GOEDGEVONDEN COMPLEX

A
GLENCORE
MANAGED OPERATION

Application for amendment to Environmental Authorisation in terms of regulations 19-20 of the Environmental Impact Assessment Regulations (2014, as amended)

Final Report – October 2022

DMR Ref No: MP 30/5/1/2/2/169 MR

APPLICANT

Name of Project	Goedgevonden Complex: Amendment to Environmental Authorisation
Reference Number	MP 30/5/1/2/2/169 MR
Name of Applicant	Glencore Operations South Africa (Pty) Ltd
Company Registration Number	1997/017998/07
Responsible person	Oos van der Merwe
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In terms of the NEMA 2014 EIA Regulations contained in GN R982 of 04 December 2014 (as amended) the Basic Assessment Report (BAR) must comply with Appendix 1 of the NEMA 2014 EIA Regulations (GN R982 of 04 December 2014).

Legal Requirement		**Relevant Section in BAR**
(1)	A basic assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-	
(a)	Details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae;	S1.2 Appendix 1 of EMPr
(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; and (iii) where the required information in terms(i) and (ii) and is not available, the coordinated of the boundary of the property or properties;	S2.1 S2.2
(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; or (ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	Fig 3&4 Fig 10&11
(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 activities to be undertaken, including associated structures and infrastructure;	S3 S4.2
(e)	a description of the policy and legislative context within which the development is proposed, including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools, frameworks and instruments;	S4.1 S4.2
(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;	S5
(g)	a motivation for the preferred site, activity and technology alternative;	S6
(h)	a full description of the process followed to reach the proposed preferred alternative within the site, including- (i) details of all the 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 reason for not including them; (iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	S6 S7 S9

Legal Requirement		Relevant Section in BAR
	(v) the impacts and risks identified for each alternative, 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 associated with the alternatives; (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) the outcome of the site selection matrix; (x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and (xi) a concluding statement indicating the location of the preferred alternatives, including the preferred location of the activity;	
(i)	a full description of the process undertaken to identify, assess and rank the impacts the activity 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 (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;	S8.1 S8.3 Table 42
(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;	S8.2 Table 40 S8.3 Table 42
(k)	where applicable, a summary of the findings and impact management measures identified in 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 report;	S8.1 S8.2 Table 40
(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;	S10.1

Legal Requirement		Relevant Section in BAR
(m)	based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr;	Refer to EMPr
(n)	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;	S10.3
(o)	a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;	S8.4
(p)	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;	S10.2
(q)	where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required, the date on which the activity will be concluded, and the post construction monitoring requirements finalised;	N/A
(r)	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 IAPs; (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;	S10.4
(s)	where applicable, details of any financial provision for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;	N/A
(t)	any specific information that may be required by the competent authority; and	N/A
(u)	any other matters required in terms of section 24(4)(a) and (b) of the Act.	N/A

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Glossary of Terms

Abbreviation	Abbreviation Meaning
AIP	Alien and Invasive Plant
AIPCP	Alien and Invasive Plant Control and Management Plan
AMD	Acid Mine Drainage
ARM	African Rainbow Minerals
BAS	Best Attainable State
BID	Background Information Document
CA	Competent Authority
CBA	Critical Biodiversity Area
CHPP	Coal Handling and Processing Plant
CRR	Comments and Response Report
DAFF	Department of Agriculture, Forestry and Fisheries
dBA	Decibels
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DMR	Department of Mineral Resources
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
ESA	Ecological Support Area
ER	Emergency Room
FEPA	Freshwater Ecosystem Priority Areas
GDP	Gross Domestic Product
GGV	Goedgevonden
GHG	Greenhouse Gas
GOSA	Glencore Operations South Africa Proprietary Limited
GN	Government Notice
GSP	Global Positioning System
HIA	Heritage Impact Assessment
HPA	Highveld Priority Area
HSEC	Health Safety Environment and Community
IAPs	Interested and Affected Parties
IBA	Important Bird and Biodiversity Areas
IDP	Integrated Development Plan
IEM	Integrated Environmental Management

Abbreviation	Abbreviation Meaning
IUCN	International Union for Conservation of Nature and Natural Resources
IWULA	Integrated Water Use Licence Application
IWUL	Integrated Water Use Licence
IWWMP	Integrated Water and Wastewater Management Plan
J&W	Jones and Wagener
LC	Leachable Concentration
LCC	Land Claims Commissioner
LM	Local Municipality
LOM	Life of Mine
MAE	Mean Annual Evaporation
mamsl	Meters above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbs	Meters below surface
MBSP	Mpumalanga Biodiversity Sector Plan
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land Reform and Environmental Affairs
MDEDET	Mpumalanga Department of Economic Development, Environment and Tourism
MNCA	Mpumalanga Nature Conservation Act 10 of 1998
MPRDA	Mineral and Petroleum Resources Development Act 28 of 2002
MTPA	Mpumalanga Tourism and Parks Agency
MRA	Mining Right Area
MRF	Mine Residue Facility
NBA	National Biodiversity Assessment
NDM	Nkangala District Municipality
NEMA	National Environmental Management Act 107 of 1998
NEMBA	National Environmental Management: Biodiversity Act 10 of 2004
NEMWA	National Environmental Management: Waste Act 59 of 2008
NFA	National Forest Act 84 of 1998
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act 25 of 1999
NPAES	National Protected Areas Expansion Strategy
NWA	National Water Act 36 of 1998
OFT	Oogiesfontein
PCD	Pollution Control Dam
PES	Present Ecological State
PIA	Paleontological Impact Assessment
PM	Particulate Matter
POC	Probability of Occurring
PP	Public Participation
RDL	Red Data Listed

Abbreviation	Abbreviation Meaning
RDM	Resource Directed Measures
RE	Remaining Extent
REC	Recommended Ecological Category
RMO	Recommended Management Objective
ROM	Run of Mine
RWD	Return Water Dam
RWQO	Receiving Water Quality Objectives
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SCC	Species of Conservational Concern
SDF	Spatial Development Framework
TDS	Total Dissolved Solids
TFR	Transnet Freight Rail
TIA	Traffic Impact Assessment
TOPS	Threatened or Protected Species
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
WML	Waste Management Licence
WUL	Water Use Licence

1 INTRODUCTION

1.1 BACKGROUND

African Rainbow Minerals Coal Proprietary Limited (ARM Coal) and Glencore Operations South Africa Proprietary Limited (GOSA) own and operate the Goedgevonden (GGV) Complex through unincorporated joint venture in which ARM Coal and GOSA hold 51% and 49% participating rights respectively.

GGV operates under Mining Right No. MP 30/5/1/1/2/169 MR and has an approved Environmental Management Programme (EMPr), the latest amendment having been approved by the (then) Department of Minerals and Energy (DME) on 10 February 2016.

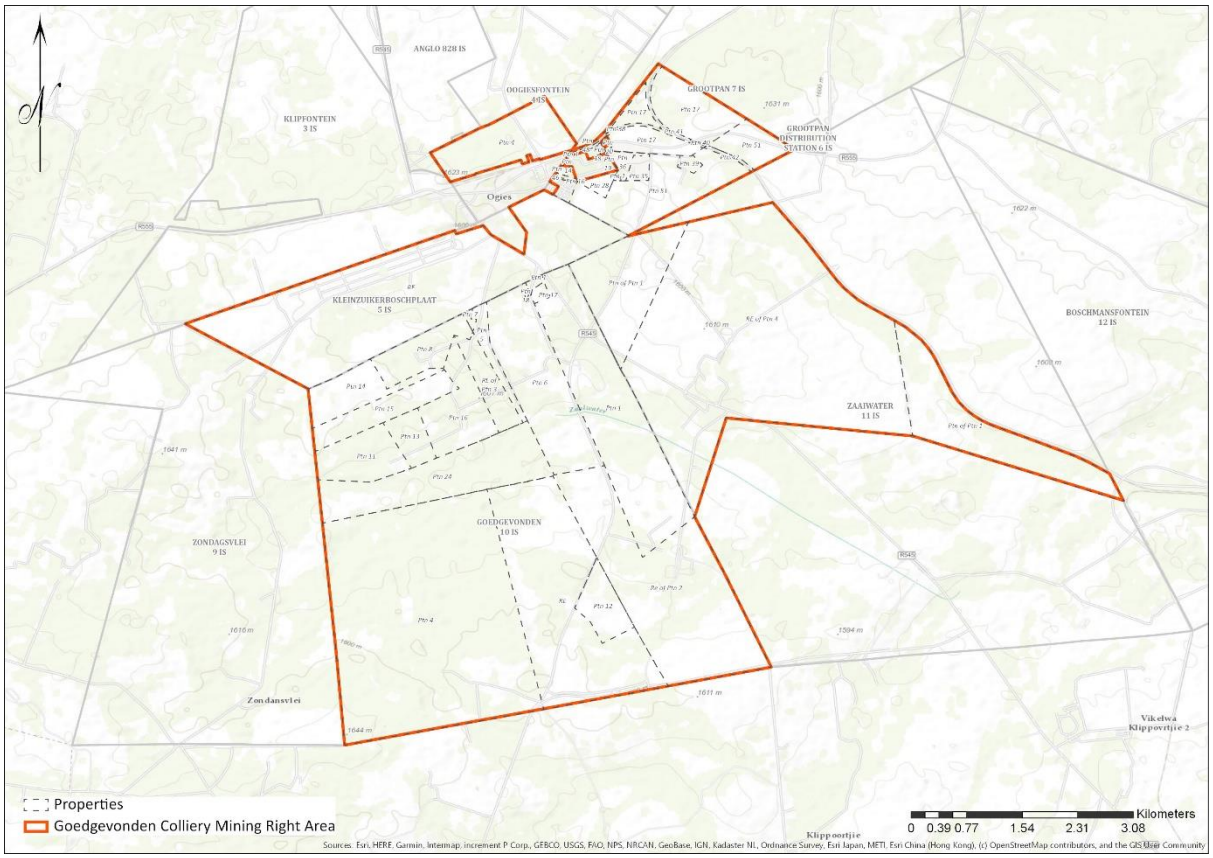

Figure 1: GGV Complex existing Mining Right boundary

The history of the GGV Mining Right applications and amendments thereto are summarised in Table 1 below.

Table 1: GGV Application Summary

Application	Applicant	Date of approval
Original EMP for Goedgevonden Colliery	Duiker Mining	27 February 2002 Ref: OT6/2/2/448
Amendment to Goedgevonden Colliery EMP	Xstrata Coal SA August 2005	-
Amendment to Goedgevonden Colliery EMP	Xstrata Coal SA	10 August 2006

Application	Applicant	Date of approval
Inclusive of Zaaiwater West Reserves	June 2006	Ref: OT6/2/2/448
New Order Mining Right for Goedgevonden Colliery	Xstrata Coal SA	February 2008 Ref: MP 30/5/1/2/2/169 MR
Mining Right for Zaaiwater West	Xstrata Coal SA	February 2008 Ref: MP 30/5/1/2/2/168 MR
Mining Right for Oogiesfontein	Xstrata Coal SA January 2009	20 April 2010 Ref: MP 30/5/1/2/2/343 MR
Oogiesfontein EMPr	Xstrata Coal SA August 2009	Ref: MP 30/5/1/2/2/(343) EM
Amendment to Goedgevonden Colliery EMP Consolidation of GGV & OFT EMPs	GOSA April 2015	10 February 2016 MP 30/5/1/2/3/2/1/(169) EM
S102 – Inclusion of 343MR & 168MR into 169MR Converted right for GGV Complex	GOSA	6 September 2018 Ref: MP 30/5/1/2/2/169 MR
S102 – Abandon of Portion 4 of Oogiesfontein 4 IS	GOSA 24 March 2020	Pending approval Ref: MP 00127/102

GGV is essentially an opencast mine, mining seam 2, seam 4 and seam 5 coal on portions of the farms Goedgevonden 10 IS, Zaaiwater 11 IS and Kleinzuikerboschplaats 5 IS. Underground mining was approved on portions of the farm Grootpan 7 IS which is still to be developed. Recent optimisation of the mineral resource within the Mining Right area (MRA) resulted in a change to the mining schedule with the introduction of additional mining areas previously excluded from the mine plan.

The 2016 approved EMPr includes the re-alignment of provincial Road P53-1 which links Road R555 and Road 545 on the south-eastern side of Ogies. Environmental Authorisation for the re-alignment of Road P53-1 was granted by the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA) on 8 September 2015 (Ref No 17/2/3N-273). The re-alignment of Road P53-1 has recently been optimised to improve traffic safety in respect of the curvature back into the existing road, as well as to effect minimum impact on coal reserves.

To facilitate the proposed mining and infrastructure changes at GGV, it is necessary to amend the approved Environmental Authorisation (EA) and EMPr in terms of the 2014 Environment Impact Assessment (EIA) Regulations promulgated in Government Notice No. R. 982-986 of 4 December 2014 in terms of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998), as amended, to:

- Introduce limited additional mining areas (underground) that have now become economically viable
- Change the mining methodology in certain areas, from opencast to underground
- Include some limited additional infrastructure requirements for the underground mining
- Slightly revise the re-alignment of P53-1

In addition to the proposed mining and infrastructural changes at GGV, GOSA is currently in negotiation with third parties in respect of the reduction and/or extension of the GGV MRA in terms

of section 102 of the Mineral and Petroleum Resources Development Act (MPRDA), 2002 (Act 28 of 2002), as follow:

- An application was submitted on 24 March 2020 to abandon the remaining extent of portion 4 of Oogiesfontein 4 IS from our GGV MR in favour of South32 SA Coal Holdings (Pty) Ltd (now Seriti Resources). South32 simultaneously lodged an application in terms of section 102 on 25 March 2020 to incorporate the said land into its adjacent right 125 MR. Both these applications remain pending.
- GOSA is in the process of negotiating a sale agreement with Mshengu Mining to buy 11790 PR from them. Once the agreement is concluded, a section 11 application to cede the PR to GOSA, together with a simultaneous application in terms of section 102 to incorporate the area into GOSA's GGV MRA will be submitted.
- A Portion of Kleinzuikerboschplaats 5 IS forms part of GOSA's GGV MR. It is contemplated that this area will be abandoned in favour of Thungela Resources and/or Seriti Resources. Negotiations are currently taking place and the necessary section 102 applications will be submitted in due course.

The reduction/extension areas are indicated in Figure 3.

Although no new (physical) listed activities are triggered by the proposed changes and/or additions to the mining and infrastructure plan, the ***amendment or variation to a right or permit in terms of section 102 of the MPRDA*** (Listing Notice 1, Activity 21D inserted by regulation 27(j) of GN 517 dated 11 June 2021) triggers a Basic Assessment process contemplated in regulation 19 to regulation 20 of the 2014 EIA Regulations.

GOSA appointed Jacana Environmentals cc (Jacana) to apply for the said amendment to the EA and to act as the independent Environmental Assessment Practitioner (EAP).

This document serves as the **Final Basic Assessment Report** (BAR) following a 30-day commenting period by registered Interested and Affected Parties (IAPs) and Commenting Authorities on the draft BAR, from **11 August to 12 September 2022**.

1.2 ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

Independent EAP	Jacana Environmentals cc
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Professional Affiliation	Registered Environmental Assessment Practitioner at the Environmental Assessment Practitioners Association of South Africa (EAPASA) – Number 2020/1800 Registered as a Professional Environmental Scientist (Pr.Sci.Nat.) at the South African Council for Natural Scientific Professions – Registration No. 400090/02 Member of the Land Rehabilitation Society of Southern Africa (LaRSSA): Membership ID 30835
Abbreviated Curriculum Vitae	Marietjie Eksteen is the Managing Member of the consulting firm Jacana Enviromentals cc, an environmental consulting firm based in Polokwane. She is an environmental scientist with more than 30 years' experience, her main fields of expertise being water quality management, mine water management, environmental legal compliance, and project management. She obtained a Masters' degree in Exploration Geophysics (MSc) from the University of Pretoria in 1993. Since establishing Jacana Enviromentals in 2006, she has been involved in a variety of mine- and industry-related environmental projects serving clients such as MC Mining Limited, South32 SA Coal Holdings, Glencore Operations South Africa, Consol Glass and Silicon Smelters, amongst others. Prior to 2006 she was employed by Pulles Howard & De Lange Inc as an environmental consultant for 2 years. Before consulting, Ms. Eksteen was employed by BHP Billiton as a mine environmental manager at their operations in Mpumalanga, as well as the Department of Water Affairs where she was appointed as a water quality specialist for the mining industry. Her career started off as a geophysicist at Genmin in 1990.

2 PROPERTY DESCRIPTION

2.1 PROJECT LOCATION

GGV is located approximately 50 km south-west of eMalahleni, and 38 km east of Delmas. The town of Ogies is situated directly north of GGV. It falls in the eMalahleni Local Municipality of the Nkangala District Municipality, Mpumalanga Province.

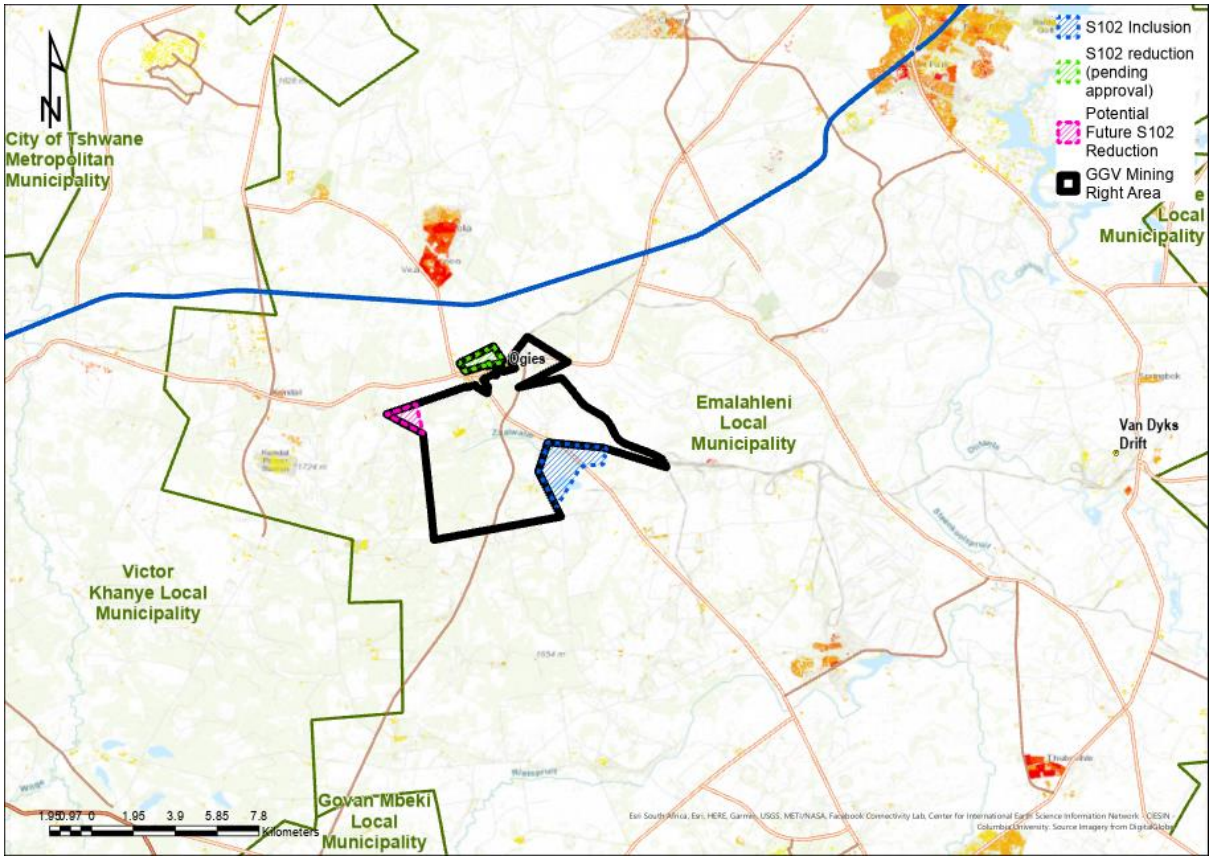


Figure 2: Locality Map

GGV is situated in a mostly rural community setting with a mixed land use including agricultural activities (mainly maize production), residential areas and various coal mining operations in the surrounding area. The GGV operation is in the Zaaiwaterspruit catchment, which forms part of the Olifants River catchment upstream of the Witbank Dam.

There are several roads servicing the area:

- Road P29-1 (Route R555). The road is aligned in an east-west direction through Ogies.
- Road P52-3 (Route R545). This route links south-eastwards from Ogies to Bethal.
- Road P53-1 links Road P29-1 to Road P52-3 on the south-eastern side of Ogies.
- Road D1955 (Route R545). This route links northwards from Road P29-1 to the N12 Freeway and the town of Phola.
- National Road N12 is aligned in an east to west direction to the north of Ogies.

There are several railway lines in proximity to GGV. The Witbank-Blackhill-Minnaar-Ogies-Kendal railway line is aligned in an east-west direction through Ogies. This line branches southwards just east of Ogies to Saaiwater Station. The latter railway line presently carries 36 trains per day. The Witbank-Ogies line carries 20 trains per day. There are also a few industrial spur lines to various mines in the area, one of which is to GGV.

2.2 SURFACE OWNERSHIP

The existing GGV MRA comprises an area of 4 683.9272 hectares (Table 2). In addition, associated infrastructure is situated on adjacent land comprising 1 862.1504 hectares (Table 3), which is owned by GOSA. The total extent of the GGV operations equals 6 546.0776 hectares.

It is noted that GOSA has applied for the abandonment of a portion of its MRA to South32 SA Coal Holdings (Pty) Ltd (now Seriti Resources), in respect of Remaining Extent (RE) of Portion 4 of the farm Oogiesfontein 4 IS in 2020 in terms of S102 of the MPRDA. Approval of this application is pending; hence this portion is still included in the MRA as indicated in Figure 3.

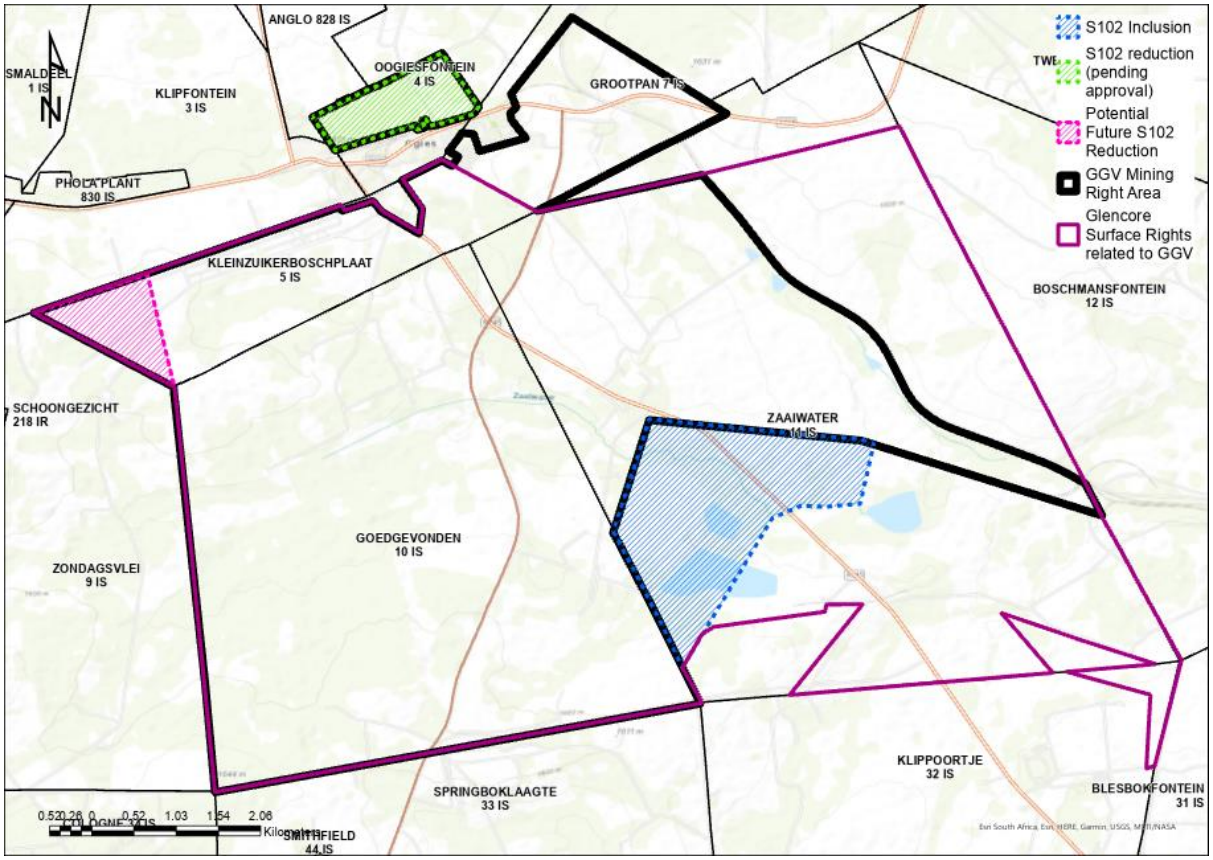


Figure 3: GGV operational area

Table 2: Surface ownership for the GGV MRA

Property	Ptn	Registered Landowner	Title Deed nr	Size (ha)
Goedgevonden 10 IS	RE	Glencore Operations (Pty) Ltd	T14199/2014	334.0457
Goedgevonden 10 IS	RE 1	Glencore Operations South Africa (Pty) Ltd	T9057/2013	275.9915
Goedgevonden 10 IS	RE of Ptn 2 (Ptn of Ptn 1)	Glencore Operations (Pty) Ltd	T3707/2014	339.777

Property	Ptn	Registered Landowner	Title Deed nr	Size (ha)
Goedgevonden 10 IS	RE of Ptn 3	Glencore Operations South Africa (Pty) Ltd	T4219/2009	35.7486
Goedgevonden 10 IS	Ptn 4	Glencore Operations (Pty) Ltd	T3707/2014	716.6175
Goedgevonden 10 IS	RE of Ptn 5	Glencore Operations South Africa (Pty) Ltd	T4219/2009	19.2653
Goedgevonden 10 IS	Ptn 6 (Ptn of Ptn 5)	Glencore Operations (Pty) Ltd	T7750/2014	170.8733
Goedgevonden 10 IS	Ptn 7	Glencore Operations South Africa (Pty) Ltd	T11895/2010	2.3197
Goedgevonden 10 IS	RE of Ptn 8 (Ptn of Ptn 3)	Glencore Operations South Africa (Pty) Ltd	T4219/2009	54.7821
Goedgevonden 10 IS	RE of Ptn 11 (Ptn of Ptn 3)	Glencore Operations South Africa (Pty) Ltd	T4219/2009	46.5563
Goedgevonden 10 IS	Ptn 12	Glencore Operations (Pty) Ltd	T3707/2014	42.8255
Goedgevonden 10 IS	RE of Ptn 13 (Ptn of Ptn 3)	Glencore Operations South Africa (Pty) Ltd	T4219/2009	24.1091
Goedgevonden 10 IS	Ptn 14 (Ptn of Ptn 8)	Glencore Operations South Africa (Pty) Ltd	T4219/2009	57.1017
Goedgevonden 10 IS	Ptn 15	Glencore Operations South Africa (Pty) Ltd	T4219/2009	57.1017
Goedgevonden 10 IS	RE of Ptn 16 (Ptn of Ptn 3)	Glencore Operations South Africa (Pty) Ltd	T4219/2009	64.0445
Goedgevonden 10 IS	Ptn 17	TVL Board for development of peri-urban areas	T366366/1971	4.2827
Goedgevonden 10 IS	Ptn 18	Ogies Muslim Jamaat	T95815/1995	0.4331
Goedgevonden 10 IS	Ptn 24	Glencore Operations (Pty) Ltd	T3707/2014	210
Goedgevonden 10 IS	Ptn 25	Mayet Ismail	T113452/2002	0.6783
Zaaiwater 11 IS	RE of Ptn 4	Glencore Operations South Africa (Pty) Ltd	T9057/2013	1102.0323
Zaaiwater 11 IS	Ptn of RE	Glencore Operations South Africa (Pty) Ltd	T9057/2013	169.10
Kleinzuikerboschplaats 5 IS	RE	Glencore Operations (Pty) Ltd	T7750/2014	528.5919
Grootpan 7IS	RE of Ptn 1	Ogies Township Co (Pty) Ltd	T36789/2004	3.806
Grootpan 7IS	Ptn 14	Marthinus Janse Potgieter	T941/2009	2.5696
Grootpan 7IS	Ptn 16	Delphitorque cc	T7183/2019	1.3242
Grootpan 7IS	Ptn 17	Emalahleni Local Municipality	T13805/2012	115.937
Grootpan 7IS	Ptn 18	Mohamed Mayet	T2839/2010	2.0771
Grootpan 7IS	Ptn 19	Holiness Union Mission	T22964/1956	0.8565
Grootpan 7IS	Ptn 23	Provincial Government of Mpumalanga	T10622/1951	0.4283
Grootpan 7IS	Ptn 28	Ogies Township Co (Pty) Ltd	T18178/1963	8.6301
Grootpan 7IS	Ptn 35	Provincial Government of Mpumalanga	T7354/2013	8.6441
Grootpan 7IS	Ptn 38	Transnet Ltd	T3624/1982	13.8056
Grootpan 7IS	Ptn 39	Gilbert P.V. de Cort	T26866/1989	5.0881
Grootpan 7IS	Ptn 40	Transnet Ltd	T85134/1995	0.4105
Grootpan 7IS	Ptn 41	Transnet Ltd	T85134/1995	0.0397
Grootpan 7IS	Ptn 42	Transnet Ltd	T85134/1995	2.9958
Grootpan 7IS	Ptn 46	Ou Apostoliese Kerk van Afrika	T93177/1996	0.3889
Grootpan 7IS	Ptn 48	Transnet Ltd	T10343/1983	1.9881
Grootpan 7IS	Ptn 51	Masakhane Mining Supply & Construction cc	T5726/2013	154.316
Oogiesfontein 4 IS[#]	RE of Ptn 4	South32 Coal Holdings (Pty) Ltd	T14931/2018	104.3438
			TOTAL	**4 683.9272**

[#] Pending S102 application for abandonment to South32 SA Coal Holdings (Pty) Ltd (now Seriti Resources).

Table 3: Surface ownership for the GGV operational area outside the MRA

Property	Ptn	Registered Landowner	Title Deed nr	Size (ha)
Zaaiwater 11 IS	Ptn of RE	Glencore Operations South Africa (Pty) Ltd	T9057/2013	521.2408
Zaaiwater 11 IS	Ptn 3	Glencore Operations (Pty) Ltd	T3707/2014	225.7063
Zaaiwater 11 IS	Ptn 6	Glencore Operations (Pty) Ltd	T3707/2014	57.1021
Zaaiwater 11 IS	Ptn 7	Glencore Operations (Pty) Ltd	T14199/2014	85.6557
Zaaiwater 11 IS	Ptn 10	Glencore Operations (Pty) Ltd	T3707/2014	164.0316
Zaaiwater 11 IS	Ptn 13	Glencore Operations (Pty) Ltd	T3707/2014	0.4282
Zaaiwater 11 IS	Ptn 16	Glencore Operations (Pty) Ltd	T14199/2014	57.1032
Zaaiwater 11 IS	Ptn 17	Glencore Operations (Pty) Ltd	T3707/2014	57.1011
Zaaiwater 11 IS	Ptn 18	Glencore Operations (Pty) Ltd	T3707/2014	85.6521
Zaaiwater 11 IS	Ptn 19	Glencore Operations (Pty) Ltd	T3707/2014	85.6519
Zaaiwater 11 IS	Ptn 27	Glencore Operations (Pty) Ltd	T3707/2014	171.6163
Zaaiwater 11 IS	Ptn 23	Glencore Operations South Africa (Pty) Ltd	T91757/2007	180.2840
Zaaiwater 11 IS	Ptn 31	Glencore Operations South Africa (Pty) Ltd	T15891/2015	127.7505
Klippoortje 32 IS	Ptn 21	Glencore Operations (Pty) Ltd	T14199/2014	42.8266
			TOTAL	**1862.1504**

The surface ownership associated with the two re-alignment options discussed in this report is provided in Table 4 and shown in Figure 4.

Table 4: Landownership associated with the existing and proposed re-alignment options

Property	Ptn	Landowner	Title Deed	Size
Goedgevonden 10 IS	Ptn 1 (RE)	Glencore Operations SA (Pty) Ltd	T9057/2013	275.9915
Zaaiwater 11 IS	RE of Ptn 4	Glencore Operations SA (Pty) Ltd	T113453/02	1102.0323
Kleinzuikerboschplaats 5 IS	RE	Glencore Operations SA (Pty) Ltd	T7750/2014	528.5919
Grootpan 7 IS[#]	Ptn 51	MMS Masakhane Mining Supply & Construction	T5726/2013	154.316

[#]Note: Only the existing (approved) re-alignment encroaches onto the farm Grootpan 7 IS. The proposed (revised) re-alignment is wholly situated within properties belonging to GOSA.

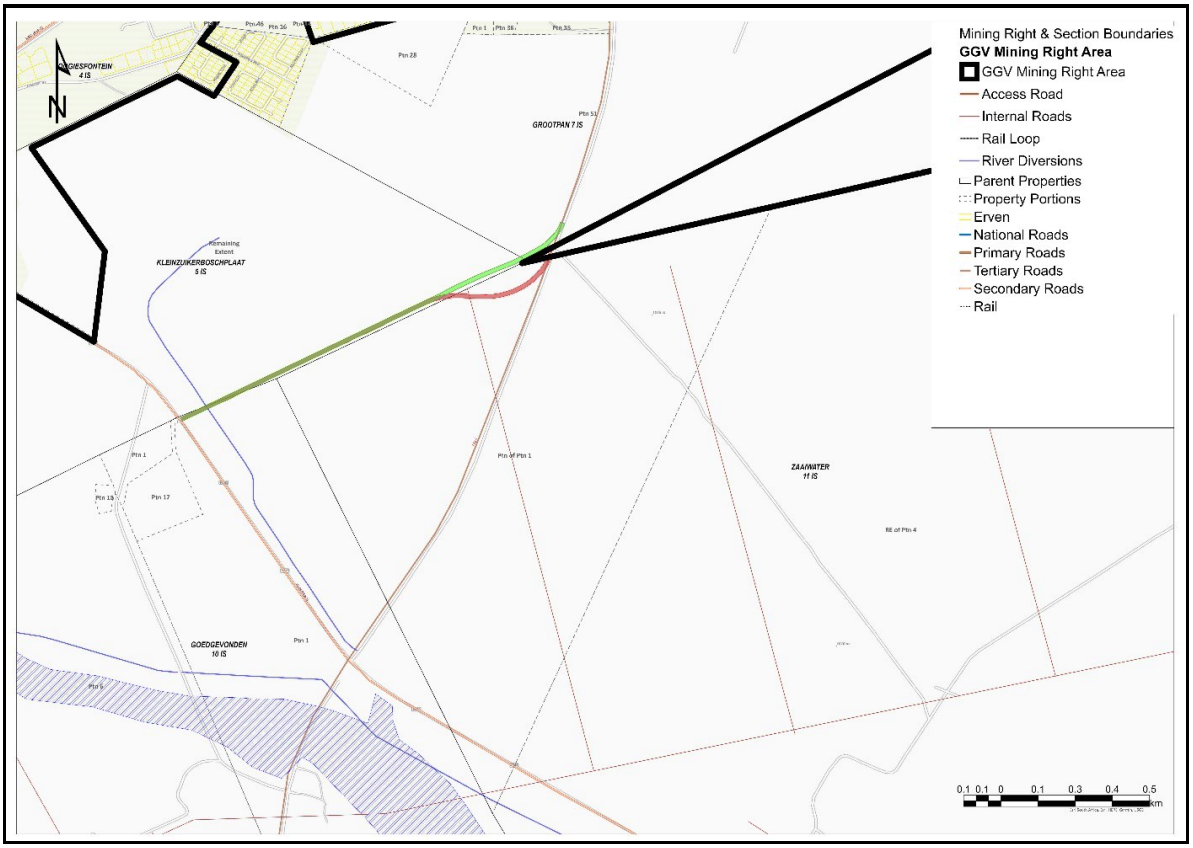


Figure 4: Landownership associated with the existing and proposed re-alignment options

The surface ownership associated with the section 102 inclusion of certain portions into the MRA is listed in Table 5 and shown in Figure 3.

Table 5: Landownership associated with the area to be included in the MRA (S102)

Property	Ptn	Landowner	Title Deed	Size
Zaaiwater 11 IS	Ptn 6	Glencore Operations (Pty) Ltd	T3707/2014	57.1021
Zaaiwater 11 IS	Ptn 7	Glencore Operations (Pty) Ltd	T14199/2014	85.6557
Zaaiwater 11 IS	Ptn 16	Glencore Operations (Pty) Ltd	T14199/2014	57.1032
Zaaiwater 11 IS	Ptn 17	Glencore Operations (Pty) Ltd	T3707/2014	57.1011
Zaaiwater 11 IS	Ptn 18	Glencore Operations (Pty) Ltd	T3707/2014	85.6521
Zaaiwater 11 IS	Ptn 19	Glencore Operations (Pty) Ltd	T3707/2014	85.6519

Three servitudes are registered in and adjacent to the GGV MRA (Figure 5):

- Thungela Resources Limited: overland conveyor along the western boundary of the MRA.
- Sasol Limited: oil pipeline to the south-east and east of the MRA.
- Eskom: overhead high-voltage transmission lines

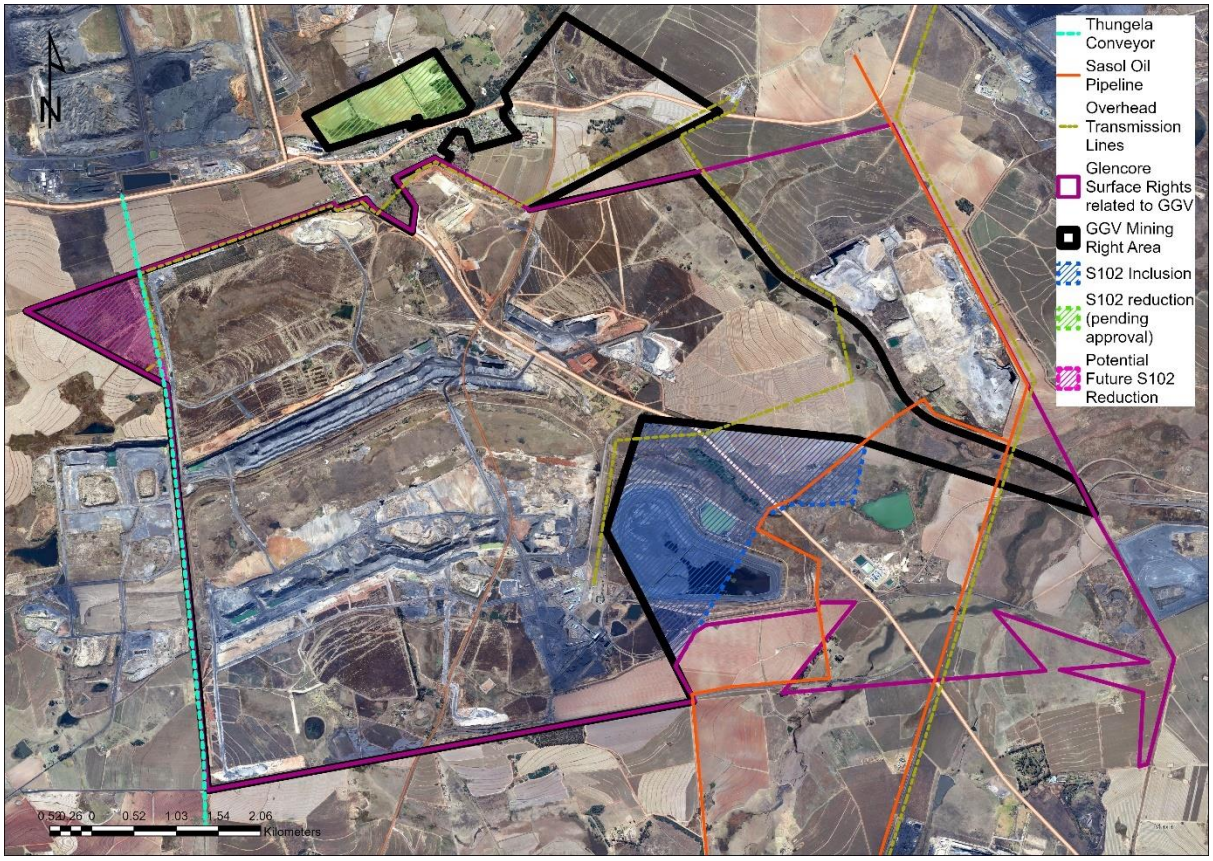


Figure 5: Registered servitudes within and adjacent to the GGV MRA

2.3 LAND CLAIMANTS

According to the GOSA Legal Department no land claims have been lodged in the GGV MRA.

