bronkhorstspruit flows adjacent to the project area in a northerly direction into the larger Olifants River, located downstream of Bronkhorstspruit Dam. The catchment surrounding the project area consists predominantly of agricultural fields and various other coal mining operations. A portion of the Manungu Colliery is located in the upper reaches of the B20A-1362 SQR. The Leeuwpan Colliery is another mining operation of considerable extent, with a portion located in the B20A-1308 SQR. The activities in the area and local land uses have impacted upon the associated watercourses which has rendered the systems as moderately modified at a desktop level (DWS, 2019).

The Bronkhorstspruit SQR B20A-1362 spans 11.42 km of a tributary of the Bronkhorstspruit River. The Present Ecological Status (PES) category of the reach is classed as moderately modified (class C). The moderately modified state of the reach is attributed to small to moderate impacts to instream habitat, wetland and riparian zone continuity, flow modifications and small to moderate potential impacts on physio-chemical conditions (water quality).

The Bronkhorstspruit SQR B20A-1308 is a tributary of the Bronkhorstspruit River. The PES category of the reach is classed as largely modified (class D). The largely modified state of the reach is attributed to moderate to large impacts to instream habitat, wetland and riparian zone continuity, flow modifications and serious potential impacts on physic-chemical conditions (water quality). Further details are summarised in Table 21 below. The attainable ecological management class for the Bronkhorstspruit project area is class C or moderately modified (DWS, 2019).

The cumulative impact to the local wetland systems prior to the project go-ahead was rated as high. The impact after the go-ahead will remain high due to baseline catchment wide modifications. Despite the go-ahead of the proposed project, it is unlikely that catchment wide modification will cease and therefore a high rating after the project go-ahead was derived. An important consideration for cumulative regional scale impacts includes both the direct and indirect losses of wetland systems, and the expected indirect degradation of wetland systems. These will result in the loss of important ecosystem services, or the deterioration of ecosystem services provided by the remaining wetlands.

11.6 CUMULATIVE SOILS IMPACTS

Cumulative impacts associated with the existing Kangala operation as well as pending and approved environmental authorizations (namely the approved Eloff Phase 1 project and pending Middelbult applications) in the areas close to, or adjacent to the Eloff Phase 3 pit, show that the landscape which was predominantly used for farming, is now changing into mining landscapes. The high land capability areas are slowly being approved for mining and being lost. This impacts on land capability and food security at a national level. The Chamber of Mines of South Africa/Coaltech (2007) guidelines also recognise that the restoration of mined land to pre-mining conditions is impossible with current best practise guidelines.

Soil quality deteriorates during stockpiling and replacement of these soil materials into soil profiles during rehabilitation cannot imitate pre-mining soil quality properties. Depth however can be imitated but the combined soil quality deterioration and resultant compaction by the machines used in rehabilitation, leads to a net loss of land capability. A change in land capability then forces a change in land use.

The impact on soil is high because natural soil layers are stripped and stockpiled. In addition, soil fertility is impacted because stripped soil layers are usually thicker than the defined topsoil layer. The topsoil layer is the layer where most plant roots are found and is predominantly 0.30 m thick throughout the Eloff Phase 3 project area. Once soil resources or agricultural land has been lost it is increasingly difficult to replace. Therefore, the impacts on a site specific and cumulative bases remain high.

11.7 CUMULATIVE AIR QUALITY AND CLIMATE CHANGE IMPACTS

In order to prioritise the simulated impacts, it is necessary to assess the potentially significant impacts in terms of cumulative impacts and the degree to which the impact may cause irreplaceable loss of resources, as well as taking the public opinion and sentiment regarding the prospective development into account (see Appendix B for the methodology used to prioritise impacts).

The cumulative impacts with respect to the Eloff Colliery construction and decommissioning phases are both assessed as Low, and the cumulative impacts with respect to Eloff Colliery operational phase is assessed as Medium for both design-mitigated operations and additionally mitigated operations. The final impact significance associated with the proposed Eloff Colliery development is determined as low for the construction phase and decommissioning phase and high for the operational phase (with design mitigation applied) and Medium for the operational phase (additional mitigation applied).

Considering the project's potential incremental (low) impacts, the cumulative impact significance with respect to the Eloff Phase 3 Project is assessed as very low and will not result in spatial and temporal cumulative change.

11.8 CUMULATIVE VISUAL IMPACTS

In terms of cumulative effects, the proposed mine extension will combine with existing mining operations in the area. However, the extension will not extend the area of influence of mining operations in the area as the proposed Eloff Phase 1 and Middelbult Mine projects will extend the area of influence past that of the proposed Kangala Mine Extension. The proposed project will also not result in additional stockpiles in the landscape.

11.9 CUMULATIVE BLASTING AND VIBRATION IMPACTS

The cumulative effect from blasting operations is not a simplistic definition. Cumulative effective is rather defined by the quantity of blasts that could occur at the same time. Multiple blasts that occur directly after each after will cumulatively add to the total time of blast operations. This may have influence on exposure time to the effects of blasting. Multiple blasting operations occurring at the same time or directly after each other may or may not contribute to higher or lower effects such as ground vibration and air blast. This is due to the possible constructive and destructive effect when shocks waves – ground or air borne – intercept from the different blasts that could occur. These effects are very dependent of factors such as blast geometry, blast size, blast location, blast sequence, blast duration, geology and distance from the blast to name a few. In summary it is difficult to define what cumulative effect blasting may have on the surroundings. The only fact is that multiple blasts occurring directly after each other will contribute to a prolonged period of effects from blasting.

11.10 CUMULATIVE NOISE IMPACTS

Cumulative impacts occur when potential NSD are located between two mining projects, or, lives close to a road where traffic volumes are to increase. Generally, unless the noise from a particular project dominates, the magnitude of the increases due to the cumulative effects is less than 3 dB. If a particular project dominates the soundscape, this impact normally is defined in the Operational phase, and sometimes also the Construction phase impact assessment.

Considering existing and potential mining activities in the area, NSD02 and NSD06 may be subject to potential cumulative noise effects. Worse case increases may be 3 dB, increasing the total noise levels to around 40 dBA at both NSDs.

11.11 CUMULATIVE LAND USE IMPACTS

Cumulatively the projects in the area have vastly better GDP creation potential. A potential direct net GDP of R10.8 billion is expected. This is a significant increase for any alternative land use in South Africa. In the direct comparison, the project creates more jobs than what is foregone by agriculture. Relative to Victor Khanye's employment base of 24 102, the net benefits on jobs created are very small.

Although the mine investments exceed that of the potential value of agricultural land lost, the investment is not considered as significantly high compared to many other mining projects in South Africa for the cumulative projects. Although there is no evidence that spatially agriculture is preferred over coal mining, it is evident that Victor Khanye is the Nkangala District's best agricultural area. This is partly because the study area has good rainfall conditions for maize farming, and the soil is fertile. The granting of mining licenses in the study area will undoubtedly change the nature of the areas immediately south of Delmas and Eloff. If mining continues, it is directionally correct to find that spatially the study area will become more coal and industrial oriented, and on balance will reduce the agricultural development priorities. The fact that coal fired powerplants are significantly negative to our climate is well-established and hence mining gets a high negative rating.

The municipality is a major maize producing area, with an annual maize production calculated at between 230 000 and 250 000 metric tons. The total hectares to be replaced by the cumulative projects are set at 1 744 hectares and at 8 tons per hectare, this amounts to potentially 13 952 tons of maize lost to Victor Khanye. This amounts to 6% of current production in the municipality. This is a significant reduction as a result of the land substitution of the cumulative impacts of all other planned projects.

However, on a national scale the cumulative effects would not impact food security. The estimated maize tons lost of 13 951 is a fraction of the national tonnage, being 0.1%. Grain South Africa sets the national maize crop estimate for the 2018/2019 season at 13.2 million tons. The national area estimate for maize is 2.3 million hectares. Eloff Phase 3 is very unlikely to have any significant impact on South Africa's food security.

At the time of compiling this document, a new Integrated Resource Plan from the Department of Energy had been released. In the report it is stated that in the medium future 50% of South Africa's energy will remain coal dependent. However, South Africa is facing a constant energy shortage in the short term, and Eskom's indicated that its supply of coal is under pressure. Regardless of all considerations against coal mining, this commodity is still essential in the short to medium term for South Africa's energy needs. From this perspective, the rating for the project is strongly to the benefit of energy security.

The advent of the Social and Labour Plan has brought about strict regulations regarding Human Resource Development in the mining industry. The type of training interventions and HRD is significantly better than that of agriculture. Thus, even though the employment is less sustainable because of the life of mine, the quality of training is strongly better than agriculture, and portable, and this enhances the region's skills levels.

For the cumulative impacts associated with multiple planned mines in the area the history and the sense of place for the study area will change strongly, but not absolutely. This is because several coal mines already exist in the area, and the cumulative projects as a ratio to existing coal mines in the immediate area is not significantly high. The landscape will undoubtedly change, and visually the study area will continue to take on the form of a coal mine area. Should phase 2,4,5,6 and 7 come on stream, then the sense of place in the study area will change absolutely, and if all the known and unknown mine right applications be approved and coal mining operations commence, then it is hard to imagine that the study area will ever look like a farming community again. In the case of the Eloff Phase 3 only, the sense of place is unlikely to change –the study area already has the negative visual impact of the existing mine and the extension is not likely to add further significant negative impacts.

Both coal mining and farming production has locational advantages in the Victor Khanye municipality. The location factors as they are, are deemed to be of equal ranking status between coal and farming. Mines pay, relative to farms, much more in direct and indirect taxes. The mining industry thus attracts a much better rating than agriculture.

The cumulative projects are likely to enhance urban sprawl because a mine development attracts job seekers and existing housing settlements tend to increase in depth and breadth a result of this. It there attracts a significant negative rating. Eloff Phase 3 will use the same workforce, and other than the construction period, little urban sprawl is anticipated. However, regardless of this, a conservative negative rating had been assigned to it. Although there are many benefits to mine development, its major disadvantage is that of its limited life span. In this case, the cumulative projects when phased in succession could have a relatively long life-span, but ultimately the mine(s) will close down and between visual impacts, soil sterilisation and environmental disturbance, the next generations will be negatively impacted. Unfortunately, mines in South Africa have a poor reputation regarding mine rehabilitation, and for that reason this attracts a high negative rating.