2.4 COMMUNITY DESCRIPTION

The host and neighbouring communities are indicated in Figure 6, and include:

- ***Phola / Ogies Community***: The Phola/Ogies community is situated directly north of the GGV Section and is a current labour sending area for the GGV Complex. GGV is also currently implementing Social and Labour Plan (SLP) projects in these communities.
- ***Madrassah (Muslim) Community***: The Madrassah Community is located centrally to GGV. It consists of a Mosque and approximately 4-5 families. The land where this community resides is owned by Ishmael Mayet and Ogies Muslim Jamaat (Portions 18 & 25 of Goedgevonden 10 IS).
- ***Springboklaagte Community***: Consists of 13 households located to the south of the GGV MRA. Households are mostly extended families with 6 to 8 members per family, indicating a population of 78 to 104 people. The community is organised, has representatives and are currently engaging with GGV.

- ***New Goedgevonden Community***: Consists of 6 households that was resettled from the original Goedgevonden Village that was situated on Portion 35 of the farm Zaaiwater 11 IS prior to mining. The remainder of the approximately 23 households were resettled to Phola.
- ***Mafufela Community***: Consists of 2 households situated on Portion 23 of Zaaiwater 11 IS, just to the south of the Mine Residue Facility on land that belongs to GOSA. This community has indicated that they do not want to be resettled.

Current issues prevalent amongst the stakeholders are associated with empowerment and benefit strategies focused on local procurement, local employment processes, and community ownership in mining ventures.

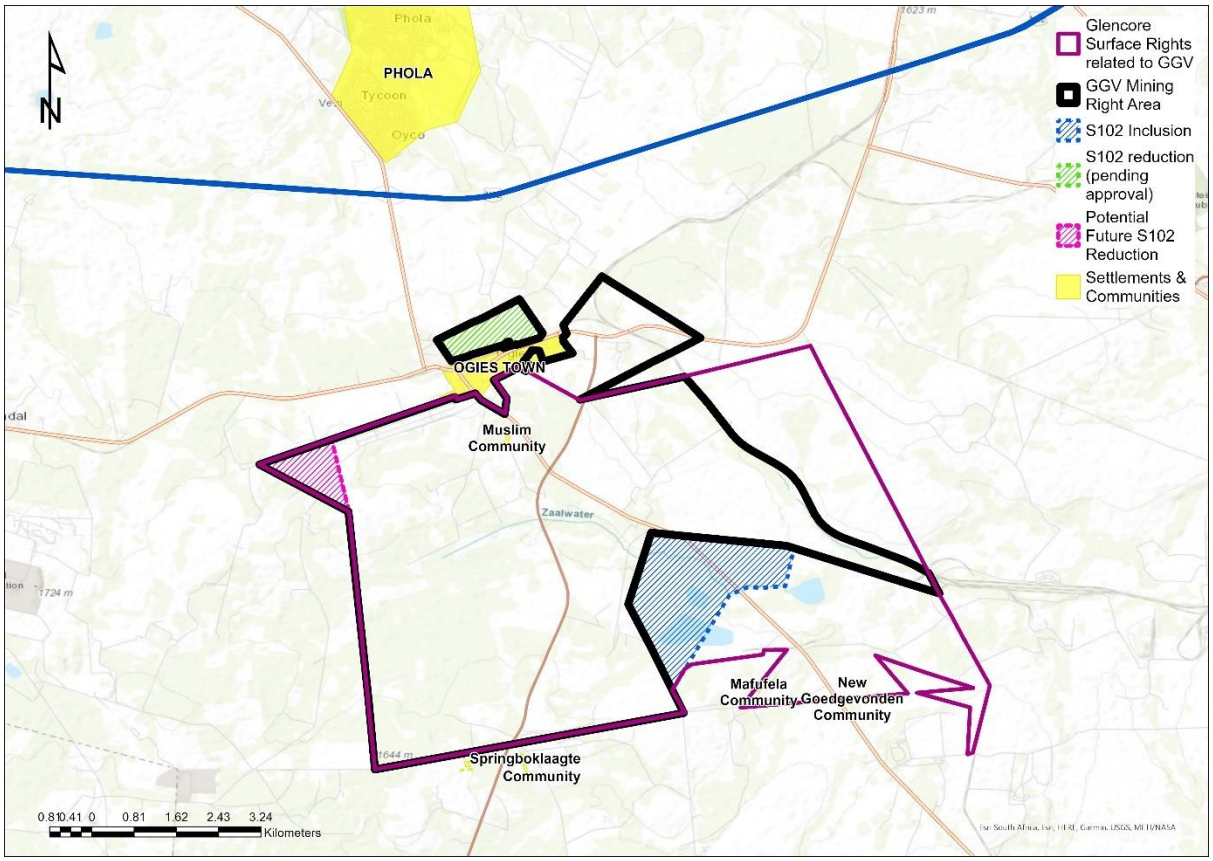


Figure 6: Host and Neighbouring Communities

3 PROJECT DESCRIPTION

3.1 APPROVED MINING AND INFRASTRUCTURE LAYOUT

GGV is essentially an opencast mine, mining seam 2, seam 4 and seam 5 coal on portions of the farms Goedgevonden 10 IS, Zaaiwater 11 IS and Kleinzuikerboschplaats 5 IS. Underground mining was approved on portions of the farm Grootpan 7 IS which is still to be developed. The approved LOM mining schedule (2016) for the mining operations on the farms Goedgevonden 10 IS, Zaaiwater 11 IS, Kleinzuikerboschplaats 5 IS and Grootpan 7 IS is indicated in Figure 7.

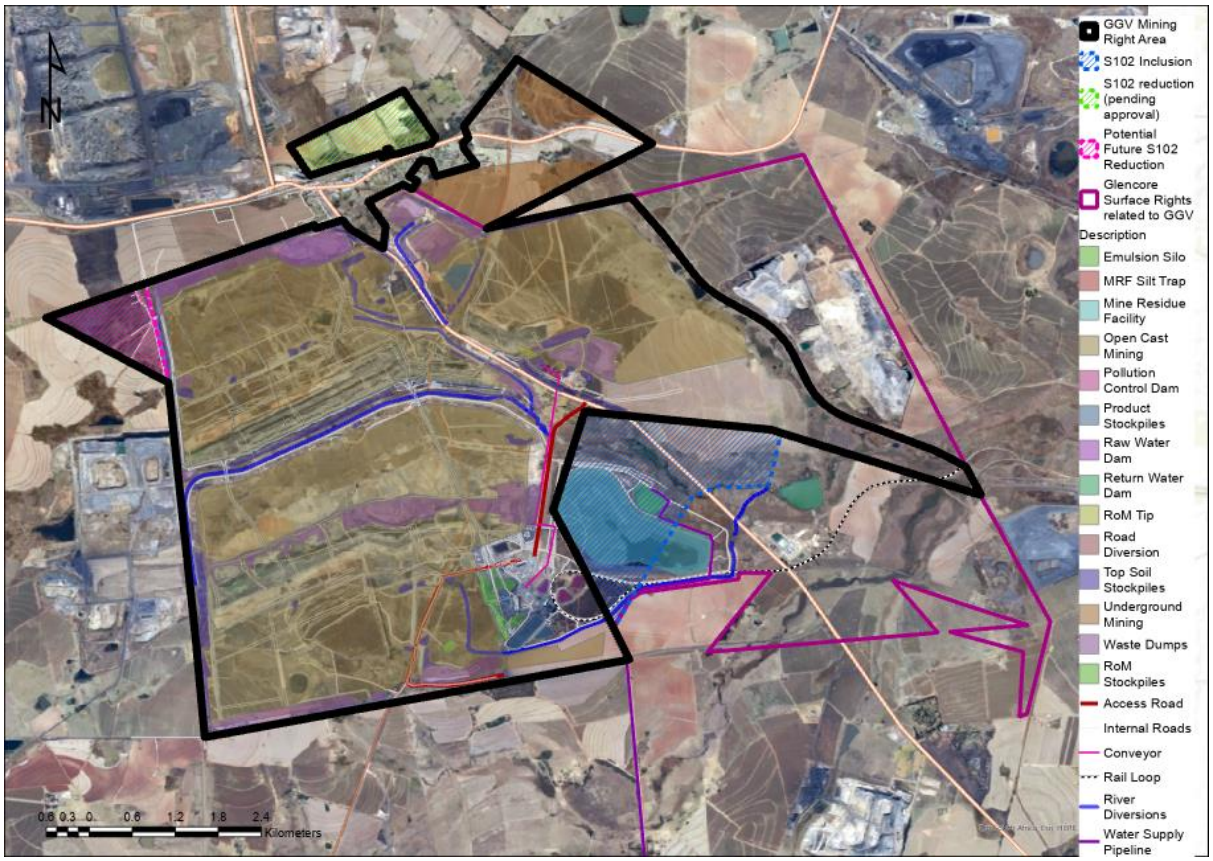


Figure 7: Approved LOM Mining Plan

Coal mined at GGV is beneficiated on site and the mine supplies coal both to Eskom for power generation and to the export market. GGV's existing mine infrastructure as approved includes (refer to Figure 8):

- Main GGV site established including existing formal controlled entrance to site from the provincial road R545.
- Coal Handling and Processing Plant (CHPP) and associated stockpiles (ROM and product).
- Supporting infrastructure for the CHPP and opencast mining operations.
- ROM Tips (Goedgevonden and Zaaiwater Sections) and crushing facilities.
- Overland conveyor from Zaaiwater Section.
- Mine Residue Facility (MRF).

- Sewage treatment plant.
- Potable water treatment plant.
- Offices, stores, and workshop areas with associated parking areas.
- Waste tyre storage area (existing and new).
- Emulsion silos (old and new).
- Underground equipment storage facility.
- Bulk hydrocarbons facilities.
- Hard Park area.
- Primary river diversion, comprising the Zaaiwaterspruit and Southern Tributary diversions.
- Secondary water management canals and pipeline systems.
- Dirty water management facilities: Western Stormwater Dam; Eastern Pollution Control Dam (PCD); Farm Dam; Raw Water Dam; MRF Return Water Dam.
- Settling dam facilities (silt traps) associated with the PCDs and MRF.
- Surface overburden and waste rock dumps.
- Topsoil dumps.
- On-site roads (tar and gravel which also allow access to the neighbouring farms).
- Powerlines that pass from east to west through the mining area.
- Rail load-out terminal (RLT) and rail loop.
- Product loading area (trucks).
- Water pipelines from Waterpan and South Witbank areas to the MRF.
- Dragline walkway.

The 2016 approved EMPr also includes the re-alignment of provincial Road P53-1 which links Road R555 and Road 545 on the south-eastern side of Ogies.

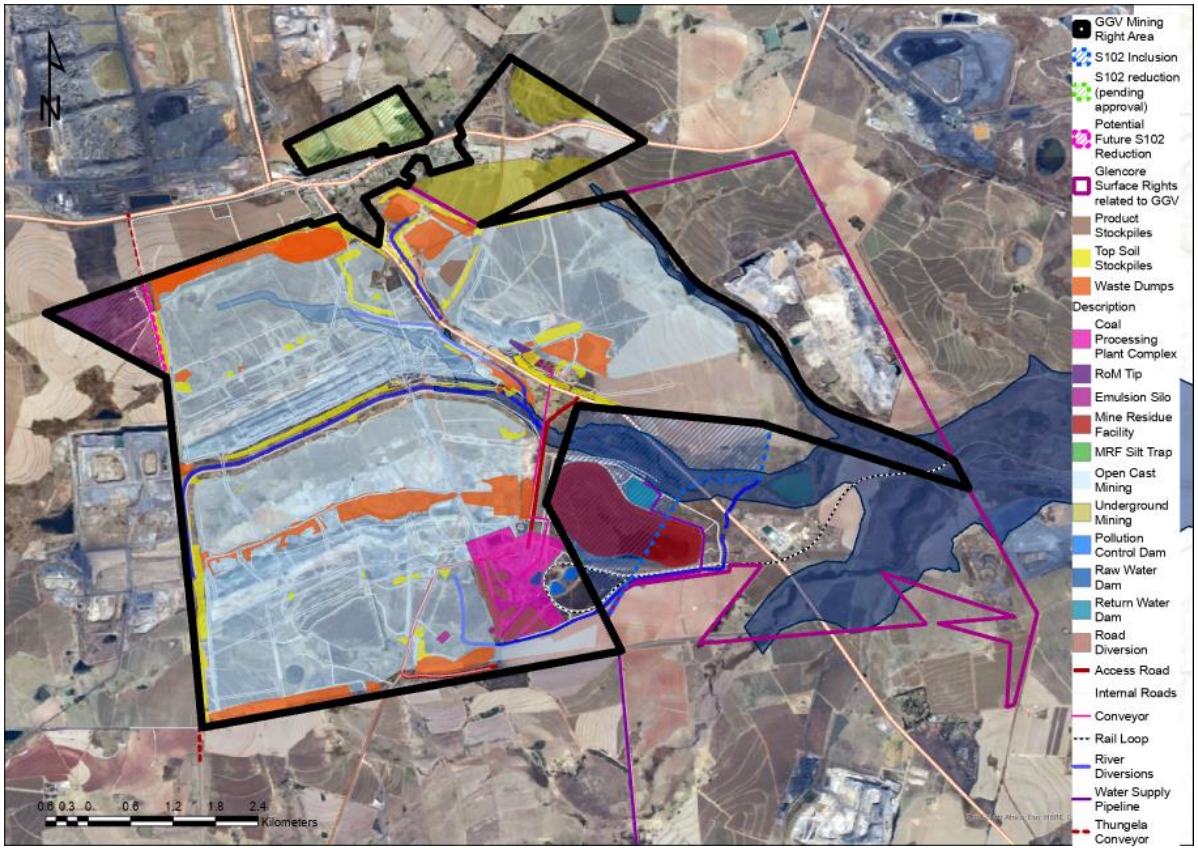


Figure 8: Existing mine infrastructure layout

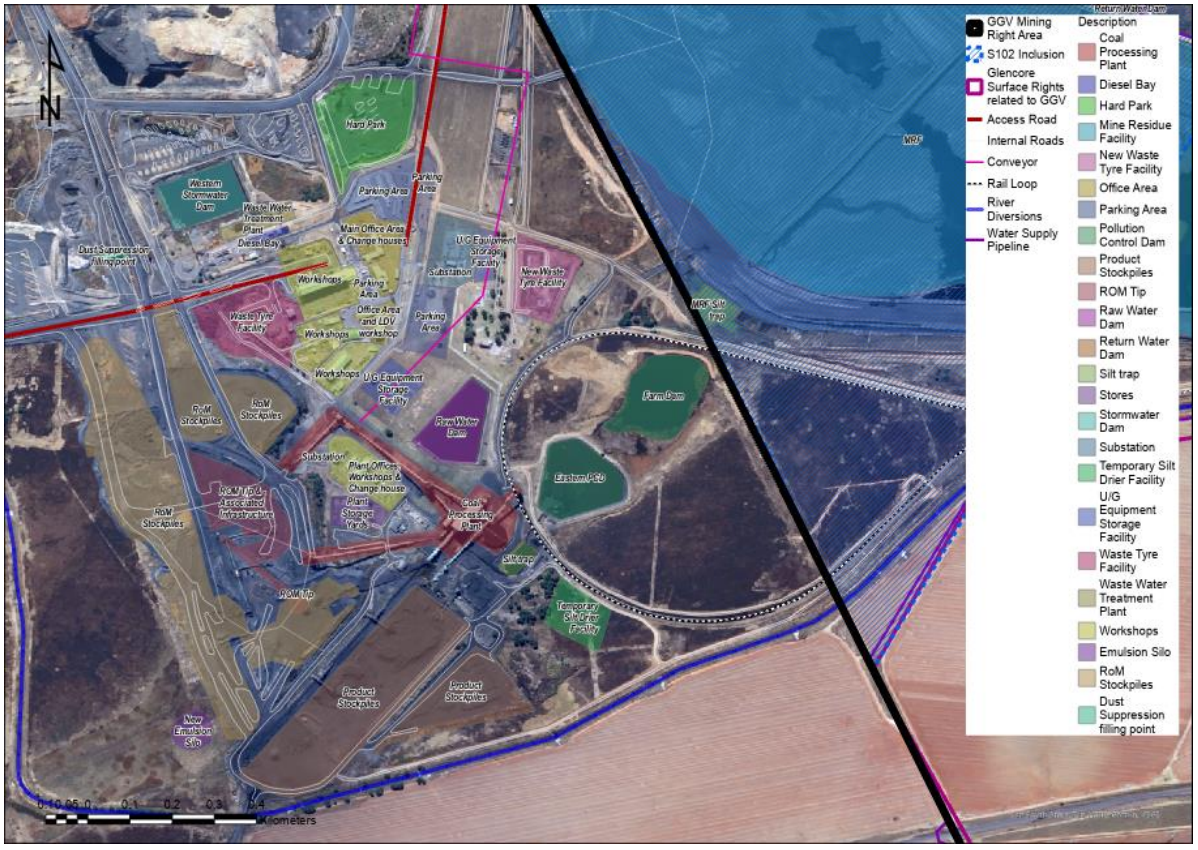


Figure 9: Processing plant infrastructure area

3.2 PROPOSED CHANGE OF SCOPE

3.2.1 Optimisation of Mineral Resource

Recent optimisation of the mineral resource within the MRA resulted in a change to the mining schedule with the introduction of additional mining areas previously excluded from the mine plan. The mining methodology in certain areas also changed from opencast to underground.

Figure 10 indicates the proposed underground mining areas associated with the revised LOM plan together with the infrastructure required to access the underground workings. Figure 11 indicates the revised LOM plan overlain on the approved (2016) mine plan.

The following main changes to the LOM schedule are depicted on Figure 11:

i. Additional underground areas have been included along the northern, western, and southern boundaries of the farm Goedgevonden 10 IS.
ii. The southwestern corner of the farm Goedgevonden 10 IS will now be mined via underground methods.
iii. A small portion situated to the south of the CHPP will be mined via underground methods, previously approved for opencast.
iv. A portion of the northern part of Goedgevonden 10 IS, associated with the old Ogies Underground Mine will now be mined underground instead of opencast.
v. The main Zaaiwaterspruit river diversion running through the centre of Goedgevonden 10 IS will be undermined.
vi. The eastern underground block on the farm Grootpan 7 IS has increased in size, whilst the southern underground block has decreased slightly.
vii. The unnamed tributary of the Zaaiwaterspruit on the eastern boundary of Zaaiwater 11 IS and its associated wetland system will be undermined.

Run of Mine (ROM) coal from the underground workings will be brought to surface via dedicated conveyors and stockpiled at the incline mouth. The ROM will be collected via truck and transported to the existing CHPP for processing, where the coal will be washed, classified, and stockpiled. The stockpiled coal will be transported by railway and road for domestic use and export.

The underground workings will be accessed through an incline shaft from the opencast highwall. The planned infrastructure at the incline area is shown in Figure 12 and includes:

- Offices, change houses, water treatment plant, PCD, workshops, substations, parking lots, wash bays, diesel tanks, weighbridge, stores yard and sewage plant.
- Conveyor systems for the No 2 and 4 seams with stockpile area.
- Stone dust silos.
- Underground fans.
- Concrete water reservoir.
- Stormwater trench and holding dam.

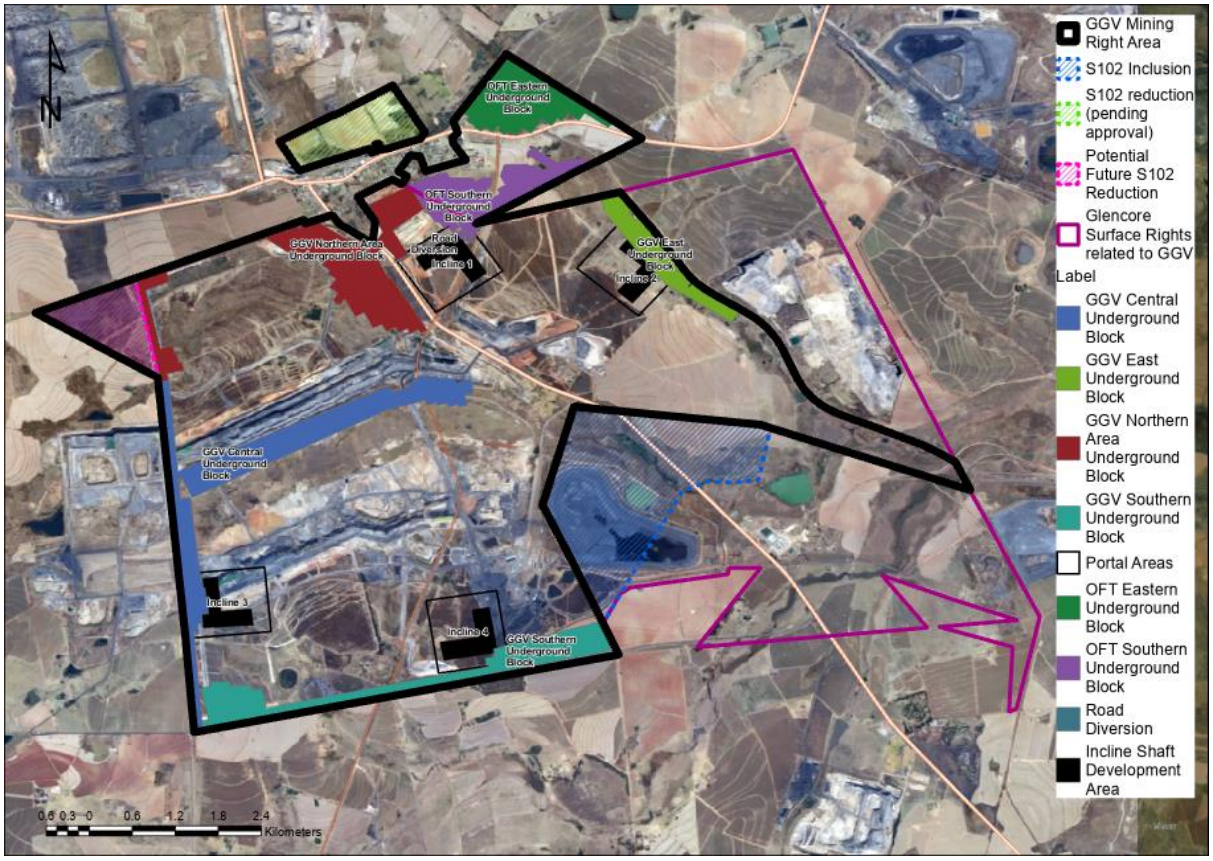


Figure 10: Underground mining areas and infrastructure

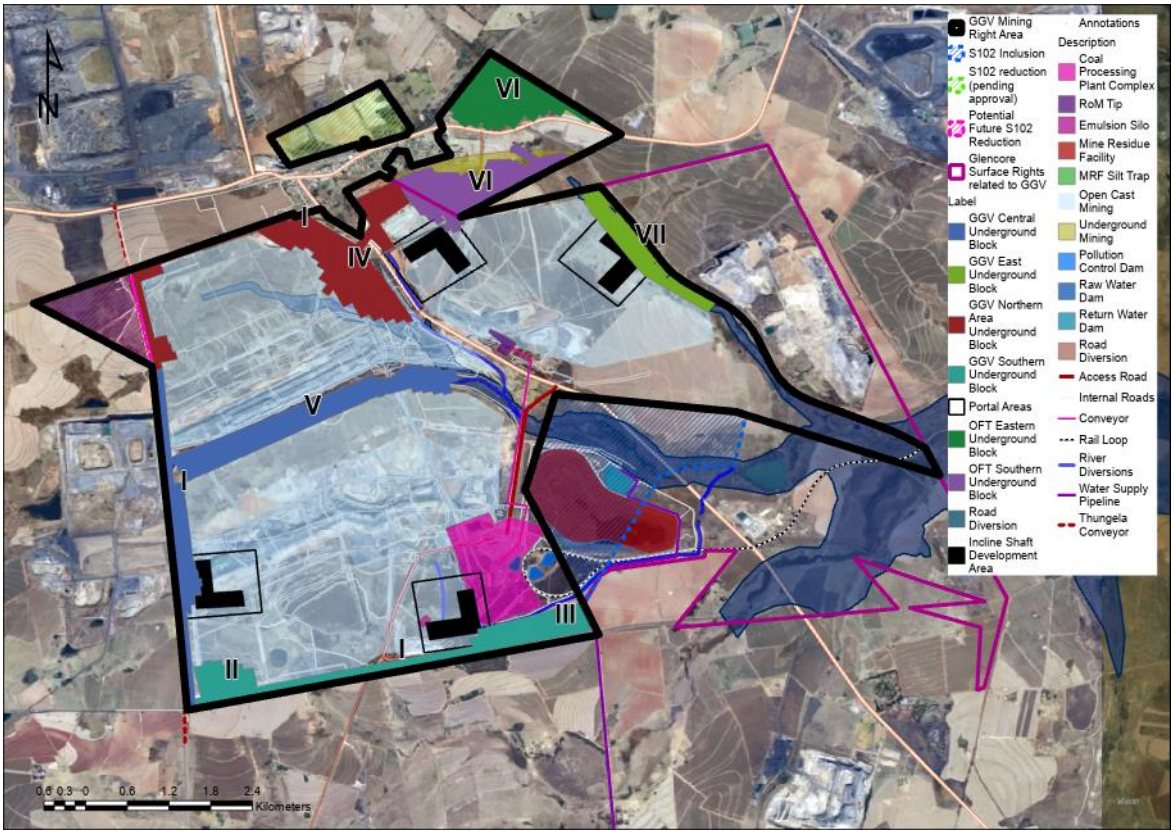


Figure 11: New LOM plan overlain on approved (2016) mine plan

Underground mining will only commence at a later stage and detail infrastructure layout plans will be developed at that time.

Figure 12: General layout of underground incline

3.2.1.1 List of Main Mining Actions, Activities or Processes

Below a summary of the main activities/processes at GGV, inclusive of the proposed changes, and their associated activities:

Opencast mining	• Mining Pits: North Pit; South Pit; Zaaiwater Pit. • Primary river diversions, comprising the Zaaiwaterspruit and Southern Tributary diversions. • Secondary stormwater management canals and pipeline systems. • In-pit water management: sumps and pumping systems. • Surface overburden and waste rock dumps. • Topsoil dumps/berms. • Supporting infrastructure. • Haul roads. • Dragline walkway.
Underground mining	• Portal area. • Incline shaft. • Supporting infrastructure: offices, change houses workshops, parking lots, wash bays, diesel tanks, weighbridge, stores yard and substations. • Access roads.

	• Conveyor systems for the No 2 and 4 seams. • ROM stockpile. • Stone dust silos. • Pumping systems. • U/G sumps/dam. • Sewage treatment plant. • Water tanks / concrete water reservoirs. • Underground fans. • Stormwater management: stormwater trench and holding dam (PCD).
Coal Handling and Processing Plant (CHPP) area	• Access road with controlled entrance to site from provincial road R545. • Main Coal Handling and Processing Plant (CHPP). • 5 seam CHPP/blending facility. • ROM Tip and crushing facilities. • Pillared ROM Tip. • Surge facility. • ROM stockpiles. • Product stockpiles. • Clean water storage tanks. • Mine Residue Facility (MRF). • Dirty water management facilities: Western Stormwater Dam; Eastern Pollution Control Dam (PCD); Farm Dam; Raw Water Dam; MRF Return Water Dam. • Settling dam facilities (silt traps) associated with the PCDs and MRF. • Silt traps / dirty water canals. • Sewage treatment plant. • Potable water treatment plant. • Supporting infrastructure: offices, stores, and workshop areas with associated parking areas. • Communication towers. • Wash-bay. • Waste tyre storage area. • Emulsion silos. • Hard Park area. • Underground equipment storage facility. • Bulk hydrocarbons facilities.
ROM Tip (Zaaiwater Section)	• ROM stockpile with PCD. • Crushing facilities. • Overland conveyor to CHPP. • Bridges (road/dragline walkway) and conveyor over the R545.
On-site conveyance of ROM & product	• On-site haul roads / service roads. • River crossings / culverts. • Overland conveyor from Zaaiwater Section.
Stockpiles, mine residue & waste management	• MRF and return water dam. • Surface overburden and waste rock dumps. • Topsoil stockpiles / berms. • Waste management (general / hazardous).

	• In-pit disposal of overburden, discard and slurry.
Off-site product transport	• Rail load-out terminal (RLT) and rail loop. • Product loading area (trucks). • Off-site truck transport. • River crossings / culverts.
Bulk services	• Water pipelines from Waterpan and South Witbank areas. • Dewatering of Ogies underground workings. • Powerlines that pass from east to west through the mining area.

3.2.1.2 Mining schedule

The remaining opencast mining is scheduled for the next 22 years until 2044 as indicated in Figure 13. Underground mining is scheduled over a period of 8 years, of which the commencement date is still to be determined. The 2 Lower and 4 Lower coal seams will be targeted through underground mining. The underground mining schedule is indicated in Figure 14 and Figure 15 for the 2L and 4L seams respectively.

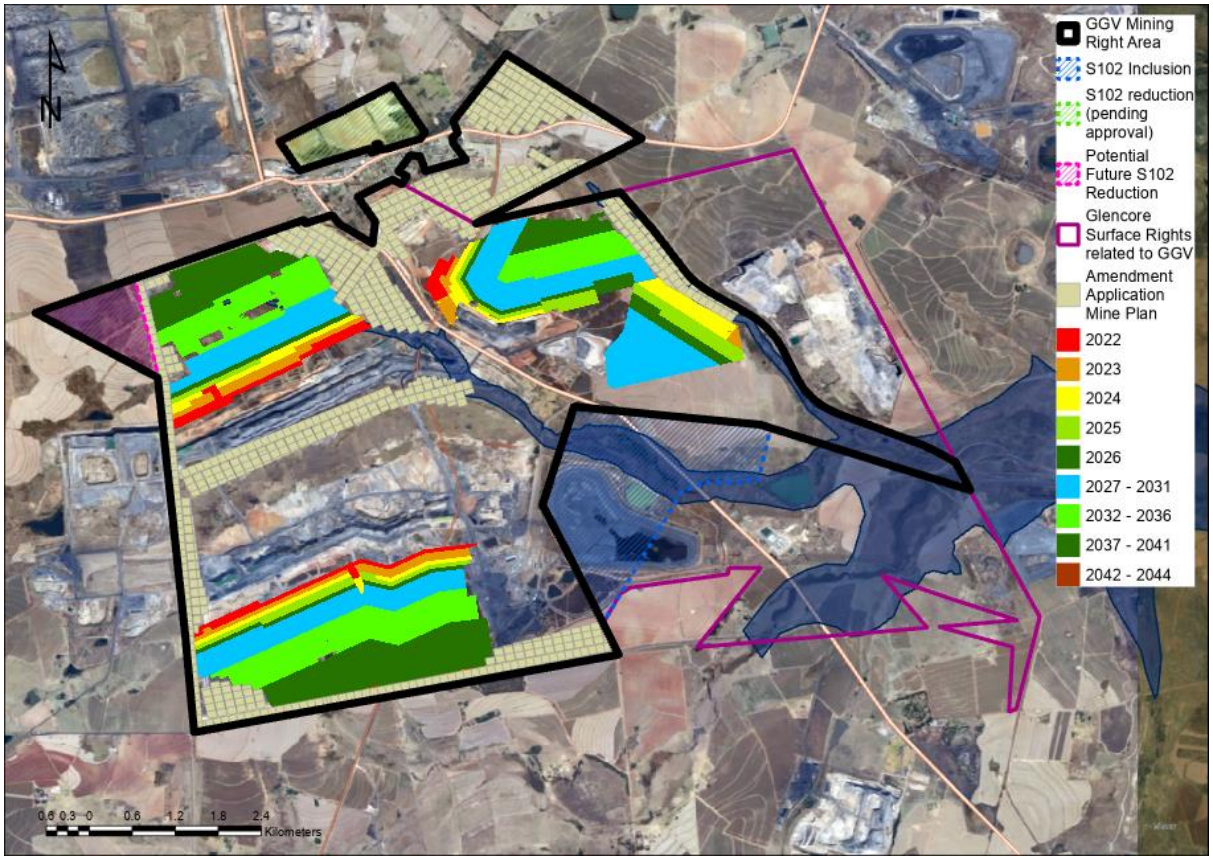


Figure 13: Opencast mining schedule

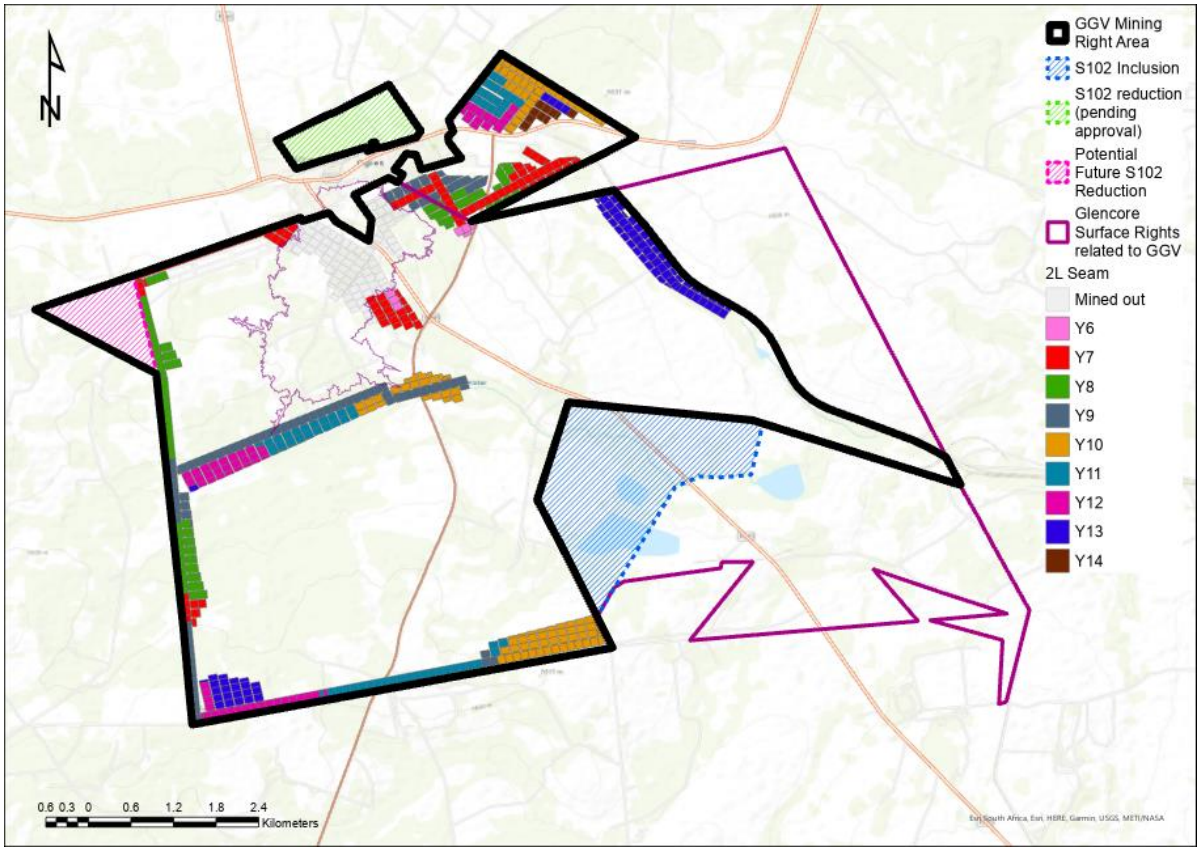


Figure 14: Underground mining schedule for the 2L seam

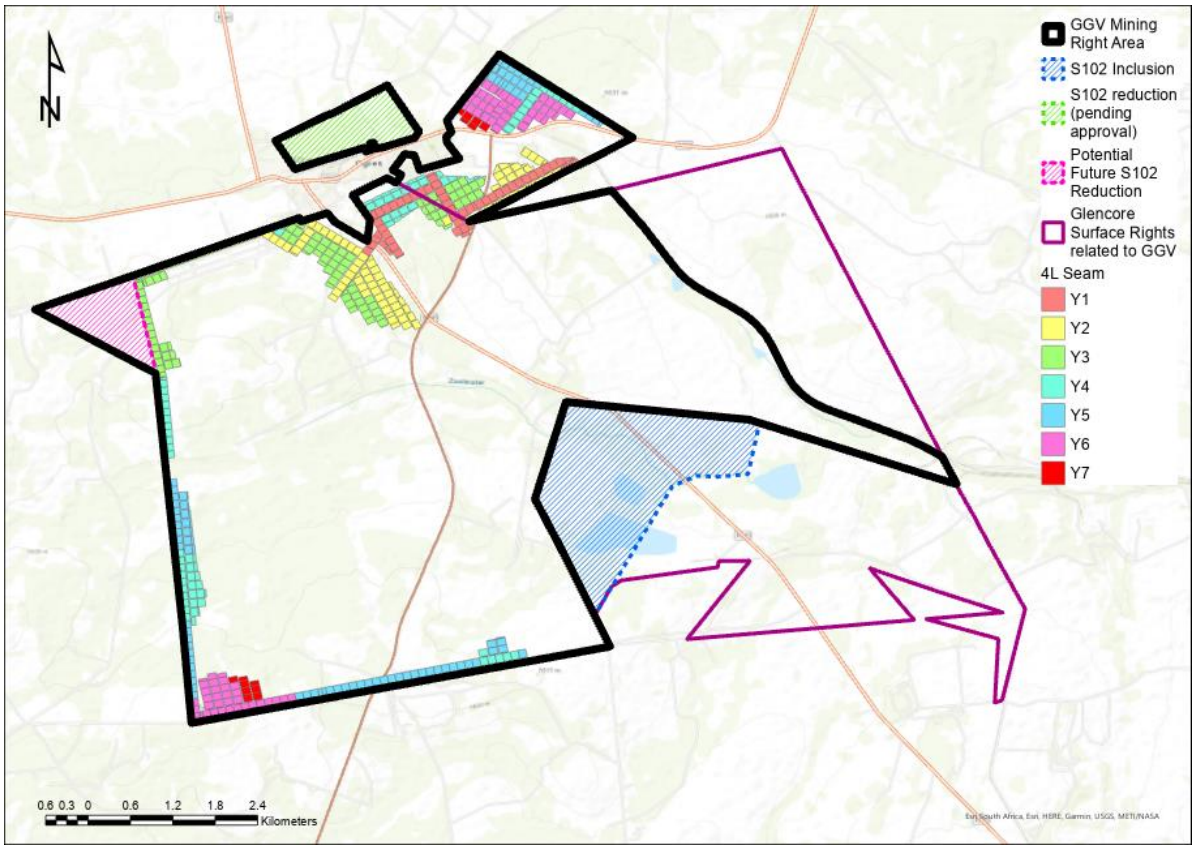


Figure 15: Underground mining schedule for the 4L seam

3.2.2 Re-alignment of Road P53-1

3.2.2.1 Existing (approved) re-alignment

The re-alignment of Road P53-1 as approved within the 2015 Environmental Authorisation and the 2016 EMPr is shown as the green line in Figure 16. The route encroaches on the farm Grootpan 7 IS, which is privately owned.

A Traffic Impact Assessment (TIA) was conducted by Avzcons Civil Engineering Consultants (Avzcons) in May 2014 to determine the preferred re-alignment at the time. The study concluded that from a geometric and traffic point of view Alternative 2 (approved re-alignment), that runs along the north-western boundary of the farm Zaaiwater 11 IS, is the preferred option as it is the shorter and more direct route.

The relevant detail of this approved re-alignment (2016) is as follows:

- Route length = 1.28 km.
- Position of the proposed intersection onto Road R545 is 1.4 km north of the existing intersection of P53-1 onto R545.
- The proposed intersection of P53-1 onto R545 satisfies both the required horizontal and vertical sight distances (Avzcons, 2014). Note that this position is similar for both the approved and revised re-alignment as indicated in Figure 16.