Both agriculture and mining has well developed infrastructure in the study area and there is little to choose between them. However, in the case of Eloff Phase 3, it will be using the existing infrastructure of the Kangala Colliery, and thus it attracts a positive good rating. The cumulative projects, however, will have as an impact the diminished use in agricultural infrastructure. Victor Khanye has a wide range of agricultural support facilities, and these may well be negatively impacted.

11.12 CUMULATIVE SOCIAL IMPACTS

The Delmas area became a small frontier for new coal field developments with around 15 new greenfield development joining existing 2 mines in the past 14 years. In the immediate vicinity of the Eloff project there are at least five coal mine operations (e.g. Stuart, Exxaro Leewpan, Mbuyelo, Keaten). The potential cumulative impacts of these mines on the rural character of VKLM, water availability and quality, declining agricultural land and post-closure issues need to be considered for future developments in Delmas.

Farmers and local residents are already experiencing negative impacts of visual impacts, noise, blasting and vibrations from existing mining operations in the area. Other mining activities also add to the long-term loss of agricultural land. Other mines operational and expanding in the local area add to rapid transformation of arable land to mining land in the VKLM, effectively reducing land available for staple food production. It enhances people's sense of economic development if mines continue to grow and expand and increases people's expectations for employment.

Other development projects in the area that create employment could increase in-migration. Nearby Leeuwpan colliery is also expanding to extend its LoM by another 10 years. At the time of the study it was not known how many job opportunities will be created at Leeuwpan, but this expansion project in combination with the Eloff expansion project could give rise to the perception that the mining industry in the VKLM is expanding rapidly and that this will create lots of employment. A total of 19 households have to be relocated at the Leeuwpan expansion site. The RAP is underway but has been met with some community resistance. However, the likelihood of cumulative impacts in the form of community members influencing each other to increase social resistance is unlikely as the Eloff Project only affects a single homestead.

Simultaneous construction taking place at nearby mines (e.g. Leeuwpan) or other development projects in the area can attract more job seekers to the area. Job seekers can establish informal settlements in the area in the hope of procuring employment at one of the mines. The extreme social conditions, high unemployment and the absence of social amenities in informal settlements exacerbates social stress, which often manifests in crime. Social defiant behaviour in large groups can spread to the wider community and lead to an incitement to violence.

Other mines operational and expanding in the local area could add to the creation of additional employment opportunities and subsequent income generation. However, based on the skills levels required, these opportunities might not be solely confined to benefit of the local area. They could also intensify labour draw-down from other sectors as opportunities in mining might seem more lucrative than in other sectors. Other mines operational and expanding in the local area could add to the creation of additional employment opportunities and subsequent income generation. However, based on the skills levels required, these opportunities might not be solely confined to benefit of the local area.

Other mines and agricultural activities in the local area also increase the vulnerability of the local area in terms of external factors such as weather patterns and international commodity prices and could increase fluctuations in economic output in the local area.

The potential negative cumulative impacts of mining on agricultural production and long-term food security is of specific concern but is an issue for the broader Delmas area that falls outside the impact assessment scope of a single mining project. It is a public policy issue that needs to be addressed though clear spatial planning principles to protect arable land on a national and local level, including the demarcation of no-go areas and/or requirements for alternative mining methods such as underground mining in priority areas.

11.13 OVERALL CUMULATIVE IMPACT STATEMENT

Overall cumulative impacts for biodiversity, wetlands and soils are considered to be of potentially high significance. All other cumulative impacts are considered to be of potentially low - moderate significance. Based on the predicted cumulative impacts, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential cumulative environmental impacts, it is the opinion of the EIA project team that the cumulative environmental impacts associated with the application for the proposed Eloff Phase 3 project are acceptable.

12 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets in a region. The sensitivity mapping technique integrates numerous datasets (base maps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software. 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. Therefore, the sensitivity mapping exercise assists in the identification of low, medium and highly sensitive areas within the Phase 3 Project area, towards selecting the preferred location, design and layout, and process or technology alternatives for the proposed activities and infrastructure.

This sensitivity mapping approach allows for the proposed Phase 3 Project activities to be undertaken whilst protecting identified sensitive environmental areas / features. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. Table 34 below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect, and Figure 41 below presents how the sensitivity mapping technique integrates numerous datasets into a single consolidated sensitivity layer, and Figure 42 presents the combined sensitivity map according to heritage, biodiversity, wetlands, social, soil land types, blasting and vibrations, noise and air quality sensitivities in and around the proposed Phase 3 Project area.

The combined sensitivity map includes individual sensitivities according to heritage, biodiversity, blasting and vibration, wetlands, surface water and soil land type features in and around the project area. The sensitivities related to hydrogeology (groundwater), visual, air quality, social, land use and climate change were excluded as their effects cannot be directly or accurately measured to ascertain sensitivity. Climate change effects occur over time and at a very broad scale influencing several features and thus, it is not possible to assign sensitivity at project area level. Groundwater features are continuous in nature and their sensitivity or vulnerability dependant on various entities (e.g. water travel time, contamination migration, plume stability, soil, etc.) making it difficult to directly and accurately measure or assign sensitivity at project area level. Furthermore, land use economics and social impacts pertain to the economic value of different land uses in an area which cannot be allocated sensitivity criteria due to their variability. Lastly, the exclusion of visual and air quality sensitivity as part of the combined sensitivity map does not mean that there will be no visual sensitivities, but indicates that the entire site and its surroundings is already visually impacted upon by similar activities as the proposed development (i.e. as the Kangala Colliery pit activities decrease including their visual impacts, they will be replaced by the similar activities with similar visual impacts at the proposed new extension site), and thus the project area and its immediate surroundings cannot be assigned different levels of sensitivity. A final layout map is included as Figure 43 showing the final preferred layout in line with specialist recommendations.

Table 34: Sensitivity rating and weighting

Sensitivity Rating	Description	Weighting
Least concern	The inherent feature status and sensitivity is already degraded or contain no inherent sensitivities. 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 moderately 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

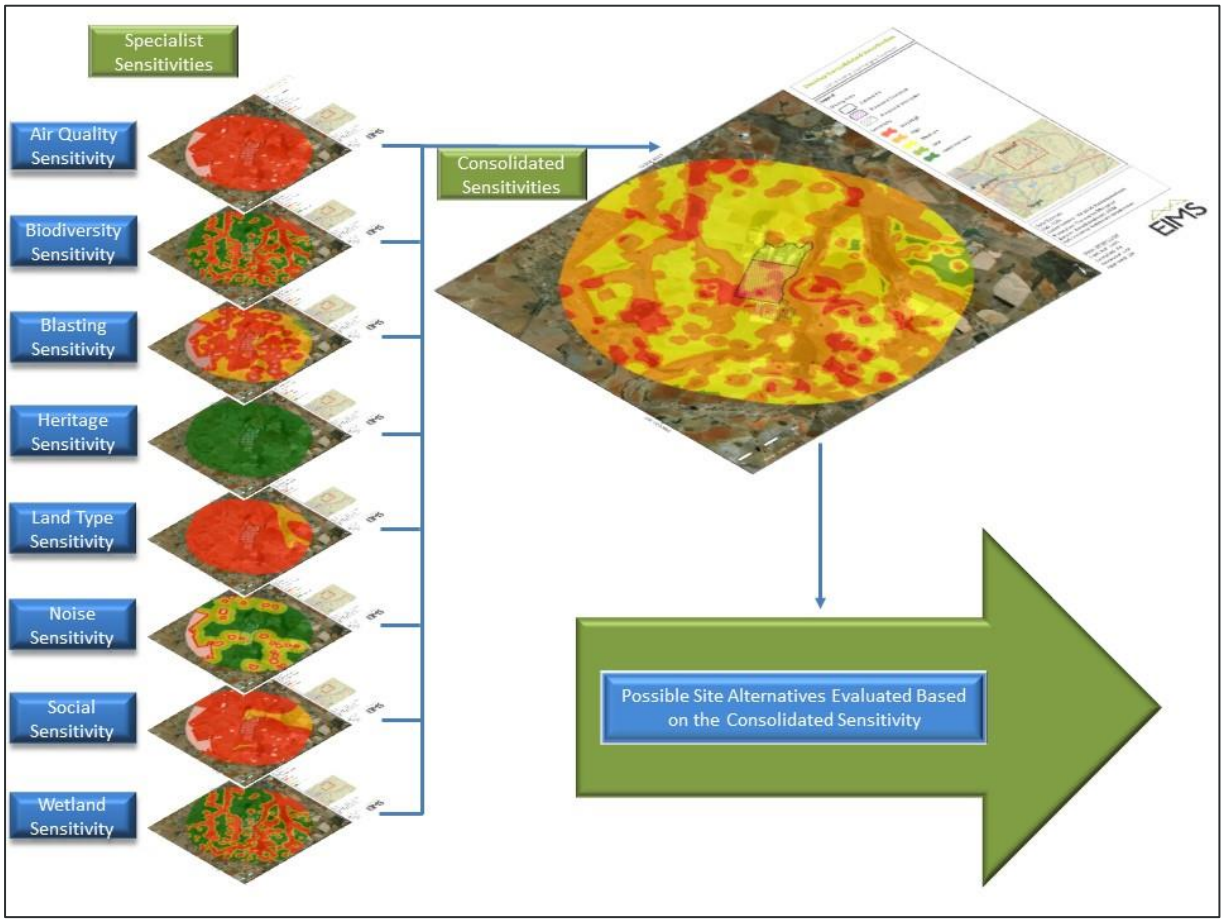

Figure 41: Sensitivity mapping approach

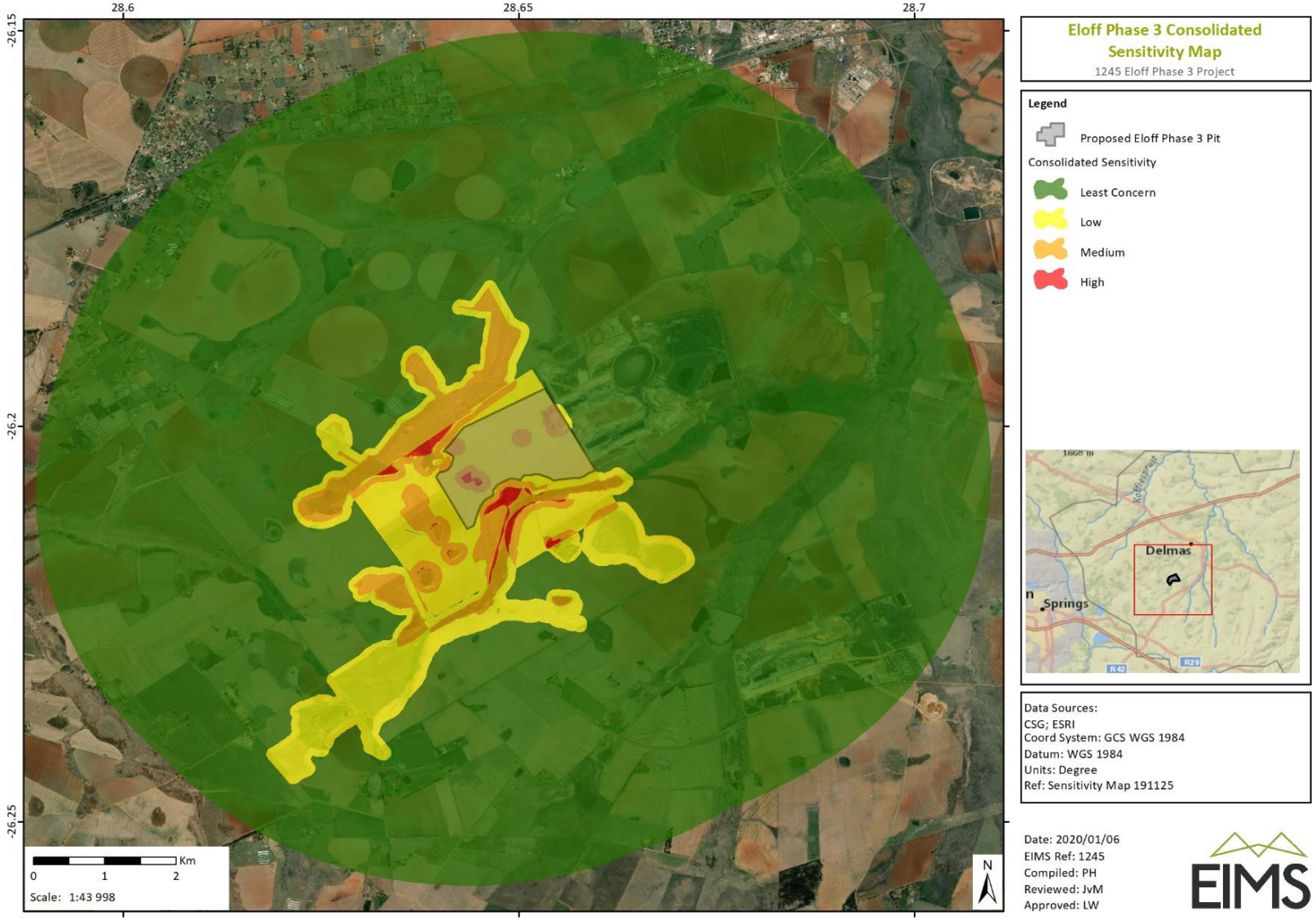

Figure 42: Sensitivity map

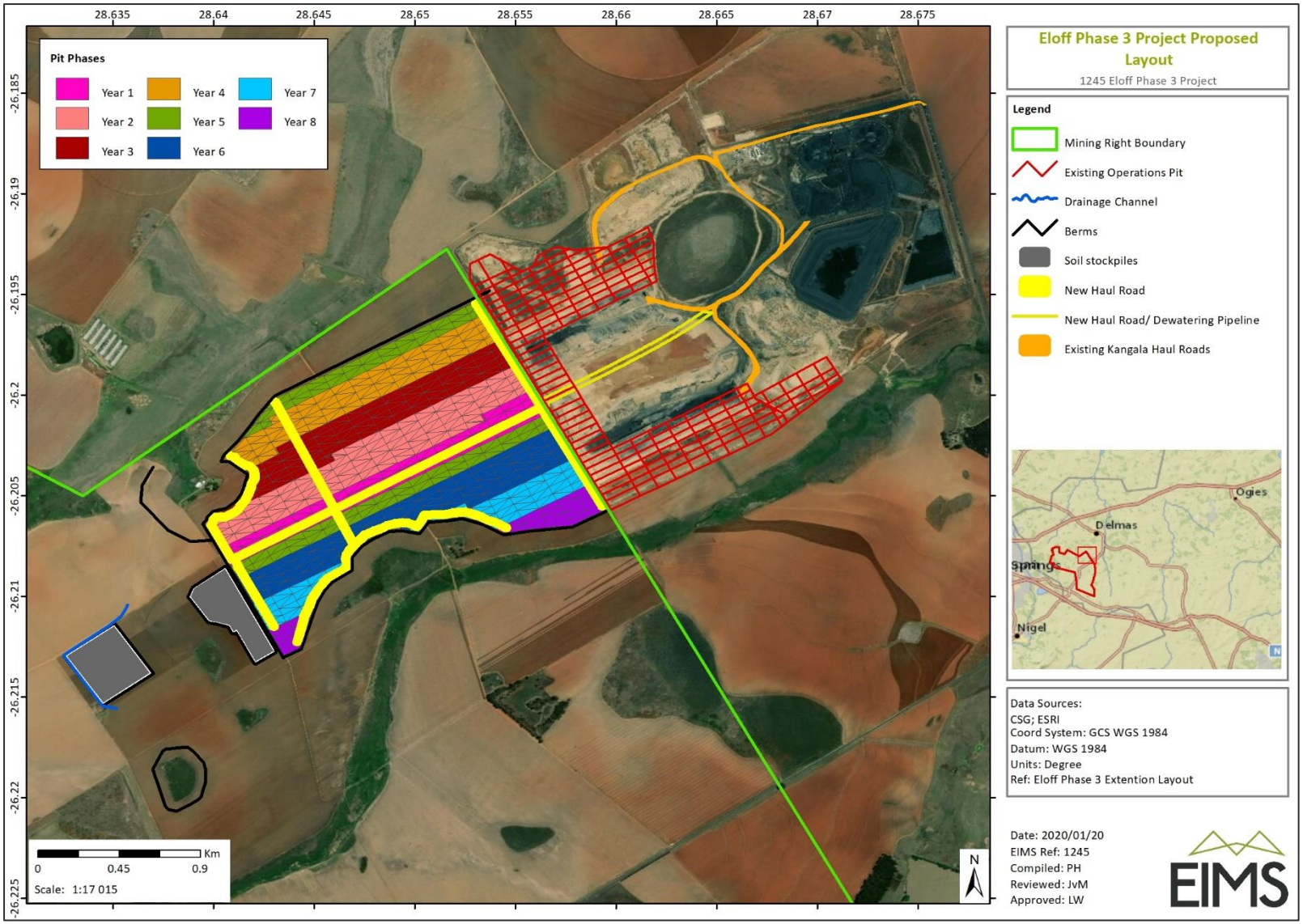

Figure 43: Final Layout Map

13 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process identified potential issues and impacts 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 aimed 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.

With reference to Section 10, a determination of the quantum for financial provision for rehabilitation decommissioning and closure was undertaken the results of this assessment are as follows:

- DMR Guideline based calculation: R 14 069 364.64 (excl VAT and long term water treatment).
- NEMA Financial Provisions based calculation: R 381 940 006.00 (excl VAT and long term water treatment).

Further details regarding the determination of financial provision and the estimated cost for long term water treatment is included in the Final Rehabilitation Decommissioning and Closure Plan.

13.1 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.

13.1.1 HERITAGE

The HIA identified various heritage resources within the study area of which only four could be rated as having a medium to high heritage significance. These sites need to be avoided or relocated prior to mining occurring in that area. The development footprint is completely underlain by the Vryheid Formation.

The four burial grounds (KG1, 5, 8 and 9) was identified during the fieldwork in May 2019. All four burial grounds will be directly impacted by the mining expansion. KG1 and KG9 was subsequently relocated under SAHRA permit 2897. It is recommended that the relocation permits for the graves KG5 and KG8 be applied for within the project implementation schedule allowing for at least a 12-month buffer before to completed the relocations before the mining activity will only approach the sites (KG8 and KG5). It is projected that these sites will only be directly impacted in six (6) years' time of mining.

The Palaeontological Sensitivity of this formation is rated Very High. The expected duration of the impact is assessed as potentially permanent to long term. In the absence of mitigation procedures (should fossil material be present within the affected area) the damage or destruction of any palaeontological materials will be

permanent. Impacts on palaeontological heritage during the mining phase could potentially occur but are regarded as having a low impact with the implementation of a chance finds protocol. In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments.

13.1.2 BIODIVERSITY

The proposed development is associated with mining activities, specifically opencast coal mining. The proposed activities have the potential to result in direct loss and destruction of habitats (including an EN vegetation type), direct mortalities and displacement of fauna and flora. The removal of any remaining natural vegetation to accommodate mining will reduce the habitat available for fauna species and may reduce animal populations and species compositions within the area. Two avifaunal SCCs were observed, they are the Red-footed Falcon and the African Grass-Owl. An African Grass Owl nest was observed in the project area and therefore it is evident that these animals are using this a breeding site. Three (3) mammal SCC were also recorded in the project area - Serval, Cape Clawless Otters and Vlei Rat. A total of 49 tree, shrub and herbaceous plant species were recorded in the proposed project area during the field assessment of which one Protected plant species, namely *Hypoxis hemerocallidea*, was recorded in the wetland habitat.

Considering the above-mentioned conclusions, it is the opinion of the specialist that no fatal flaws are evident for the proposed project. However, all the mitigation measures and recommendations prescribed should be strictly adhered to and enforced.

13.1.3 DOLOMITIC STABILITY

The environmental impact of the potential formation of sinkholes are low for all the scenario's considered.

13.1.4 GROUNDWATER

Three distinct superimposed groundwater systems are present in the Eloff Coal Resource area, namely:

- Weathered Karoo rock aquifer;
- Fractured aquifers within the Karoo Supergroup sediments; and
- Karst aquifers within the Transvaal Supergroup dolomites.