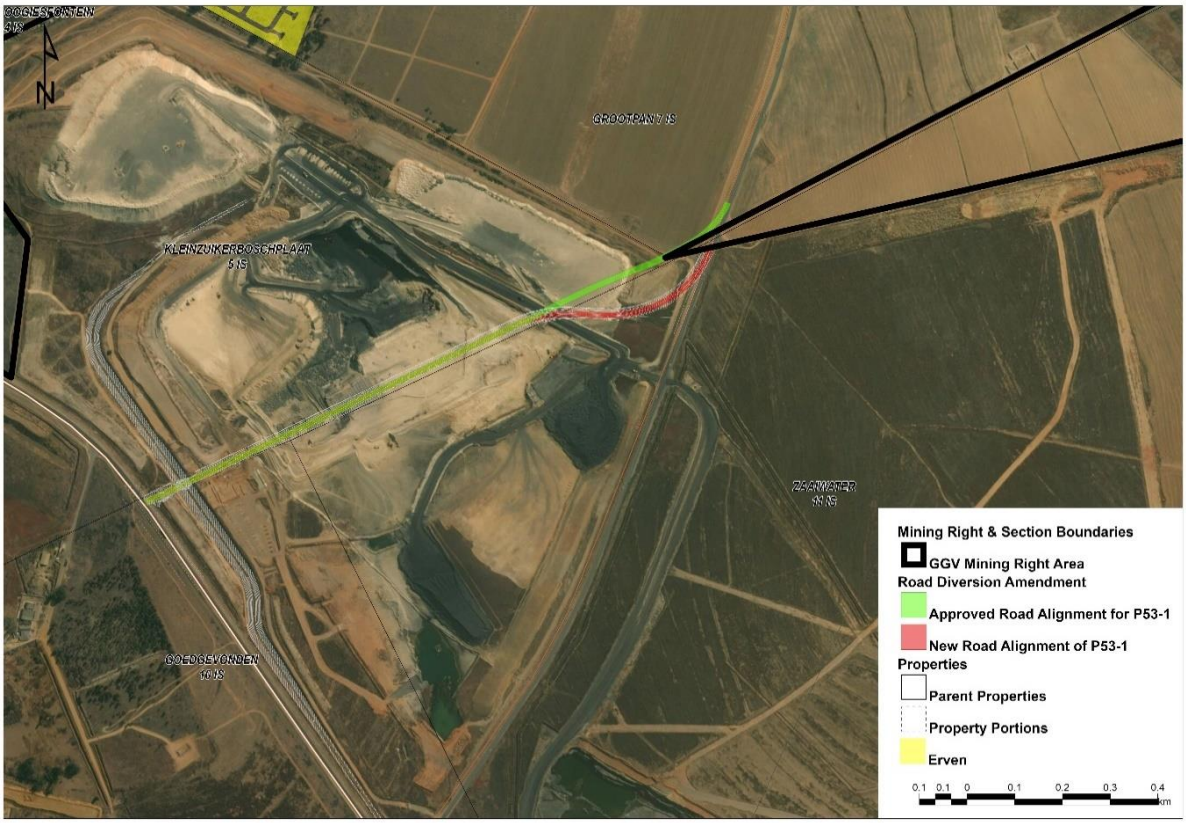


Figure 16: Existing and proposed options for re-alignment of P53-1

3.2.2.2 Proposed (revised) re-alignment

The proposed re-alignment of P53-1 is indicated as the red line in Figure 16.

The proposed re-alignment follows the approved re-alignment for the first 860 m from the Road R545 intersection. It then deviates east for approximately 390 m, to intersect with the current alignment of Road P53-1 approximately 105 m further south than the approved re-alignment.

The total length of the proposed (revised) re-alignment is 1.25 km vs original alignment length of 1.28 km. This is a deviation of less than 5% on the total road alignment.

The revised re-alignment of Road P53-1 has been optimised to improve traffic safety in respect of the curvature back into the existing road, as well as to effect minimum impact on coal reserves. In addition, the approved re-alignment (EMPr, 2016) extends outside of GOSA's property boundary, whilst the proposed re-alignment remains on GOSA property.

4 POLICY AND LEGISLATIVE CONTEXT

4.1 LEGAL FRAMEWORK FOR THE ENVIRONMENT

The legal frameworks within which the mining development and associated infrastructure aspects operate is complex and include many acts, associated regulations, standards, principle, guidelines, conventions and treaties on an international, national, provincial and local level. The main legal frameworks that require compliance in terms of Environmental Authorisation are:

- Act No. 28 of 2002: Mineral and Petroleum Resources Development Act (MPRDA), as amended
- Act No. 107 of 1998: National Environmental Management Act (NEMA), as amended
- Act No. 36 of 1998: National Water Act (NWA), as amended
- Act 59 of 2008: National Environmental Management: Waste Act (NEMWA), as amended

Other legislative frameworks applicable to the GGV Complex include:

- Act No. 108 of 1996: The Constitution of South Africa
- Act 25 of 2014: National Environmental Management Laws Amendment Act (NEMLAA)
- Act No. 25 of 1999: National Heritage Resources Act (NHRA)
- Act No. 10 of 2004: National Environmental Management: Biodiversity Act (NEMBA)
- Act No. 43 of 1983: Conservation of Agricultural Resources Act (CARA)
- Act No. 84 of 1998: National Forests Act (NFA)
- Act No. 39 of 2004: National Environmental Management: Air Quality Act (AQA)
- Act No. 57 of 2003: National Environmental Management: Protected Areas Act
- Act No. 101 of 1998: National Veld and Forest Fire Act
- Act No. 15 of 1973: Hazardous Substances Act
- Act No. 15 of 2019: Carbon Tax Act
- GN No. 704 of 4 June 1999: Regulation on use of water for mining and related activities aimed at the protection of water resources
- GN No. R.267 of 24 March 2017: Water Use Licence Application and Appeals Regulation
- GN No. R. 982-985 of 4 December 2014: NEMA: EIA Regulations, as amended
- GN No. 960 of 5 July 2019: Notice of the requirement to submit a report generated by the National Web-based Environmental Screening Tool
- GN No. 320 of 20 March 2020: Procedures for the assessment and minimum criteria for reporting on identified environmental themes when applying for Environmental Authorisation
- GN No. R.993 of 8 December 2014: National Appeal Regulations, as amended
- GN No. 634 of 23 August 2013: NEMWA: Waste Classification and Management Regulations

- GN No. R. 921 of 2013: NEMWA: Waste Management Activities, as amended by GN No. R.332 of 2 May 2014 and GN No. R.633 of 24 July 2015
- GN No. R632 of 24 July 2015: Regulations regarding the planning and management of residue stockpiles and residue deposits, as amended
- GN No. R.893 of 22 November 2013: Atmospheric Emissions Activities
- GN No. 275 of 3 April 2017: National Greenhouse Gas Emission Reporting Regulations
- GN No. 712 of 21 July 2017: National Pollution Prevention Plans Regulations
- GN No. R.152 of 2007: NEMBA: Threatened or Protected Species (TOPS) Regulations
- GN No. R.598 of 2014: NEMBA: Alien and Invasive Species Regulations
- GN No. R.1147 of 20 November 2015: Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, as amended
- GN No. R527 of 23 April 2004: Mineral and Petroleum Resources Development Regulations, as amended
- GN No. 1556 of 29 November 2019: Regulations on Carbon Offsets under section 19 of the Carbon Tax Act
- Act No. 29 of 1996: Mine Health and Safety Act
- Act No. 125 of 1991: Physical Planning Act
- Act No. 16 of 2013: Spatial Planning and Land Use Management Act (SPLUMA)
- Act No. 117 of 1998: Municipal Structures Act
- Act No. 32 of 2000: Municipal Systems Act
- Act No. 67 of 1995: Development Facilitation Act (DFA)
- Act No. 2 of 2000: Promotion of Access to Information Act
- Act No. 3 of 2000: Promotion of Administrative Justice
- Act No. 75 of 1997: Basic Conditions of Employment Act
- Act No. 66 of 1995: The Labour Relations Act
- Act No. 4 of 2000: Promotion of Equality and Prevention of Unfair Discrimination Act
- Act No. 85 of 1993: Occupational Health and Safety Act
- Act No. 53 of 2003: Broad Based Black Economic Empowerment Act
- Act No. 9 of 1972: National Road Safety Act
- Act No. 93 of 1996: National Road Traffic Act
- Act No. 19 of 1998: Prevention of Illegal Eviction from and Unlawful Occupation of Land Act
- Act No. 22 of 1994: Restitution of Land Rights Act, as amended

- Act No. 112 of 1991: Amendment of the Upgrading of Land Tenure Rights Act

The following provincial legislation has bearing on the project:

- Mpumalanga Local Government Ordinance 17 of 1939 that deals with nuisance pollution
- Mpumalanga Land Administration Act No. 5 of 1998, which regulates land administration
- Mpumalanga Nature Conservation Act No. 10 of 1998 (MNCA), which regulates nature conservation

Strategies, guidelines, and other documents of importance to this project (list not exhaustive) are:

- National Protected Areas Expansion Strategy, 2010 (NPAES)
- National List of Threatened Terrestrial Ecosystems for South Africa, 2011
- National Biodiversity Assessment, 2011 (NBA)
- Mining and Biodiversity Guideline: Mainstreaming Biodiversity into the Mining Sector, 2013
- Implementation Manual for Freshwater Ecosystem Priority Areas, 2011
- Important Bird Areas, BirdLife South Africa
- Mpumalanga Biodiversity Sector Plan (2014)
- Good Practice Guidance for Mining and Biodiversity: International Council on Mining and Metals
- Convention on Biological Diversity (1995)
- Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora
- Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or the Bonn Convention)
- Agreement on the Conservation of African-Eurasian Migratory Water birds (AEWA)
- World Summit for Sustainable Development (2002)
- National Climate Change Adaption Strategy, 2017

Policies and planning documents include:

- Mpumalanga Provincial Growth and Economic Development Strategy
- Mpumalanga Tourism Growth Strategy / Master Plan
- Mpumalanga Spatial Development Framework
- Nkangala District and eMalahleni Local Municipal Spatial Development Framework
- Nkangala District and eMalahleni Local Municipal Integrated Development Plan
- Highveld Priority Area Air Quality Management Plan, 2012

- Environmental Management Framework (EMF) for the Olifants and Letaba Rivers Catchment Areas, 2009

4.2 REQUIREMENTS FOR EIA PROCESS AND STAKEHOLDER ENGAGEMENT

As indicated earlier, GGV Complex is an existing operational mine, operating under Mining Right No. MP 30/5/1/1/2/169 MR and has an approved EMPr. Below a list of Environmental Authorisations approved for the GGV MRA over the years.

Table 6: Existing Environmental Authorisations granted for the GGV Complex

Ref Nr	Description	Approval Date	Approval Number
GGV1	EMPR Amendment: Goedgevonden Expansion	10-Feb-16	MP30/5/1/2/2/1/(169) EM
GGV EA1	EIR: GGV Dragline Crossings	1-Mar-10	16/2/7/B100-C7
GGV EA2	EIR: Proposed Installation of Additional ammonium nitrate and high energy fuel silos	1-Aug-08	17/2/6/3(3-1) N-1
GGV EA3	EIR: Proposed temporary Construction and Installation of Bulk aboveground storage facilities for fuel, lubricants and waste oil	1-Dec-07	17/2/1/7 MP-21 (a)
GGV EA4	EIR: GGV Waterpan Pipeline	1-May-08	17/2/1/ (1 k) MP 16
GGV EA5	EIR: The Installation of additional aboveground ground bulk storage tanks	12-Jun-12	17/2/3N-109
GGV EA6	EIR: Dragline walk from Tavistock Colliery to GGV	1-Jun-06	17/2/5 NK 52
GGV EA7	EIR: Construction and Installation of Bulk aboveground storage facilities for fuel, lubricants and waste oil	1-Nov-07	17/2/1/7 MP-21
GGV EA8	EIR: Installation of additional High energy fuel silos	1-Mar-09	17/2/1/7 NK-3
GGV EA9	EIR: GGV Diversion of road P53-1 and D356	1-Jun-06	17/2/5 NK 58
GGV EA10	EIR: Construction of two (2) crossings over Zaaiwaterspruit River Diversion.	1-Sep-09	17/2/1/1 (m) MP-24
GGV EA11	EIR: GGV Expansion	1-Sep-15	17/2/3N-273
GGV EA12	BA: GGV South Witbank Pipeline	24-Jan-22	MP 30/5/1/2/2/3/2/1(169) EA

Although no new physical listed activities are triggered by the proposed changes and/or additions to the mining and infrastructure plan as discussed in Section 3.2, the ***amendment or variation to a right or permit in terms of section 102*** of the MPRDA triggers a Basic Assessment (BA) process contemplated in regulation 19 to regulation 20 of the 2014 EIA Regulations.

There are three phases associated with the BA process, namely the pre-application/application phase, the EIA phase and the Authority review and decision-making phase (Figure 17).

- **Pre-Application and Application Phase:** Notification of Interested and Affected Parties (IAPs) prior to submission of the Application. Thereafter, the submission of the application form to the relevant Competent Authority, in this case the Mpumalanga DMRE.

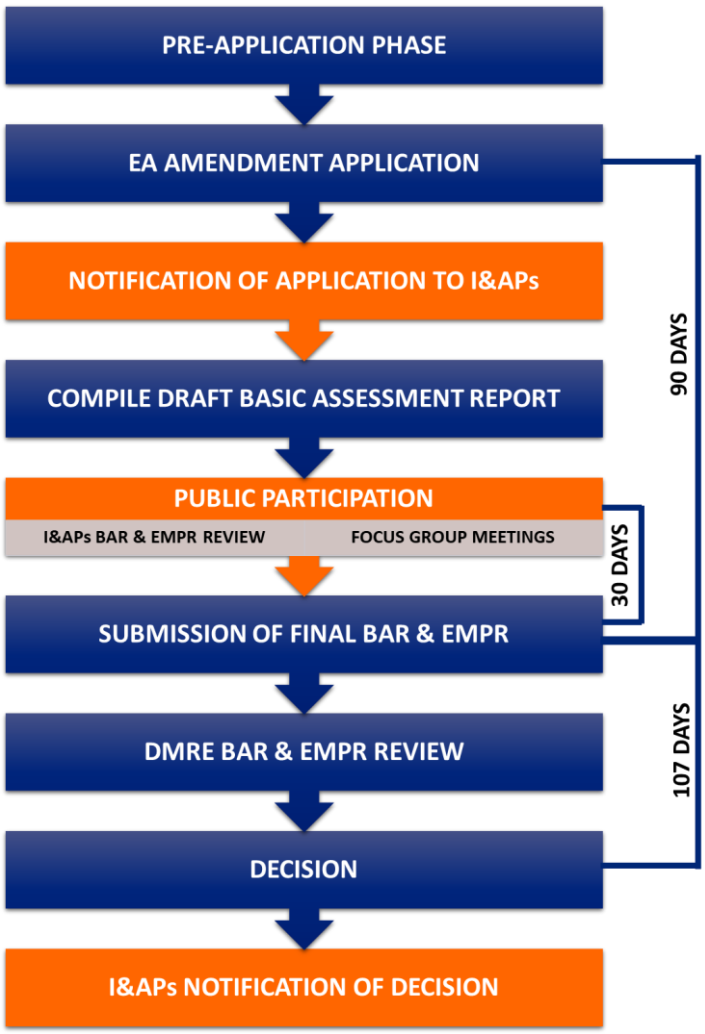


Figure 17: Basic Assessment process and timeframes

- **EIA Phase:** Compilation of a draft Basic Assessment Report (BAR) which provides detailed assessments of the significance of biophysical and social impacts, as well as the EMPr. The draft documents are provided to all registered IAPs for their comments for a period of 30 days. Comments received from IAPs are incorporated in the BAR/EMPr and the final BAR/EMPr is submitted to the Competent Authority, for decision-making.
- **Authority Review and Decision-making Phase:** The Competent Authority reviews the information and recommendations provided in the final BAR and EMPr and is required to issue a decision to authorise (or refuse to authorise) the project within 107 days of submission of the documents.

The total timeframe for a "non-substantive" Basic Assessment process is legislated to take no more than 197 calendar days (excluding public holidays and the December break). This implies an EIA process where all issues could be satisfactorily resolved, and no substantive changes needed to be made or new and unexpected information needed to be added to the environmental reports.

In parallel to the EIA process, a comprehensive Public Participation process must be conducted. This offers stakeholders the opportunity to learn about the project, to raise issues that they are concerned about, and to make suggestions for enhanced project benefits.

4.3 APPROACH TO THE EIA PROCESS AND RISK ASSESSMENT

As the GGV Complex is an existing operation, numerous environmental studies have been conducted in the GGV MRA since 2002. The most recent impact assessment studies were conducted in 2013 as part of the current approved EMPr and were based on the approved mining plan (Figure 7). The baseline information was therefore considered outdated and had to be verified during this BA process to reflect the existing social and environmental attributes associated with the MRA. Also, the risk assessment had to be reviewed to assess the proposed changes in the mining plan and methodology. Therefore, several studies have been initiated as part of this BA process to assess the proposed changes in the mining plan and methodology and to verify the social and environmental attributes associated with the MRA.

Additional specialist studies that were conducted during this process are:

- Terrestrial Biodiversity Ecology Assessment
- Freshwater and Aquatic Ecology Assessment
- Hydropedology Assessment
- Air Quality Impact Assessment
- Noise and Vibration (Blasting) Impact Assessment
- Visual Impact Assessment
- Socio-Economic Assessment
- Heritage Impact Assessment
- Geotechnical Assessment
- Revision of Geohydrology Assessment and Groundwater Model
- Revision of Integrated Water and Wastewater Management Plan (IWWMP)

In respect of soils, the available baseline data was used to determine impacts related to the changes to the mining plan and no additional field work was conducted.

No additional specialist studies were conducted for the re-alignment of Provincial Road P53-1.

The specialist risk assessments focused on the potential impact associated with the proposed amendments; however, impact modelling (groundwater, air quality, ambient noise, visual and blasting) considered both the existing (approved) and future (amendment application) mining plan and infrastructure development.

5 NEED AND DESIRABILITY OF THE PROJECT

The GGV Complex is an operational mine and will continue operating regardless of the outcome of this amendment application. The benefits of the continued mining operation are detailed in the Socio-Economic Assessment (ANNEX-9) conducted by Diphororo Development.

5.1 Contribution to Economic Growth in the Local, Provincial and National Economy

Based on the National Social Accounting Matrix and the financial data provided by GOSA, it is anticipated that GGV has an annual direct Gross Domestic Product (GDP) contribution of R2 639 million and total GDP (indirect and induced included) of R4 280 million. The total contribution is 7% of the local and 1.3% of the provincial GDP, where mining contributes 22.5% to the provincial economy.

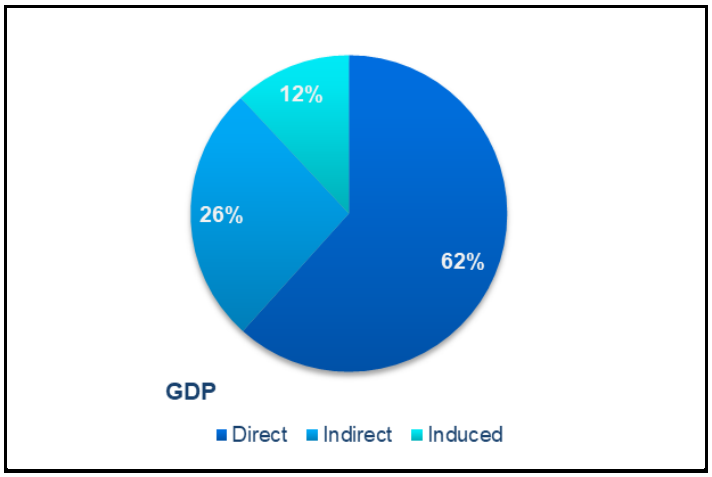


Figure 18: GDP contribution

The GDP contribution is made up of direct, indirect and induced impacts. The sectoral analysis shows a wide effect on the economy of Mpumalanga. The Mining Sector is the economy's largest beneficiary (64% of GDP generated by project) of the total GDP impact of the project, followed by the Trade & Accommodation Sector with 12% of GDP generated by the project.

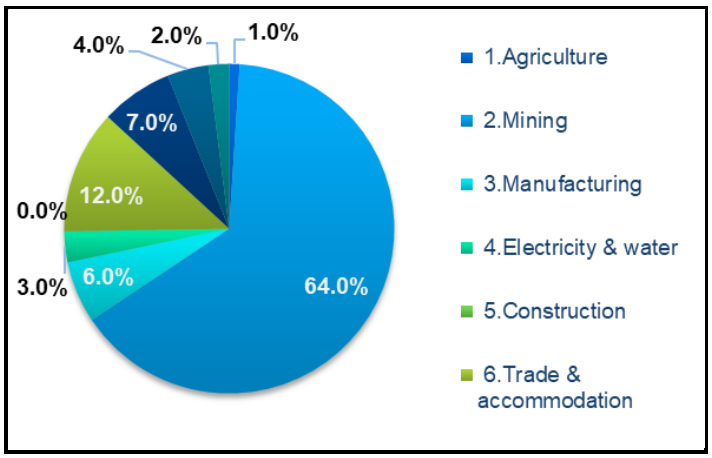


Figure 19: Sectoral contribution to Mpumalanga economy

Capital expenditure is money that institutions spend to buy, maintain or upgrade fixed assets such as buildings, vehicles, land and equipment. It is the brick-and-mortar type of investment that forms the backbone on which the economy functions. It is important for economic growth as it increases the productive capacity of the economy. By increasing productivity through improved capital equipment, more goods can be produced, and the standard of living can rise. The GGV operation will directly invest on average R 600 million in capital per annum over the next 10 years. This will be spread amongst the plant, equipment, group capital and other. The knock-on effect adds further capital expenditure indirectly (R350 million) and induced (R180 million).

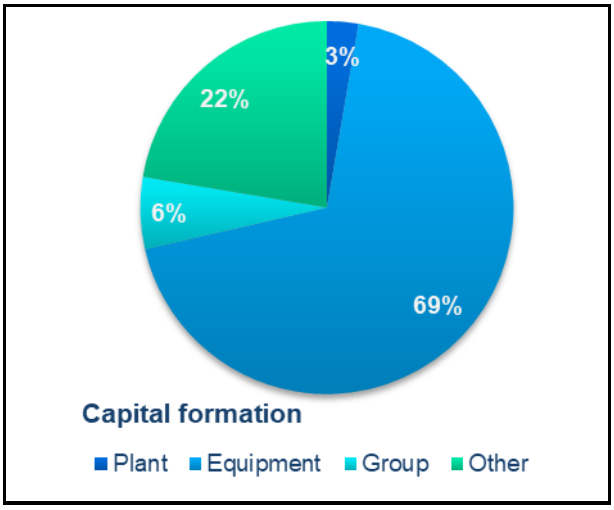


Figure 20: Capital formation

Balance of payments in the economy refers to the trade transactions with other countries and is relevant for GGV due to the export of coal. The balance of payments in South Africa as it provides information for economic policy, import and export taxes, and also indicates the state of our economy. GGV's export of coal will have a very positive impact on the Balance of Payments with an estimated amount of R 4 922 million per annum expressed in 2021 prices (which is approximately 0.3% of total export of goods). The additional capital expenditure for the amendment activities (i.e. underground mining, additional infrastructure, etc) will have an increase in the benefits generated for direct, indirect and induced economic growth.

5.2 Contribution to public finance through tax revenue

South Africa faces critically low growth levels amidst other challenges of high unemployment levels and significant inequalities. Government has a role of intervening in the economy through provision of public goods and services promoting economic development. This is facilitated through the levying of taxes. Without the revenue generated by tax, Government cannot provide the public services and development programmes. The GGV operation contributes to public finance through the payment of tax revenues, employee tax, rates & taxes, royalties and the payment of skills development levy. Of these, corporate tax, (approximately R330 million per annum) and employee tax is the largest contributors.

Tax payments to Government is based on production and therefore revenue generation. With a slight increase in production as well as an increase in profitability there may be a moderate increase in tax payments.

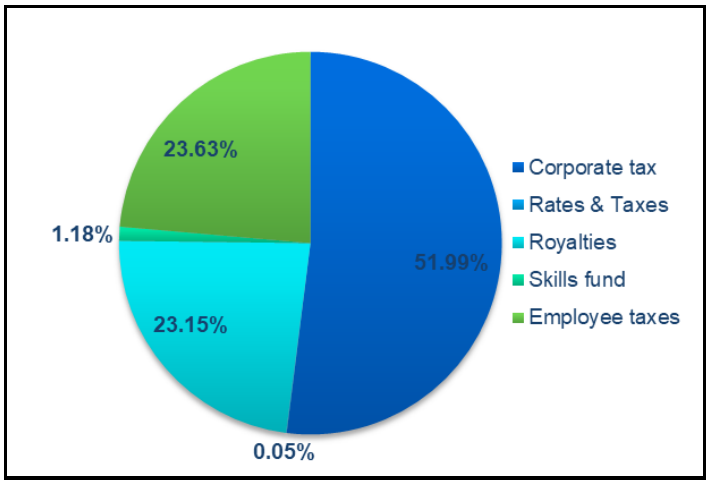


Figure 21: Tax contribution

5.3 Secondary benefits in the creation of electricity to supply the domestic demand

The GGV operation provides on average 3.8 million tonnes per annum to Eskom for the generation of electricity, which in turn has an impact on Eskom's economic footprint.

5.4 Employment Opportunities, Skills Development and Household Income

The employment rate and economic growth are linked. This is because employment contributes to economic growth: Workers produce valuable goods and services, and in turn receive an income which they can spend on buying other goods produced. The higher the employment rate, the greater the number of goods being produced (demand and supply).

GGV operations provide 962 workers and a further 461 contractor workers employment. The employment provided will be mostly sustained for the following 10 years. The employment is made up of unskilled, semi-skilled and skilled members. Indirect employment is estimated at 5 644 (58%) and induced employment is estimated at 2 584 (27%) with a total employment impact of 9 648 sustained during the operational period. Every direct job supports 6.8 jobs in the indirect and induced sectors. If it is accepted that each job created provides for a household of 3.2 inhabitants providing for around 30 000 people a living income.

Table 7: Total employment at current estimates

	Direct Impact	Indirect Impact	Induced Impact	Total Impact
Skilled	335	1605	903	2843
Semi-skilled	625	1916	860	3401
Unskilled impact	461	2123	821	3405
Impact on employment	**1421**	**5644**	**2584**	**9648**

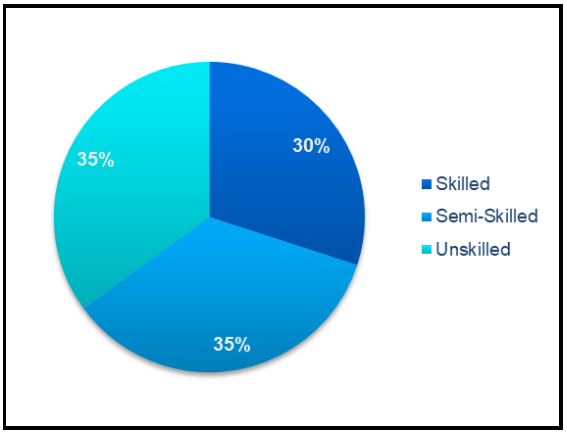


Figure 22: Employment division by skill level

The Community Services sector is expected to be the largest beneficiary (29% of total employment), the Transport and Communication sector benefits to the tune of 27% of the jobs created and the mining sector benefit by 15% of jobs created.

Employment levels will be sustained throughout the operational phase, and therefore the positive impact currently experienced due to the employment will continue.

5.5 Contribution to poverty alleviation

The project contributes to poverty alleviation on two fronts, namely first the payments to low-income households through wages paid to workers; and secondly through the Social and Labour Plan (SLP) spend on skills development and community development projects.

The total annual household income (direct, indirect and induced) is estimated at R 2 335 million per annum with R449 million (19%) to the low-income households.

Apart from the wage payments to low-income households, GGV operation also implement its commitments for Employee Skills Development and Community Development through its SLP. Further provision has been made for the SLP for the rest of the LOM at an amount of approximately R4.5 million per annum.

SLP contribution as well as payments to low-income households will continue regardless of the amendment.

5.6 Participation of local businesses in procurement opportunities

GOSA is committed to local procurement and SMME development. As part of the SLP, projects have been identified for SMMEs and income-generating projects, and measures have been committed to ensuring procurement levels comply with the Mining Charter.

Procurement levels are bound to increase for historically disadvantaged, women-owned and local businesses due to the transitional targets set by the Mining Charter.

6 DEVELOPMENT ALTERNATIVES CONSIDERED

6.1 ALTERNATIVE LAND USE

GGV Complex is an existing operational mine, operating under Mining Right No. MP 30/5/1/1/2/169 MR and has an approved EMPr.

Mining is therefore the selected (approved) land use going forward, and no further discussion or motivation for this land use is provided in this EMP amendment.

6.2 DEVELOPMENT ALTERNATIVES

Development alternatives of the approved EMPr have been addressed in the original EMPr and are therefore not repeated in this amendment.

Development alternatives associated with this amendment are discussed below.

6.2.1 Re-Alignment of Road P53-1

The two re-alignment options (approved and revised) as indicated in Figure 16 were subjected to a high-level risk assessment process to determine the difference in risks associated with the two alternative options. The risk matrix is presented in Table 8.

From the risk assessment it is clear that the new proposed re-alignment poses a lower risk in respect of specifically surface ownership, existing land use and traffic safety.

Table 8: Alternative re-alignment option risk matrix

{Risk ratings (RR): 1: Best, 2: Similar risk, 3: Worst}

Aspect	Existing (Approved) Re-alignment	RR	Proposed (Revised) Re-alignment	RR
Surface ownership	Re-alignment encroaches onto the farm Grootpan 7 IS that is privately owned.	3	Re-alignment situated wholly within properties belonging to GOSA.	1
Land use	Re-alignment marginally impacts on existing agricultural activities on Grootpan.	3	Re-alignment situated within existing mined out areas, no impact on agricultural activities.	1
Natural vegetation clearance	No additional vegetation clearance, routed within existing mining area and agricultural field.	2	No additional vegetation clearance, routed within existing mining area.	2
Travelling distance	Longer route at 1.28 km.	3	Marginally shorter at 1.25 km.	1
Intersection with Road P53-1 – line of sight	The intersection of the re-alignment with Road P53-1 has sufficient available sight distance in both directions (Avzcons, 2014).	2	The intersection of the re-alignment with Road P53-1 has sufficient available sight distance in both directions (Avzcons, 2014).	2
Road stability	Re-alignment will be constructed over an existing mining area and the necessary engineering design	2	Re-alignment will be constructed over an existing mining area and the necessary engineering design	2

Aspect	Existing (Approved) Re-alignment	RR	Proposed (Revised) Re-alignment	RR
	criteria must be considered to ensure long-term stability of the road.		criteria must be considered to ensure long-term stability of the road.	
Traffic safety	Due to the gentle curvature of the re-alignment, it poses some risks in respect of traffic safety due to speeding.	3	Re-alignment was optimised to improve traffic safety in respect of the curvature back into the existing road.	1
Impact on coal reserves	Re-alignment will have an impact on coal reserves unlaying the overburden dump to the north of the existing mining area.	3	Re-alignment will have a minimum effect on coal reserves.	1
Community safety	Route does not pass by any schools or residential areas and does not travel through any established community.	2	Route does not pass by any schools or residential areas and does not travel through any established community.	2
Total RR Rating		**23**		**13**

6.2.2 Undermining of Water Resources

As indicated earlier in this report, GGV intends to undermine the main Zaaiwaterspruit river diversion running through the centre of Goedgevonden 10 IS, as well as the the unnamed tributary of the Zaaiwaterspruit on the eastern boundary of the MRA and its associated wetland system. The initial mining schedule targeted both the 2 Lower and 4 Lower coal seams for underground mining.

To assess the risk that undermining of the water bodies will pose for the environment after closure, Bare Rock Consulting conducted an independent geotechnical assessment of the proposed undermining (ANNEX-11). The geotechnical assessment concluded that due to the potential for unstable roof conditions and the formation of sinkholes, no underground mining should occur within areas associated with the main river diversion and remaining wetlands at depths of less than 20m.

After consideration of the geotechnical and hydrogeological risks with respect to mining shallower than 20m below the said water resources, the proposed mine plan was revised to exclude mining shallower than 20m in these areas. Therefore, no mining of the 4 Lower seam will occur under the water resources as indicated in Figure 15 and therefore the risk of roof collapse between the pillars will be low. This will also result in a low risk of water inrush after mine closure and the subsequent contamination of surface and groundwater downstream (Bare Rock, 2022).

The 2 seam is deeper than 20m and all the mining blocks as defined will be mineable.

6.2.3 Underground Mine Access

The underground workings will be accessed through an incline shaft from the opencast highwall and the required infrastructure to support the underground workings will be constructed within the

already approved opencast footprint. This will prevent any further surface disturbance and vegetation clearance within the remaining natural environment.

6.3 NO-GO OPTION

The GGV operation is an important economic driver within the local area, and contributes to the economic growth, employment and indirect and induced economic benefits of not just the local area, but within the Mpumalanga Province.

Mining activities and associated employment benefits and SLP contribution will continue regardless of whether this amendment is approved of not. However, if the decision is taken not to approve the proposed amendments, some of the benefits discussed in Section 5 may reduce slightly, i.e. tax contribution, capital formation. The LOM may also reduce slightly, thereby reducing the supply to Eskom for power generation.

There will be limited new impacts due to the amendment application, rather a continuation of existing impacts on the socio-economic and physical environment. Existing impacts on the environmental and local communities will continue regardless of this amendment.

7 ENIRONMENTAL AND SOCIAL CONTEXT (BASELINE)

7.1 CONSERVATION CHARACTERISTICS

7.1.1 Ecological Sensitivity

According to the Mpumalanga Biodiversity Conservation Plan's terrestrial biodiversity assessment, as indicated on Figure 23, about 80 % of GGV is classified as heavily to moderately modified. Small patches of "Other Natural Areas" are associated with the remaining wetland systems within the MRA. The Zaaiwaterspruit as it exits the MRA is classified as CBA Irreplaceable.

GGV falls within the grassland biome, within the remaining extent of the Eastern Highveld Grassland which is currently considered to be Vulnerable (VU) and is Poorly Protected. 30% of the biome has been irreversibly transformed and only 1.9% is formally conserved, as a result the National Biodiversity Strategy and Action Plan identified this biome as one of the spatial priorities for conservation action. However, the GGV area is not identified as one of the 15 grassland priority sites.

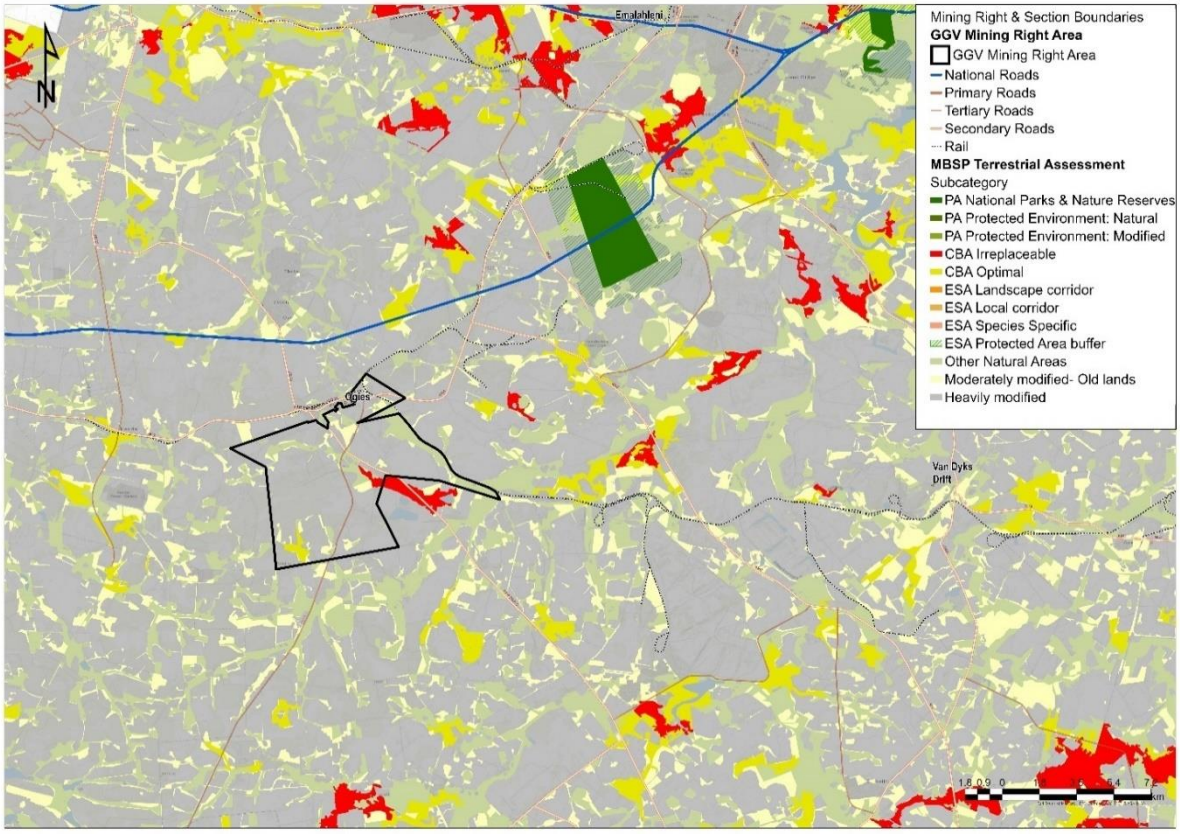


Figure 23: Ecological sensitivity map (MBSP Terrestrial, 2019)

7.1.2 Formal Conservation initiatives in the region

There are no protected areas, formal conservation initiatives, established or planned conservancies in or within a 10 km radius to the GGV Complex.

7.1.3 National Freshwater Ecosystem Priority Areas (NFEPA)

According to the NFEPA database, there are numerous natural and artificial wetlands located within the focus area and investigation area. The north-eastern, southwestern and north-western wetlands comprise several HGM units: the majority of HGM units are indicated as channelled valley bottom wetlands, wetland 'flats' and seeps, although one system in the north-west is indicated as comprising both channelled and unchanneled HGM units. There are also two depression features indicated in the south of the investigation area. According to the NFEPA database the natural wetlands are classified as FEPA wetlands due to their importance for threatened waterbirds, although given the degree of anthropogenic influences it is unlikely that the wetlands are extensively utilised by sensitive avifauna. The natural wetlands are furthermore indicated to be in a moderately modified (Wetcon Class C) ecological condition according to the NFEPA database, while the artificial wetlands are heavily to critically modified (Class Z3).

7.1.4 Important Bird and Biodiversity Areas (IBA)

The site does not fall within an identified IBA.

7.2 BIOPHYSICAL ENVIRONMENT

7.2.1 Climatic data

7.2.1.1 Regional Climate

GGV is situated on the Highveld in the central part of the Mpumalanga province, between 1530 and 1630 meters above mean sea level (mamsl). The mine is situated in a semi-arid zone within the central Highveld, a region that is characterized by cool, dry winters (May to August) and warm, wet summers (October to March), with April and September being transition months (Figure 24).

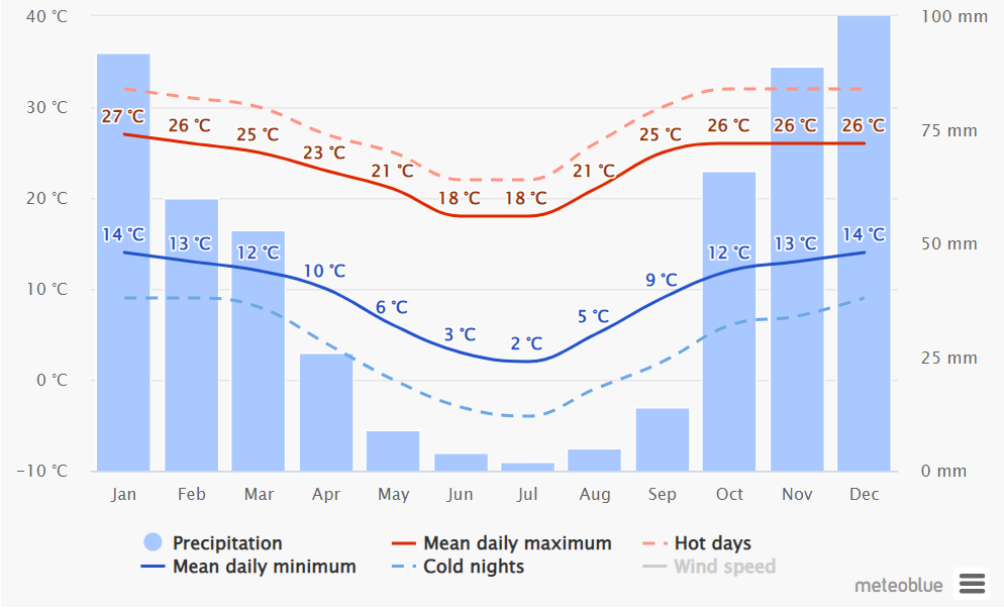


Figure 24: Average temperature and precipitation for Ogies for the past 30 years as modelled by the Metroblue Database

7.2.1.2 Temperature

The average monthly temperatures for the study area are depicted in Figure 25. Daily summer temperatures range between ~13 °C and ~26 °C. Winter temperatures range between ~7 °C and ~18 °C. Spring temperatures range between ~ 9 °C and ~ 24 °C, while autumn temperatures range between ~ 12 °C and ~ 22 °C.

Humidity is highest during the winter months and lowest in the summer months, rarely exceeding the 70% threshold.

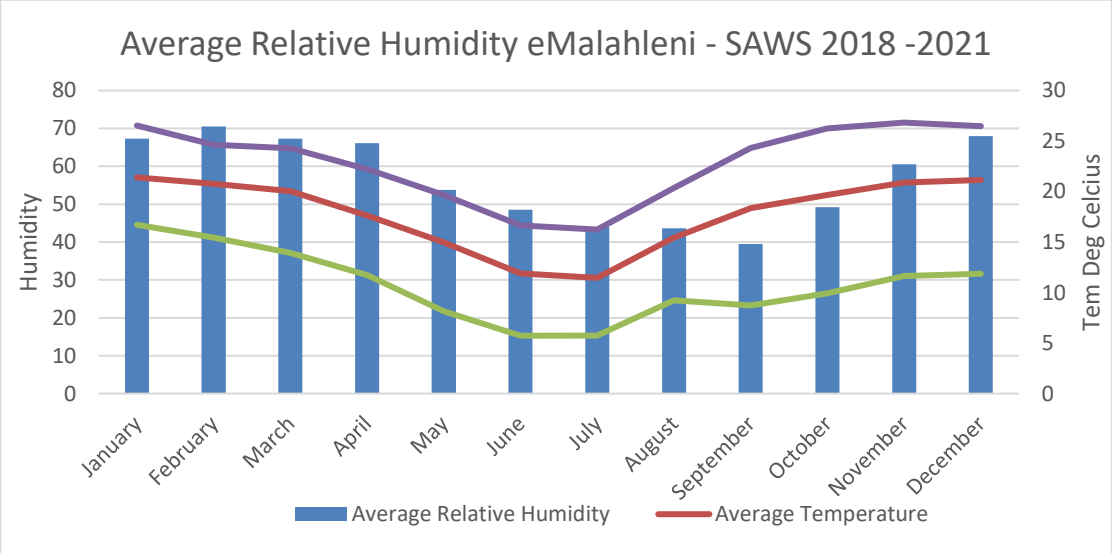


Figure 25: Monthly average temperatures at eMalahleni for last 3 years (EBS Advisory, 2022)

7.2.1.3 Winds

A period wind rose for the site is presented. Wind rose comprise of 16 spokes which represent the directions from which winds blew during the period. The colours reflect the different categories of wind speeds. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. Based on an evaluation of the modelled meteorological data obtained from Metroblue and monitored data provided by the SAAQIS database, the following prevailing wind direction and wind frequency are summarised in Figure 26 and Figure 27 respectively. The predominant wind direction within the GGV area is mainly from the north, north-westerly, easterly, and east-north-easterly regions. Secondary winds are noted from the west-south-westerly and south-easterly regions. At the site, 14.26 % of the time, calm conditions exist. The highest frequency of wind speeds lies between 2-4 m/s (7-14 km/hr) occurring 38.5% of the time. The second highest wind class 4-6 m/s (14-22 km/hr) occurred 9 % of the time.

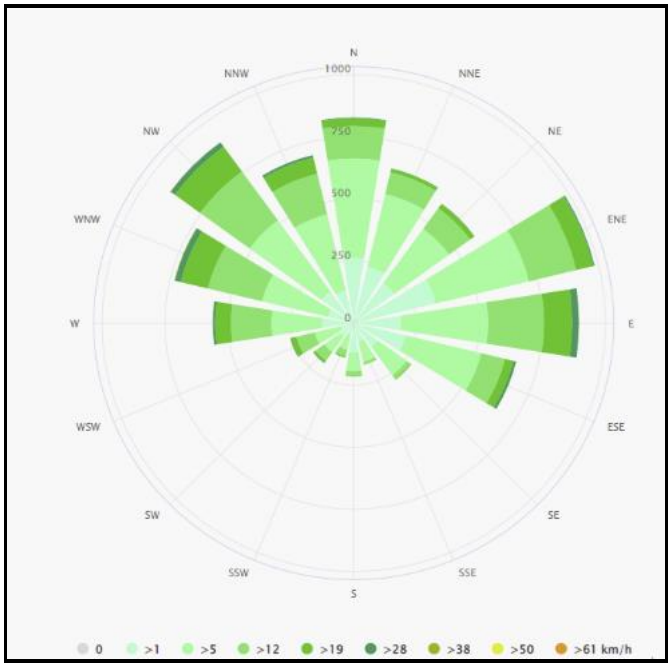


Figure 26: Average annual wind rose for last 30 years at Ogies (Metroblue) (EBS Advisory, 2022)

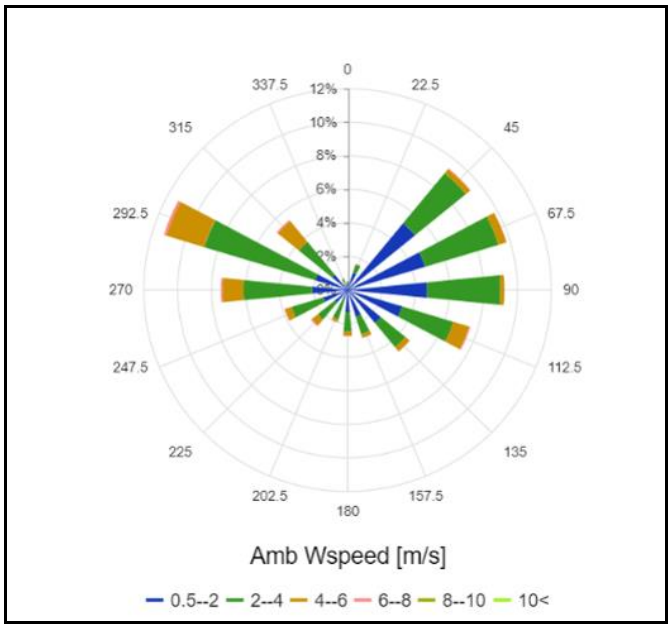


Figure 27: Average annual wind rose for last 5 years (2016 – 2021) at eMalahleni (SAAQIS database) (EBS Advisory, 2022)

7.2.1.4 Rainfall and Evaporation

The mine is located adjacent to the town of Ogies, where rainfall was recorded daily from 1907 to 2004. The average monthly rainfall depths for Ogies - South African Weather Service station number 0478093 is indicated in Table 9 and Figure 28 (J&W, 2013). GGV is situated in a summer rainfall area where precipitation is mainly in the form of afternoon thundershowers. Most of the precipitation is experienced over the summer months, mostly in the form of afternoon thundershowers. Mean annual precipitation (MAP) is 707 mm with 85% of annual rainfall occurring between October and March. The highest rainfall occurs from October to January. The winters are generally dry and cold

with intermittent light rain with June and July being the driest months of the year. Average rainfall recorded from 2018 - 2021 by the South African Weather Services at eMalahleni is 880 mm (EBS Advisory, 2022).

The mean annual evaporation (MAE) for the area is in the region of 1700 mm. Evaporation data for GGV was taken directly from the WR90 report. The average monthly evaporation depths are presented in Table 9 and Figure 28. January is the month with the highest evaporation rate at an average of 186 mm for the month; the months of June and July have the lowest evaporation rate of an average of 81 mm and 88 mm respectively (J&W, 2012).

Table 9: Average monthly rainfall at Ogies (SAWS 0478093) and evaporation (WR90)

Month	Average rainfall (mm)	Average evaporation (mm)
October	75	183
November	120	172
December	123	190
January	132	186
February	100	155
March	80	153
April	43	118
May	18	99
June	8	81
July	7	88
August	9	117
September	24	151
Annual Total	739	1694

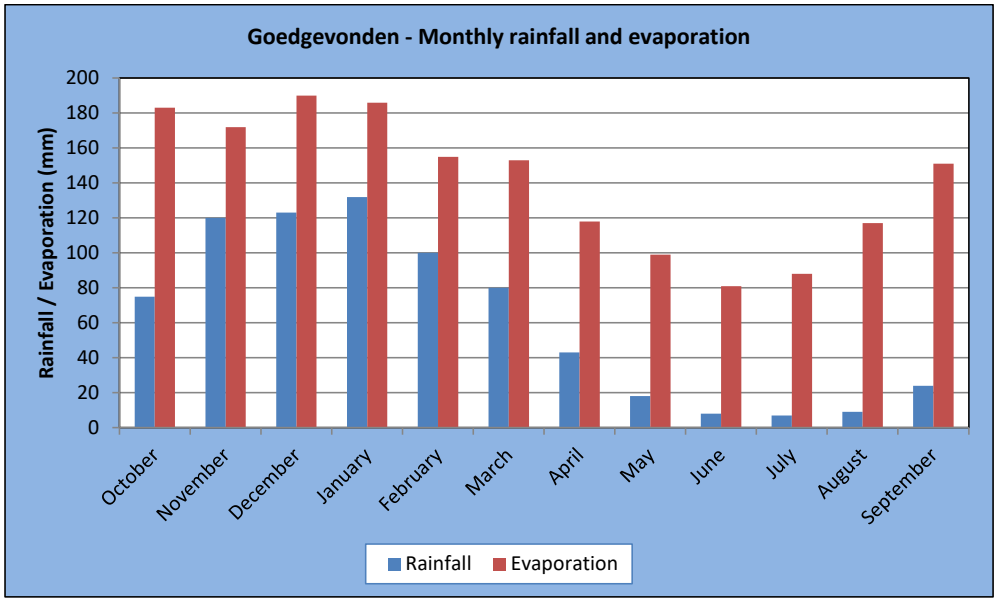


Figure 28: Monthly Rainfall and Evaporation at GGV (J&W, 2012)

7.2.2 Topography and Landscape Character

Surface elevations range between 1530 mamsl (northeast) and 1630 mamsl (south). The GGV area comprises gently sloping ground with slopes generally ranging 1% to 5%.

Natural drainage is primarily to the northeast and east, with the Zaaiwaterspruit and Klippoortjiespruit being the major drainage lines. The mining area is roughly divided in half by the wide floodplain of the Zaaiwaterspruit with stream diversion. The original location of the Zaaiwaterspruit along the northern border of the South Pit has been diverted between the North Pit and the South Pit.

7.2.3 Soils, Land Capability and Land Use

7.2.3.1 Pre-mining Soils

Numerous soil surveys have been performed for the GGV Complex since commencement. The information was utilised to develop a consolidated pre-mining soil map for the MRA, inclusive of the MRF area.

The soils were divided in four distinct groups with relatively similar characteristics within each. These are: Red Apedal, Yellow-brown Apedal Soft Plinthic, Yellow-brown Apedal Hard Plinthic and Wetland soils. Table 10 indicates the areas that constitute these soils as provided on the Figure 29.

The average depth of the soils across the MRA and MRF area are indicated in Figure 30.

Table 10: Pre-mining soil classification

Soil Group	Soil Types	Average soil depth (mm)	Land Capability	Hectares (ha)
Red Apedal Soils	Hutton, Bainsvlei, Bloemdal	900-1500	Arable	1 348.01
Yellow-brown Apedal Soils - Soft Plinthic	Clovelly, Avalon, Pinedene	600-1200	Arable	1 924.84
Yellow-brown Apedal Soils - Hard Plinthic	Glencoe, Dresden	600-900	Arable	225.08
			Grazing	89.05
Wetland Soils	Longlands, Katspruit, Wasbank	200-600	Grazing	67.56
			Wetland	1 167.36
Infrastructure	-	0	Infrastructure	137.01
Total				**4 958.91**

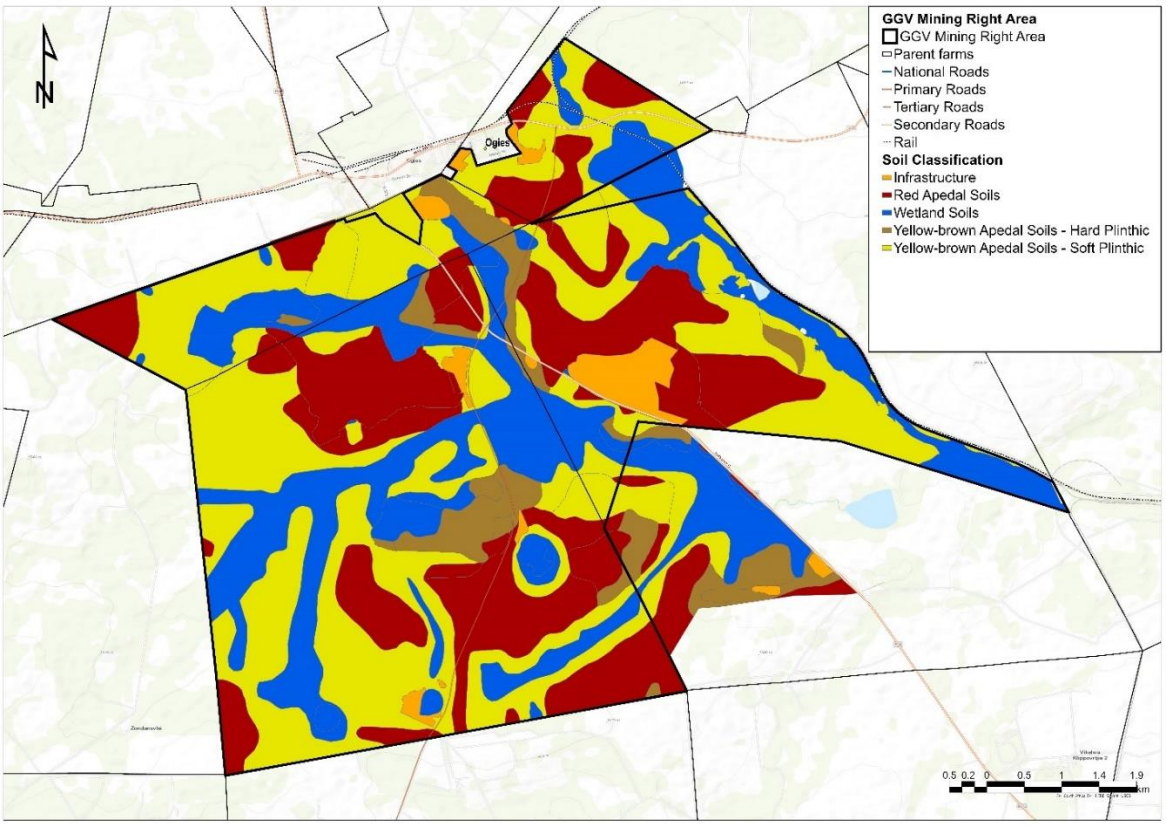


Figure 29: Soils group within the MRA

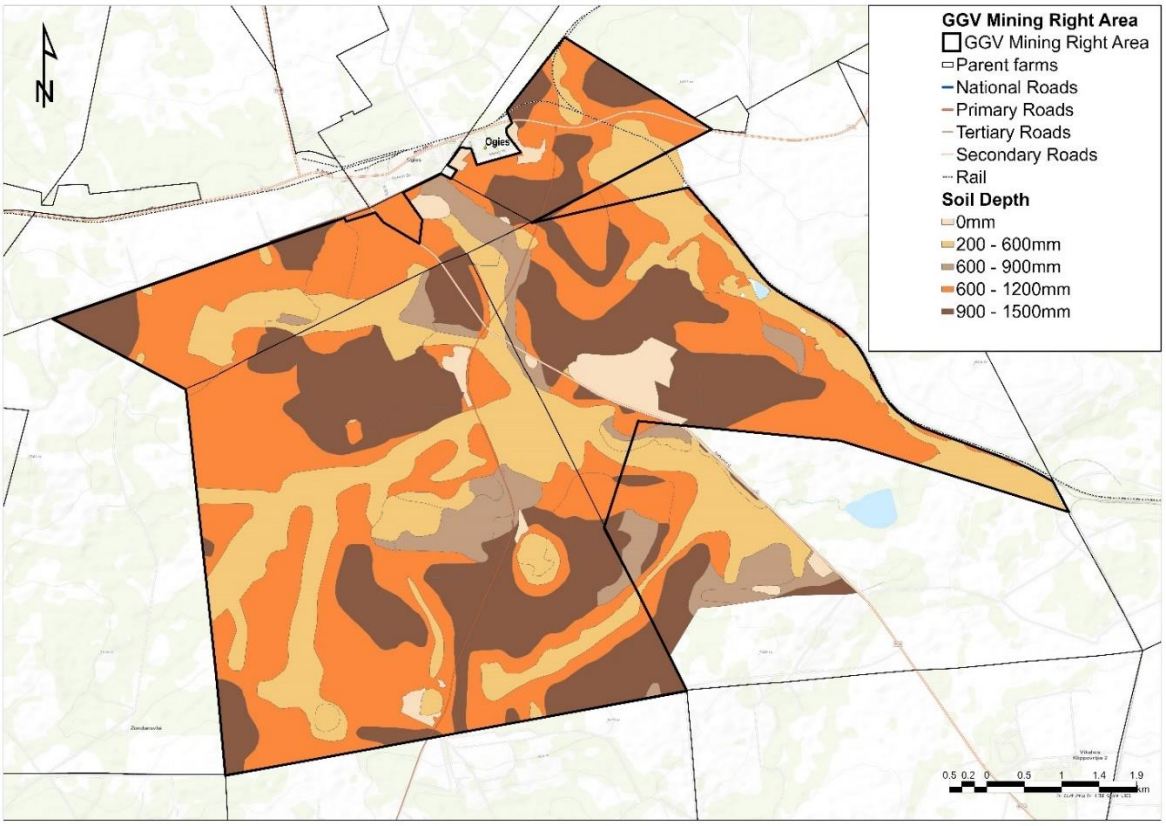


Figure 30: Average soil depths across the GGV Complex

7.2.3.2 High-level Soil Stripping Guide

Table 11 contains the total soil volume (topsoil and subsoil) available for stripping and rehabilitation based on the total MRA, and inclusive of the MRF area. The total soil volume allows for an average soil thickness post mining of approximately 73 cm should the total MRA be disturbed, which is not the case. These aspects will be further assessed during the compilation of the Decommissioning, Rehabilitation and Closure Plan currently under development, and will be based on the actual areas of disturbance.

Table 11: Soil groups and their respective soil stripping depth and volume

Soil Group	Hectares (ha)	Topsoil Stripping Depth (m)	Approximate Soil Volume (m^3)	Subsoil Stripping Depth (m)	Approximate Soil Volume (m^3)
Red Apedal Soils	1 287.19	0.30	3 861 570	0.90	7 723 140
Yellow-brown Apedal Soils – Soft Plinthic	1 811.98	0.30	5 435 940	0.90	10 871 880
Yellow-brown Apedal Soils – Hard Plinthic	248.54	0.30	745 620	0.60	745 620
Wetland Soils	1 094.05	0.30	3 282 150	0.40	1 094 050
Sub Total	4 441.76		13 325 280		20 434 690
Grand Total					33 759 970
Post Mining Soil Thickness (m) for full MRA, including MRF area (4958.91 ha)					0.73

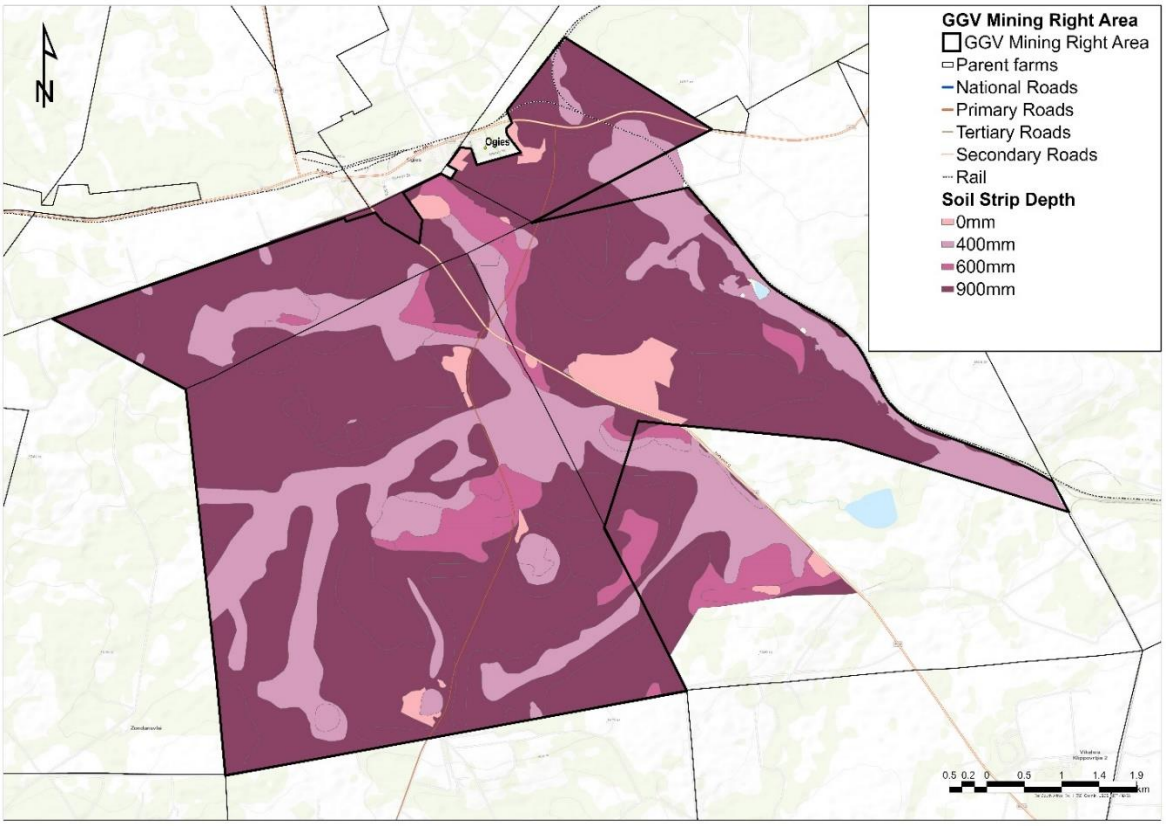


Figure 31: High-level soil stripping guide

7.2.3.3 Pre-mining Land Capability

Land capability was assessed according to the definitions of the Chamber of Mines of South Africa, 1981. The total area (ha) covered by each land capability class is provided in Table 12.

The pre-mining land capability varies between arable, grazing and wetland classes as indicated in Table 12. Most of the area is classified as arable (71%), followed by wetlands (24%) and grazing (3%). There were no areas considered to fall into the wilderness class.

The pre-mining land capability is indicated in Figure 32.

Table 12: Pre-mining land capability

Land Capability	Soil Group	Hectares	Total hectares	Percentage
Arable	Red Apedal Soils	1 348.01	3 497.93	70.54%
	Yellow-brown Apedal Soils - Soft Plinthic	1 924.84		
	Yellow-brown Apedal Soils - Hard Plinthic	225.08		
Grazing	Yellow-brown Apedal Soils - Hard Plinthic	89.05	156.61	3.16%
	Wetland Soils	67.56		
Wetland	Wetland Soils	1 167.36	1 167.36	23.54%
Infrastructure	-	137.01	137.01	2.76%
Total		**4 958.91**	**4 958.91**	**100%**

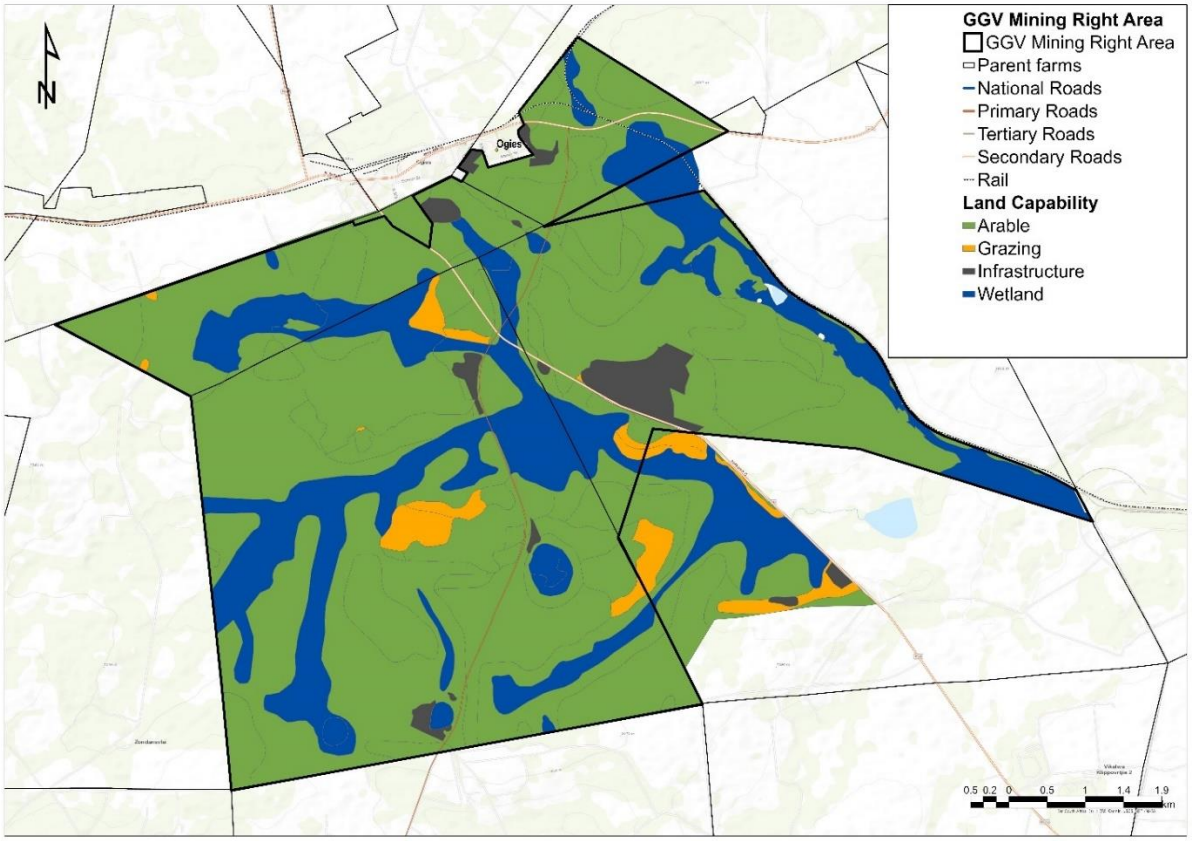


Figure 32: Pre-mining land capability associated with the GGV Complex

7.2.3.4 Present Land Use

Most of the MRA is currently transformed by opencast mining activities and related infrastructure. The current structures on the site are mainly associated with mining uses. The southern portion of the farm Goedgevonden has been transformed by opencast mining activities, dumps and stockpiles together with related infrastructure including CHPP, ROM tip, office buildings, workshops and dirty water management infrastructure. Various stream diversions are in place to divert clean water around the CHPP area.

No mining activities are taking place on the farm Grootpan 7 IS and land use consists mainly of agricultural and urban (residential/educational) activities.

The Mosque village and associated gravesite occur on the north-eastern boundary of the farm Goedgevonden. A few other remaining gravesites and historical structures occur within the MRA.

The present land use within the MRA is summarised in Table 13.

Table 13: Present land use within MRA

Land Use	Hectares (ha)	Percentage
Agricultural Fields	732.97	16.01%
Commercial / Light Industrial	2.14	0.05%
Dams	15.76	0.34%
Educational	17.26	0.38%
Graves	22.1	0.48%
Grazing	174.21	3.80%
Mining Disturbed	1 465.79	32.01%
Municipal	0.74	0.02%
Rehabilitation Sites	485.73	10.61%
Residential	13.96	0.30%
Roads	12.51	0.27%
Vacant land	1 100.83	24.04%
Wetlands	535.57	11.69%
Total	**4 579.57**	**100.00%**

The surrounding land use is complex, consisting of:

- The town of Ogies, located just north of the GGV Complex, with the town including a number of residential and business activities;
- Significant coal mining activities to the north and west of the GGV Complex. There are a number of other collieries scattered in the area;
- Croplands and livestock farming to the south and east of the existing GGV Complex;
- Several farm dwellings. Most dwellings featuring in the vicinity of the project focus area are scattered in a heterogeneous fashion; and

- Several provincial roads, such as the R545 and R555. Due to the significant mining activities, these roads carry significant coal hauling traffic.

The surrounding land use within a radius of 2 km of the MRA is indicated in Figure 33.

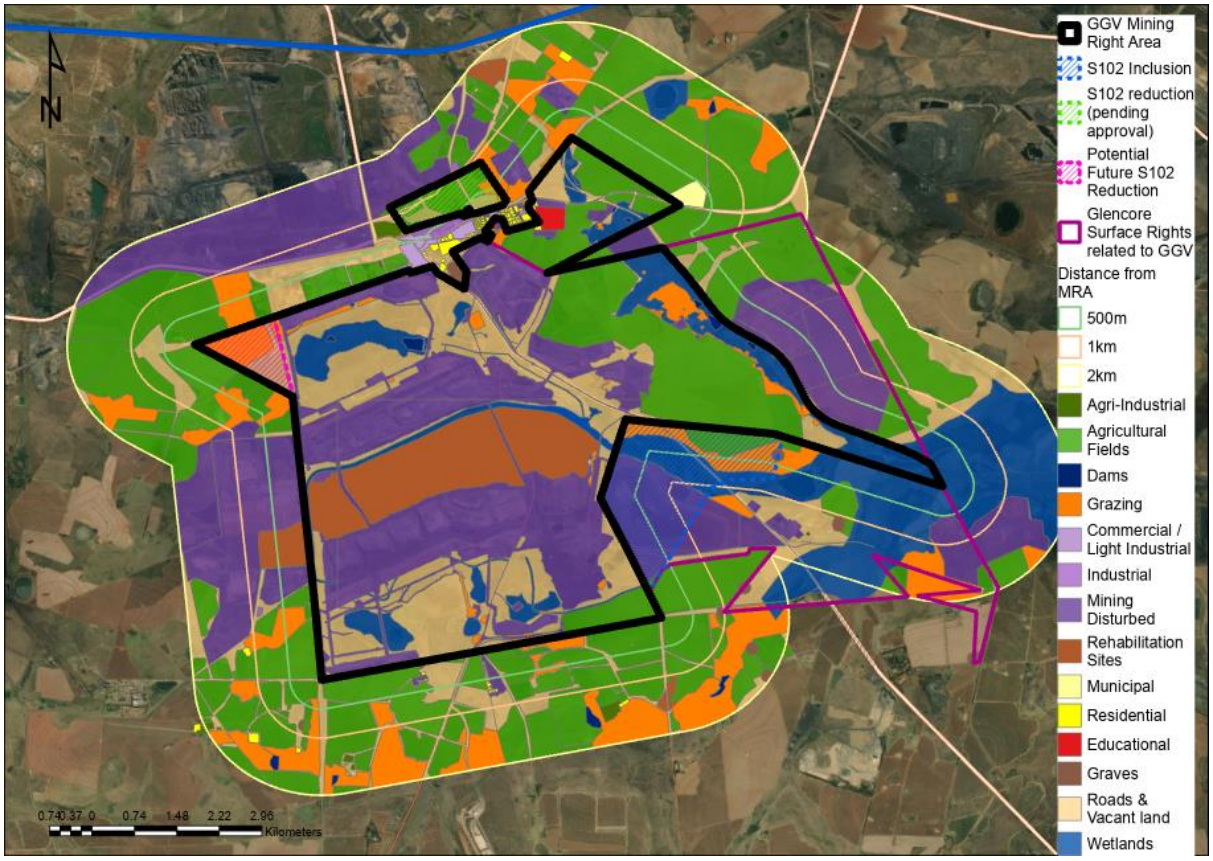


Figure 33: Present land use within a 2 km radius from the MRA

7.2.4 Terrestrial Biodiversity (Flora and Fauna)

7.2.4.1 Vegetation Type and Landscape Characteristics

The GGV Complex is situated within the Grassland Biome within the Mesic Highveld Grassland Bioregion and falls within the Eastern Highveld Grassland (Gm12) vegetation type. According to Mucina and Rutherford (2006) the conservation status of the Eastern Highveld Grassland vegetation type is Endangered; however, the threat status has been updated to a vulnerable (Vu) status in the 2018 Final Vegetation Map of South Africa, Lesotho, and Swaziland (SANBI, 2018a).

The conservation target is 24%. Only a very small fraction (less than 1%) is conserved in statutory reserves (Nooitgedacht Dam and Jericho Dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Some 44% is transformed primarily by cultivation, plantations, mines, urbanisation and by building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed sites. Erosion is very low (Mucina & Rutherford, 2006).

Typical Eastern Highveld Grassland vegetation is short dense grassland dominated by the usual highveld grass composition (*Aristida*, *Digitaria*, *Eragrostis*, *Themeda*, *Tristachya* etc.) with small, scattered rocky outcrops with wiry, sour grasses and some woody species (*Senegalia caffra*, *Celtis africana*, *Diospyros lycioides* subsp *lycioides*, *Parinari capensis*, *Protea caffra*, *P. welwitschii* and *Searsia magalismontanum*) (SAS, 2022).

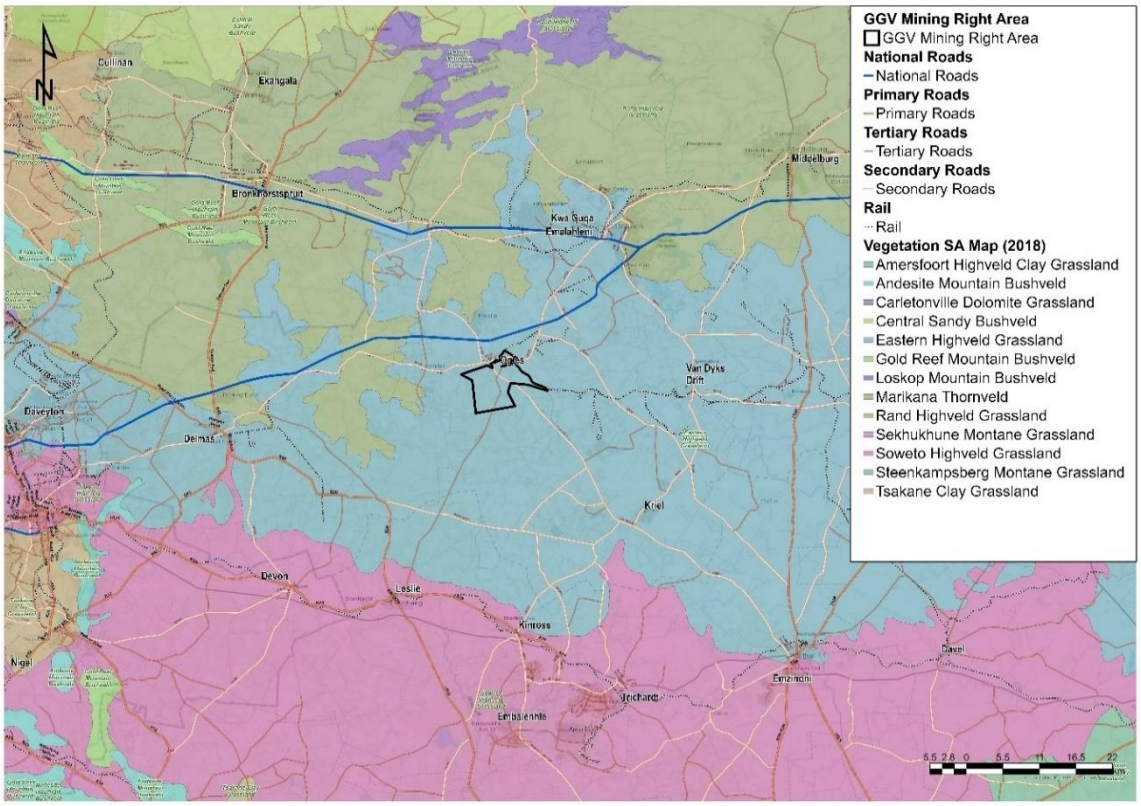


Figure 34: Regional vegetation map

7.2.4.2 Habitat Units

Following the two field assessments of 2020 and 2021, the following habitat units were distinguished for the MRA:

- Modified Habitat – Rehabilitation Sites; and Secondary Grassland.

Figure 35: Secondary Grassland

- Natural Grasslands.

Figure 36: Representative photographs of the Natural Grasslands habitat

- Transformed Habitat – AIP Tree Stands; Agricultural Fields; and Mining Areas.

Figure 37: Left – Agricultural Fields; middle – AIP stands and right – Mining areas

- Wetland Habitat – Dams; Modified Wetlands; and Natural Wetlands.

Figure 38: Left – Natural Wetland habitat subunit; Right – Modified Wetland habitat subunit

Figure 39: Representative photographs of the Dams habitat subunit

Table 14: Summary breakdown of the approximate extent of each habitat unit and subunit

Habitat Unit	Habitat Subunit	Extent (Ha)	Percentage
Modified Habitat	Rehabilitation Sites	487	10.6%
	Secondary Grassland	1 129	24.7%
Natural Grasslands	Natural Grasslands	56	1.2%
Transformed Habitat	AIP Tree Stands	131	2.9%
	Agricultural Fields	735	16.1%
	Mining Areas	1 503	32.8%
Wetland Habitat	Dams	18	0.4%
	Modified Wetlands	83	1.8%
	Natural Wetlands	437	9.5%
Total		**4 579**	**100%**

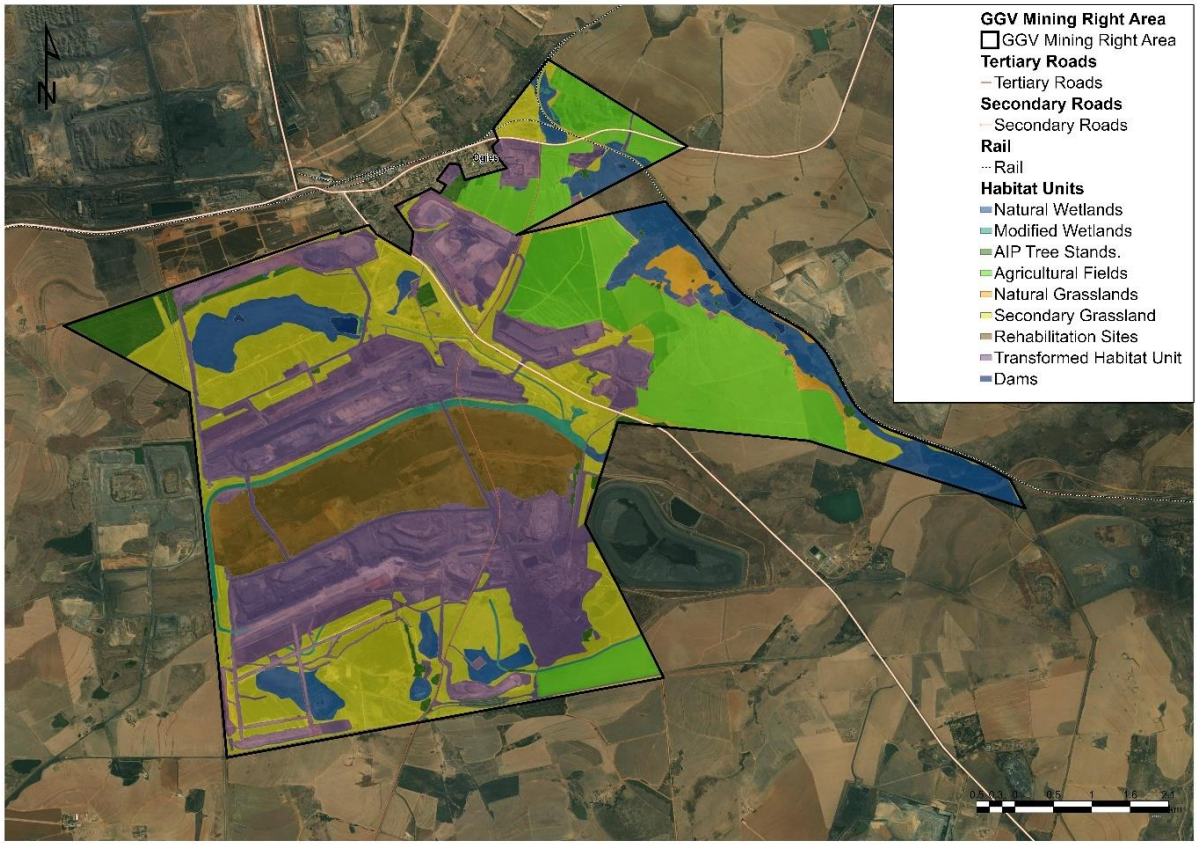


Figure 40: Habitat Unit Map

7.2.4.3 Floral Habitat and Diversity

The findings of the field assessments in November 2020 and October 2021 can be summarised as follow:

- Most of the MRA is located within either active mining areas or actively cultivated areas. The remaining natural sites include the Wetland Habitat and historically mined or historically cultivated areas (Modified Habitat).

- The Wetland habitat is not indicated as an ESA within the Mpumalanga Biodiversity Sector Plan (MBSP, 2019) but is considered part of the Mpumalanga Tourism and Parks Agency's (MTPA) Climate Change Corridors (Figure 41). These Climate Adaptation Corridors include a detailed corridor network to link up climate change priority areas (refugia) and key nature reserves. This network is used to inform climate change adaptation for species and ecosystems to respond to a changing climate, which are important to build resilience into biodiversity planning within Mpumalanga.