The weathered Karoo layer has a thickness of approximately 17m and is comprised of residual soils and weathered shales and sandstone. The underlying fractured units consist of shale, sandstone and coal seams and are too well cemented to allow any significant permeation of water which is therefore limited to fractures. Fracturing mainly occurs in the top of this unit decreasing with depth.

Aquifer testing confirmed the aquitard / aquiclude conditions of the Karoo Supergroup Dwyka Group shale and tillite which separates the dolomitic aquifer from the Vryheid Formation in which the planned mining will take place.

Groundwater in the Eloff Coal Resource area is mainly used for domestic supply, stock watering and / or large-scale irrigation purposes. The groundwater quality within the Eloff Coal Resources area is generally good with some impact from historical mining around the Kangala opencast. Groundwater levels generally following topography and static groundwater levels are on average approximately 17.4 mbgl.

Hydraulic conductivity values for the weathered layer are in the order of 10^{-2} m/d. Hydraulic conductivity of the fractured Karoo unit decreases with depth and will range between 10^{-1} m/d in the upper layers and 10^{-3} m/d for the lower layers (these values are typical of Karoo type aquifers).

The geochemical analyses showed some potential of acidic drainage generation. Interstitial water in the oxic zone of the discard dump and backfill will likely be alkaline to neutral within less than 150 days. Based on the geochemical results, the following potential sulphate concentrations can be expected for the discard dump range between 480 to 1,500 mg/l and for the backfill between 100 and 550 mg/l.

The main potential onsite contamination sources for the Eloff Coal Resource area are the opencasts. Possible pathways for on-site contaminations are the weathered and fractured Karoo aquifers and surface water streams.

Potential receptors are the ephemeral Dwars-in-die-wegvlei and tributaries of the perennial Bronkhorstspruit flow system on the site.

Based on scenario modelling the water levels will only be lowered over a relatively small area around the opencasts. Groundwater flow directions will be directed towards the mining areas due to the mine dewatering during the operational phase. Therefore, contamination will be contained within the mining area, and little contamination will be able to migrate away from the mining areas. Four (4) privately owned boreholes are likely to be impacted by the proposed opencast mining activities.

The potential decant points are located at the lowest topographical sections of the opencast mines. Based on the current groundwater levels at the Project site it is estimated that a moderate risk of decant exists for the rehabilitated opencasts

13.1.5 SURFACE WATER

The Eloff Phase 3 Project has a MAP of 669 mm and MAE (Symons Pan) of 1 677 mm, implying higher evaporative losses than the incident rainfall giving rise to distinct wet and dry seasons.The site area is in the upper catchment region of the Olifants River, Wilge and Bronkhorstspruit and is drained by the Koffiespruit (north) and an unnamed watercourse (south) that are tributaries of the Bronkhorstspruit catchment.

MAR for quaternary catchment B20A is ~6.6% of MAP. Localised runoff, however, is expected that ~21% of rain that falls on the CHPP, discard facility and overburden dump area will run directly off surfaces, where it needs to be contained into the lined Kangala PCD. The proposed Eloff Phase 3 Project will modify an estimated area of 1.844 km^2 of land, which will become an opencast pit.

Approximately 1.244 km^2 of the total opencast pit area includes the portion of the sub-catchment that drains towards the Koffiespruit (north) and 0.6 km2 drains towards the southerly located unnamed tributary. Total reduction of natural MAR could be 82 262 m^3/yr (0.2% of total quaternary catchment B20A runoff).

The water quality in the PCD and DEF indicated electrical conductivity, calcium, magnesium and sulphate concentrations exceeding the Kangala WUL PCD upper limits and chloride concentration exceeding the lower limits. The water quality in the STPE indicated sodium and chloride concentrations exceeding the Kangala WUL PCD upper limits and magnesium concentration exceeding the lower limits.

Two (2) additional localities (INJ11 and INJ12) are added to the surface water monitoring network plan, which should now include 15 monitoring localities of which 12 are surface water localities and three (3) are process water localities.

Proposed SWMP measures for the site include berms around the pit area and topsoil stockpile.

Three (3) water balances were calculated for the Eloff Phase 3 Project for the operational phase at the beginning of the LOM (early mining period (2020)) and at the end of LOM (late mining period (2027)). The early mining water balance determined the water balance if the opencast pit of the Eloff Phase 3 Project started in 2020 and groundwater inflows are 464 m^3/d in 2020. No excess water balance was calculated, and raw water supply import can be reduced to 495 m^3/d out of a total licensed volume of 1 342 m^3/d. The late mining period water balance (2027) was based on groundwater inflows into the opencast pits in 2027, assuming a working area of 10% of the total opencast pit footprint area (+/-25 ha) and rehabilitation performed on the backfilled spoils on 225 ha (recharge assumed at 10% of MAP). An excess water balance was calculated of 97 m^3/d despite water being re-used water for dust suppression and the CHPP at maximum rates. A potential excess water balance can be explained due to high contributions from recharge onto backfilled spoils into the opencast pit workings. Highest salt loads emanate from the opencast pit, discard facility, Kangala PCD and CHPP.

Surface water quality in the surrounding water rivers may be impacted upon by the mobilisation of salts (sulphate), sediments, release of chemicals, oil and fuel spillages. Catchment characteristics, runoff and peak flows will be altered due to the removal of vegetation, construction of impervious area and implementation of storm water infrastructure. Rehabilitation of all infrastructure should be implemented and will include re-vegetating, capping and shaping. As understood the opencast pit should be backfilled with overburden and

topsoil dump material, shaped and rehabilitated to promote clean runoff. Post-closure decant is expected from the rehabilitated opencast pit with marginal water quality after approximately 130 years.

13.1.6 WETLANDS AND HYDROPEDOLOGY

The hydropedology survey indicated that both transects are marked by interflow (soil/bedrock) soils from the crest to the lower midslope/foot slope positions. The occurrence of well-developed gleyed horizons in the valley bottom suggest that these soils are subjected to long periods of saturation. Based on the hillslope hydropedology, the source of water to the valley bottom is lateral flow from upslope land segments. Interception of this lateral fluxes through open-cast mining is therefore likely to impact the water regimes of the valley bottom wetland as well as lateral fluxes into the stream.

These impacts are clearly illustrated through the modelling results. The development is likely to reduce natural outflow from the slope with approximately 50%. The relative importance of outflow from these slopes will depend on the antecedent moisture conditions. Under wet conditions outflow was approximately 30% of rainfall but declined to 25% under drier conditions. Outflow from the slope is still however a significant contributor to streamflow and a 50% reduction will affect wetlands and streamflow negatively. The difference in lateral fluxes between the natural and developed state could be explained through the reduction in soil water contents associated with the development. Interception of the lateral flow paths will restrict the continuous lateral flow of water to the valley bottom soils and will impact their normal functioning as wetland soils.

The negative effect of the development on wetlands and streamflow can be reduced if lateral flow paths are artificially maintained. It is suggested that this be done through artificial subsurface irrigation between the development and the wetland using water which accumulates in the open cast. Such a strategy must however be accompanied with detailed monitoring of water quality and the risk of surface and sub-surface erosion must be determined prior and during operation.

A number of datasets indicated the presence of wetlands in and around the project area, these included the FEPA, MBSP for freshwater systems and MPHG wetlands. The processing of spatial data further supported the expectation for the presence of wetlands within the project and adjacent areas.

The presence of wetlands was confirmed during the fieldwork which was completed during the wet season. A total of three (3) HGM types were identified and delineated for the project These comprised of 15 separate HGM units which were identified and delineated for the project. For this study, where it was deemed acceptable (and appropriate), HGM units were collectively assessed per the respective HGM type. Based on this, a total of five (5) HGM types were assessed.

The two wetland systems located to the north and south of the project area were identified as unchanneled valley bottom systems. The remaining HGM units comprised endorheic pans and seepage areas.

The overall wetland health for the wetlands varied from Moderately Modified (Class C) to Largely Modified (Class D) systems, with the majority of the wetlands rated a Class C. The two valley bottom wetland types had overall moderately high level of service, with the remaining wetland units displaying an intermediate level of service. All the wetland units contribute considerably (moderately high) to regulating and supporting services, the bulk of which includes the enhancement of water quality.

The EIS of the two valley bottom wetland types, and the adjoining seepage systems was rated as high (Class B), with the remaining wetland types being rated as moderate (Class C).

The buffer tool recommends at a desktop level that the required buffer for opencast mining be 180 m. The MPTA will request a minimum buffer width of 100m from the edge of the delineated wetlands. The recommended buffer width is 45 m and 65 m for the construction and operational phases respectively. It is recommended that the larger buffer width of 65m be implemented from the onset of the construction phase of the project.

The project is for the proposed opencast mining operation and two new stockpiles. The most notable impact is the expectant loss of some water resources, the delineated wetlands in particular. The loss of wetlands is expected for the mining of the opencast area, with approximately 6 ha of wetland area being lost.

A number of aspects were considered for the construction phase of the project. The majority of these aspects are not expected to have a direct impact (or risk) on the delineated wetland areas. Unmitigated moderate risks identified include management of waste and the release of untreated run-off into the catchment during the construction phase of the project. The longevity of these risks is considered to be short (for the construction phase), but these risks will continue into the operational phase of the project. The significance of the risks associated with the management of waste and the release of untreated run-off during the construction phase will be reduced to a low risk if the prescribed mitigation measures are implemented, these include:

A number of moderate risks are expected for the operational phase of the project, with the significance of the majority of these risks being reduced to a low risk should the prescribed mitigation measures be implemented. A number of these risks are carried through from the construction phase of the project, and this emphasises the need and importance to have these risks managed and mitigated from the onset of the project. The fracturing of aquifers caused by blasting and coal (dust) precipitate are considered to pose a moderate risk with-mitigation, these is largely attributed to the nature and depth (+/- 70m) of mining proposed, and the proximity and extent of wetland area in relation to the opencast area. The most notable risks posed during the operational phase of the project area the actual opencast mining methods which will result in the loss of wetlands area, and the altered topography which will have an effect on the hydrology of the catchment. Not only will wetlands be mined, but the loss of wetlands will also be an indirect result of impacts to the structural integrity of the aquifers, resulting in the dewatering of the perched aquifers. These two aspects are considered to pose a high risk, and there is no mitigation available for the mining of wetlands. Similarly, owing to the fact that the opencast mining footprint area is located on a watershed, there are also limited possibilities to mitigate the altered topography.