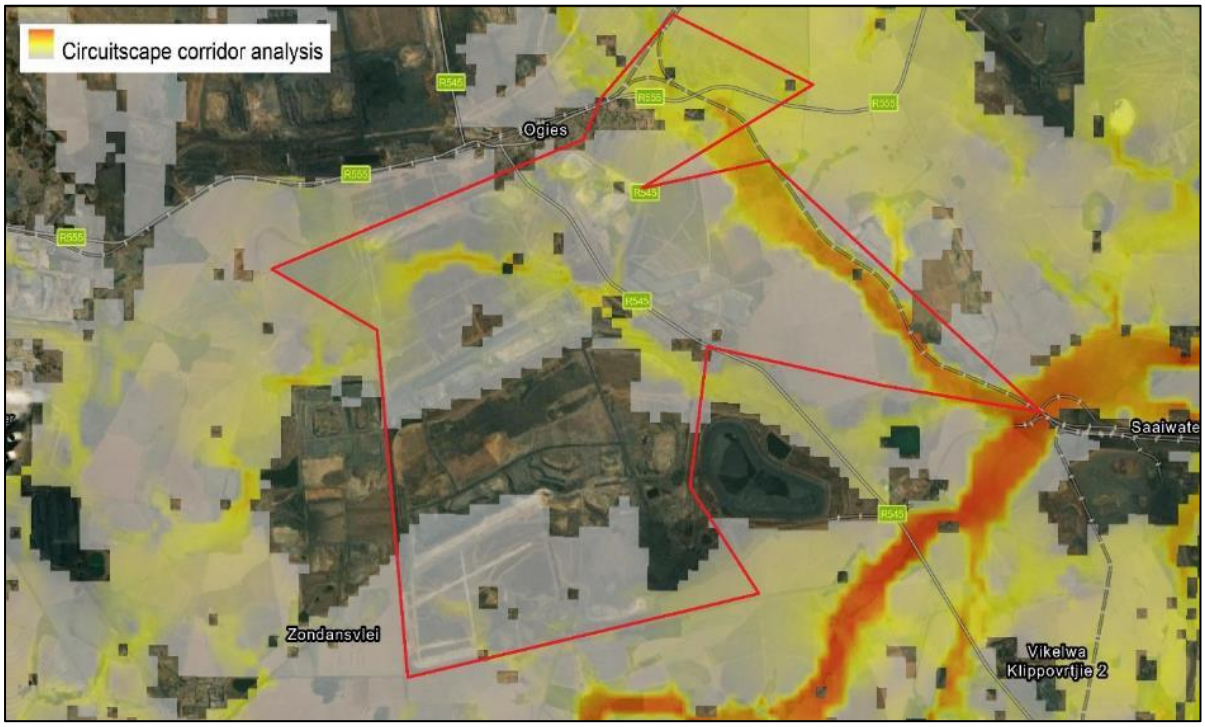


Figure 41: MTPA's Climate Change Adaptation Corridors. Map downloaded from the MTPA's Maps and GIS webpage (*https://mtpa.maps.arcgis.com/home/index.html*).

- The MRA is associated with Natural Grasslands only along its eastern sections, with moist grasslands associated with the Natural Wetlands scattered across the MRA (but best represented in the northern and eastern sections). Both fire and grazing have been altered in the Natural Grasslands and Natural Wetlands, with the Natural Grasslands impacted by heavy grazing from cattle and horses. These habitats are also fragmented to varying degrees by mining expansion, agriculture, and linear features such as road and rail networks. The Natural Grasslands and Natural Wetlands are the only sections within the MRA where natural ecological processes and drivers are still deemed present, albeit modified.
- The Wetland Habitat Unit is of moderately low (Modified Wetlands), intermediate (impacted Natural Wetlands and Dams) to moderately high (Natural Wetlands along the eastern section of the MRA) ecological importance and sensitivity from a floral perspective. Various direct and indirect impacts from mining and agriculture have resulted in the loss of some wetland ecosystem function and lowered floral species diversities; however, the Wetland Habitat Unit cannot be considered at the habitat scale alone. Instead, the habitat unit is viewed in the

larger landscape as it is part of a greater wetland system and collectively contribute to regional biodiversity and ecological processes.

- Three species listed under Schedule 11 was recorded within the Wetland Habitat Unit, namely *Crinum bulbispermum, Cyrtanthus breviflorus,* and *Disa woodii.* Available habitat for several additional species within the Natural Wetlands is present (due to suitable habitat, growing conditions) and overlap with these species' known distribution. Permits from the MTPA should be obtained to remove, cut, or destroy any of the above-mentioned protected species before any vegetation clearing may take place.
- The Natural Grassland have been subjected to grazing pressures and important ecological processes such as fire regimes have been altered. Nevertheless, the Natural Grasslands have not reached a tipping point and if allowed to recover (maybe with some anthropogenic intervention), the grasslands can recover their integrity. These Natural Grasslands occur alongside Natural Wetlands and may play an important role as a buffer for these wetlands against edge effects from the adjacent Agricultural Fields. Despite these grasslands no longer considered representative of the reference state, they form part of the few remaining patches of natural veld within a landscape otherwise characterised by mining and cultivation. As such, the Natural Grasslands are considered of intermediate sensitivity and importance from a floral ecological and resource management perspective.
- No species from the NEMBA TOPS list are likely to occur in the Natural Grasslands, and only *Boophone disticha* and *Gradiolus* species (Schedule 11) are likely to occur as these species are more resilient and able to establish within more degraded habitat (also not typically eaten by grazers).
- The Modified Habitat Unit is characterised by a lack of vegetation (Transformed Areas) and an overall lack of indigenous floral diversity (Agricultural Fields and Degraded Vegetation). The causes are related to direct anthropogenic influences and the natural floral communities have either been diminished or has experienced a complete shift from the reference state.
- The Modified Habitat Unit and the Transformed Habitat Unit are of low-to-moderately low ecological importance and sensitivity from a floral perspective. Floral SCC were absent from this habitat unit and due to a lack of suitable habitat and growing conditions, it is highly unlikely that any floral SCC will establish persistent populations.
- Bush encroachment by the shrub *Gomphocarpus fruticosus* and *Seriphium plumosum* was observed within the Modified Wetlands and Natural Grasslands. The extent of this encroachment is not severe yet but has contributed to loss of diversity and habitat within the Wetland and Natural Grassland Habitat Units. *Seriphium plumosum* specifically is a species known to be an aggressive encroacher of mesic grasslands that leads to severe veld degradation.
- Avoiding or reversing bush encroachment is possible with rangeland management; however, in cases where bush encroachment has passed the tipping point where the encroacher species account for more than 40% - 50% of vegetation cover, it is recommended that bush

encroachment be cleared or thinned manually or mechanically. The guidance of a suitably qualified person should be sought.

- An intermediate diversity of medicinal species is present within the MRA with most of the species being common and widespread and not confined to the MRA – nor are any of the species on the MNCA protected species list and they are not considered RDL species. Many of the species are alien species, with two listed as Category 1b invaders. The impact on medicinal species is thus considered to be localised and will not affect these floral communities on a regional scale.
- The Wetland and Natural Grassland Habitat Unit had a low to moderate abundance of AIPs. The Transformed Habitat Unit generally had a moderate to high abundance of AIPs, with the Modified Habitat Unit dominated by AIPs. Of the AIPs recorded during the field assessment, nine species are listed under NEMBA Category 1b. The remaining 27 species are not listed under NEMBA but species such as *Bidens Pilosa (*common blackjack*), Cosmos bipinnatus (*cosmos*), Conyza bonariensis (*flax-leaf fleabean*), Conyza canadensis (*horseweed) and *Tagetes minuta* (khakiweed) are considered problem plants having a negative impact on indigenous floral communities within the MRA (achieving monodominance in several sections and pushing out indigenous flora). Due to the extent of AIPs within the MRA, as well as the proximity to wetlands, it is highly recommended that the Alien and Invasive Species Control and Management Plan be implemented as soon as possible to ensure no further loss of indigenous floral communities occurs.

Table 15 provides an overview of recorded and anticipated floral Species of Conservational Concern (SCC) for the GGV MRA.

Table 15: Schedule 11 - Protected Plants

Scientific Name	POC
Sensitive species 691 - Suitable habitat is available in the Natural Grasslands and Natural Wetlands.	Medium
Zantedeschia spp. Only two species in this genus are likely to occur within the Natural Wetlands Habitat unit due to suitable habitat, namely: - *Zantedeschia aethiopica* - It prefers seasonally damp sandy or rocky places. It is often found adjacent to permanent springs, frequently growing in standing water. It is resilient to disturbance and persists in degraded habitats. - *Zantedeschia albomaculata* subsp. *albomaculata* - It occurs in seasonally wet marshy areas, damp grasslands, and along stream sides.	Medium
Kniphofia spp.	Medium
Aloe spp., excluding: (a) All species not occurring in Mpumalanga (b) The following species: *Haworthia spp.; Agapanthus spp.; Scilla spp*. Suitable habitat is available for *Aloe ecklonis* within the Natural Wetlands Habitat Unit. This species can tolerate disturbed conditions.	High
Eucomis spp. - Suitable habitat is available for *Eucomis autumnalis* within the Natural Wetlands Habitat Unit.	High
Boophane disticha	Medium

Scientific Name	POC
- Suitable habitat is available in the Natural Grasslands.	
Brunsvigia spp. - Suitable habitat is available in the Natural Grasslands.	Medium
Crinum spp. - Suitable habitat is available for three species in this genus, namely *Crinum bulbispermum*, *Crinum graminicola* and *Crinum macowanii* - *Crinum bulbispermum* was confirmed in the Natural Wetland habitat.	Confirmed
Cyrtanthus spp. - Suitable habitat is available in the Natural Grasslands.	Confirmed
Gladiolus spp. - Suitable habitat is available in the Natural Grasslands and Natural Wetlands.	High
All species of the family Orchidaceae - One species of orchid was recorded within the Natural Wetlands Habitat Units, namely *Disa woodii*. - The Natural Grasslands and the Natural Wetlands are also suitable for several other orchid species such as *Habenaria epipactidea*, *Habenaria schimperiana*, *Habenaria filicorn*is and *Habenaria nyikana* subsp*. nyikana*	Confirmed

The data gathered during the site visit indicate that the Secondary Grassland, AIP Tree Stands, Agricultural Fields, and Mining Areas are of Low sensitivity, the Rehabilitation Sites and Modified Wetlands of Moderately Low sensitivity, the Natural Grasslands, Dams, and Natural Wetlands (including those associated with Incline 4) of Intermediate sensitivity, and the less disturbed Natural Wetlands (including those associated with small sections of Incline 2) are of Moderately High sensitivity. The flora sensitivity map is indicated in Figure 42.

Figure 42: Flora sensitivity map

7.2.4.4 Faunal habitat and diversity

The findings of the field assessments in November 2020 and October 2021 can be summarised as follow:

- Several mammal species were observed on site, notably in the more intact areas in the east of the MRA where the wetland systems and grassland areas provide suitable habitat and available forage. The scat and tracks of SCC *Leptailurus serval* (Serval, NT IUCN and Protected TOPS) were seen in the GGV northern area during the field 2020 assessment. Other SCC which were not observed on site, but have a medium probability of occurring (POC) within the MRA are: *Atelerix frontalis* (Southern African Hedgehog, NT) and *Crocidura mariquensis* (Swamp Musk Shrew, NT). The mammal species listed by the screening tool are: *Hydrictis maculicollis* (Spotted Necked Otter, NT), *Ourebia ourebi* (Oribi, EN) and *Chrysospalax villosus* (Rough-haired Golden Mole, VU). Following the site assessment and taking into consideration the quality of available habitat in the MRA as well as the current anthropogenic activities and impacts, none of the screening tool listed species are expected to occur in the MRA.
- Taking into consideration the available habitat and the diversity of avifauna as well as the SCC that may make use of various habitats, the MRA is considered to be of increased importance from an avifaunal perspective. In particular, this related to the natural habitats (wetlands and grassland) within the east of the MRA. The South African Bird Atlas Project 2 (SABAP2) website has records of *Geronticus calvus* (Southern Bald Ibis, VU), *Oxyura maccoa* (Maccoa Duck, VU), *Tyto capensis* (Grass Owl, VU), *Phoenicopterus roseus* (Greater Flamingo, NT) and *Phoeniconaias minor* (Lesser Flamingo, NT) within the associated pentads for the MRA. On-site habitat characteristics for breeding and foraging exist for these species. These species are likely to occur in the east of the MRA in association with the wetlands and dams. *T. capensis* (Grass Owl, VU) may make use of the wetland habitats for breeding whilst the two flamingo species may make use of the dams for brief rest periods and to drink, foraging is unlikely herein. *O. maccoa* (Maccoa Duck, VU) will likely forage in the dams and may also breed herein. No suitable breeding sites for *G. calvus* were observed on site, however this species will likely make use of the grasslands for foraging, notably in the east of the MRA. Avifauna with a "Medium" potential to occur on site are *Sagittarius serpentarius* (Secretary bird, NT), *Circus ranivorus* (African Marsh Harrier, NT) *Eupodotis caerulescens* (Blue Korhaan, VU), *Eupodotis senegalensis* (White-bellied Korhaan, VU), *Neotis denhami* (Denham's Bustard, VU) and *Anthropoides paradise* (Blue Crane, VU). These SCC have a "Medium" POC on the grounds that their regional distribution range and habitat overlap with the MRA, although they have not been recently recorded in the local area. *Tyto capensis* (African Grass Owl, VU), and *Circus ranivorus* (African Marsh Harrier, EN) are the only faunal SCC listed by the online DFFE screening tool to have an increased POC in the MRA.
- Freshwater areas, where amphibians are expected to occur were actively searched, however no species were observed during the site visit. The cryptic nature of many amphibian species and the areas they inhabit make them challenging to observe in the field even when abundances are high. Habitat (wetlands and dams) for *Pyxicephalus adspersus* (Giant Bullfrog, NT and P) is present in the MRA and the species has been historically recorded in the QDS. This species therefore has a high POC and will likely make use of the wetland and adjacent

Natural Grassland habitat in the east of the MRA. This species therefore has a high POC and will likely make use of the wetland and adjacent Natural Grassland habitat in the east of the MRA. This species will likely aestivate for much of the year underground, emerging after heavy rains to breed. The dams and areas of standing water in the wetlands will provide ideal habitat for breeding, most likely in and around Shaft 2. As this species is underground for much of the year, earth moving activities pose a significant risk to aestivating individuals.

- No reptile species were observed during the field assessment, owing to the fact that reptiles are inherently secretive and shy, making their detection and identification in the field challenging (specifically during site visits of a short duration). However, based on the available databases, atlases, food resources and habitat, it is deemed likely that the MRA will be able to support common reptile species, such as *Chamaleo dilepsis* (Flap-necked Chameleon, LC), *Trachylepis varia* (Variable Skink, LC), *Trachylepis punctatissima* (Speckled Rock Skink), *Stigmochelys pardalis* (Leopard Tortoise), *Psammophylax rhombeatus* (Rhombic Skaapsteker), *Amplorhinus multimaculatus* (Cape Reed Snake) and *Crotaphopeltis hotamboeia* (Red-lipped Herald). All these species are widespread and common to the region.
- Insect diversity and abundance is deemed to be moderately high for the MRA, with a significant number of species observed. All species observed were commonly occurring and widespread in the area. Odonatans, Orthopterans and Lepidopterans were the most abundant orders within the MRA at the time of the survey, which is likely due to the availability of freshwater in the wetlands and food resources in the adjacent flowering grasslands.
- Only one arachnid species from the family Agelenidae (Funnel-web spider, NYBA) was observed during the field assessment.
- The Transformed Habitat Unit is of low ecological importance from a faunal perspective. Anthropogenic activities herein, have significantly reduced faunal habitat availability and quality herein. As such, these units can no longer support diverse faunal communities.
- The Rehabilitation Sites subunit is of limited importance from a faunal perspective. While vegetation has regrown herein that may support some resilient invertebrate and reptilian species, the unit is dominated by AIPs, which significantly limits the sensitivity and conservation value of these areas from a faunal perspective.
- The Secondary Grassland includes areas that have historically been under cultivation. However, with no rehabilitation intervention, the habitat has transitioned to a homogenous field dominated by AIPs. This unit is therefore in a heavily degraded condition and dominated by AIPs such as *Bidens pilosa* (Black-Jack). Due to its highly disturbed condition, this subunit is of low ecological importance to faunal communities.
- The Natural Wetlands habitat subunit remains relatively intact and therefore offers suitable habitat and forage for faunal communities, offering potential refugia for more specialist species, including several SCC. The modified wetlands, albeit in an altered state, may still provide valuable niche habitat for water reliant faunal species, notably amphibians, however the impacted state of the modified wetlands lessons the likelihood that SCC may occur herein.

- The dams are artificial in nature but are located within natural wetland systems. As such, they should be viewed together with the larger wetland systems in which they occur when interpreting their importance for biodiversity. These impoundments are characterised by permanent stands of water where vegetation is largely restricted to their outer edges. A high diversity of water associated avifauna were observed in this habitat subunit, indicating that these dams still provide valuable habitat to fauna, serving an important ecological function albeit amidst disturbed and fragmented surroundings.
- The Natural Grasslands were encountered within the eastern section of the MRA occurring along the Wetland Habitat. Despite these grasslands being in a relatively natural state, these grasslands have been heavily grazed which has resulted in a highly homogenous vegetation structure with reduced food resources for herbivores which in turn, limits the favourability of these areas for predators. Despite its reduced habitat quality and overall suitability to fauna, this subunit currently functions as an important movement corridor that animals will utilise to access the water resources in the Wetland Habitat (referring especially to the wetland in the eastern portion of the MRA). As such, this subunit is considered of moderate importance from a faunal perspective.

Table 16 provides an overview of recorded and anticipated faunal SCC for the GGV MRA.

Table 16: List of faunal SCC potentially occurring in the MRA

Scientific and Common Name	Habitat Description	Regional Status	POC (%)
Mammals			
Leptailurus serval **(Serval)**	**Range:** Throughout Central Africa, extending into eastern portion of South Africa. **Major habitats:** Forest, Savanna, Grassland and inland wetlands**.** **Description:** In sub-Saharan Africa, Servals are found in well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types. **Food:** Small mammals, birds, reptiles and arthropods. **Available habitat within the MRA:** Wetland and adjacent Natural Grassland habitats**.**	NT	**Confirmed**
Atelerix frontalis **(Southern African Hedgehog)**	**Range:** Widespread throughout mid-eastern South Africa **Major habitats:** Dry grassland and bushveld **Description:** Remains in their burrows during the day and forages at night. Hibernates in winter. **Food:** Invertebrates **Available habitat within the MRA:** Natural Grassland habitat	NT	**Medium**
Crocidura mariquensis **(Swamp Musk Shrew)**	**Range:** Mid-central and southern sub-Saharan Africa, including north-eastern parts of South Africa. **Major habitats:** Waterlogged areas such as inundated grasslands and vleis. Description: Only occur close to open water with intact riverine and semi-aquatic vegetation such as reedbeds, wetlands and the thick grass along riverbanks They are found both in the wet substrates and drier grassland away from the water's edge. **Food:** Invertebrates **Available habitat within the MRA:** Wetland habitat unit	NT	**Medium**
Avifauna			

Scientific and Common Name	Habitat Description	Regional Status	POC (%)
Circus ranivorus **(African Marsh Harrier)**	**Range:** This species is resident in wetlands from South Africa north to Democratic Republic of Congo and southern Sudan. The extensive Okavango marshes (Botswana) are probably its stronghold (Harrison et al. 1997a). **Major habitats:** The species breeds in wetlands, foraging primarily over reeds and lake margins (Harrison et al. 1997a). **Food:** Its diet consists largely of small mammals, particularly striped mouse *Rhabdomys pumilio* (Kemp and Dean 1988). **Available habitat within the MRA:** Wetland habitat and adjacent Natural Grassland habitat	EN	**Medium**
Anthropoides paradiseus **(Blue Crane)**	**Range:** Mpumalanga, KwaZulu-Natal, Free State and Eastern Cape **Major habitats:** breeds in natural grass- and sedge-dominated habitats, preferring secluded grasslands at high elevations where the vegetation is thick and short (Barnes 2000). Occasionally it will breed in or near wetland areas (Barnes 2000), in pans or on islands in dams (Hockey et al. 2005). **Food:** Feeds primarily on plant material including the seeds of sedges and grasses, roots, tubers and small bulbs **Available habitat within the MRA:** Wetland and adjacent grassland habitat	NT	**Medium**
Neotis denhami **(Denham's Bustard)**	**Range:** Within the region, an isolated population occurs widely but sparsely over much of mesic eastern half of South Africa, from the Overberg in Western Cape through Eastern Cape and KwaZulu-Natal to the high-lying grasslands of Mpumalanga, with an outlying sub-population in Limpopo Province. **Major habitats:** Inhabits grasslands, grassy Acacia-studded dunes, fairly dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains, also grass-covered ironstone pans and burnt savanna woodland **Food:** Feeds on insects, small vertebrates and plant material. **Available habitat within the MRA:** Wetland habitat	VU	**Medium**
Eupodotis caerulescens **(Blue Korhaan)**	**Range**: South African Endemic. Ranging between Mbombela in Limpopo to Cradock in Eastern Cape and southern portion of the Northern Cape. **Major habitats**: plateau grassland, dry shrubland, arable land and pastureland. **Description**: Inhabits open, fairly short grassland and a mixture of grassland and karoo dwarf-shrubland within 1km of water, with termite mounds and few or no trees. Sedentary species, usually found in pairs or small groups. **Food:** Omnivorous. Feeds on insects, small reptiles and plants. **Available habitat with the MRA:** Natural Grassland and Wetland habitat.	NT	**Medium**
Eupodotis senegalensis **(White-bellied Korhaan)**	**Range**: Scattered populations through southern, central, eastern and western Africa. **Major habitats**: Open Savanna, Tall Grassland and Wetlands. Excluding deserts. **Description**: Uncommon resident that is sedentary and usually seen in pairs or small groups. **Food:** Insects, small vertebrates and vegetable matter. **Available habitat with the MRA:** Natural Grassland and Wetland habitat.	VU	**Medium**
Geronticus calvus **(Southern Bald Ibis)**	**Range:** Endemic to South Africa and Lesotho. Ranging from Polokwane in Limpopo down to Lesotho. **Major habitats:** High altitude short grasslands, also cultivated lands, reaped maize fields and ploughed areas**.** **Description:** Endemic, uncommon resident, gregarious with winter altitudinal movements. **Food:** Insects, snails, frogs. **Available habitat with the MRA:** Wetland habitat, particularly in the Dams subunit.	VU	**High**

Scientific and Common Name	Habitat Description	Regional Status	POC (%)
Tyto capensis **(African Grass Owl)**	**Range:** Central and southern Africa, ranging through South Africa, Zimbabwe, Mozambique, Zambia, northern Angola and southern DRC. Small distribution noted in northern Tanzania and wester Kenya. **Major habitats**: Savanna, Grassland and Wetlands**.** **Description:** Uncommon resident, predominantly within Gauteng, Mpumalanga and Limpopo. Also seen along the garden route in the Western Cape. Favours tall rank, or dense grasslands. Species has been severely affected by the degradation of grassland habitat. **Food:** Rodents, birds and insects **Available habitat with the MRA:** Wetland and adjacent Natural Grassland habitat.	VU	**High**
Phoenicopterus roseus **(Greater Flamingo)**	**Range:** Extensive range including much of southern Africa, the east and west coast of Africa, North Africa and southern Europe extending east to India and inland towards East Russia. **Major habitats**: Wetlands (inland) and Marine Neritic (Estuaries). **Description:** Migratory species which favours eutrophic water bodies in which it feeds on small aquatic vertebrates, invertebrates and molluscs. Freshwater systems often used as rest points during flight and to drink water. Breeding does not occur in freshwater systems. **Food:** Aquatic vertebrates and invertebrates as well as plant material from time to time. **Available habitat with the MRA:** Wetland habitats and the dams.	NT	**Medium**
Phoeniconaias minor **(Lesser Flamingo)**	**Range:** Southern Africa, parts of west Africa and east Africa, Saudi Arabia and India. **Major habitats**: Wetlands (inland) and Marine Neritic (Estuaries). **Description:** The Asian and southern African populations are partially migratory, with many making regular movements from their breeding sites inland to coastal wetlands when not breeding. Unlikely to breed within the MRA but may use the freshwater systems as stop over points to rest and drink water. **Food:** Obligate filter feeder and feeds by filtering the algae near the surface with a specialised bill. **Available habitat with the MRA:** Wetland habitats and the dams.	NT	**Medium**
Eupodotis senegalensis **(White-bellied Korhaan)**	**Range**: Scattered populations through southern, central, eastern and western Africa. **Major habitats**: Open Savanna, Tall Grassland and Wetlands. Excluding deserts. **Description**: Uncommon resident that is sedentary and usually seen in pairs or small groups. **Food:** Insects, small vertebrates and vegetable matter. **Available habitat with the MRA:** Natural Grassland and Wetland habitat.	VU	**Medium**
Sagittarius serpentarius **(Secretarybird)**	**Range**: Throughout Sub-Saharan Africa, absent from forested West. **Major habitats**: Open grassland with scattered trees, shrubland and savanna **Description**: Usually in pairs, nut can congregate in larger groups at waterholes. Strides along open grassy areas for hours. Stampedes to catch its prey **Food:** Insects, amphibians, birds, small mammals, reptiles, invertebrates. **Available habitat with the MRA:** Wetland habitat unit and adjacent Natural Grasslands.	VU	**Medium**
Oxyura maccoa **(Maccoa Duck)**	**Range**: Mainly within southern Africa, with small distributions noted in Tanzania and Ethiopia. **Major habitats**: Aquatic habitats with extensive emergent vegetation. **Description**: Inhabits small temporary and permanent inland dams preferring those that are shallow and nutrient-rich with extensive emergent vegetation such	VU	**Medium**

Scientific and Common Name	Habitat Description	Regional Status	POC (%)
	as reeds. Prefers areas with a bottom of mud or silt and minimal amounts of floating vegetation. **Food:** Invertebrates, seeds, plant matter and molluscs. **Available habitat with the MRA:** Wetland habitat		
Herpetofauna			
***Pyxicephalus adspersus* (Giant Bullfrog**	**Range:** Central and southern Africa. Distribution extends from South Africa up to Kenya. Major Habitats**:** Savanna, Grassland, Wetlands, Shrublands. **Description:** Restricted to drier savannahs. Fossorial for most of the year, remaining buried in cocoons. They emerge at the start of the rains, and breed in shallow, temporary waters in pools, pans and ditches. Diurnal during the breeding season**.** **Available habitat with the MRA:** Wetland habitat and adjacent Natural Grassland habitat	VU	**High**
Invertebrates			
***Metisella meninx* (Marsh Sylph)**	**Range:** Endemic to South Africa. Found in Mpumalanga, Gauteng and northern parts of Free State and Kwa-Zulu Natal**.** **Major habitats**: Marshy and saturated wetland environment. Description: Found mainly between altitude of 1600m and 1700m where thick clumps of marsh grass are available. Larval food is *Leersia hexandra.* **Available habitat with the MRA:** Wetland habitat and adjacent Natural Grassland habitat	NT	**High**
***Harpactira hamiltoni* (Highveld Baboon Spider)**	**Range:** Found in Gauteng, North-West, Free Sate and Mpumalanga**.** **Major habitats**: Grassland and bushveld **Available habitat with the MRA:** Natural Grassland habitat	TOPS	**Medium**

From a faunal perspective, the Wetland Habitat was determined to be of **Moderately High sensitivity**, the Natural Grassland of **Intermediate sensitivity**, the Modified Habitat of **Moderately Low sensitivity**, and the Transformed Habitat Unit of **Low sensitivity**. The fauna sensitivity map is indicated in Figure 43.

Figure 43: Fauna sensitivity map

7.2.5 Surface Water

GGV Complex is located within two different catchment areas (Figure 44), namely:

- Olifants River catchment. Most of the site drains to the Zaaiwaterspruit and falls within quaternary sub-catchments B11F of the Limpopo-Olifants primary drainage region. The Zaaiwaterspruit drains to the Olifants River which in turn flows through the Witbank Dam; and
- Wilge River catchment. The most northernly portions of Grootpan 7 IS and Kleinzuikerboschplaats 5 IS is situated in quaternary sub-catchment B20G of the Limpopo-Olifants primary drainage region, which drains to the Saalboomspruit. The Saalboomspruit drains into the Wilge River, and eventually into the Olifants River downstream of the Witbank Dam.

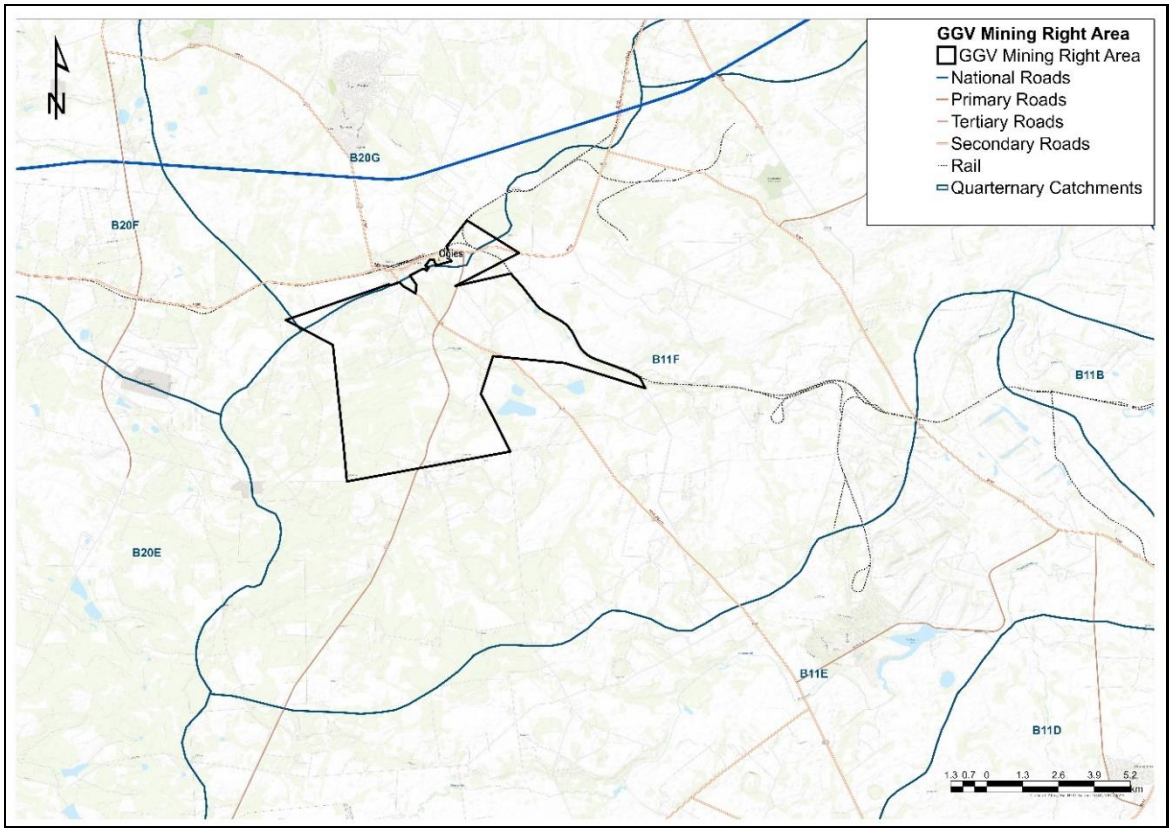


Figure 44: Quaternary catchments

7.2.5.1 Surface water quantity

Several nodes or points of interest were identified on the watercourses at GGV Section, at which MAR and peak flows were determined. The MAR at selected nodes was determined from data published in WR90 and shows that the various catchments affected by the mining are small in relation to the Witbank Dam catchment.

The dry weather flow for the Zaaiwaterspruit catchment contributes 17% of the dry weather flow for the total catchment. An accepted definition for dry weather flow is that flow that is equaled or exceeded 70% of the time. The Zaaiwaterspruit is an ephemeral watercourse, being highly seasonal. Periods of inundation can be brief, with the shortest recorded period being two weeks.

The 1:100-year floodlines for GGV was determined by Jones &Wagener in 2013 and is depicted in Figure 45. The 1:100-year floodlines for diversions and channels within GGV was determined by Golder Associates in 2020 and is indicated in Figure 46.

7.2.5.2 Surface water use

GGV Section is situated in a farming district. Primary uses are for irrigation, formal and informal domestic usage, and livestock watering. However, most of the usage occurs downstream of GGV because of the low yield at the top end of the catchment. Water is also abstracted from the Witcons dam for use as industrial water by other operations. Aquatic life is also present as a downstream user.

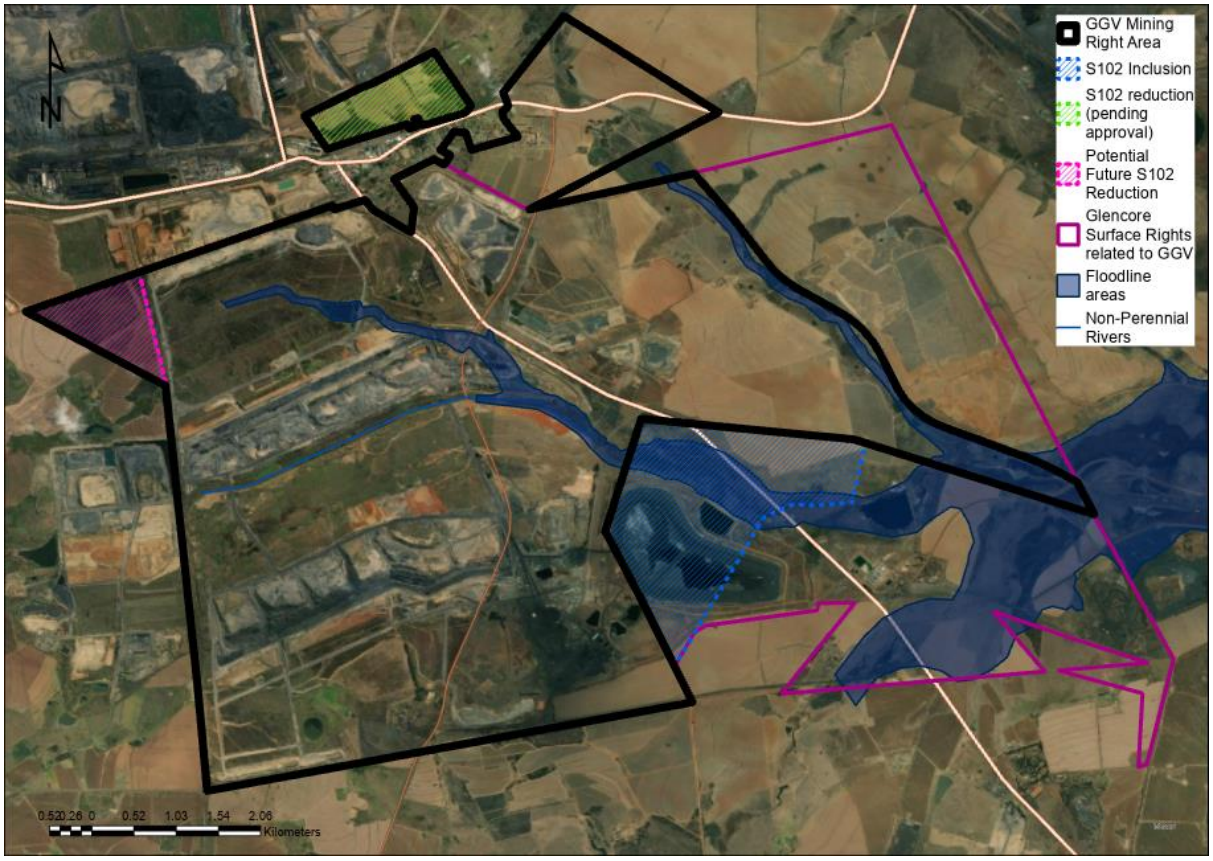


Figure 45: 1:100-year floodlines (J&W, 2013)

Figure 46: 1:100-year floodlines (Golder, 2020)

7.2.5.3 Surface water quality

The Integrated Water and Waste Management Plan (IWWMP) for GGV was recently updated by J&W (2022). The available surface water quality data was divided into the pre-mining period (i.e. 2001 to 2008) and operational period (i.e. 2009 onwards) and the water quality data for these periods was compared were compared to the Receiving Quality Objective (RQO). The surface water monitoring locations are indicated in Figure 47.

The average values for pH, Electrical Conductivity (EC) and sulphate (SO_4) for period 2001-2008 as well as for periods 2009-2011 and 2018-2021 can be seen in Table 17. The values in RED indicate instances where the RQO or the SANS241 Guidelines have been exceeded.

Figure 47: Surface water monitoring locations (J&W, 2022)

Sample locations GOSR1, 2, 3, 5 and 6 are located on the Zaaiwaterspruit, while GOSD1 and GOSR4 are located on the northern tributary. Sampling locations GOSD02 and GOSD03 are located within the dirty water system and would therefore be expected to have concentrations reflecting contaminated water.

From Table 17 it can be noted that the surface water quality in the northern tributary has deteriorated but remains within the RQO limits. Surface water quality in the Zaaiwaterspruit diversion as well as in the Zaaiwaterspruit within the mine boundary and downstream of the river diversion has deteriorated.

Table 17: Pre-mining and operational phase water quality data comparison (J&W, 2022)

	2001-2008			2009-2011			2018-2021		
Sample location	**pH**	**EC mg/ℓ**	**SO_4 mg/ℓ**	**pH**	**EC mg/ℓ**	**SO_4 mg/ℓ**	**pH**	**EC mg/ℓ**	**SO_4 mg/ℓ**
SANS 241 2015 screening guidelines	**5-9.7**	**170**	**500**	**5-9.7**	**170**	**500**	**5-9.7**	**170**	**500**
RQO 2016, Olifants River, IUA 1, Resource Unit 11		**111**	**500**		**111**	**500**		**111**	**500**
Clean Areas									
GOSD1	7	31	89	7	23	13	9	54	131
GOSR1	7	64	285	7	57	191	7	146	799
GOSR2	7	102	505	7	59	205	7	425	541
GOSR3	7	97	417	7	45	151	7	131	714
GOSR4	7	22	46	7	24	38	6	16	52
GOSR5	7	20	44	7	97	458	7	94	460
GOSR6	7	30	99	7	57	272	6	206	1190
Dirty Areas									
GOSD3	8	219	1223	4	217	1039	Not currently sampled – dams have been mined through and were replaced by other monitoring points		
GOSD2	7	49	194	4	295	1523			

The IWWMP (J&W, 2022) concluded that:

- The current monitoring data indicates that the RQO are exceeded within the majority of sampling locations along the Zaaiwaterspruit.
- Over the past 2-4 years the water quality in the Zaaiwaterspruit downstream of the GGV opencast and MRF (GOSR06) has shown a marked decline in water quality, with EC and sulphate significantly exceeding the RQO (IWWMP, 2022).
- Elevated EC is observed at GOSR5, at the downstream end of the existing Zaaiwaterspruit river diversion.
- The water quality monitoring data indicates that the Zaaiwaterspruit was already impacted by mining activities in the catchment prior to the start of mining at GGV. However, the impact on water quality has increased during mining operations at GGV, indicating an impact from the mine.

7.2.5.4 Wetland Delineation

The pre-mining wetland delineation based on the soil mapping (wetland soils) is indicated in Figure 48. The pre-mining wetlands identified within the GGV MRA amount to approximately 1 094 ha or 24% of the total area. It is noted that of these approximately 590 ha have been approved for destruction in terms of the MPRDA and NWA.