Due to the nature of opencast mining and the total disruption to the hydrogeology of the area, there will be a loss of wetland re-charge from any perched aquifers in the area, resulting in the loss of these wetland areas. The restoration of these geohydrological features is unlikely and the risk remains high with mitigation. The change in slope is expected to pose a moderate level of risk (without mitigation) during the decommissioning phase of the project. The relatively low level of risk posed by the remaining aspects may be attributed to the fact that wetland areas would already be lost and degraded at this stage of the mining project, as a result of the local activities. The rehabilitation of the area must by no means be regarded as a positive impact, but in accordance with the mitigation hierarchy, rehabilitation of the area does provide some level of mitigation, albeit limited due to the nature of opencast mining. The topography of the area is expected to change and may not resemble a slope, but a void will be present.

The post-closure impacts are considerable and could be mitigated to a moderate level of impact with some level of mitigation. Mitigation would require the in-sourcing of material to prevent a void in the landscape, returning the topography to a close to natural slope. It is unsure at this stage of the certainty of acid mine drainage (AMD) decant, but it has been assumed decant is likely. In order to address this, a passive treatment system is required to allow for the expected volumes and water quality emanating from the decant area.

The impact assessment ratings were presented with a similar “pattern” as that determined for the risk assessment. Similar to the risk assessment unmitigated moderate and high significance impacts were identified for the operational, decommissioning and closure phases of the project. These impacts include fracturing aquifers, dust / coal precipitation, dewatering aquifers and changes to slope, and also acid mine drainage for the closure phase of the project. The proposed opencast mining will result in the loss of wetlands as a result of changes to the geology and hydrogeology of the catchment. The loss of wetlands cannot be mitigated and these losses will need to be offset to provide some level of compensation. The loss of recharge will also result in a high post-mitigation impact significance for the catchment to be mined.

13.1.7 SOIL

The field assessment was conducted by combining inputs from the soil survey done in April 2019 and the hydropedology and wetland assessments. During the site assessment, four major soil forms were identified, namely; The Oakleaf, Tukulu, Westleigh and Katspruit forms.

The project area is dominated by arable land capability classes (class III and Class IV) which accounts for 88.4% (488.03 ha) of the project area. 11.3% (65.52 ha) was classified as wetland type soils.

The project area is dominated by L2 and L3 land potential classes which accounts for 69.2% (382.16 ha) and 19.2% (105.87 ha) respectively. 11.3% (65.52 ha) was classified as wetland type soils.

The dominant land use is agriculture taking up approximately 87.9% (478.84 ha) of the project area, Disturbed areas covering 0.5% (1.36 ha), and wetland areas covering 11.6% (64.1 ha).

During the construction phase the initial mining areas for opencast mining will be cleared of vegetation and topsoil for the mining to commence. Whilst the construction/operation/rehabilitation takes place vehicles will drive on the soil surface compacting it. This reduces infiltration rates as well as the ability for plant roots to penetrate the compacted soil. This then reduces vegetative cover and increases runoff potential. The increased runoff potential then leads to increased erosion hazards. During the construction/operational phases, If the topsoil and subsoil are stripped and stockpiled as one unit (on existing colliery site and not new project area), the topsoil's seed bank and natural fertility balance is diluted. This will affect the regrowth of vegetation on the stockpiles as well as the regrowth when they have been replaced during the rehabilitation process, therefor soils should be handled with care from the construction phase through to the decommissioning phase.

It is important to note that the impacts are high during the construction and operational phases, due to the fact the soil resource and land capability are lost. The mitigation required during these phases does not reduce the impact during the current phases. The mitigation is however very important to reducing the long-term impact by ensuring that during the decommissioning and rehabilitation phases, the impacts become less severe by rehabilitating the mining impacts.

It is the specialist's opinion that rehabilitation of the land use back to original crop yields is not possible. The best-case scenario with intense management and a high level of specialised monitoring is that 70% of historic yields are achieved.

13.1.8 AIR QUALITY

The daily PM10 SA NAAQS was exceeded at 25 (out of 25) AQSRs for unmitigated activities. For the design mitigated scenario, simulated PM10 concentrations exceeded the daily SA NAAQS at 6 AQSRs, over an area up to 2.8km to the southwest, 2.4km to the south, 2.4km to the east and 3.0km to the north from the mining boundary. With additional mitigation the footprint was reduced, with 3 AQSRs non-compliant. Over an annual average unmitigated PM10 impacts exceeded the annual NAAQS at 2 AQSRs. With design mitigation applied, exceedances were still simulated at 2 AQSRs, and with additional mitigation applied, PM10 impacts exceeded the annual NAAQS at only one AQSR.

PM2.5 daily GLCs, with no mitigation in place, were in non-compliance with the 2030 NAAQSs at 14 AQSRs. Simulated impacts were reduced when design mitigation is applied with exceedance of the 2030 NAAQS simulated at only two AQSRs. With additional mitigation, simulated PM2.5 daily GLCs were still in non-compliance at two AQSRs. Over an annual average design mitigated simulated GLCs and additionally mitigated GLCs, were within compliance currently and after 2030.

The simulated maximum daily dustfall rates due to the unmitigated scenario exceeded the NDCR for residential areas at one AQSR. Simulated dustfall rates exceeded the NDCR for residential areas at one AQSR for the design mitigated scenario but were well within the residential limit for the additionally mitigated scenario.

The project operations resulted in High significance for design mitigated operations and Medium significance for additionally mitigated operations. Similar to the baseline scenario, the highest PM10 impacts were due to vehicle entrained dust from unpaved roads, whereas the highest PM2.5 impacts were due to in-pit operations and the highest dustfall impacts were due to windblown dust.

The impact significance associated with the proposed Eloff Colliery construction, decommissioning/closure and post-closure phases was determined as Low. The simulated footprint areas of exceedance for PM10 and PM2.5 impacts, were found to be much larger for the Project Scenario (Eloff Project) than for the Baseline Scenario (Kangala operations). Even with additional mitigation applied on haul roads to achieve a control efficiency of 90% the area of exceedance of the daily PM10 NAAQS extended well beyond the mining rights boundary. This increase in magnitude may be explained by the higher throughput of annual ROM tonnages for the Eloff Project,

and more vehicle entrained dust from the new haul road and in-pit roads. The up-sizing of the Kangala CHPP to process the higher ROM production will also lead to higher crushing emissions.

13.1.9 CLIMATE CHANGE

The total CO_2-e emission for the project operations is approximately 62 tpa, of which 76% is due to vehicle exhaust emissions and 24% is due to electricity consumption. The GHG emissions from the project are low and will not likely result in a noteworthy contribution to climate change on its own.

13.1.10 VISUAL

The proposed project will not result in major new visual impacts. Given the relatively low level of visual impact that is likely to be associated with the proposed mine extension and the temporary nature of impacts, there is no reason from a landscape and visual impact perspective that the project should not proceed.

13.1.11 BLASTING AND VIBRATION

The evaluation of effects yielded by blasting operations was evaluated over an area as wide as 3500 m from the mining area considered. The range of structures observed is typical roads (tar and gravel), low cost structures, brick and mortar houses, boreholes, heritage sites and mine installations.

The location of structures around the Eloff Phase 3 Pit area is such that the charge evaluated showed possible influences due to ground vibration. The closest structures observed are the Power Lines/Pylons, Hydrocensus Boreholes and a Chicken Farm. There are Heritage Sites - Graveyards (POI 34 & POI 35), Hydrocensus Borehole (POI 64), Farm Buildings (POI 30) and the Road that falls within the Pit area. Specific attention will be required for adjustments in the blasting operations to ensure expected levels of ground vibration and air blast are within the required limits. There are also regulations that will need to be followed for permission to conduct blasting operations as these installations area within 500 m from the blast operations. Ground vibrations predicted for the pit area ranged between low and very high. Ground vibration levels predicted ranged between 0.1 mm/s and 1222.9 mm/s for structures surrounding the pit area. The expected levels of ground vibration for some of these structures are high and will require specific mitigations in the way of adjusting charge mass per delay to reduce the levels of ground vibration. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage.

Air blast predicted showed some concerns for opencast blasting. High levels may contribute to effects such as rattling of roofs or door or windows with limited points that are expected to be damaging and others could lead to complaints. The current accepted limit on air blast is 134 dBL. Damages are only expected to occur at levels greater than 134dB. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pits are located such that “free blasting” – meaning no controls on blast preparation – will not be possible.

On charges considered it is expected that air blast will be greater than 134 dB at a distance of 90 m and closer to pit boundary. Infrastructure at the pit areas such as roads, heritage sites and hydrocensus boreholes are present but air blast does not have any influence on these installations.

An exclusion zone for safe blasting was also calculated. The exclusion zone was established to be at least 266 m. The use of the normal practice observed in mines of 500 m exclusion zone will include the Farm buildings/structures, road, hydrocensus boreholes and heritage sites which all falls within the pit area. The use of minimum 500 m exclusion zone is rather recommended and it will be required that evacuation be negotiated when blasting is done. There is no reason to believe that this operation cannot continue if attention is given to the recommendations made.

13.1.12 NOISE

The potential noise rating levels were calculated using a sound propagation model, developing conceptual noise generating scenarios considering the location where mining activities may take place. The conceptual worst-case scenarios were developed for both the construction and operational phase with the output of the modelling exercise indicating a low risk for a noise impact during the construction and operation of this extension project.

Several recommendations with respect to noise impacts were highlighted to ensure that potential annoyance with the project is managed and to ensure that the significance of noise impacts remains low.

13.1.13 LAND USE

The Eloff Phase 3 is a better alternative land use than the current farm operation on the affected land, and its need and desirability is acceptable. The main reason for this is that Eloff Phase 3 is a planned extension of the current Kangala Colliery, and this expansion is important for continued energy security, economic value add, and maintenance of jobs given that the Colliery's pit is nearing its end of life.

13.1.14 SOCIO-ECONOMIC

Although most of the impacts identified and assessed are in the low to medium negative range, none of these impacts can be considered fatal flaws. While the Eloff Project will not create a large number of new employment opportunities, it holds very high potential in terms of continued short-term job and income creation for the local community, the generation of local development funds as well as public revenues in the form of taxes and royalties. If done correctly, social investment in mining communities can result in meaningful social development within poverty stricken local communities and support the upliftment of people through non-mining related activities.

There are, however, also stakeholders that carry social and economic risks related to the project. These include local farmers adjacent to the project area, their unskilled farm workers, local agricultural suppliers and low-income households nationally who consume staple maize meal products. These stakeholders will not experience any direct socio-economic benefit from the project and therefore more effort will be required from the mine to obtain and then retain this group's support in the mine's social licence to operate (SLTO).

To ensure that the Eloff Mining Company obtain and maintain a SLTO, it is recommended that the Project develops and implements a stakeholder engagement plan, inclusive of a communications plan for liaising with adjacent landowners and those negatively impacted by the Project without any positive offsets. Open, transparent and continuous two-way engagement with stakeholders are important in establishing a relationship with the mine's impacted communities. The SEP should also include a grievance mechanism that should be widely communicated so that stakeholders know how to lodge grievances. The mine in turn, should commit to addressing grievances timeously and effectively. A grievance can only be closed once all parties agree that the issue was dealt with to everyone's satisfaction. An effective SEP can prevent social mobilisation, social defiant behaviour in the form of protests and can go a long way in addressing people's concerns in general.

The potential negative cumulative impacts of mining on agricultural production and long-term food security is of specific concern but is an issue for the broader Delmas area that falls outside the impact assessment scope of a single mining project. It is a public policy issue that needs to be addressed though clear spatial planning principles to protect arable land on a national and local level, including the demarcation of no-go areas and/or requirements for alternative mining methods such as underground mining in priority areas.

13.2 ALTERNATIVE ASSESSMENT SUMMARY

In summary, the following Process Alternatives were assessed in this EIA report:

- **Process Alternative P4a** – Using water obtained from dirty water containment facilities: This option involves utilising dirty water from the containment facilities (e.g. stockpile dump area sumps containing dirty runoff water, and Kangala Colliery PCD holding dirty water from the pit, etc.) for some of the mining activities such as dust suppression at the haul roads and coal beneficiation processes at the CHPP; and
- **Process Alternative P4b** – Water from existing licensed water resources: Potable water is already supplied to the Kangala complex from a borehole and / or the Rand Water Board, and similarly it is anticipated that the potable water for the Eloff Phase 3 Project will be sourced from existing licenced resource such as boreholes and / or municipal supply whereby the amount of water utilised for the project is to be within the allocated thresholds for the water source. The relevant abstraction legislation will be adhered to in this regard.

The following Site Layout Alternatives were assessed:

- **Site Layout Alternative S2a** – The initially proposed mine layout had a wider footprint extending further south than the current proposed project area. The small portion on the extreme south of the project area was deemed not feasible due to its proximity to a watercourse.
- **Site Layout Alternative S2b – Maximum mining over entire area**: This alternative involves mining over the entire proposed opencast mining pit extension area. This option can only be considered if no high-sensitivity and / or no-go areas are identified within the proposed project area. In this site layout alternative, the mining and economically efficient production of coal is emphasised. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production. This approach has the potential to increase the financial viability of the proposed Phase 3 Project at the potential expense of any identified environmental features on site.
- **Site Layout Alternative S2c – Sensitivity-based approach:** This alternative aims to avoid no-go areas and highly sensitive areas and takes into account specialist recommendations regarding buffer distances from important environmental features. In this site layout alternative, environmental resource protection is emphasised and relies on the use and implementation of stringent mitigation and management measures to minimise identified adverse impacts. This development alternative will use environmental specialist planning and evaluation of opencast mining methodologies, mining footprint alteration, and infrastructure placement and logistic options in order to avoid consolidated sensitive environmental features and to locate the proposed development in the least sensitive area.

The following activity alternatives were assessed

- **Activity Alternative A1** – Mining: This option relates to the land within the proposed project area being used for mining activities. The extent of the mining activities will be subject to the findings of the EIA process guided by the sensitivity-based approach; and
- **Activity Alternative A2** – Farming: This option relates to continuing with the current land use within the project area which is farming (i.e. cultivation / livestock).
- The **no-go option (Activity Alternative A3**) means 'do nothing' or the option of not undertaking the proposed Eloff Phase 3 Project or any of its alternatives, and therefore links to the above activity alternative of continuing with the current farming land use.

13.2.1 NOMINATION OF PREFERRED ALTERNATIVES

A combination of **both Process Alternative P4a and P4b** is considered the most suitable option for water use. No significant hydrological impacts result from either option. Make-up supply for the CHPP will be supplied from the existing Press Steel Tank that is fed by boreholes (KAM01 and KAM03) or from Rand Water. Dirty water will be re-used as a priority where possible from the Kangala PCD.

Overall, the sensitivity-based approached **Site Layout Alternative S2c is preferred** in order to reduce impacts on the environment to acceptable levels as per the final layout indicated in Figure 43. This involves the avoidance of the 100m wetland buffer zone as well as the avoidance of high sensitivity areas identified in the biodiversity assessment.

Assessments of the two activity alternatives (mining and agriculture) suggest that opencast mining as a land use will yield more economic benefits in the short-term than agriculture. Furthermore, farming practises are able to commence after the previously mined areas are suitably rehabilitated in accordance with the relevant legislation thereby allowing for the economic benefits from agriculture to continue. The projected mining benefits are mostly in relation to the project's strategic value of supplying coal to Eskom, whereby the Gross Geographic Product (GGP) addition will outstrip that of agriculture over an economic generation by a significant amount, and the mining alternative will add more jobs to the local municipality. Once again, these benefits are largely in the short-term (the proposed LOM for the Phase 3 Project being 10 years). Kangala Colliery is an already operational mine, continued mining at the adjacent Phase 3 Project area is considered the most feasible land use going forward unless environmental impacts associated with the extension cannot be mitigated to

acceptable levels. Based on the two most basic decision-making criteria for an alternative land-use analysis, namely GDP and employment, Eloff Phase 3 is considered a better alternative land-use than agriculture in the study area. It has a net GDP benefit of R 5.06 billion over the 60-years comparison period, even though the life of this project was set at 10 years, meaning that for 50 years the land was considered as sterile and an agricultural loss to the economy was included. In an optimal year the total GDP for Victor Khanye today is estimated R10.5 billion, of which R601 million is agriculture and R1 568 million is mining. From an employment perspective, Eloff Phase 3 is also more positive than agriculture. The employment comparisons are permanent employment at the mine of 926 employees over 10 years, amounting to a pro-rata number of 154 employees relative to the 60-year comparison period. Including a small amount of construction workers pro-rata to 60 years (2/60 years), and a potential loss of 101 agricultural workers, the net benefit amounts to 57 employees. The net benefit of 57 employees is, however, almost negligent compared to the estimated employment of 24102 people in Victor Khanye. The agricultural and mining industries today employ 3410 and 1789 people respectively in Victor Khanye. However, this employment net benefit increases substantially when the multiplier effects are included, and this is discussed below. In conclusion **Activity A1 (mining)** is a better alternative land use than the current farm operation on the affected land, and its need and desirability is acceptable.

13.3 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 negative 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. 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 Eloff Phase 3 project can be mitigated to an acceptable level and the project should be authorized.

13.4 RECOMMENDATIONS FOR INCLUSION IN ENVIRONMENTAL AUTHORIZATION

The following key recommendations are made:

- The management and mitigation measures at the existing Kangala colliery must be applied to all inputs from the Eloff Phase 3 project;
- All linked water and waste facilities at the existing Kangala colliery must be fully licensed and legal before commencing with Eloff Phase 3;
- All recommendations in the attached EMPr and accompanying rehabilitation and closure plan (Appendix E) must be adhered to;
- It is recommended that a project area specific but also species-specific biodiversity monitoring and action plan be compiled on authorisation for the project. The monitoring and action plan must inform and guide the proposed project and prescribed clear goals and objectives that can be practically implemented and easily monitored using appropriate variables;
- Any new access roads or haul roads must avoid the depression wetlands or any other highly sensitive areas identified in this EIA report;

- Due to the high agricultural potential of this area, rehabilitation must be back to an Arable post-mining land capability. It is recommended that rollover mining (concurrent backfilling) be conducted for the project, minimising the required footprint area of the mining blocks. Eloff Mining company must review and report on the implementation of the rehabilitation annually. If it is determined during this review period that rehabilitation is not being properly implanted then mining should cease until rehabilitation of the area is considered adequate;
- Soil stripping and stockpiling must adhere to the Soil Stripping Guideline in the attached EMPr;
- Frequent water sprays (> 2 litres/m²/hr) should be implemented on the in-pit roads to ensure a control efficiency of at least 75% and chemical suppressants on the unpaved haul roads to ensure a control efficiency of more than 90%;
- Temporary wind breaks to be installed onto the topsoil stockpile (30% control efficiency) and vegetation cover to be established on the dormant areas and side slopes (40% control efficiency);
- To ensure the impacts on the surrounding environment and human health remain acceptable throughout the Life of Mine, 3 dustfall units are recommended to be added to the existing dustfall monitoring network;
- An exclusion zone for safe blasting was also calculated. The minimum exclusion zone was established to be at least 266 m. The use of the normal practice observed in mines of 500 m exclusion zone will include the farm buildings/structures, roads, hydrocensus boreholes and heritage sites which all falls within the Pit Area. The use of minimum 500 m exclusion zone is preferable and it will be required that evacuation be negotiated when blasting is done;
- The loss of wetlands cannot be mitigated and these losses will need to be offset to provide some level of compensation. The wetland offset strategy provided in Appendix D must be adhered to;
- In the event that fossil remains are discovered during any phase of construction, either on the surface or exposed by fresh excavations the Chance Find Protocol must be implemented by the ECO in charge of these developments;
- A pump and treat system is the preferred method for dealing with decant;
- The closure reports and financial provisions assume a treatment period of 50 years from commencement of treatment. A detailed kinetic geochemical model and updated groundwater model should be undertaken to confirm this duration prediction. This study must be undertaken within 12 months of commencement of mining and the financial provisioning reports must be updated accordingly;
- A closure water management plan should be developed. This should assess the managed of decant via channelled decant or the management of a critical water level to minimise contamination of the shallow weathered aquifer; and
- It is recommended that the project develops and implements a stakeholder engagement plan, inclusive of a communications plan for liaising with adjacent landowners and those negatively impacted by the project.