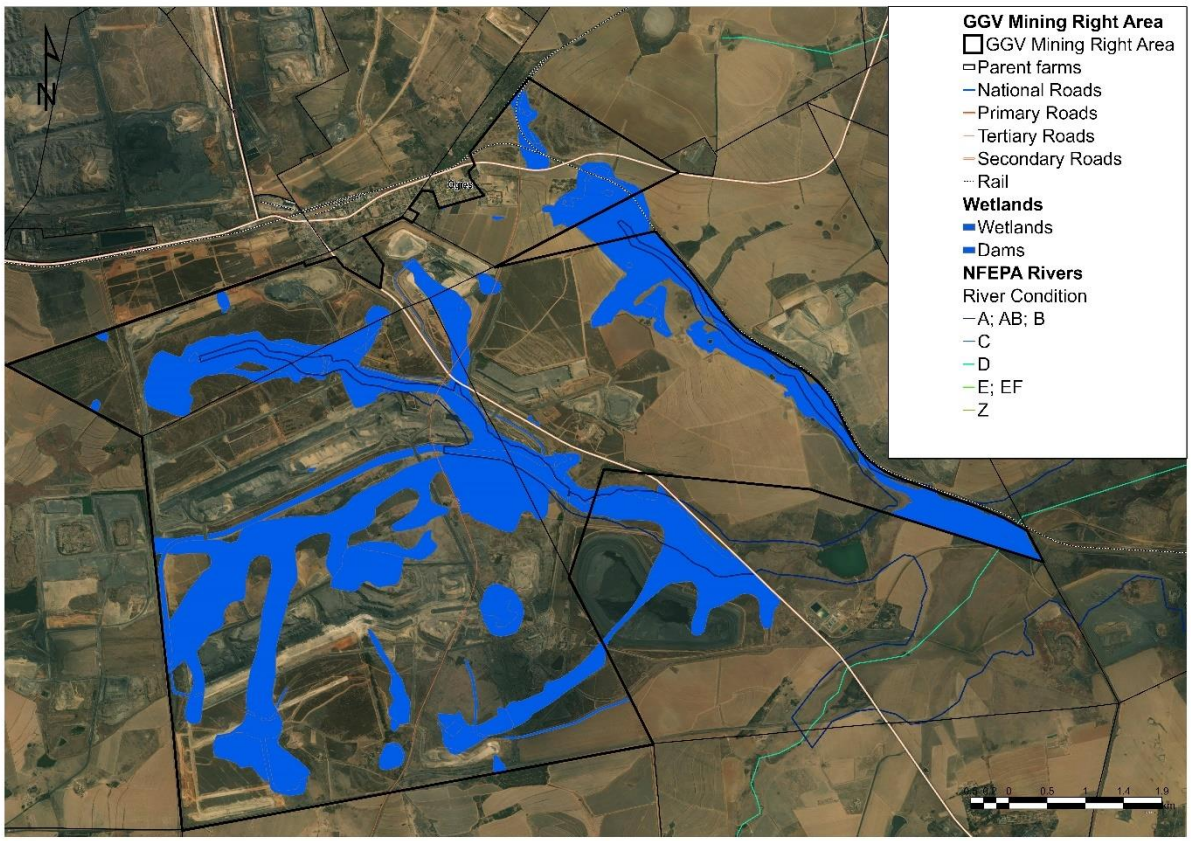


Figure 48: Wetland delineation for GGV Complex (pre-mining)

Scientific Aquatic Services (SAS) updated the wetland delineation map in 2022, indicating the remaining wetland systems within the GGV MRA. The remaining wetlands consists of channelled valley bottom and hillslope seep wetlands and pans as indicated in Figure 49. The remaining wetland systems amount to approximately 555 ha (Table 18), of which a further 264 ha will be destroyed due to previous approvals in terms of the MPRDA and NWA. The wetland characterisation below conducted by SAS focused on the natural wetlands that have not yet been approved for destruction, as indicated in Figure 50.

Table 18: Remaining wetlands within GGV MRA (SAS, 2022)

Wetland Type	Wetlands remaining 2022 (ha)	Approved for destruction (ha)	Wetlands remaining LOM (ha)
Natural wetlands			
Channelled valley bottom	19.75	-	19.75
Hillslope seep	434.67	243.57	191.10
Pan	13.15	13.15	-
Subtotal	467.57	256.73	210.84
Unnatural wetlands			
River diversion	70.67	-	70.67
Dam	16.30	7.16	9.14
Subtotal	86.97	7.16	79.81
Total	**554.54**	**263.89**	**290.65**

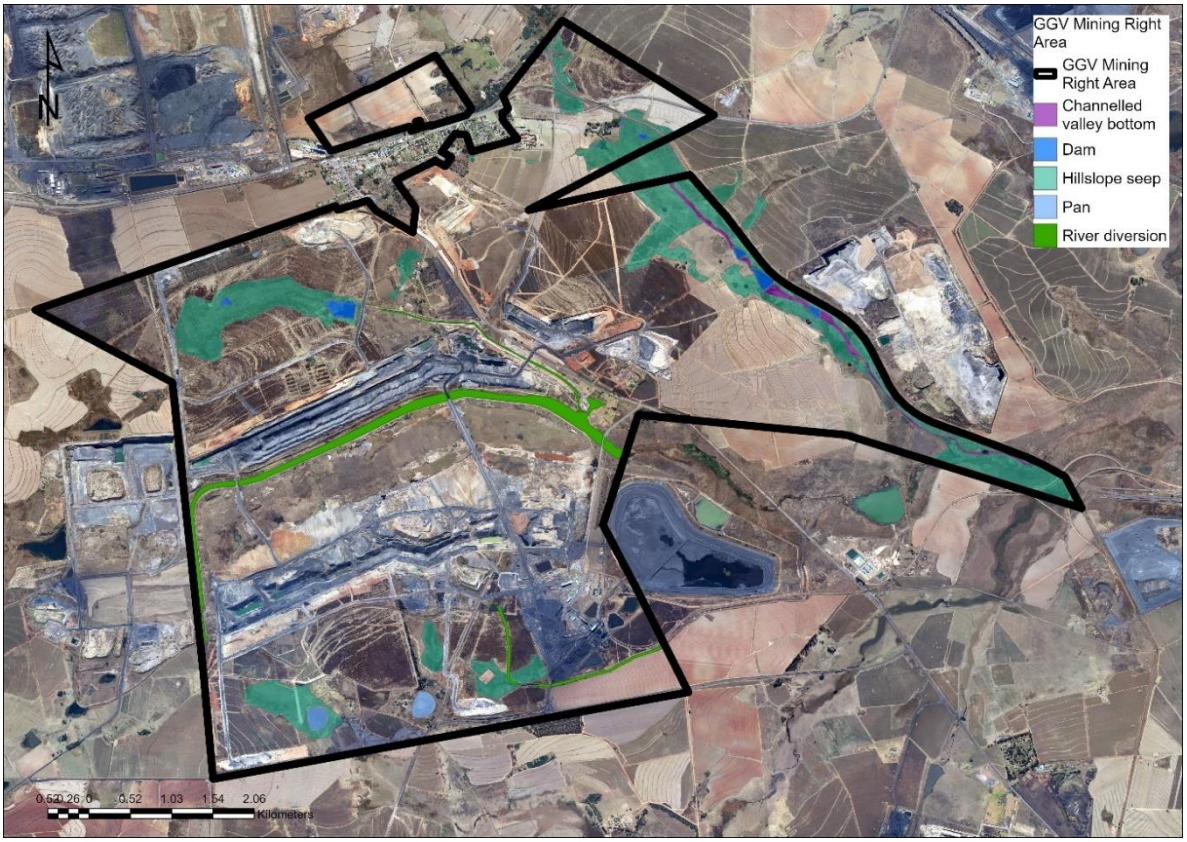


Figure 49: Wetland delineation of remaining wetlands (SAS, 2022)

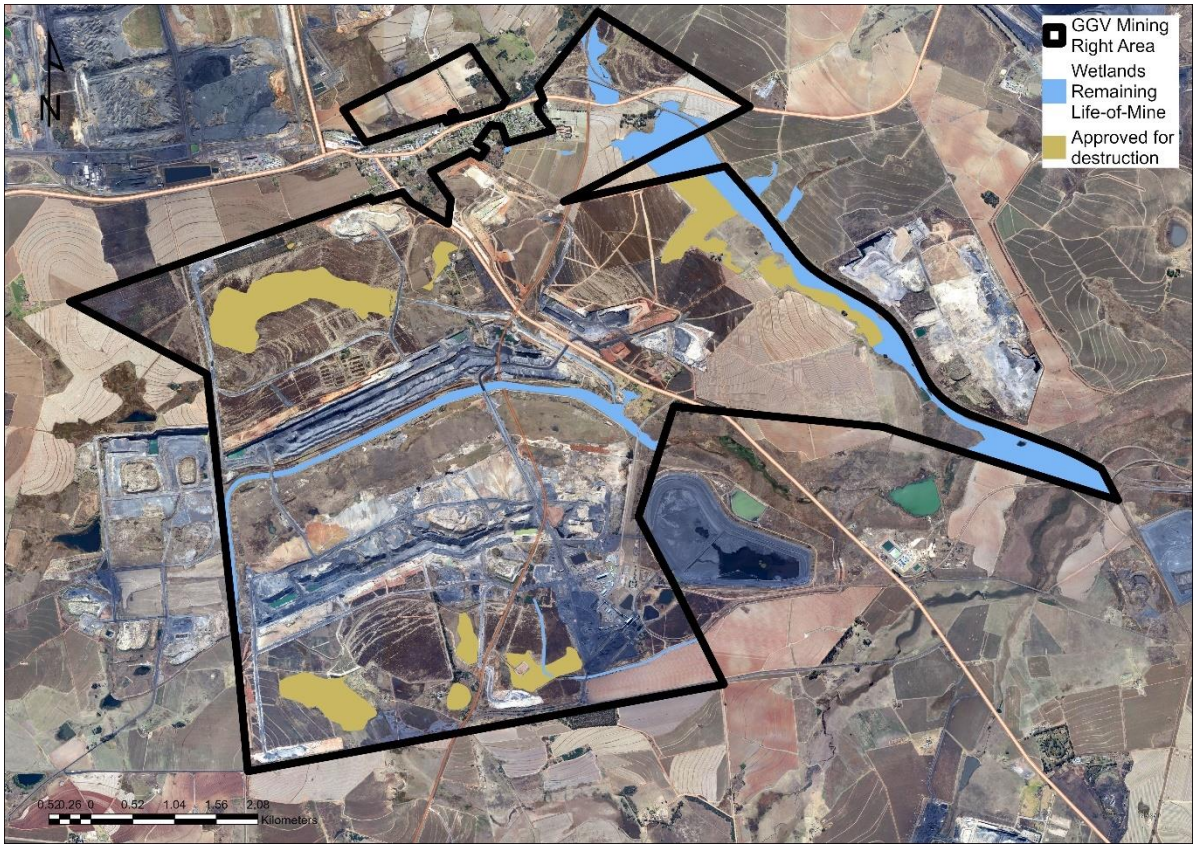


Figure 50: Wetlands remaining after LOM as per current authorisations

7.2.5.5 Wetland characterisation of remaining wetlands (LOM)

Two freshwater ecosystems comprising three wetland HGM units were identified in association with the Oogiesfontein (OFT) Eastern and Southern Underground Blocks and Incline 2. The ecosystem associated with the OFT Eastern Underground Block was characterised as a hillslope seep HGM unit, draining south to north to a larger wetland system which is not associated with GGV. A second hillslope seep HGM unit and a channelled valley bottom HGM unit comprise the second freshwater ecosystem which is associated with the OFT Southern Underground Block and Incline 2. For discussion purposes and ease of reference, the two hillslope seep HGM units will hereafter be referred to as HS HGM 1 (in the north-east of the focus area, associated with the OFT Eastern Underground Block) and HS HGM 2 (along the eastern boundary of the focus area, associated with the OFT Southern Underground Block and with Incline 2).

The three wetland HGM units identified within the investigation area were classified according to the Classification System (Ollis *et al.*, 2013) as Inland Systems. The watercourses fall within the Highveld Aquatic Ecoregion and the Mesic Highveld Grassland Group 4 WetVeg (wetland vegetation) group, classified by Mbona *et al.* (2015) as "Least Threatened". At Levels 3 (Landscape Unit) and 4 (HGM Type) of the Classification System, the systems were classified as per the summary in Table 19.

Table 19: Characterisation at Levels 3 and 4 of the Classification System (Ollis et al., 2013) of the watercourses associated with the proposed haul road options and investigation area

Wetland system	Level 3: Landscape unit	Level 4: HGM Type
Freshwater ecosystem located within the eastern portion of the investigation area (associated with OFT Southern Underground Block, GGV East Underground Block and Incline 2).	**Valley floor:** The base of a valley, situated between two distinct valley side-slopes.	**Channelled valley bottom:** A valley bottom wetland with a river channel running through it.
	Slope: An inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	**Seep:** A wetland located on gently to steeply sloping land and dominated by colluvial (i.e gravity-driven) unidirectional movement of water and material down-slope.
Freshwater ecosystem located within the north-eastern portion of the investigation area (associated with OFT Eastern Underground Block).	**Slope:** An inclined stretch of ground typically located on the side of a mountain, hill or valley, not forming part of a valley floor. Includes scarp slopes, mid-slopes and foot-slopes.	**Seep:** A wetland located on gently to steeply sloping land and dominated by colluvial (i.e gravity-driven) unidirectional movement of water and material down-slope.

One hillslope seep (HS HGM 1) is considered largely to seriously modified and of moderate ecological importance and sensitivity whilst the second hillslope seep (HS HGM 2) and the channelled valley bottom are both deemed moderately modified and of increased ecological importance and sensitivity.

Table 20: Summary of results of the field assessment (SAS, 2022)

{PES: Present Ecological State; EIS: Ecological Importance and Sensitivity; REC: Recommended Ecological Category; RMO: Recommended Management Objective; BAS: Best Attainable State}

Wetland	PES	Ecoservices	EIS	REC / RMO / BAS
Hillslope seep HGM 1 (OFT Eastern Underground Block)	D/E	Moderate to moderately low	Moderate	D / D / Improve
Hillslope seep HGM 2 (OFT Southern Underground Block and Incline 2)	C	Moderate	High	C / B / Improve or Maintain

Wetland	PES	Ecoservices	EIS	REC / RMO / BAS
Channelled valley bottom HGM unit (GGV East Underground Block and Incline 2)	C	Moderate	High	C / C / Maintain

The 2022 study concluded that the Ecostatus of the two hillslope seep wetlands appears to have remained largely the same when compared to the 2013 Wetland Consulting Services assessment. That of the channelled valley bottom wetland appears to have improved, although this is likely only due to some level of recovery of the floral community associated with the wetland.

7.2.6 Groundwater

7.2.6.1 Aquifer types

In the GGV area, two interacting aquifer systems were identified, although they are of the same aquifer type. These include:

- A shallow aquifer that occurs in the transitional soil and weathered bedrock zone or sub-outcrop horizon; and
- A deeper fractured rock aquifer (main aquifer).

The first, the upper, semi-confined aquifer would occur in the weathered zone and on pedological discontinuities (e.g. hardpan ferricrete formations). This aquifer is, however, poorly developed in the project area and according to previous studies where boreholes were drilled, only seepage was intersected during drilling. It is concluded that this aquifer only develops during and after times of high rainfall (e.g. summer months).

The second, deeper aquifer is associated with fractures, fissures and joints and other discontinuities within the consolidated Karoo bedrock and associated intrusives. Mining in the GGV area penetrates both aquifers at different points and the physical structure of the aquifers will be influenced.

Water entering the system will migrate vertically downwards until a perched aquifer is encountered. The weathered zone aquifer did not feature very prominently during drilling and it is likely that the majority of recharge water will migrate downwards into the saturated zone. From there it will migrate in the direction of the hydraulic gradient until it eventually enters surface water bodies from where it will flow out as surface water. The lateral rate of migration usually exceeds the vertical rate, especially in a sedimentary rock environment where the layers are more or less horizontal.

The potential radius of influence on the groundwater regime around a coal mine in Karoo sediments is usually accepted as 1 km. This is subjective, because the radius of influence depends strongly on geological structures such as faults and dykes (preferred groundwater flow paths), groundwater gradients, nearby mining operations and the presence of other groundwater production boreholes or dewatering from mining in the area. Experience from other coal mines in similar Karoo-type aquifer conditions has indicated that the influences of open pit coal mining activities on the regional groundwater level are usually not very extensive and usually limited to as little as 0.5 km.

Four springs were recorded in the GGV area during previous studies. Springs in a semi-confined or confined fractured rock aquifer usually occur where structural discontinuities in the aquifer bisect the confining layer/material and a fracture or fracture system reaches the surface. For a spring to occur, the water level or piezometric head at that point in the aquifer must be higher than the land surface.

Although the natural trend for the groundwater level or piezometric head is to follow the surface topography, the water level is the closest to surface in the topographically low-lying areas. For this reason, springs will mostly occur in these areas, or at least on the slopes of hills. In perched and confined aquifers however, groundwater or piezometric levels may also be high in topographical higher lying areas with subsequent spring formation.

7.2.6.2 Groundwater Levels and Groundwater Flow

Pre-mining groundwater levels and groundwater flow directions, as determined through numerical modelling are depicted in Figure 51 (Groundwater Square (GW2), 2022). Natural regional pre-mining groundwater level elevations probably emulated the surface topography.

Groundwater levels typically vary 1m to 3m deep in low-lying areas such as rivers and streams. In the high-lying areas, groundwater levels may be 10m deep and even 20m deep in extreme cases. It is believed that significant evaporation and evapotranspiration occurs from the shallow groundwater table in/around streams and wetland areas.

Except for monitoring boreholes into the underground, no other borehole indicated a definite mining impact.

7.2.6.3 Groundwater quality

All current active monitoring boreholes are indicated in Figure 52. Groundwater quality of these boreholes are presented in Table 21

Table 21: Water quality ranges of the active groundwater monitoring points (GW2, 2022)

Borehole number	Starting water quality					Ending water quality				
	Start date	EC (mS/m)	Cl (mg/L)	SO4 (mg/L)	NO3 (mg/L)	End date	EC (mS/m)	Cl (mg/L)	SO4 (mg/L)	NO3 (mg/L)
GOGW-14	2006/03/28	27	14	122	16.0	2021/03/15	22.73	10.23	1.80	21.41
GOGW-15	2006/06/28	11	4	<1	1.0	2021/03/15	11.26	5.27	1.71	<0.46
GOGW-33	2012/12/05	23.1	7	44	11.0	2021/03/17	71.3	18.23	298	4.82
GOGW-34	2012/12/05	7.76	<1.4	3	3.1	2021/03/17	7.36	7.95	3.46	0.46
GOGF-5	2007/10/24	9	4	4	1.0	2021/03/17	238.6	13.21	1375	<0.46
GOGF-6	2007/10/25	6	1	<1.00	1.0	2021/03/17	37.3	4.64	77.84	<0.46
GOGM-3	2011/10/25	320	553	565	0.2	2021/03/17	207	404	290	<0.46
GOGM-4	2012/01/16	16	<1.4	10	<0.06	2021/03/17	14.98	3.20	9.78	<0.46
GOGM-5	2012/01/16	19	10	12	10.7	2021/03/15	14.81	5.37	6.84	<0.46
GOGM-6	2012/01/16	13	<1.4	<0.13	2.8	2020/09/22	17.9	7.22	13.4	<0.35

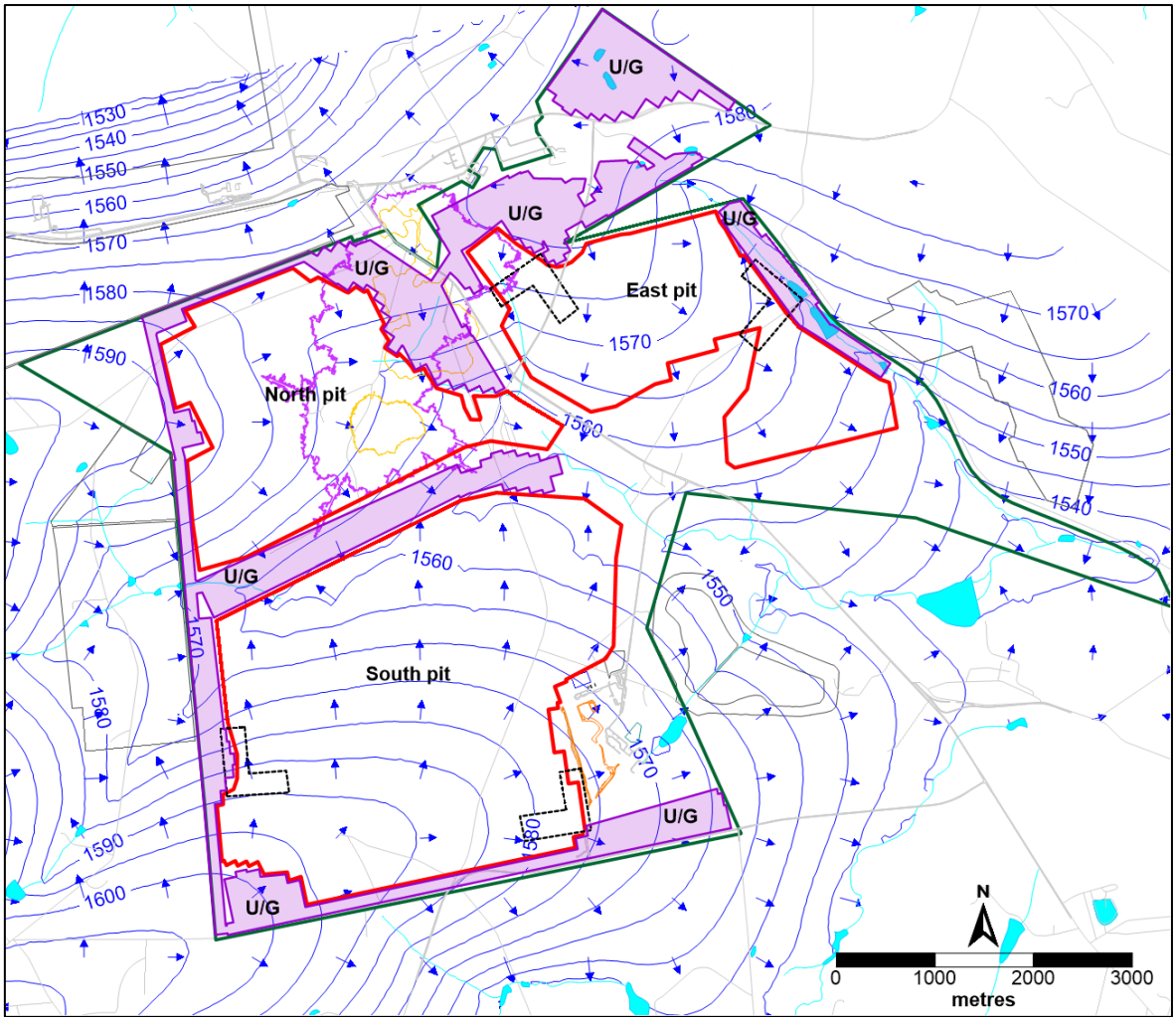


Figure 51: Numerically simulated steady-state pre-mining groundwater level elevations (mamsl) (GW2, 2022)

As far as the active monitoring site groundwater quality is concerned, regular monitoring boreholes GOGW-33 (south-eastern MRF Return Water Dam corner), and GOGM-3 (west of MRF) exceed the SANS 241-1:2015 aesthetic health limit for SO_4, whereas borehole GOGF-5 (north of MRF) exceeds the acute health (GOGF-5) limits. Borehole GOGW-14 is indicative of a persistent non-mining related NO_3 concentration problem exceeding the SANS 241-1:2015 acute health limit.

An EC profile conducted on the water column in borehole GOGM-3 with a YSI 600XLM Multi-Parameter Probe during September 2020 indicated the EC to increase (deteriorate) from ±150 mS/m to ±200 mS/m between 13m and 16m below surface, from where the quality further deteriorated to 208 mS/m to the end of the hole (GW2, 2022).

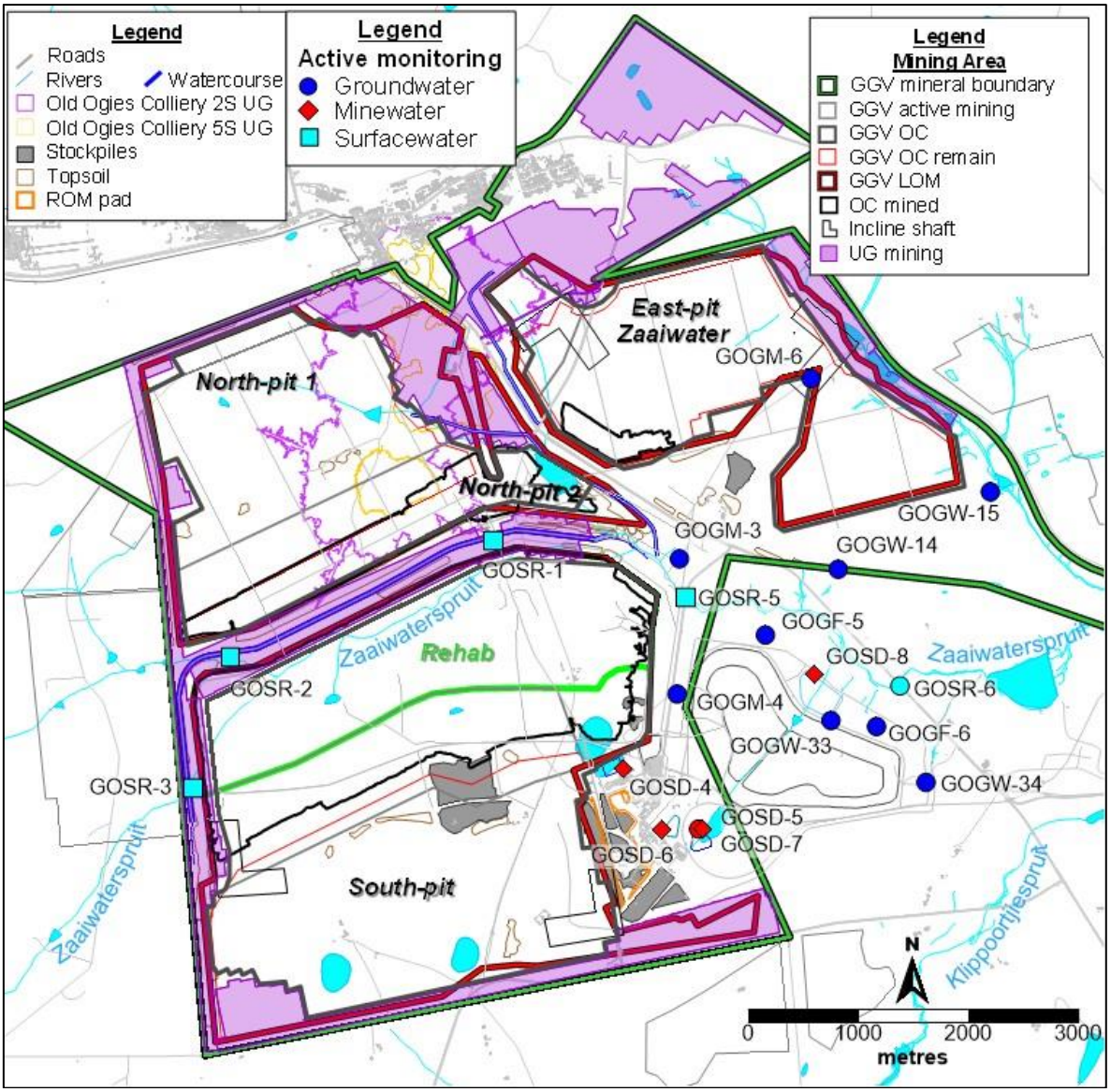


Figure 52: All current (active) groundwater monitoring localities (GW2, 2022)

7.2.6.4 External Groundwater Users

Pertinent external groundwater users' information is summarised in Table 22 to Table 25. The relevant boreholes and wells are depicted in Figure 53.

Table 22: Hydrocensus - owner information (GW2, 2022)

Nr on Map	Name of Owner	Name of Farm
BH01 – BH05	Boetie Gani	Grootpan 7 IS
OS-1, OS-2, OS-2 New	Ogies Combined	Grootpan 7 IS
WSW-20	Western Reserve	Grootpan 7 IS
Mosque Well	Ogies Mosque	Goedgevonden 10IS

Table 23: Hydrocensus – location information (GW2, 2022)

Nr on Map	Drainage Region	Latitude	Longitude	Elevation (mamsl)	Site Type	Info Source	Site Status	Site Purpose	User Consumer	User Application	Equipment
BH01	B20G	26.05050	29.06774	1601.00	B	G	G	P	N	AD	S
BH02	B20G	26.05109	29.06805	1602.00	B	G	U	P	N		N
BH03	B20G	26.05124	29.06809	1602.00	B	G	U	P	N	AS	N
BH04	B20G	26.05010	29.06656	1598.00	B	G	U	P	N	AS	N
BH05	B20G	26.05050	29.06775	1597.00	B	G	U	P	N		N
OS-1	B20G	26.04811	29.07126	1602.00	B	G	G	P	N	DA	S
OS-2	B20G	26.04836	29.06874	1602.00	B	G	U	P	N		S
OS-2 New		26.04838	29.06883	1602.00	B	G	G	P	N	DA	S
WSW-20	B20G	26.04813	29.07135	1602.00	B	G	G	O	N	TM	N
Mosque Well	B11F	26.06503	29.05593	1581.00	D	G	U	P	N	DA	N

Codes: Site Type: B - Borehole, D - Dug well, Info Source: G - Geologist/technician/operator's record, Site Status: D - Destroyed, G - In use, U - Unused, Site Purpose: E – Exploration, O - Observation, P - Production(water supply), User Consumer: N - Non-urban, User Application: AD – Agricultural and domestic use, AS – Agricultural – stock watering only, DA – Domestic – all purposes, TM – Industrial – mining, Equipment: C – Centrifugal pump, H – Hand pump, M – Mono-type pump, N – No equipment, P – Piston pump, S – Submersible pump, W – Windpump,

Table 24: Hydrocensus – hydrogeological information (GW2, 2022)

Borehole Number	Date	Collar (m)	Depth (m)	Water Level (m)	Sustainable Safe Yield 24hr/d (L/s)	Recommended Abstraction Schedule (hours/d)	Recommended Abstraction Rate (m^3/d)
BH01	20180208		150.00	66.35			
BH02	20180207		150.00	23.40	0.02		
BH03	20180205		150.00	44.39	0.01		
BH04	20180206		100.00	16.55	0.02		
BH05	20180205		100.00	Dry			
OS-1	20181130	0.19	85.40	38.10	0.15	8	7.484
OS-2	20181202	0.17	136.41	72.46			
OS-2 New	20181130				0.04	8	1.996
WSW-20	20181130	0.41	30.00	7.43			
Mosque Well	20180910		6.53	3.51	0.16		

Table 25: Hydrocensus – groundwater quality information (GW2, 2022)

BH Nr	Date	pH	EC (mS/m)	TDS (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Cl (mg/L)	SO4 (mg/L)	NO3 (as N) (mg/L)	Mn (mg/L)
BH01	2017/12/18	8.22	48.8	340.0	39.9	24.1	28.8	6.1	17.8	174	0.78	<0.01
	2020/09/23	6.76	312	3043.9	456.4	251.8	55.6	11.1	15.2	2116	<0.35	4.28
BH02	2017/12/18	8.13	29.9	208.0	21.1	10.5	36.1	6.1	3.92	11.3	<0.459	<0.01
	2020/09/18	7.04	42.5	225.8	29.8	15.2	36.4	1.9	5.01	38.2	0.36	0.02
BH03	2017/12/18	7.66	15	89.0	9.3	4.0	18.9	2.6	2.67	<0.45	<0.459	<0.01
	2020/09/18	6.98	24.9	116.9	15.3	9.2	9.6	2.4	4.96	10.2	<0.35	<0.01
BH04	2017/12/18	6.97	37.4	264.0	20.9	18.5	29.3	6.3	29	68.7	4.43	<0.01
	2020/09/18	7.38	41.1	249.2	42.4	16.5	19.3	4.2	4.03	83.5	0.97	<0.01
Mosque Well	2018/09/10	7.63	83.3	538.9	81.8	27.3	33.1	34.8	29.23	227.45	4.80	<0.01
	2021/03/19	7.36	19.42	144.0	17.4	8.5	9.4	5.1	6.98	22.94	<0.45	0.05
OS-1	2018/11/30	8	27.10	140.46	36.81	4.62	9.67	2.65	6.42	15.70	1.01	<0.01
	2021/05/13	7.68	59.3	430	88.64	25.05	18.62	5.61	7.04	149.50	<0.46	2.12
OS-2	2018/12/02	7.24	30.60	155.00	32.93	9.11	11.50	2.77	8.35	18.20	<0.35	0.08

Based on a geophysical survey commissioned during November 2018, a water supply borehole [S26.06883 E29.06168] was drilled within the GGV area, 750m southeast of the Mosque. The borehole was drilled to a depth of 140m with a reported blow yield of 1,800 to 2,000L/hour.

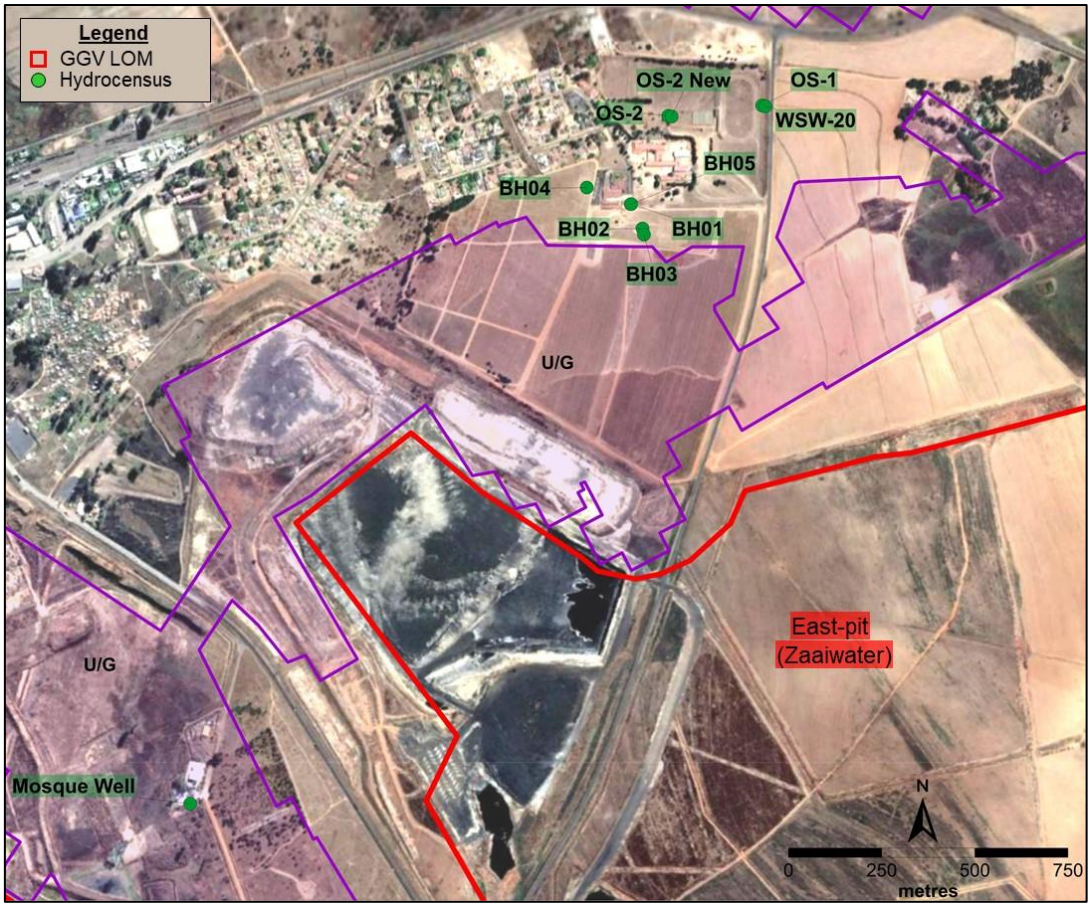


Figure 53: External users monitoring localities (GW2, 2022)

7.2.7 Air Quality

EBS Advisory conducted an air quality impact assessment for the proposed changes to the current operations at GGV, the detailed report is attached as ANNEX-5.

A detailed emissions inventory for the Ogies area is not available. Based on site visits and 1:50 000 topographical maps, the following sources of air pollution have however been identified. These are important to consider in terms of assessing the cumulative impact potential on air quality in the region:

- Agricultural activities;
- Duvha & Kendal Power Stations;
- Vehicle entrainment and exhaust gas emissions;
- Mining activities; and
- Veld fires.

A qualitative discussion on each of these source types is provided in the subsections which follow.

7.2.7.1 Agricultural activities

Agricultural activity can be considered a significant contributor to particulate emissions, although tilling, harvesting and other activities associated with field preparation are seasonally based.

The main focus internationally with respect to emissions generated due to agricultural activity is related to animal husbandry, with special reference to malodours generated as a result of the feeding and cleaning of animals. Mixed farming is practised in the area. The farming includes maize, wheat, grain sorghum, sunflower seed, drybeans and soybeans. The types of livestock assessed included pigs, sheep, goats, chickens and cattle. Emissions assessed include ammonia and hydrogen sulphide (USEPA, 1996).

7.2.7.2 Duvha and Kendal Power Stations

Coal fired electricity power plants are one of the major contributions to poor air quality. A coal fired electricity power plant is designed on a large scale for continuous operation. It has some kind of rotating machinery to convert the heat energy of combustion into mechanical energy, which then operates an electrical generator.

The prime mover may be a steam turbine, a gas turbine or, in small isolated plants, a reciprocating internal combustion engine. Some thermal plants have the intermediate step of using the heat from combustion to produce steam, reducing overall efficiency of electricity production. All plants use the drop between the high pressure and temperature of the steam or combusting fuel and the lower pressure of the atmosphere or condensing vapour in the steam turbine.

Sometimes waste heat due to the finite efficiency of the power cycle, when not recovered and sold as steam or hot water, must be released to the atmosphere, often using a cooling tower, or river or lake water as a cooling medium, especially for condensing steam. The flue gas from combustion of the coal is discharged to the air; this contains carbon dioxide and water vapour, as well as other substances such as nitrogen, nitrogen oxides, sulphur oxides, and in the case of coal-fired plants fly ash and mercury. Solid waste ash from coal-fired boilers must also be removed, although some coal ash is recycled for building materials.

Kendal Power stations first unit began producing power in 1982. The station consists of six 686MW coal fired units with a full install capacity of 4116MW and an efficiency rating of 35.3%, with Duvha Power stations starting in 1975. The station consists of six 60MW coal fired units with a full install capacity of 3600MW and an efficiency rating of 37.6%. Due to the size of the stations, it is expected the particulate matter and sulphur dioxide emissions could have an impact of the site of the GGV site.

7.2.7.3 Vehicles

The force of the wheels of vehicles travelling on unpaved roadways causes the pulverisation of surface material. Particles are lifted and dropped from the rotating wheels, and the road surface is exposed to strong air currents in turbulent shear with the surface. The turbulent wake behind the vehicle continues to act on the road surface after the vehicle has passed. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic (USEPA, 1996). Due to the nature of both mining and agricultural activity, road networks can often be of a temporary nature, and are thus

unpaved. An extensive unpaved road network exists in the area. Due to the volume of heavy vehicles using the N12 National Road near the site and the R545, the expected volumes of entrained dust are likely to be considerable and will need to be addressed.

Due to the high degree of transport of product from the site expected during mining operations, exhaust tailpipe emissions from vehicles is a significant source of particulate emissions. Exhaust fumes contain nitrogen, oxygen, carbon monoxide, water vapour, sulphur dioxide, nitrogen oxide, volatile hydrocarbons and polyaromatic hydrocarbons (PAHs) and their derivatives, acetylaldehyde, benzene and formaldehyde, carbon particles, sulphates, aldehydes, alkanes, and alkenes.

7.2.7.4 Mining Activities

Mining operations are generally associated with significant sources of fugitive dust emissions which occur due to wind erosion of extensive, poorly controlled impoundments or other large material storage piles. Such sources are frequently associated with localised nuisance dust that contributes to the concentration of fine particulate matter in the atmosphere. Whereas high dust fallout rates have been measured to occur in close proximity to poorly controlled impoundments, the contribution of such impoundments to airborne fine particulate concentrations is lower. The potential effects are significantly increased in areas where residential settlements occur in close proximity.

Other emissions generated due to mining operations are generally associated with surface mining activity. Dust fallout and inhalable particulate emissions are generated due to aeolian action on exposed storage piles, material transfer activity, vehicle entrainment on both paved and unpaved road networks, drilling and blasting operations, as well as due to various process related emissions (crushing and screening of ore and ore products).

7.2.7.5 Veld Fires

A veld fire is a large-scale natural combustion process that consumes various ages, sizes, and types of flora growing outdoors in a geographical area. Consequently, veld fires are potential sources of large amounts of air pollutants that should be considered when attempting to relate emissions to air quality. The size and intensity, even the occurrence, of veld fires depend directly on such variables as meteorological conditions, the species of vegetation involved and their moisture content, and the weight of consumable fuel per hectare (available fuel loading).

Once a fire begins, the dry combustible material is consumed first. If the energy released is large and of sufficient duration, the drying of green, live material occurs, with subsequent burning of this material as well. Under suitable environmental and fuel conditions, this process may initiate a chain reaction that results in a widespread conflagration. It has been hypothesized, but not proven, that the nature and amounts of air pollutant emissions are directly related to the intensity and direction (relative to the wind) of the veld fire and are indirectly related to the rate at which the fire spreads. The factors that affect the rate of spread are (1) weather (wind velocity, ambient temperature, relative humidity); (2) fuels (fuel type, fuel bed array, moisture content, fuel size); and (3) topography (slope and profile). However, logistical problems (such as size of the burning area) and difficulties in safely situating personnel and equipment close to the fire have prevented the collection of any reliable emissions data on actual veld fires, so that it is not possible to verify or disprove the hypothesis.