14 ASSUMPTIONS, LIMITATIONS AND UNCERTAINTIES

Certain assumptions, limitations, and uncertainties are associated with the EIA Phase. This report is based on information that is currently available and, as a result, the following limitations and assumptions are applicable:

- The EIA Report is based on project information provided by the client; and
- The description of the baseline environment has been obtained from specialist studies.

Furthermore, certain assumptions, limitations, and uncertainties are associated with the EIA phase specialist studies and these are detailed for each aspect below.

14.1 HERITAGE

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that 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 set out in the Heritage Report.

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;
- The impact assessment was completed for the proposed mining areas and associated activities only. No supporting infrastructure is proposed for the project. The impact assessment has considered the project to be final, and have not considered the No Go alternative;
- It was assumed all associated specialists have followed best practice; 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.

14.2 BIODIVERSITY

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;
- The impact assessment was completed for the proposed mining areas and associated activities only. No supporting infrastructure is proposed for the project. The impact assessment has considered the project to be final, and have not considered the No Go alternative;
- It was assumed all associated specialists have followed best practice; 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.

14.3 DOLOMITIC STABILITY

The following limitations should be noted for the study:

- The information provided in this specialist report is based on information provided by the client and or the client's representatives, published scientific literature, maps, and information published in the public domain and that collected by Bare Rock Consulting during September and October 2019.

14.4 HYDROGEOLOGY (GROUNDWATER)

The numerical groundwater model is a simplified representation of the very complex and heterogeneous interacting aquifer systems underlying the project area. The integrity of a numerical model depends strongly on the formulation of a sound conceptual model and the quality and quantity (distribution, length of records etc.) of input data.

Where accurate long-term monitoring and test data over the entire project area are not available, the model results should be regarded as providing qualitative rather than quantitative results and need to be verified and updated regularly by means of a comprehensive groundwater monitoring program. Nonetheless, a numerical model can be applied successfully to assess the effectiveness of various management and remediation options/techniques, especially if the shortcomings in information and assumptions made in the construction and calibration of the model are clearly listed and kept in mind during modelling.

All available information regarding the geological makeup (especially geological structures) of the project area was considered in the construction of the numerical model. Geological structures such as dykes and faults, because the aquifer is of a secondary fractured nature, usually have higher transmissivities in comparison with the host rock and serve as preferred flow paths or conduits for groundwater movement. Note that no detailed structural geological information was available at the time of submission of this report, therefore modelling (i.e. updating of the model) should be an ongoing process as new information becomes available with time.

14.5 HYDROLOGY (SURFACE WATER)

During the site visit, existing SWMP measures for the Kangala Colliery were assessed and appear to comply with relevant guidelines and legislation. The assumptions for SWMP of the Eloff Phase 3 Project are as follows:

- Diversion berms will be placed on the boundary of the pit for each phase to ensure the diversion of runoff from small clean water catchments away from the active mining pit.
- Berms will be placed along the contours to ensure minimum cut and/or fill and prevent soil erosion.
- Smaller berms should be placed around the topsoil and soft dump area to ensure that any soil which erodes from exposed surfaces is contained.
- Pans found in the affected area will not have berms around them and every effort shall be made to ensure that they remain connected with the surrounding environment.

The limitation noted during the compilation of the SWMP section of the overall Eloff Phase 3 Project are as follows:

- No detailed information provided on mining schedules and how open cast pits will be rehabilitated during the LOM.

The following assumptions apply to the water balance:

- The static PFD illustrates the water balance concept. The water balance model includes the consolidation of the proposed Eloff Phase 3 Project and current Kangala Colliery operations.
- A combination of the water storage alternatives was Process Alternative P3a and Process Alternative P3b (Section 2) was assumed as this combination will occur in real practise. When possible, pump-store-evaporate was applied in the opencast pit at a maximum pit sump surface area of 10% of the opencast pit workings and all remaining opencast pit water is pumped to the Kangala PCD.

- Dewatering is taking place from the opencast pit areas. It is therefore assumed that all rainfall into the opencast pit areas will either runoff into working areas, recharge into spoils, or evaporate/seep into the ground. Projected groundwater inflows into the opencast area of the Eloff Phase 3 Project were determined by GCS (2019) (Table 10.1) and inflows from 2020 onwards were considered. It was assumed that rollover mining with concurrent rehabilitation would be undertaken maintaining a constant opencast pit working area of approximately 25 ha. Maximum inflows during LOM that are expected from groundwater are ~464 cubic metres per day (m3/d).
- Also, a combination of Process Alternative P4a and Process Alternative P4b was assumed in terms of raw water supply. Make-up supply for the CHPP will be supplied from the existing Press Steel Tank that is fed by boreholes (KAM01 and KAM03) or from Rand Water. Dirty water will be re-used as a priority where possible from the Kangala PCD.
- Dirty water includes runoff from the CHPP area (including ROM stockpile, product stockpile and overburden stockpile) and will be captured in the existing Kangala PCD. It is estimated that a total surface area of +/-35ha comprises the dirty water catchment area. In addition, decant from the discard facility via a penstock system is also captured in the Kangala PCD as well as dewatered water from the opencast pit.
- Total water make-up requirement for the CHPP was provided at between 40 000 -50 000 cubic metres per month (m^3/mon) (1 315-1 643 cubic metres per day (m^3/d) based on the MWP (DMR, 2017) and IWWMP (Headwaters, 2018). Based on an average projected ROM of 272 000 tonnes/month (t/m) until 2028 (DMR, 2017) and a daily make-up requirement of approximately 1 400 m^3/d (Headwaters, 2018), this equates to 0.157 cubic metres per tonne (m^3/t). According to DMR (2017) ROM moisture and product moisture contents are in the order of magnitude of 4%.
- Potable/raw water for domestic use is also supplied from the Press Steel Tank fed by boreholes or Rand Water. Total potable and raw water make-up (workshop) at the Kangala Colliery section were estimated at 29.3 m^3/d based on consumption figures from the Sewage Treatment Plant (STP) provided (Headwaters, 2018).
- Sewage effluent is assumed to be treated in the sewage treatment plant (STP) and effluent discharge figures from the STP were taken from consumption figures and Headwaters (2018). It is common and assumed that 80% of potable and domestic water usage will end up in the Kangala PCD for reuse into the CHPP.
- Total dust suppression water requirements were provided at ~60 m^3/d or 2.5 cubic metres per hour (m^3/hr) based on consumption volumes provided by Headwaters (2018). This includes estimations for dust suppression on haul roads taken from Kangala PCD (30 m^3/d)), dust suppression at the CHPP area (~20 m^3/d) and from the Press Steel Tank (20 m^3/d).

14.6 WETLANDS

The following are applicable to the wetland study:

The following are applicable to this study:

- Access to areas adjacent to the project area (within the required 500m regulation area) was restricted. As much of the area was ground truthed as possible, but extrapolations have been made for these adjacent areas. Further to this, previous reports have also been reviewed (Middelbult EIA) in an attempt to address this limitation;
- Due to numerous amendments to the designs, not all maps within the report have been updated;
- The GPS used for wetland delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side;

- The fieldwork component of the assessment comprised one seasonal assessment only, that was conducted during the March 2018 wet season. This study has not assessed any temporal trends for the respective seasons; and
- No detailed activity list or mining methods for the proposed project were provided and therefore the risk assessment has been completed based on presumptions for standard development operations.

14.7 HYDROPEDOLOGY

The following aspects were considered as limitations;

- Only the slopes affected by the proposed open cast mining areas have been assessed;
- No surface impacts (i.e. haul roads, infrastructure, adits, evaporation ponds etc) have been included into this report given the irrelevance of these components to a level 3 assessment;
- It has been assumed that the open cast mining areas provided to the consultant are correct;
- The GPS used for ground truthing is accurate to within five meters. Therefore, the wetland and the observation site's delineation plotted digitally may be offset by at up to five meters to either side; and
- Geohydrological modelling was not part of the hydropedological assessments.

14.8 SOIL

The following assumptions and limitations have been made:

- The information contained in this report is based on auger points taken and observations on site. There may be variations in terms of the delineation of the soil forms presented compared to when stripping of soil is undertaken. If this is encountered the soil stripping plan may need to be updated to reflect these variations in terms of how soil is stripped and stockpiled;
- The GPS used for delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

14.9 AIR QUALITY

The following important assumptions, exclusions and limitations to the specialist study should be noted:

- No provision was made for:
    - Emission estimation, dispersion modelling and impacts assessment for the nearby Leeuwpan Colliery and Stuart Colliery, but impact prioritisation taking cumulative impacts into account was done to determine the final impact significance ratings associated with each phase of the project.
    - Ambient air quality sampling/monitoring.
    - Dust fallout sampling.
    - Meteorological monitoring.
- The health risk assessment was limited to the screening of ambient air concentrations against NAAQS and applicable international legal guidelines and limits (WHO, IFC and US EPA). The scope of the study was confined to the quantification of impacts due to exposures via the inhalation pathway only.
- The impact of the operational phase was determined quantitatively through emissions calculation and dispersion simulation. Due to their temporary nature, the assessment of impacts from the construction and closure phases is mainly of a qualitative nature. A general estimation of emissions due to the construction phase was provided. No impacts are expected post-closure provided the rehabilitation of final land forms is successful.
- Meteorology:

- In the absence of on-site meteorological data (that is required for atmospheric dispersion modelling), use was made of MM5 modelled meteorological data for the study site for the period 2014-2016.
- The National Code of Practice for Air Dispersion Modelling prescribes the use of a minimum of one year on-site data or at least three years of appropriate off-site data for use in Level 2 assessments. It also states that the meteorological data must be for a period no older than five years to the year of assessment. The data set applied in this study complies with the requirements of the code of practice.

- Emissions:
  - The impact assessment was limited to airborne particulates (including TSP, PM10 and PM2.5). These pollutants are either regulated under NAAQS or considered a key pollutant released by this operation.
  - The quantification of sources of emission was restricted to the proposed Project. Although other existing sources of emission within the area were identified, such sources were not quantified as part of the emissions inventory and simulations. Their impact would be considered by ambient air quality monitoring in the region.
  - In the absence of detailed construction and decommissioning plans, fugitive dust emissions for these phases were discussed qualitatively. The confidence rating of these emissions is therefore low.

14.10 CLIMATE CHANGE

No provision was made for the following:

- GHG emission estimation and impact assessment;
- Meteorological monitoring; and
- GHG sampling / monitoring;

14.11 VISUAL

The following limitations and assumptions should be noted:

- In the assessment tables the subjective judgement as to whether an impact is negative or positive is based on the assumption that the majority of people are likely to prefer to view a natural or a rural landscape than an industrial landscape;
- A site visit was undertaken on a single day (4th April 2019) to verify the likely visibility of the proposed development, the nature of the affected landscape and affected receptors;
- The site visit was planned to ensure that weather conditions were clear ensuring maximum visibility; and
- The timing of photography was planned to ensure that the sun was as far as possible behind the photographer. This was to ensure that as much detail as possible was recorded in the photographs.

14.12 BLASTING AND VIBRATION

The following assumptions have been made:

- The anticipated areas of influence estimated in this report are based on the authors experienced from general blasting operations in the opencast coal environment;
- Accepted international and local standards with regulations are applied to guide the determination of expected influence areas;

- The assumption is made that the predicted influence areas are a good estimate. These will have to be confirmed with prediction models based on blast information data;
- Blast Management & Consulting was not involved in the mine or planned blast designs to be used; and
- The work done is based on the author's knowledge and information provided by the project applicant.

14.13 NOISE

Limitations relating this the Noise Study are:

- Ambient sound levels are the cumulative effects of innumerable sounds generated at various instances both far and near. High measurements may not necessarily mean that noise levels in the area are high. Similarly, a low sound level measurement will not necessarily mean that the area is always quiet, as sound levels will vary over seasons, time of the day, faunal characteristics, vegetation in the area and meteorological conditions (especially wind). This is excluding the potential effect of sounds from anthropogenic origin. It is impossible to quantify and identify the numerous sources that influenced a measurement using the reading result at the end of the measurement. Therefore trying to define ambient sound levels using the result of one 10-minute measurement can be inaccurate (very low confidence level in the results) for the reasons mentioned above. The more measurements that can be collected at a location the higher the confidence levels in the ambient sound level determined. The more complex the sound environment, the longer the required measurement. When singular measurements are used, a precautious stance must be adopted (as done in this report).
- It is assumed that the measurement locations represent other residential dwellings in the area (similar environment), yet, in practice this can be highly erroneous as there are numerous factors that can impact (and normally increase ambient sound levels) on ambient sound levels, including:
    - the distance to closest trees, number and type of trees as well as the height of trees;
    - available habitat and food for birds and other animals;
    - distance to residential dwelling, type of equipment used at dwelling (compressors, air-cons);
    - general maintenance condition of house (especially during windy conditions); and
    - number and type of animals kept in the vicinity of the measurement locations (typical land use taking place around the dwelling).
- Exact location of a sound level meter in an area in relation to structures, infrastructure, vegetation and external noise sources will influence measurements. It may determine whether one is measuring anthropogenic sounds from a receptor's dwelling, or environmental ambient soundscape contributors of significance (faunal, road traffic, railway line movement etc.). At times there are extraneous noises that cannot be heard during deployment, or not operational, that can significantly impact on readings (such as water pumps, transformers, faunal communication, etc.).
- Determination of existing road traffic and other noise sources of significance are important (traffic counts etc.). Traffic however is highly dependent on the time of day as well as general agricultural activities taking place during the site investigation. Traffic noise is one of the major components in urban areas and could be a significant source of noise during busy periods.
- Measurements over wind speeds of 3 m/s could provide data influenced by wind-induced noises. While the windshields used limits the effect of fluctuating pressure across the microphone diaphragm, the effect of wind-induced noises in the trees in the vicinity of the microphone did impact on the ambient sound levels. The site visit unfortunately coincided with a relatively windy period.
- Ambient sound levels are dependant not only on time of day and meteorological conditions, but also change due to seasonal differences. Ambient sound levels are generally higher in summer months when faunal activity is higher and lower during the winter due to reduced faunal activity. Winter months unfortunately also coincide with lower temperatures and very stable atmospheric conditions, ideal

conditions for propagation of noise. Many faunal species are more active during warmer periods than colder periods. Certain cicada species can generate noise levels up to 120 dB for mating or distress purposes, sometimes singing in synchronisation magnifying noise levels they produce from their tymbals .

- Ambient sound levels recorded near rivers, streams, wetlands, trees and bushy areas can be high. This is due to faunal activity which can dominate the sound levels around the measurement location. This generally is still considered naturally quiet and understood and accepted as features of the natural soundscape, and in various cases sought after and pleasing.
- Considering one or more sound descriptor or equivalent can improve an acoustical assessment. Parameters such as LAMin, LAIeq, LAFeq, LCeq, LAMax, LA10, LA90 and spectral analysis forms part of the many variables that can be considered.
- As a residential area develops the presence of people will result in increased sounds. These are generally a combination of traffic noise, voices, animals and equipment (incl. TV's and Radios). The result is that ambient sound levels will increase as an area matures.

14.14 LAND USE

The following assumptions and limitations have been made:

- The comparison between the GDP and employment values is undertaken over two time periods:
    - The life of mine (Eloff Phase 3 is 10 years).
    - Two economic generations being 2 X 30 years = 60 years.
- It is nonetheless assumed that in 60 years-time the study area would have changed in character because of urban encroachment from the Springs area. Applying a 3.2% urban encroachment shows us that in the next 60-100 years the Victor Khanye land-use may be very different, and it is difficult to foresee that the agricultural land in the Victor Khanye will be permanently protected from potential land changes.
- The nature of economic growth is such that it is possible that the agricultural land in Victor Khanye will through inexorable urbanisation increase from the estimated R40 000 per hectare in today's prices to the R1 million per hectare prices as they are in metropolitan areas. Under that scenario, it is very likely that most farms would have changed into smaller portions and eventually disappear. This scenario would mean that innovative maize farming will come to the fore in South Africa to provide in the demand for this produce. It is important to note that every generation finds solutions for their challenges and there is a believe that this is the case for maize farming as well. In this report though, it is assumed that mine land is sterilised for farming for a 60-year period and that agricultural produce on the affected land is lost for that time period.
- From the above, a 2-option comparison between agriculture and mining over 100 years will be erroneous because by then several alternative land uses are possible and only comparing the one against the other is misleading.
- In terms of economic viability it is assumed that the new mining projects are economically viable, because Universal Coal (the parent company) is a listed company and it is unlikely that it will embark on an unviable economic expansion. However, to ensure that its developments are not marginal, it is suggested in the mitigation measures that an independent competent person's report be obtained prior to any development. The resource statement shows a healthy inferred resource statement position for Eloff, which speaks to the probability that the mining developments may be economically viable.
- The evaluation of a loss of poultry was excluded in this study because the project is not likely to impact any poultry farming operation to the best this report's knowledge.

- This study is not a study in compensation management because farmers are not considered "vulnerable groups" as in a Land Access Restitution context. This study makes no claim as to whether affected landowners are entitled to compensation or not.
- It is not possible in this report to comment as to whether the water availability of the current farms will be impacted. This assessment is left to the EAP.
- The employment per hectare on a farm is based on the averages received from farmers interviewed.
- The GDP per hectare of farms in the study area is based on the calculations below. Furthermore, the GDP per hectare is based on dry and irrigated maize, as well as Soya farming. The average GDP per hectare comes to R6 105 which was used in this report's alternative land-use analysis.
- In order to undertake some benchmarking, various statistics, based on an entirely different source, shows that the above GDP per hectare in not out of line with macro-economic averages. However, the employment per hectare statistic for agriculture in the report's calculation is much higher than the macro-averages. This is ascribed to some of the farms in the study area having their own silos and employing more labour than the average farm without silos.
- Potential vs actual: It needs to be stated that all statistics referring to the future in this report needs to be viewed as potential, and not actual. Unfortunately adding the term potential to all future statistics weakens the sentence structure in a report and this limitation is therefore acknowledged in this section.
- All the macro-economic variables had not been included in this analysis because mostly these are ratios of the GDP and simply repeats what the GDP indicator expresses. Thus, any macro-economic variable that is monetary in nature, is generally a repeat of the GDP comparison. For example, a high mining GDP relative to farming also means higher household income, operating profits, procurement, fiscal income, often forex earnings and others, relative to farming. When using multipliers, these ratios are not linear anymore, and thus the multiplier effect is calculated separately.
- The total cumulative hectares potentially displaced, including the current operation, is estimated at 2 695 hectares. Of this amount, app 951 hectares is used by the current Kangala Colliery. This analysis accepts the current hectares as a "sunk cost" and thus for net benefit comparisons, the balance of 1 744 hectares (2 695-951) is used.

14.15 SOCIAL

The following limitations and assumptions apply to the SIA:

- The SIA includes consultations with key stakeholders and potentially affected parties. Issues and concerns raised during such consultations does not form part of the public participation process and have not been captured in the Project's issues and response register;
- A SIA aims to identify possible social and economic impacts that could occur in future as a result of Project implementation. These impacts are based on existing baseline information and have been made as accurately as possible based on the information available at the time of the study, both from the Project proponent and other key stakeholders;
- Technical and other information provided by the client is assumed to be correct;
- The potential external costs associated with the project were based on information supplied by sub-specialists for the Environmental Impact Assessment of the project;
- The economic impact model was based on updated information received for the current Kangala mining operations, financial information as contained in the Mining Works Plan (MWP) for the Eloff Project (2018), the Social and Labour Plan (SLP) for Kangala Colliery (2016) as well as national and provincial averages from Statistics South Africa; and
- Economic multipliers, average salaries and wages and value added as a percentage of total income were based on provincial and national averages.

15 UNDERTAKINGS

15.1 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I __**John von Mayer**__ herewith undertake 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.

Signature of the EAP

Date: _31 January 2020____

15.2 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I ___**John von Mayer**___ herewith undertake that the information provided 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.

Signature of the EAP

Date: __31 January 2020___

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17 APPENDICES

Appendix A: Environmental Assessment Practitioner (EAP) Curriculum Vitae

Appendix B: Maps

Appendix C: Public Participation

Appendix D: Specialist Reports

Appendix E: EMPr