The major pollutants from veld burning are particulate matter, carbon monoxide, and volatile organics. Nitrogen oxides are emitted at rates of from 1 to 4 g/kg burned, depending on combustion temperatures. Emissions of sulphur oxides are negligible (USEPA, 1996). A study of biomass burning in the African savannah estimated that the annual flux of particulate carbon into the atmosphere is estimated to be of the order of 8 Tg C, which rivals particulate carbon emissions from anthropogenic activities in temperate regions (Cachier *et al*, 1995).

7.2.7.6 Air Quality Baseline

Baseline dust fallout and ambient suspended particulate matter monitoring was undertaken between January and December 2020 by Aquatico Scientific (Pty) Ltd. A total of 17 dust fallout sample points were monitored, distributed along the site boundary to the south and southeast of the site, north and northeast closet to sensitive receptors at the site boundary, and to the east and north-east of the site, all (with the exception of the sites to the north) were placed within the dominant wind direction and all placed with the objective of capturing dust associated with onsite activities. The dust fallout monitoring sites are indicated in Figure 55.

Inhalable dust was monitored by means of the Aeroqual Dust Sentry Pro situated at the Church building, Church Street, Ogies. The Dust Sentry Pro delivers simultaneous measurement of PM_{10}, $PM_{2.5}$, PM_1, and Total Suspended Particulates (TSP).

7.2.7.6.1 Dust Fallout Monitoring Results

Dust fallout levels recorded across the 17 samples sites surrounding the mine indicated an exceedance of the industrial dust fallout limit in September and October 2020 at sample site GOAP28, close to the discard dump at the mine operations (Figure 54).

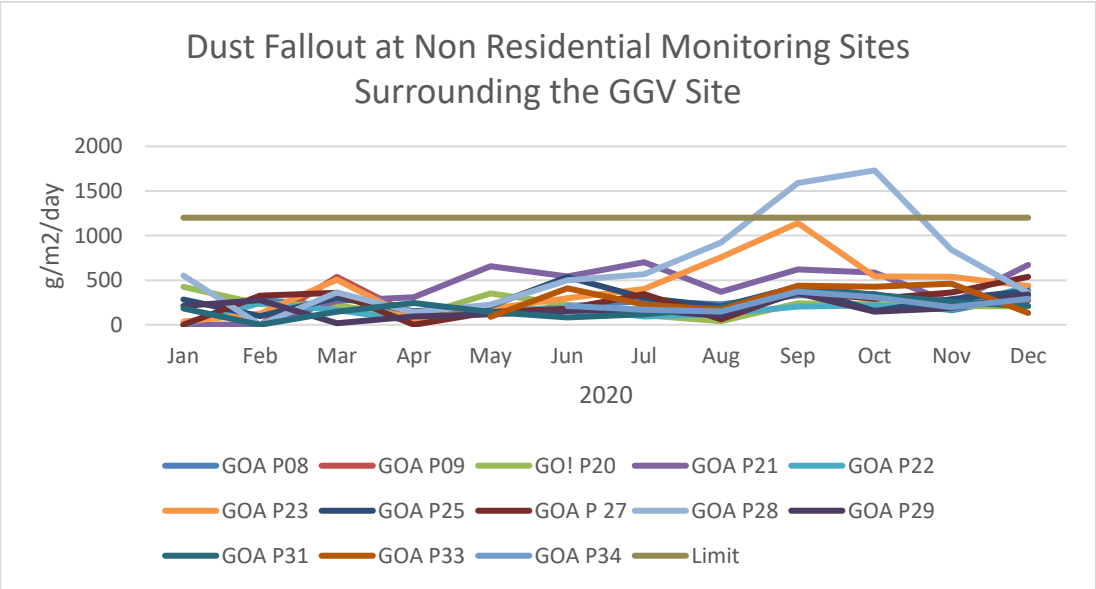


Figure 54: Dust fallout for non-residential sample sites Jan – Dec 2020

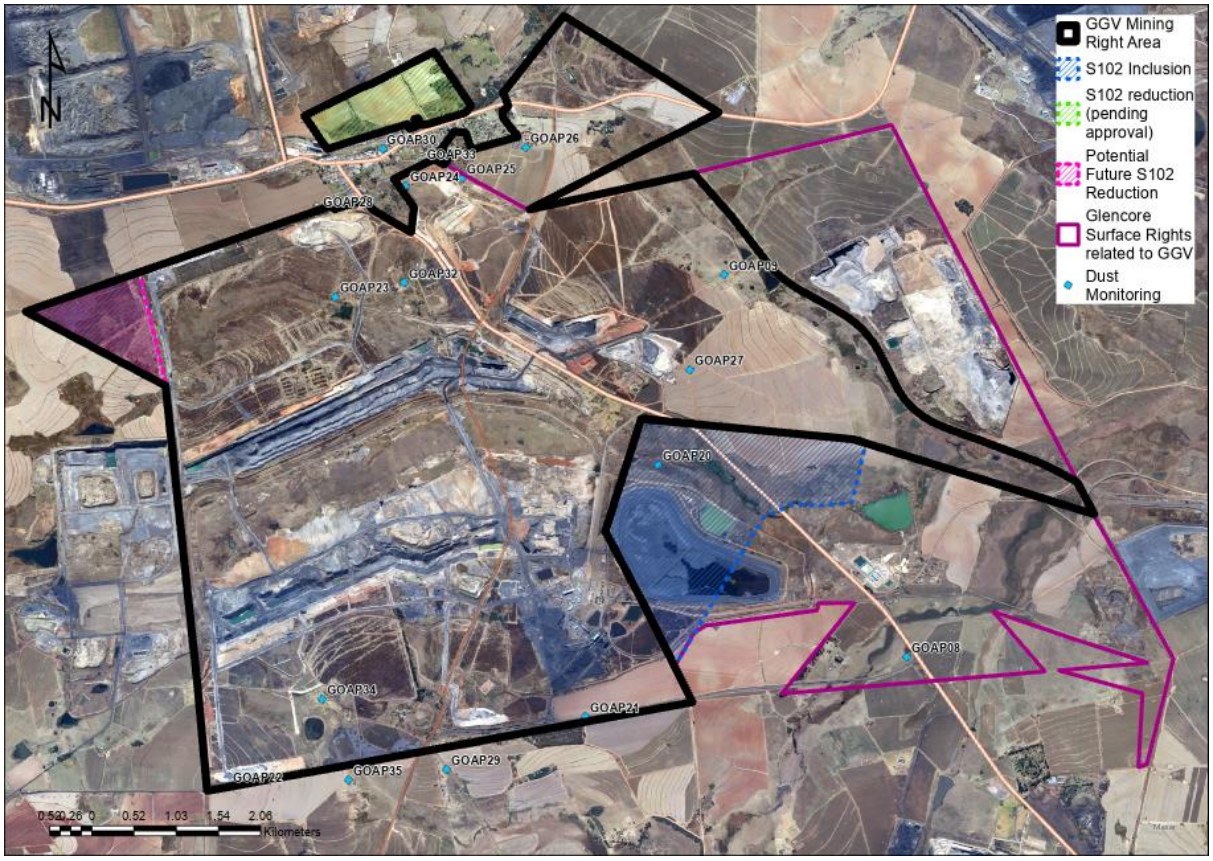


Figure 55: Dust fallout monitoring sites

Dust fallout levels recorded at the 4 residential sample sites also noted an exceedance of the residential limit during January and June of 2020 at site GOAP24 at the border of the mining site to the north close to Ogies (Figure 56).

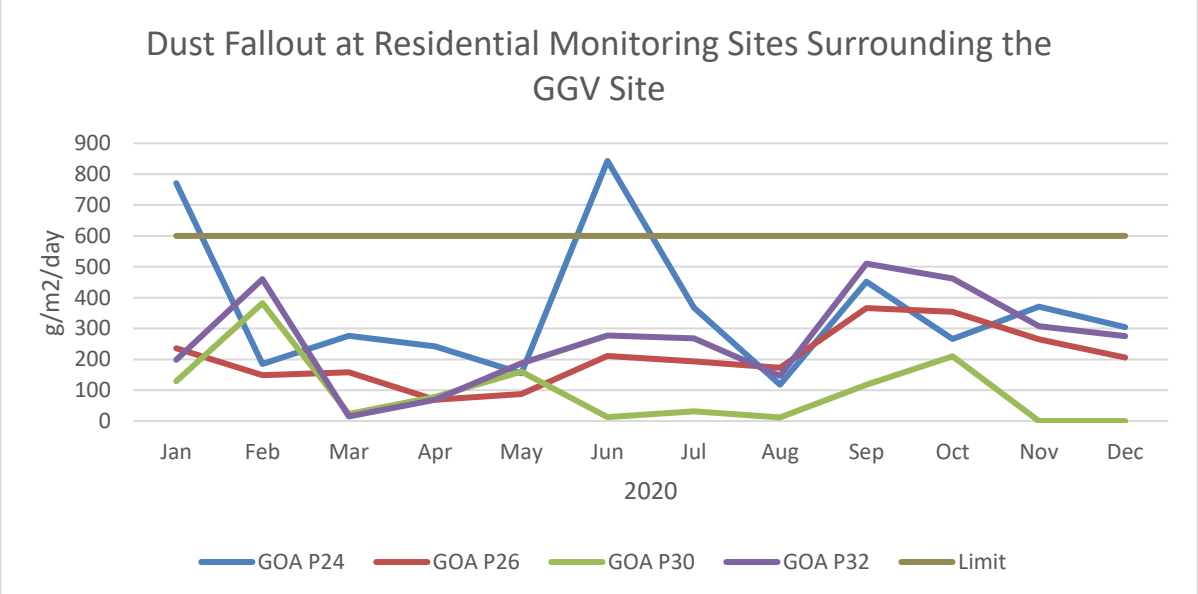


Figure 56: Dust fallout for residential sample sites Jan – Dec 2020

7.2.7.6.2 $PM_{2.5}$ and PM_{10} ambient air quality data

Monitored PM_{10} and $PM_{2.5}$ ambient particulate matter recorded at the church building in Ogies was noted not to exceed the limits for either pollutant assessed (Figure 57).

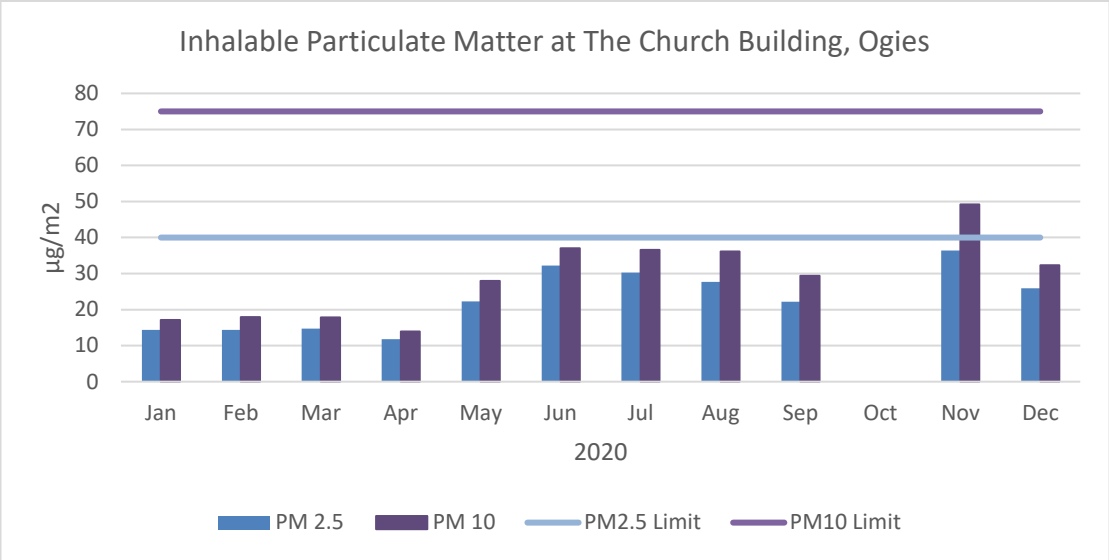


Figure 57: Average (daily) data for PM_{10} and $PM_{2.5}$ for January to December 2020

Data from the SAAQIS data base for eMalahleni shows similar results, with both daily average (Figure 58) and annual (Figure 59) average data for PM_{10} and $PM_{2.5}$ mostly falling below the South African standards. Daily exceedances are noted during the winter months of July and August, these are also months with the lowest levels of precipitation. Annual average particulate matter readings are noted to have decreased year on year (no data available for 2019), showing that the interventions put in place in the Highveld Priority Area are resulting in the required improvements in ambient air quality.

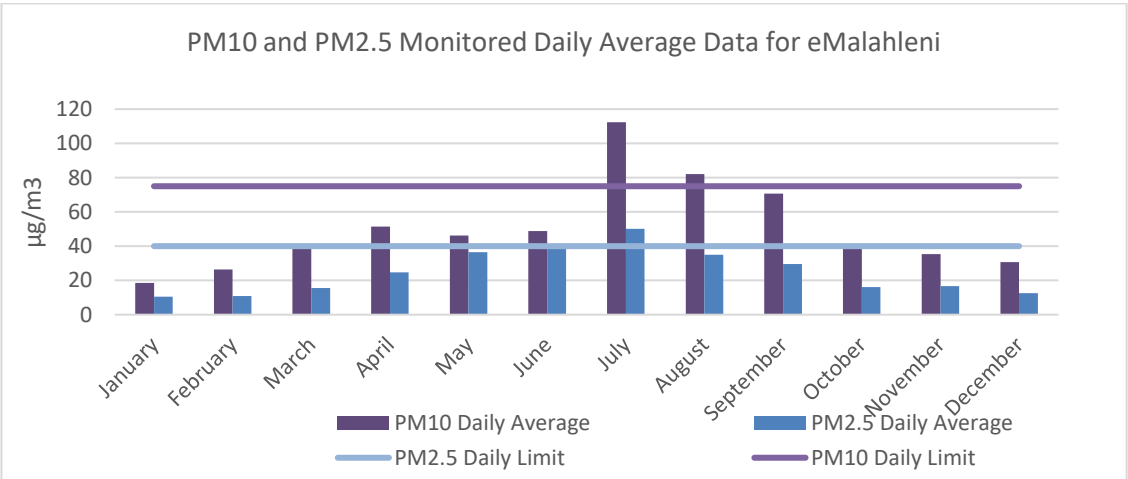


Figure 58: Average (daily) data for PM_{10} and $PM_{2.5}$ at eMalahleni as reported by the SAAQIS database for the period 2018 - 2021

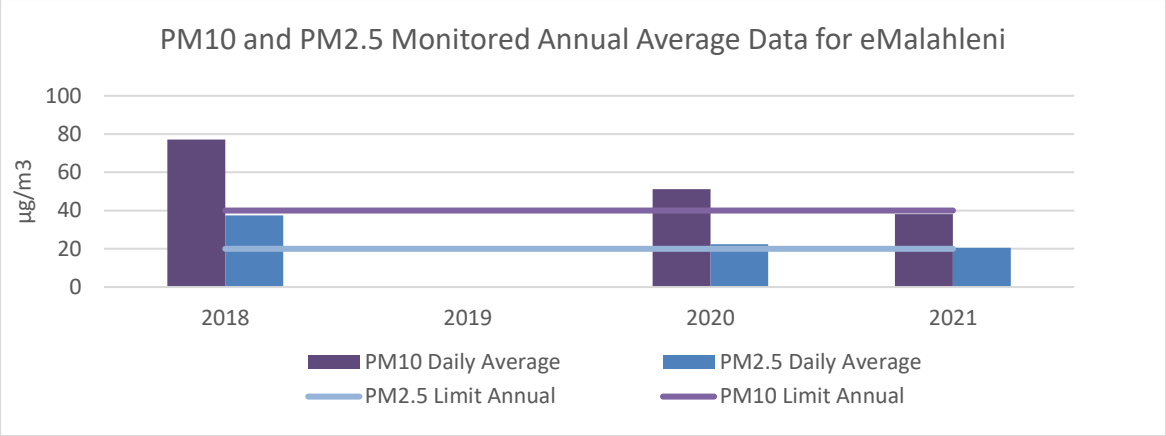


Figure 59: Average (annual) data for PM_{10} and $PM_{2.5}$ at eMalahleni as reported by the SAAQIS database for the period 2018 - 2021

7.2.8 Noise

Enviro Acoustic Research cc (EARES) conducted a noise impact assessment to determine the potential noise impact on the surrounding environment due to the existing and future activities at the GGV Complex. The report is attached as ANNEX-6.

7.2.8.1 Identified noise sources

The environmental components that may contribute to or change the sound character in the area are:

- ***Topography***: The topography can be described as *"moderately undulating plains and pans"*. Due to micro nature of the study area the surrounding area can be considered relatively horizontal. The existing stockpiles/berms of the GGV Complex form significant acoustical shielding surrounding the existing open cast pits.
- ***Surrounding Land Use***: The surrounding land use is complex, consisting of:
    - The town of Ogies, located just north of the Goedgevonden Complex, with the town including a number of residential and business activities;
    - Significant coal mining activities to the north and west of the Goedgevonden Complex. There are a number of other collieries scattered in the area;
    - Croplands and livestock farming to the south and east of the existing Goedgevonden Complex;
    - Several farm dwellings. Most dwellings featuring in the vicinity of the project focus area are scattered in a heterogeneous fashion; and,
    - Several provincial roads, such as the R545 and R555. Due to the significant mining activities, these roads carry significant coal hauling traffic.
- ***Transportation Networks***: The R545 (R52), R555 (R29) and R53 transects and pass the project focus area. These roads carry significant coal traffic and is defined as Eskom Coal Haulage roads, with up to 20% of the traffic being heavy vehicles. This classification puts Annual

Average Day Traffic (AADT) > 5000 p/d on the R555. Traffic speeds was assumed to be in the region of 80 – 100 km/h, as is the speeds on a class 2 (regional distributer) route.

- ***Other industries and mines***: There are several other mines within 10 km from the project focus area, including, amongst others, Vlakfontein Colliery, Klipfontein Mine (Iyanga Mining), Khanyisa Colliery (Wescoal) and Klipspruit Colliery. The existing mines does contribute to noises in the area, both from mining and processing activities, as well as noises from increased heavy vehicle traffic on the public roads in the area. These activities may increase cumulative noise levels in the area.
- ***Ground conditions and vegetation***: The surrounding area consists of the Grassland biome, with the vegetation type being Bakenveld. The natural veldt has been significantly disturbed due to anthropogenic activities with most of the ground stripped, compacted, tarred, concreted, etc. Taking into consideration available information it is concluded that the ground conditions (when considering acoustic propagation on a ground surface) can be classified as medium-hard, which implies that it is not very acoustically absorbent. It should be noted that this factor is only relevant for air-borne waves being reflected from the ground surface, with certain frequencies slightly absorbed by the vegetation.

Road traffic noise is a significant noise source in the area, and the potential noise levels were estimated considering traffic counts as well as the result of the ambient sound level measurements. Isopleths, illustrating contours of constant noise rating levels are illustrated for potential daytime (Figure 60) and night-time (Figure 61) road traffic noise levels.

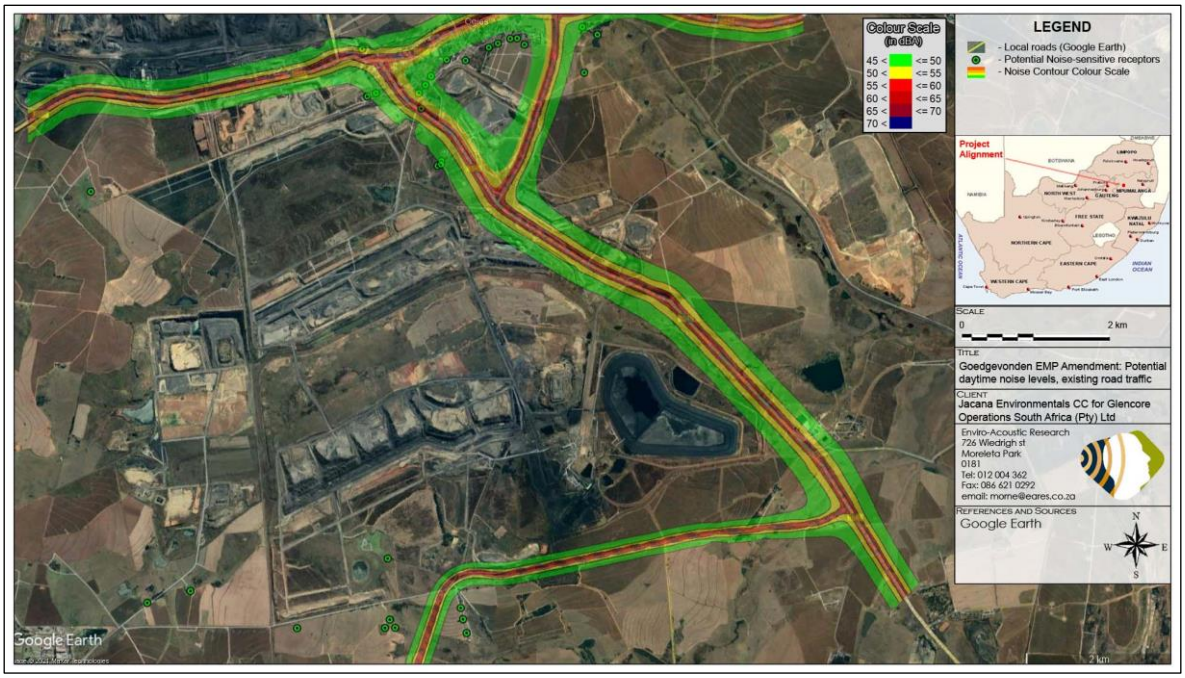


Figure 60: Noise Contours relating to long-term average daytime road traffic noises

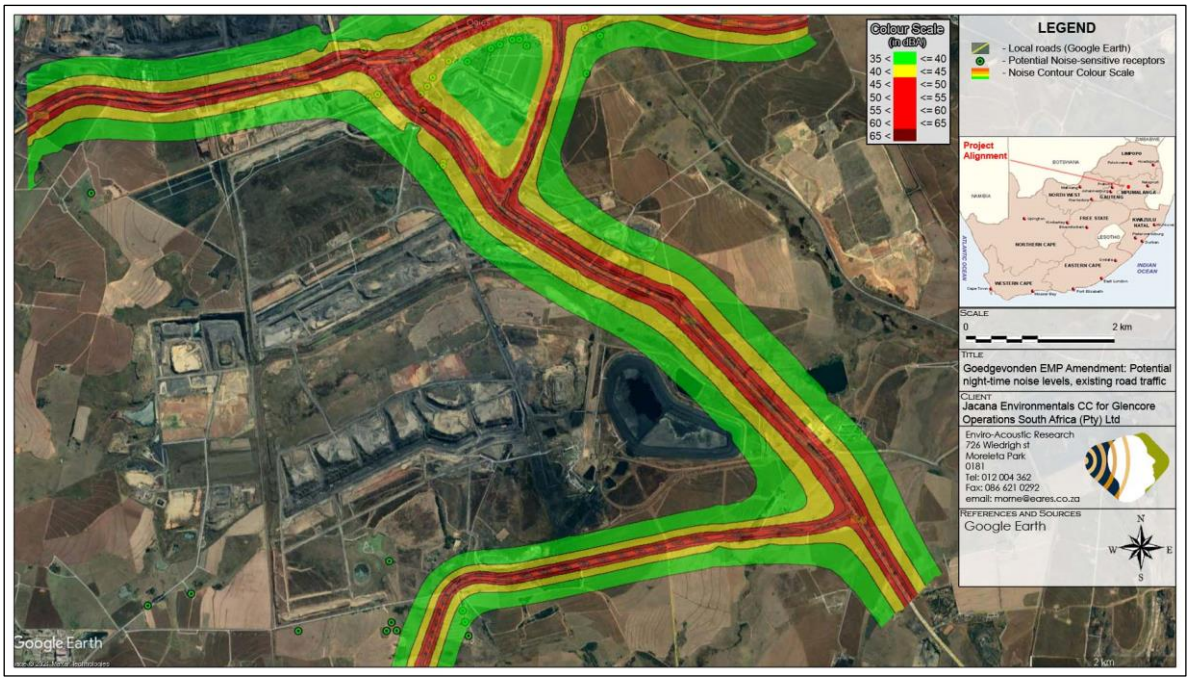


Figure 61: Noise Contours relating to long-term average night-time road traffic noises

7.2.8.2 Existing ambient noise conditions

Ambient sound levels were measured over a two-night period at three locations in the vicinity of the GGV MRA from 25 to 27 November 2020. A few short measurements were collected within the MRA to augment the data. The location of the long-term and short-term monitoring points are indicated in Figure 62 and Figure 63, respectively.

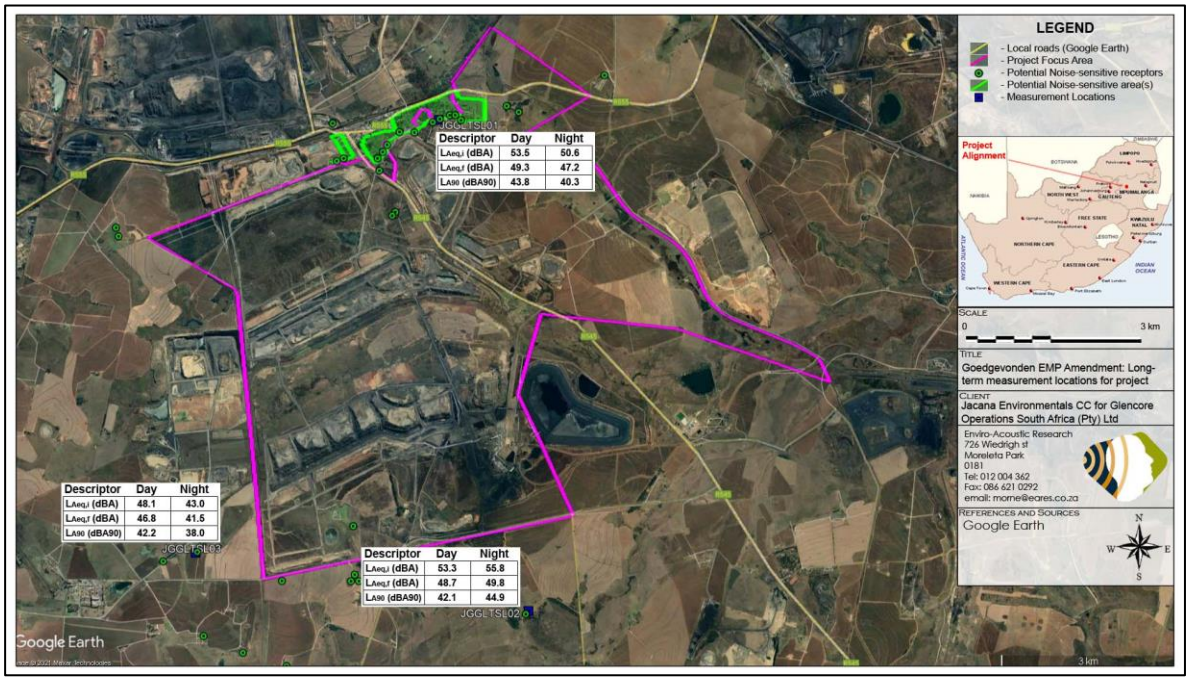


Figure 62: Long-term measurement locations where ambient sound levels were measured

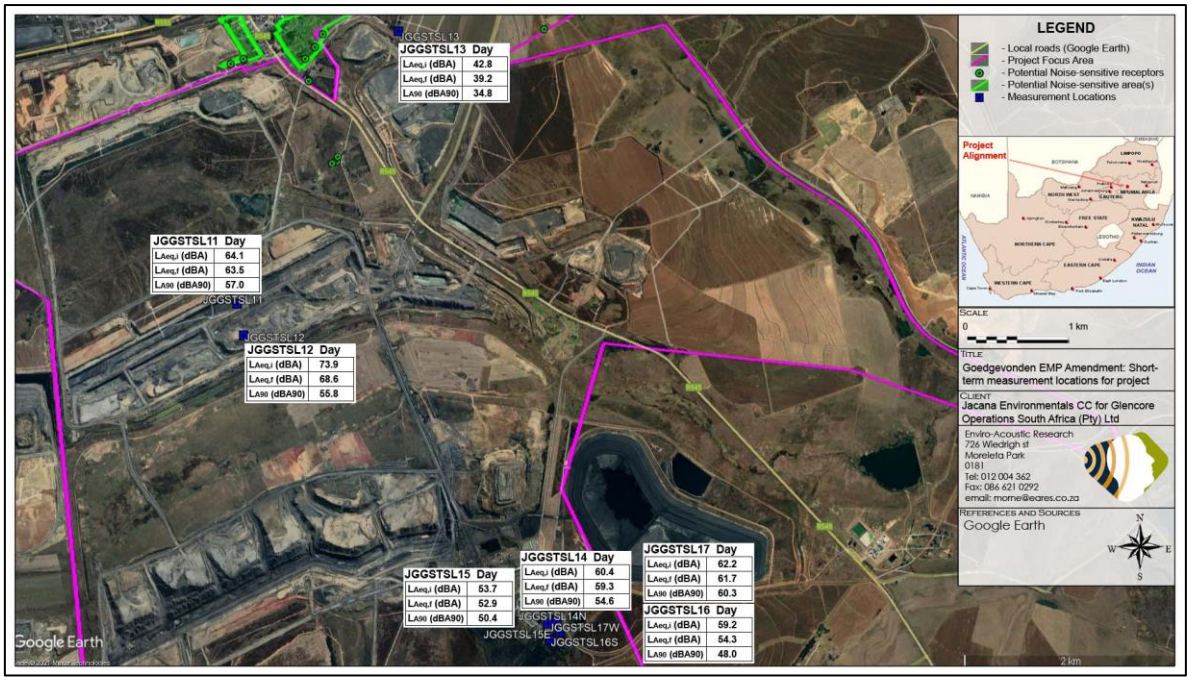


Figure 63: Short-term measurement locations where ambient sound levels were measured

The results of the long-term noise measurements are summarised in Table 26.

The noise assessment concluded that due to the elevated sound levels in the area, considering the developmental character of the area as well as audible observations, the recommended noise limits would be typical of an urban noise district. The rating levels is similar to the WHO and IFC guideline noise limits for residential use. The acceptable rating level for the area would be:

- 55 dBA for the daytime period
- 45 dBA for the night-time period

Because ambient sound levels were already higher than these guideline levels, the noise specialist recommended that the proposed activities do not change the existing ambient sound levels with more than 3 dB (as recommended by the IFC).

Table 26: Summary of long-term noise measurements (AER, 2020)

Monitoring Point	$L_{Aeq,l}$ (dBA)		$L_{Aeq,f}$ (dBA)		$L_{A90,f}$ (dBA90)		Comments
	Day	Night	Day	Night	Day	Night	
JGGLTSL01 (Edge of Ogies)	53.5	50.6	49.3	47.2	43.8	40.3	Daytime: urban noise district. Nighttime: central business noise district. The ambient sound levels are significantly higher than expected for this area, considering the developmental character. Based on the sounds heard on site, roads in the area are a significant noise source. L_{A90} levels are significantly elevated for both the day- and night-time periods, indicating constant sounds that raised this statistical indicator. The source of this acoustic energy is not clearly defined but may relate to the traffic noises.
JGGLTSL02 (Farm dwelling to the south of GGV)	53.3	55.8	48.7	49.8	42.1	44.9	Daytime: urban noise district. Nighttime: central business noise district. The ambient sound levels are significantly higher than expected for this area, considering the developmental character. Based on the sounds heard onsite, faunal noises are a significant noise source. LA90 levels are significantly elevated for both the day- and night-time periods, indicating constant sounds that raised this statistical indicator. The source of this acoustic energy is not clearly defined but may relate to faunal noises.
JGGLTSL03 (Farm dwelling close to the SW boundary of GGV, close to farm shed and animal enclosure)	48.1	43.0	46.8	41.5	42.2	38.0	Daytime: suburban noise district. Nighttime: rural to suburban noise district. LA90 levels are significantly elevated for both the day- and night-time periods, indicating constant sounds that raised this statistical indicator. The source of this acoustic energy is not clearly defined.

7.3 SOCIO-ECONOMIC ASPECTS OF THE AREA

7.3.1 Regional Analysis

7.3.1.1 Towns and Settlements

The project area is located amongst existing towns and settlements. The following towns are in the vicinity of the project:

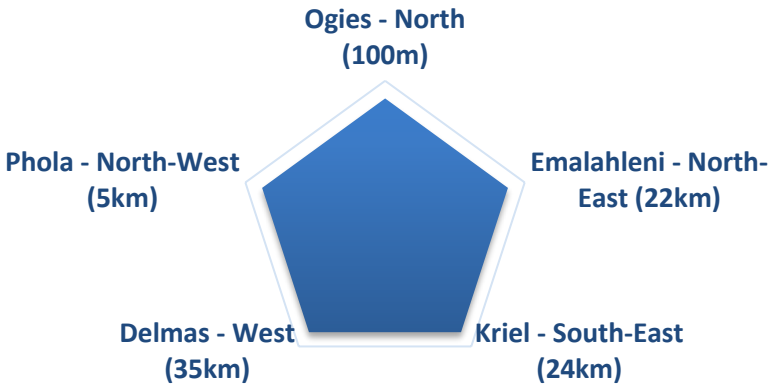


Figure 64: Nearest formal towns and settlement

On the periphery of the formal towns some settlements and informal housing has been observed, these are relevant as a risk of uncontrolled expansion in these areas due to the potential influx of jobseekers is present.

7.3.1.2 Demographic Analysis

Table 27: Demographic Indicators for eMalahleni (2011 / 2016 Community Survey)

Demographic	2011	2016
Total population	395 466	455 227
Number of households	123 560	150 419
Population density	147 persons/km^2	169.7 persons/km^2
Growth rate annually	2.6% (2011-2016)	
Average household size	3.20	3.02
Female headed households	28%	29%
Young (0-19)	35%	33%
Mid (20 – 69)	63%	65%
Elderly (65+)	3%	1%

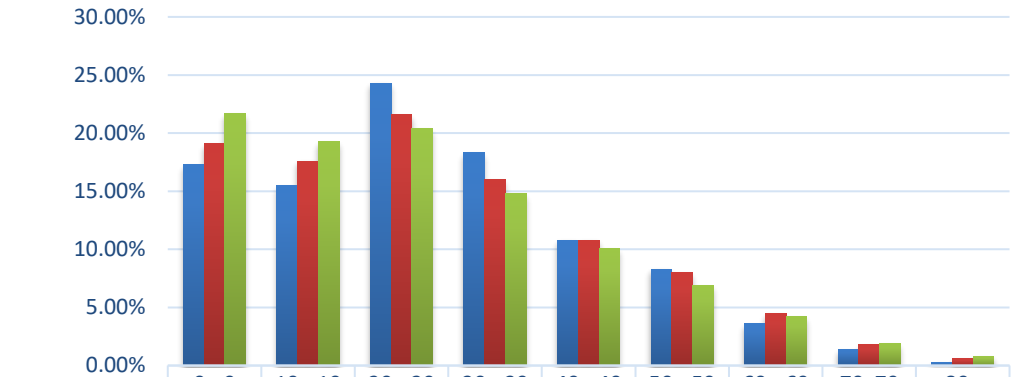
The household dynamics within the study area is a key determinant of the demand for services and employment. The average household size is indicative of the quality of life in a study area. This connection is based on the following principle: In areas where average household size is higher, the number of dependents is also expected to be more significant. Thus, income per person will be lower.

The age and gender composition of a population can significantly impact socio-economic development in a study area. It is indicative of the size of the labour force, worker migration and the demands for health care and other social services.

The collated total population (Community Survey 2016) of the Nkangala District is 1 445 624 constituting approximately 33.3% of Mpumalanga's population. The population growth rate of the District was 2.50% between the period 2001 and 2011. In eMalahleni Local Municipal area, the population grew by 2.6% annually from 2011 - 2016.

The population comprises 53% males and 47% females; 86% Black Africans, 12% Whites, 1% Coloureds, 1% Asians. Youth play an essential role in the municipal area, with 32.8% younger than 19. This brings about challenges in the immediate supply of educational facilities and teachers. This situation might improve in future as more people will be leaving the educational system than entering it. However, the size of this group will also put a strain on the supply of employment as a significant number of people will be joining the labour market in the next 12 years. It is also essential to ensure that these people are suitably trained to find work in an increasingly demanding working environment.

The population between 20 and 39 years constitute 42.6% of the population. This is the current workforce available to the area. When read in conjunction with the education levels, it is clear that extensive training is required to upskill this segment of the population.



	0 - 9 years	10 - 19 years	20 - 29 years	30 - 39 years	40 - 49 years	50 - 59 years	60 - 69 years	70 79 years	80+ years
Emalahleni	17.30%	15.50%	24.30%	18.30%	10.80%	8.30%	3.60%	1.40%	0.30%
Nkangala	19.10%	17.60%	21.60%	16%	10.80%	8%	4.50%	1.80%	0.60%
Mpumalanga	21.70%	19.30%	20.40%	14.80%	10.10%	6.90%	4.20%	1.90%	0.80%

Figure 65: Demographic Indicators for eMalahleni 2016 Community Survey

Vulnerable groups within the municipal area are female-headed households (29.1%) and 420 households with heads under 18 years old in 2016.

7.3.1.3 Literacy rates and education

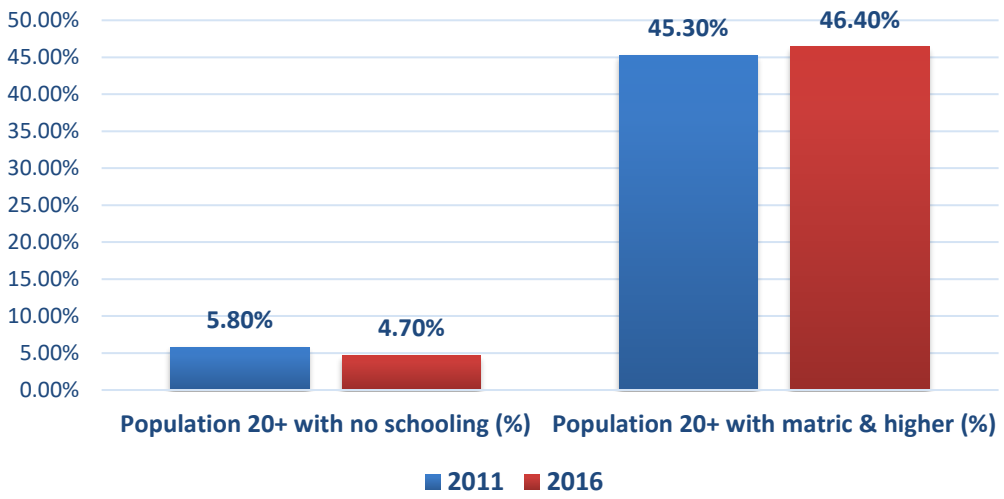


Figure 66: Education Indicators

Educational attainment is a key indicator of development in a population. To evaluate long term provision of education, it is important to disaggregate educational attainment for persons older than 20 years. This is an ideal group since they would have completed attending educational institutions indicating that the level of education is the final one. Statistics South Africa generated a measure of educational attainment for persons over age 20. This group is expected to have completed educational enrolment and therefore giving a good standard for completed level of education.

It concerns to note that 48.9% of the population above the age of 20 did not complete their schooling and a further 4.7% of the population has had no education. This means that 53.6% of the current workforce is mainly unskilled. Basic education is a requirement for a healthy and developing country, and it will be essential to give attention to Adult Education and Training Programmes.

7.3.1.4 Language

The most spoken language in this municipal area is isiZulu, followed by isiNdebele.

7.3.1.5 General health and welfare

According to the Mpumalanga Department of Health, the HIV prevalence rate of eMalahleni was measured at 40.7% in 2013 (latest available figure). It is the 9th highest of all the municipal areas in the province. The HIV prevalence rate remained more or less at the same level between 2012 and 2013. Since 2014/15, people who tested positive (as a proportion of 15-49 years' population) and 2017/18 were 13, 4% and 8.0%, respectively. This shows a downward trend. This may or may not be an accurate reflection as this figure shows who volunteered to be tested or those who were pregnant. The total number of people who are on ARV support increased from 21 348 to 32 460 in the same period. The maternal mortality rate also increased slightly between 2014/15 to 2017/18 from 275.5 to 282.6 per 100 000 live births. Death in the facility for children less than five years decreased from 13.7 to 10.2 in the same period. However, there was an increase in neonatal mortality rate per 1000 live births, from 14.5 to 20.8 from 2014/15 and 2017/18. Some programmes deal with HIV/AIDS in the

municipality. The municipality holds HIV/AIDS days and condoms distribution programmes, such as part of the mayor's programmes.

7.3.1.6 Basic Services and Housing

7.3.1.6.1 Housing

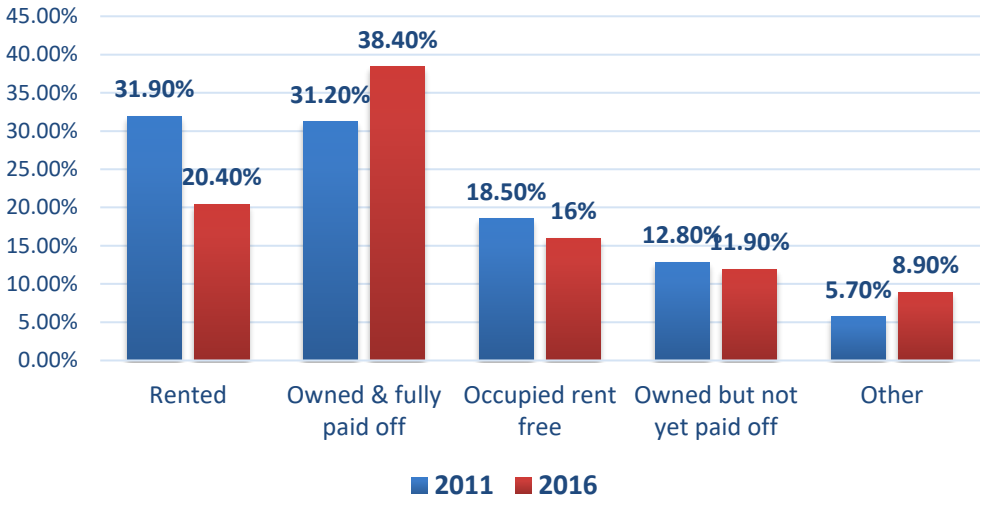


Figure 67: Basic Infrastructure Indicators

70.3% of households have formal housing and 23.2% in informal housing in the municipal area, 6.5% did not specify their housing.

7.3.1.6.2 Water and Sanitation

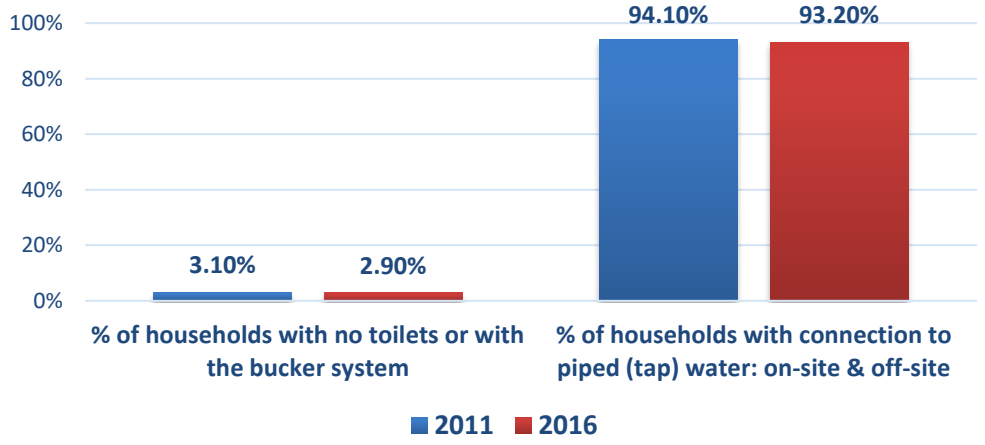


Figure 68: Water and Sanitation Indicators

Water and sanitation have generally improved in the municipal area due to service delivery increases. 76.9% of households have flush/chemical toilets in terms of sanitation, 18.7% have pit latrines, and 1.3% have no access to adequate sanitation. Piped water in a dwelling or yard accounts for 85.7% of households, with a further 7.5% of households having access to a communal standpipe or tap in neighbours' yards. 6.9% do not have access to adequate water delivery and remains backlogged.

7.3.1.6.3 Electricity

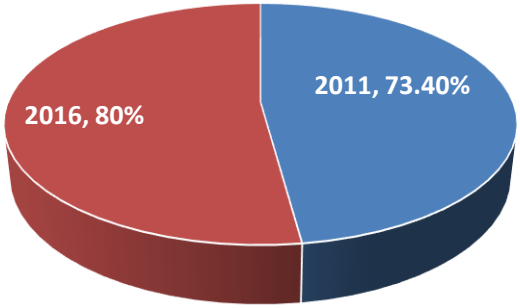


Figure 69: Electricity Indicators

Electricity provision has improved from 2011 and 2016, which aligns with the Integrated National Electrification Programme (INEP). As part of this programme, poor households pay a minimal fee for a connection, and they receive 50 kWh per month free of charge.

7.3.1.6.4 Refuse Removal

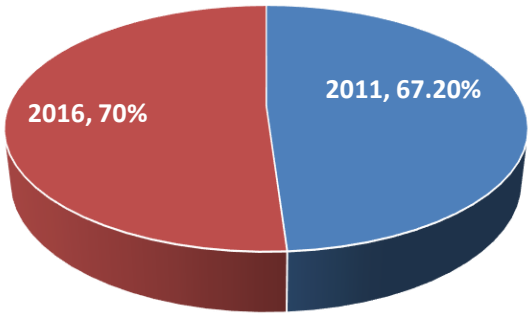


Figure 70: Refuse Removal Indicators

The project is located just south of an urban setting, where refuse removal is established. Although eMalahleni Local Municipality has had challenges in terms of refuse removal, mainly related to infrastructure, there has been an increase in access to refuse removal. Some of the smaller settlement still struggle with proper procedures and services for refuse removal.

7.3.1.7 Economic Profile

7.3.1.7.1 Development and Poverty Indicators

The Human Development Index (HDI) is a composite statistic of life expectancy, education, and income per capita indicators used to rank countries into four tiers of human development. The index for any one country has a numerical range between 1 and 0. Countries with an HDI below 0.5 are

considered to have a low level of human development, a score of 0.5 to 0.79, a medium level of development, and those with values of 0.8 and above are nations considered to have a high level of human development. For example, South Africa has an HDI of 0.684 and Mpumalanga 0.694. Provinces with an HDI below the national average deserve special attention as far as human development is concerned.

The municipality recorded an HDI of 0.63 as per 2011 statistics which is best in the province but deteriorating. Per capita, personal income is higher than the district and is second highest in the province. Apart from this, it is still lower than the province and country.

Table 28: Development and Poverty Indicators

Development And Poverty Indicators	2001	2007	2011
Human Development Index (HDI)	0.61	0.61	0.63
Per capita personal income per year	R23 794	R38 276	R48 436
% of households below R42 000 per year (R3 500/m)	56.8%	39.0%	26.9%
Gini-coefficient (0best to 1 worst)	0.63	0.63	0.62
Poverty Rate	29.5%	28.0%	26.2%
Number of people in poverty	86 201	96 621	97 228
Poverty Gap (R million)	R94	R139	R168

Gini-coefficient of 0.62 was recorded in 2011, which shows slight improvement between 2001 and 2011 & slightly lower (better) than the district but equal to the provincial level. The below table shows an improvement in terms of the poverty rate, which might be due to the contribution by the surrounding mines, which contribute to the employment and general economy of the eMalahleni. The poverty gap was R168 million in 2011, which is an increasing trend. The municipality is ranked 7th in the Multiple Deprivation Index of Oxford University.

It is expected that this picture has worsened in the past year due to the sharp economic downturn and many households losing income due to Covid-19 lockdowns and limitations.

7.3.1.7.2 Household Income

In 2017 most municipalities classified an indigent household as a family earning a combined income of less than R3 200 per month (R38,400 per annum). From the above table, it is clear that 50% of the households in eMalahleni earn less than R3,200 per month. Still, compared to Mpumalanga, which is 57% and Nkangala, which is 61%, eMalahleni remains below the provincial and District averages. Still, it indicates that income levels in eMalahleni are at par or below the indigent (poverty) line for at least 50% of its households.

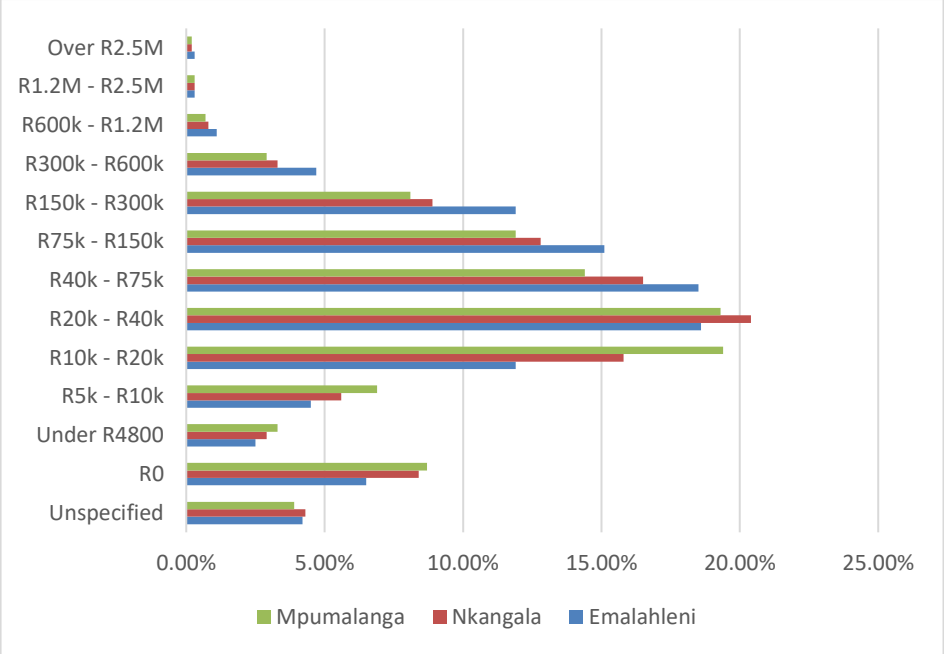


Figure 71: Annual Household Income

7.3.1.7.3 Employment Status

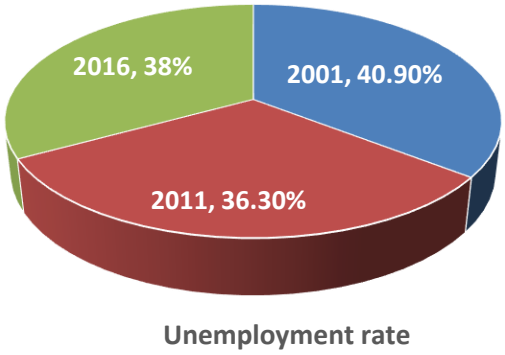


Figure 72: Labour Indicators

The unemployment rate in eMalahleni decreased since 2001. The table above shows the unemployment rate of 36.3% (strict definition) in 2011 – a slightly decreasing trend. However, in 2016 the unemployment rate increased again. The latest statistics from the labour force indicate unemployment to be on an all-time high.

7.3.1.7.4 Economic Sectors

eMalahleni Municipality contributes 45.9% to the district economy of Nkangala (Provincial Municipal Profile Report by the Department of Economic Development & Tourism, 2019). This indicates the nature of the concentration of economic activities in the area, followed by Steve Tshwete (at 37%). eMakhazeni, Dr JS Moroka, Thembisile Hani and Victor Khanye (Delmas) have the least contributions. The economic dominance of eMalahleni within Nkangala has the potential of influencing population migration from nearby localities, thereby putting a strain on the provision of job opportunities and

basic services. Growth and development within neighbouring municipalities is, therefore, a key priority at the district level.

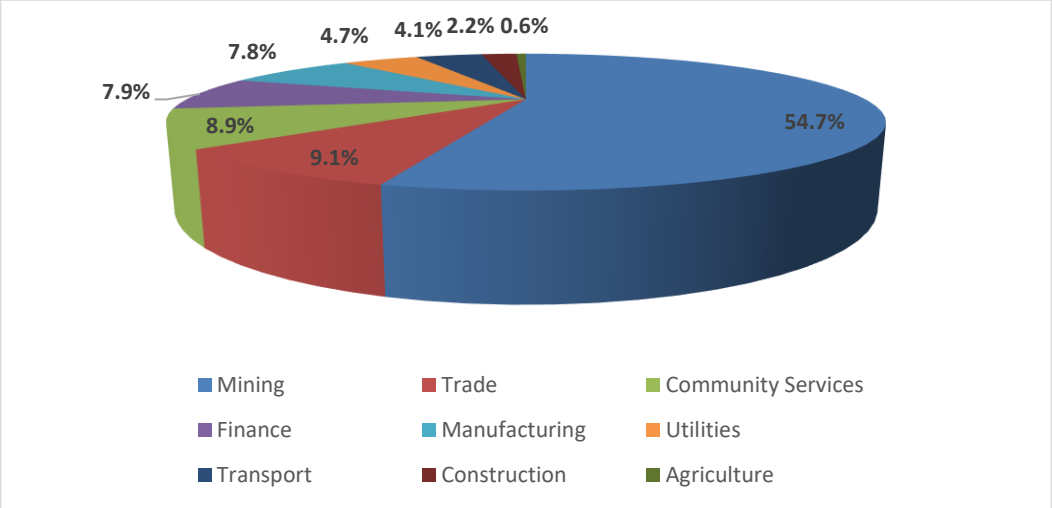


Figure 73: Economic contribution by Sectors in Emalahleni Local Municipality

The strongest sectors are mining which contributes more than half to the eMalahleni economy almost 55% in 2017. Trade is the second largest industry in Emalahleni with a contribution of 9.1% followed by community services (8.9%) and finance (7.9%) respectively. Mining is the biggest sector of the economy even though it comes with negatives consequences on environment (pollution) and health (pollution causes diseases).

It is projected that the annual growth of the GDP of eMalahleni will be less than 0.9% between 2018-2023. This is negative growth when we consider aspirations of the National Development Plan, Provincial Strategies and Emalahleni population growth. Previous growth rates between 2011 – 2016 and 1996 – 2011 was 3.3% and 2.8%, respectively.

From the socio-economic analysis, it is evident that eMalahleni faces several challenges that should be addressed by growing certain sectors of the economy capable of generating employment opportunities, reducing poverty, and the poverty gap in line with the terms of the New Growth Path.

7.3.2 Surrounding Land Use Activities

The project area mainly belongs to GOSA. Surrounding land use is a mix of industrial, mining, residential and some agriculture.

7.3.2.1 Town Development

There are two towns closest to the GGV operation, namely Ogies and Phola. The town Ogies got its name from the farm name Ogiesfontein on which it was initially built on. The town Phola is located about 5km north of Ogies and means desert. The two towns are linked via route R545. Undermining between Ogies and Phola poses constraints to the future spatial consolidation of these two towns. According to the municipal SDF, Ogies is categorised as a 2nd order Activity Node and Phola as a 3rd order Activity Node.

The land surrounding Ogies and Phola is classified as prime agricultural land, resulting in a conflict between pressure for urban expansion, agriculture, and mining development due to the mineral deposits in the region.

7.3.2.1.1 Ogies Town

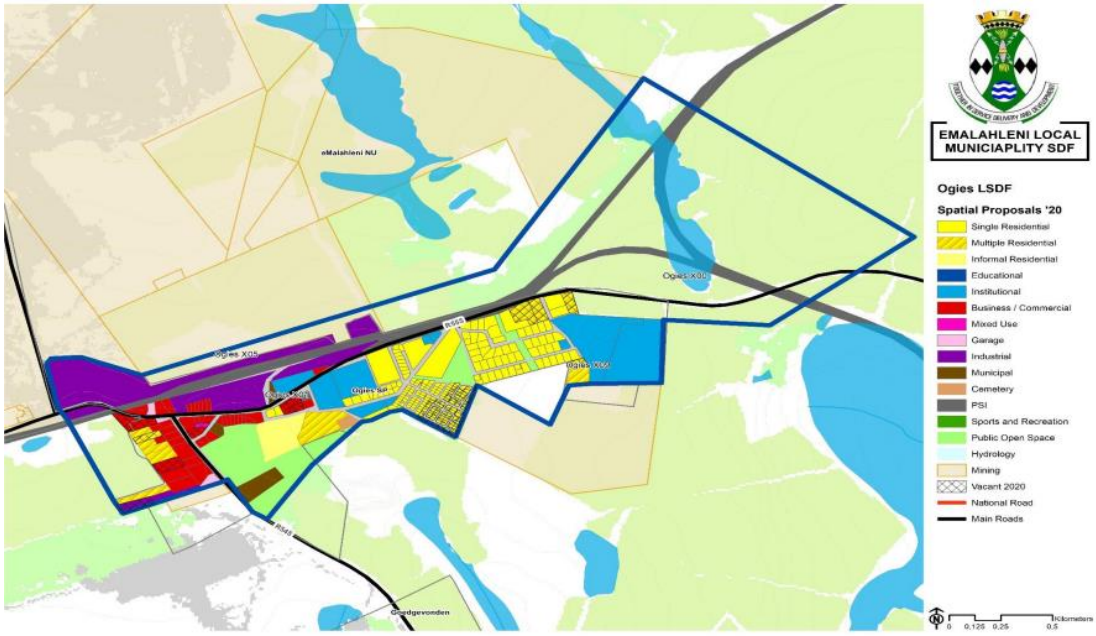


Figure 74: Ogies Spatial Development

Ogies is a typical mining town and represents the industry that dominates the region and has drawn people from far afield. The town is connected by two main roads, the R555 and the R545 to Kriel. The R545 North connects the town to the N12 freeway which links Johannesburg to Emalahleni. Ogies is situated at the intersection of route R555 (P29-1), the railway line, and route R545. Ogies is also an important railway junction on the Springs to Emalahleni rail-line, a line that connects to the port of Richards Bay. It has several branches of tracks that service the coal mines close to the town.

The bulk of commercial and retail activities in Ogies is consolidated in a north-south strip along route R545 and east-west along route R555. There is a large taxi rank with extensive informal trade adjacent to road R545 at the southern entrance to Ogies. Ogies has a fairly small residential component which is concentrated towards the east and to the south of route P29-1 (Emalahleni Road). The SDF indicates that the development priority in Ogies is to maintain and enhance the existing business core, and to consolidate infill development on developable land along route R555 to the east. This can be done by promoting retail, office and commercial uses on vacant erven along the town's east-west spine (route R555/ Emalahleni Road). Although pressure for expansion is low, the SDF proposed that the partially developed industrial area, north of the railway, be consolidated into a strong mixed-use industrial precinct. The economic base of the town is very limited.

The general maintenance of the public spaces such as road reserves, open spaces, roads etc. are very poor.

Residential expansion is currently taking place in X09 in a south-eastern direction. Once all residential stands within X09 have been occupied, the municipal SDF proposes that the triangular precinct west of X09 be earmarked for future residential development, as this is the only suitable land not earmarked for mining. An informal settlement occurs on the southern boundary, which in recent years, has expanded exponentially into X01 – previously used for Public Open Space. This expansion is supported by the agglomeration of land uses located within close proximity to this area. It is most likely that informal settlement development will continue to take place within this area. The SDF for Ogies proposes that the remaining Public Open Space, east of the informal residential development be utilised for government-funded affordable housing. It further proposes residential developments on the vacant land along the town's east-west spine when entering from the east.

Ogies was identified as a priority area for urban renewal and revitalisation by the Mpumalanga Vision 2030. Therefore, it is imperative that proper upgrading and maintenance of the existing infrastructure, especially roads, road reserves, signage, transport facilities, open spaces and parks be undertaken to improve the aesthetic quality of the town. General cleaning and beautification of the town's business precinct should also be prioritised. GGV has made provision to support this in their SLP.

7.3.2.1.2 Phola Town

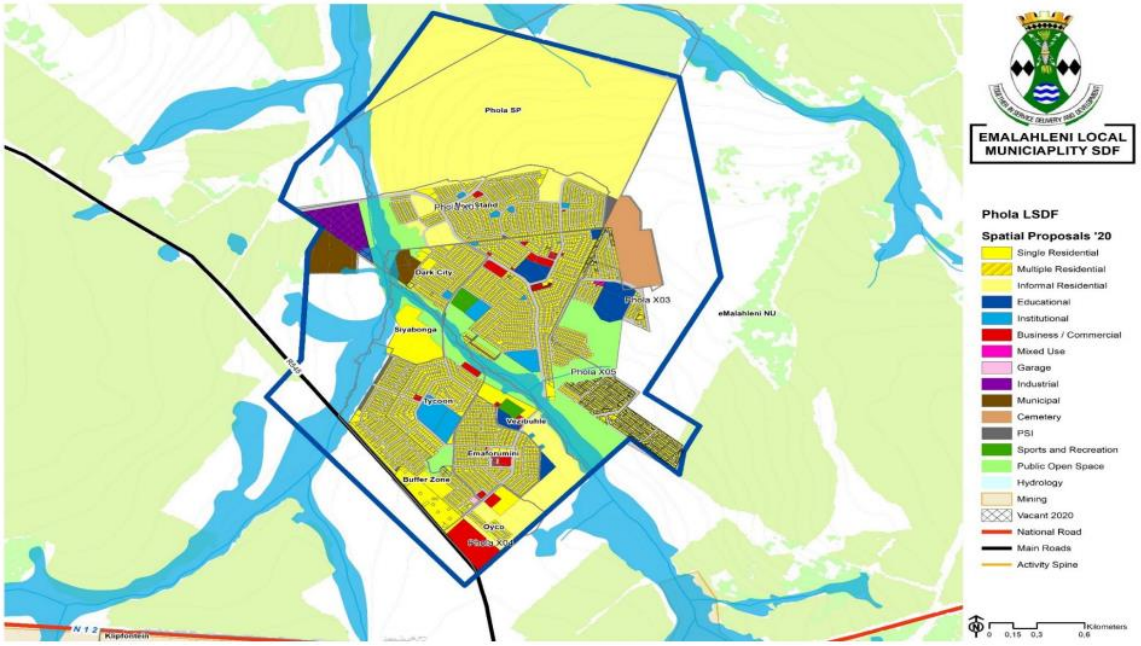


Figure 75: Phola Spatial Development

Phola town is made up of various sub-sections, namely North Stand, Dark City, Siyabonga, Tcoon, Vezibuhle, Emaforumini, Buffer zone, Oyco and some new etensions, X03, X04, and X05. Phola houses approximately 9000 households with a population of 32,000 people.

It is developed along the R545 just north of the N12 freeway. The municipal SDF is earmarking suitable land for residential expansion ad proposes that land adjacent to route R545 from the N12 freeway to Phola be earmarked for development to capitalize on visual exposure and physical access from the regional road network.

Phola has two localised activity nodes situated along the main collector road in Phola Proper and Phola Ext 1. These two nodes are being strengthened through low intensity mixed uses developments along the main access road (activity spine) serving Phola, according to the municipal SDF. These nodes accommodates both economic activities and social services.

Informal residential development is rapidly expanding towards the north of Phola. Future mining is planned to the east of the town, leaving no alternative but for Phola to expand to the west and north and south-east in future.

7.3.2.2 Agricultural Activities

The area pre-mining was predominantly used for agricultural purposes and some livestock farming. Due to coal mining activities, the land uses have been modified resulting in reduction in agricultural activities. The land adjacent to the MRA is used mainly for mining or agricultural purposes. Summer crops such as maize and soya beans are cultivated in pockets still used for agriculture especially to the west and south of the GGV operation. There are also pockets of grazing land still present, although some livestock may be kept it is understood from landowners in this area, that livestock theft has made it impossible to farm with livestock.

As part of the Agricultural Development still present in the surrounding area, there are a few sensitive receptors and land use activities. These include:

- Agricultural Structures which include residential structures, sheds and worker houses
- Some areas on the MRA have until recently been leased back to local agriculturalists for cultivation and feed production

The main agricultural land users / owners in the vicinity of the MRA are indicated in Figure 76:

- Daniel de Wet: Klippoortjie 32 IS, various portions.
- Erasmus (Albabensmit & Almatera): various portions on Springboklaagte 33 IS, Smithfield 44 IS and Zondagsvlei 9 IS.
- Ivan Enslin: various portions on Schoongezicht 218 IS, Zondagsvlei 9 IS, Klipfontein 3 IS, and Smaldeel 1 IS.
- MAD Mulder: various portions on Zondagsvlei 9 IS.
- Vosbreedt Boerdery: Smithfield 44 IS, Zondagsvlei 9 IS (Ptn 6), Leeuwenfontein 219 IR, Cologne 34 IS, Klippoortjie 32 IS.

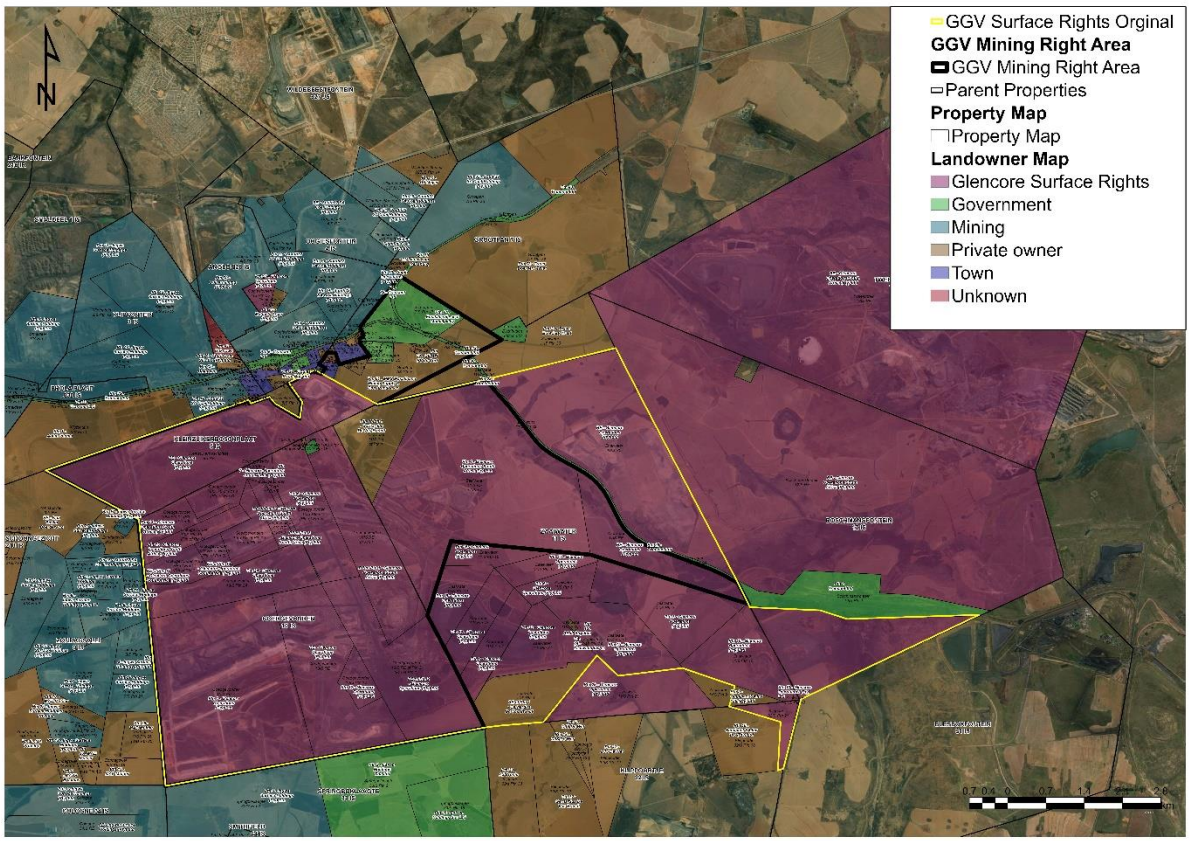


Figure 76: Landowner category map

7.3.2.3 The Mosque and Madrassah

The Mosque and Madrassah is located within the MRA and in very close proximity to the mine operations.

Figure 77: The Mosque and Madrassah

The Mosque is a religious centre utilised by local people of the Islam religion. The Madrassah is used as a residential area and for religious teachings.

7.3.2.4 Mining Development

Within the project and surrounding area, there are mining activities mostly related to coal but there are also some quarrying or sand mining activities. Figure 78 indicates land belonging to mining companies and mining activities identified.

Figure 78: Neighbouring mining operations

7.3.2.5 Sensitive Receptors

The residences (farmhouses, lodges and farm worker dwellings), schools and clinics may be defined as noise sensitive land uses in the area. The sensitive receptors are indicated in Figure 79.

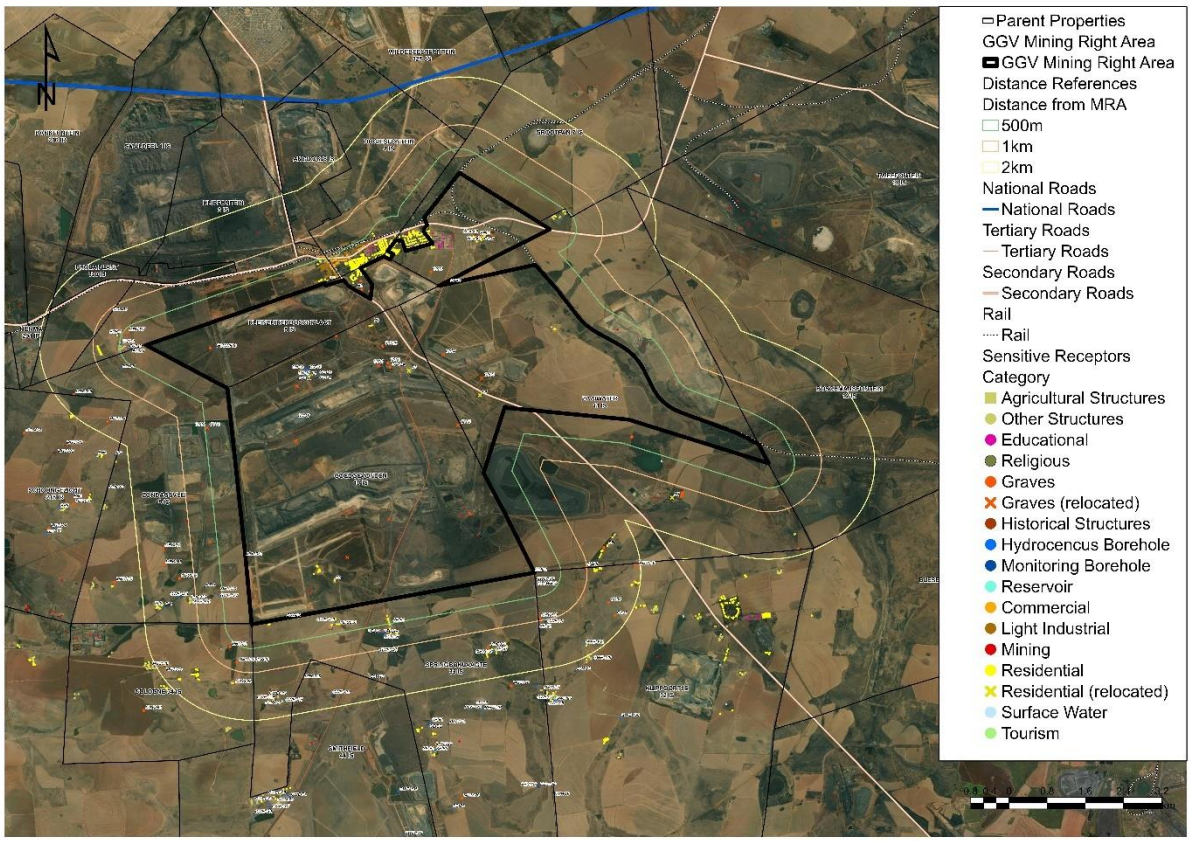


Figure 79: Sensitive receptor map

7.4 CULTURAL HERITAGE

7.4.1 Sites of Cultural Heritage Significance

A Pelser Archaeological Consulting (APAC) conducted a Heritage Impact Assessment (HIA) in 2022 at the proposed underground infrastructure areas to identify any sites of cultural heritage significance. No new sites have been identified at the incline shaft areas – refer to ANNEX-10.

Table 29 provides a list of all the known sites of cultural heritage, derived through a thorough review of the numerous cultural heritage reports and assessments conducted in the GGV area.

The sites have been split between graves/burial sites (Figure 80) and historical structures (Figure 81). 34 gravesites and 18 historical structures have been identified within the GGV area and immediate surroundings.

Most of the gravesites within the GGV area have been exhumed and relocated as mining operations extended. Some gravesites remain, most notably the Muslim site (GY-02) located at the Mosque (V2) and the sites located on Grootpan 7 IS where only underground mining is scheduled.

The majority of the historical structures identified within the GGV area have been demolished; however, a few sites of historical value are still in existence and need to be managed and maintained.

Several sites are located outside of the area directly impacted by GGV but have been recorded in the event of future expansion or development of ancillary infrastructure outside of the GGV area.
The status quo of the known cultural heritage sites is summarised the Cultural Heritage Management Plan (CHMP) developed for GGV (Appendix 4 of EMPr) and is not repeated here.

Table 29: Summary of cultural heritage site status quo

Status Category	Site ID
Gravesite: Graves exhumed and relocated	GY-03 (Mbila Estate) GY-04 GY-05 (Grave Site 5) GY-10 (Site G) GY-12 GY-13 GY-14 (GY-MK"B") GY-15 (Grave Site 18) GY-17 Site B
Gravesite: Remaining gravesites	GY-01 (Site C) GY-02 (GY-02B) (Site D) GY-02A (Site E) GY-16 (OFT GY-01) Site A1 Site A2 G-01 (OFT) GY-02 (OFT)
Gravesite: Disputed graves[#]	GY-06 GY-MK "A" GY-11 MHC031 GY-18
Gravesite: Outside of GGV area	GY-07 GY-08 GY-09 (Site F) GY-i, GY-ii, GY-iii (Ogies) GY-vii, GY-viii, GY-ix, GY-x, GY-xi (Tweefontein MRA)
Historical structure: Demolished, no historical value	F1, V3, V4
Historical structure: Demolished, historical value	F3, F4
Historical structure: Remaining, no historical value	F2
Historical structure: Remaining, historical value	H3, V2 HH01, O1, O2 (OFT)
Historical structure: Outside of GGV area	F5, H1, H2, V1, MHC026, HSRa1, HSRa2

[#] No records found, discrepancy i.r.o. family names and/or location

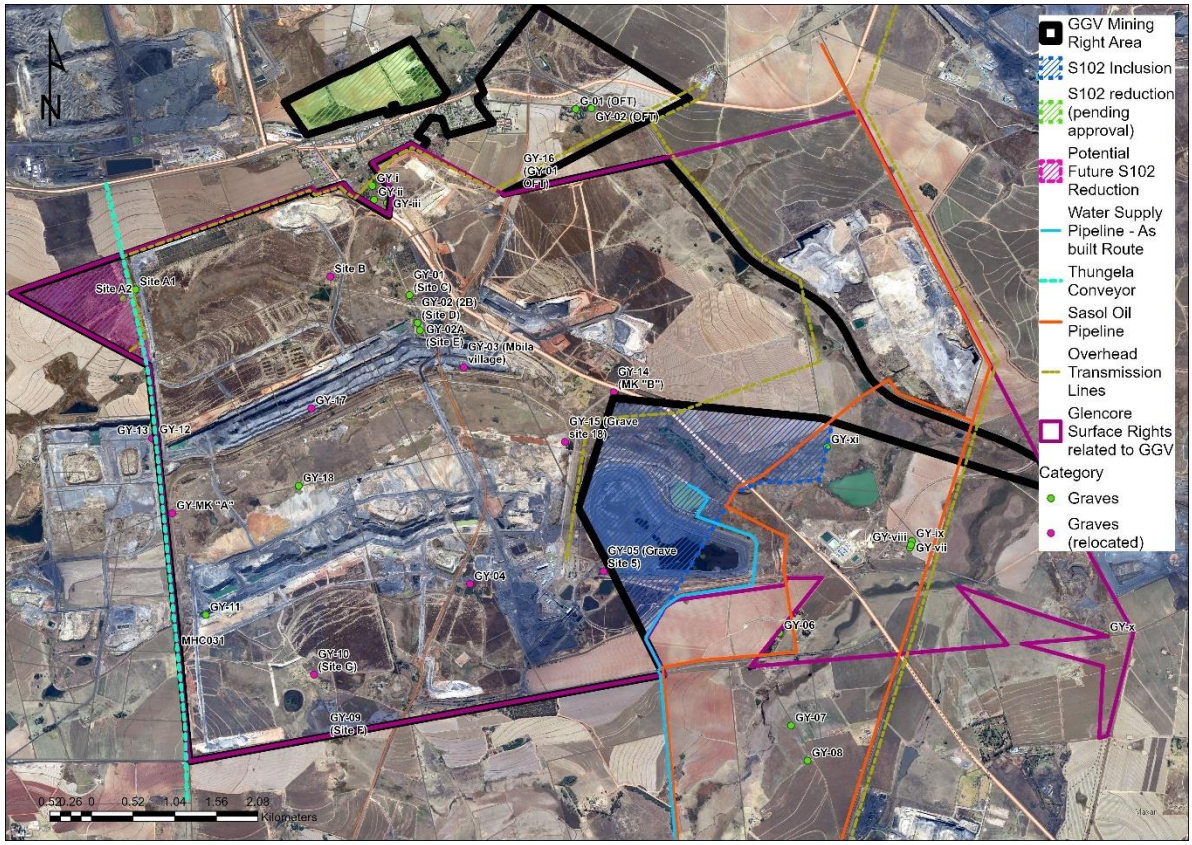


Figure 80: Known sites of cultural heritage - Graves/Burial sites

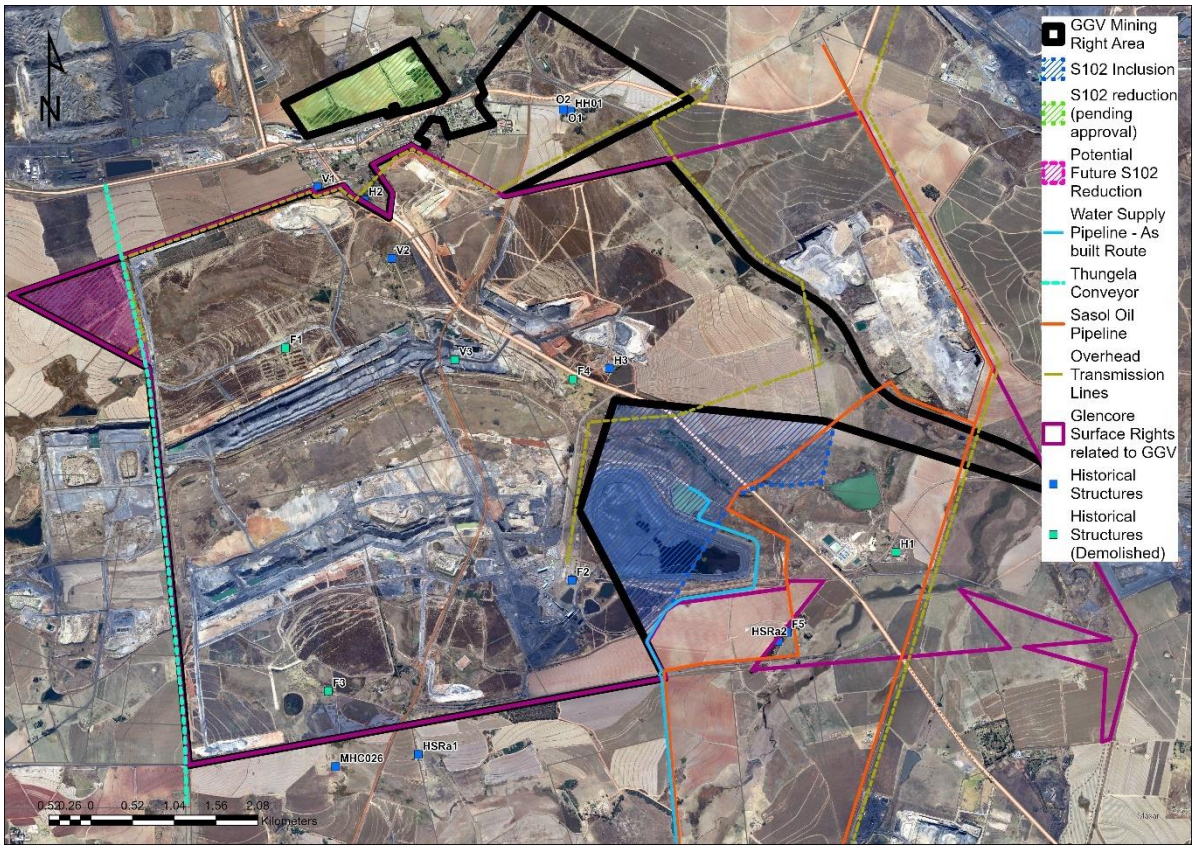


Figure 81: Known sites of cultural heritage - Historical Structures

7.4.2 Palaeontology

Dr Heidi Fourie conducted a desk-top paleontological impact assessment (PIA) during October 2022 (ANNEX-13).

The GGV MRA is underlain by the Vryheid Formation of the Ecca Group, Karoo Supergroup. The Vryheid Formation consists essentially of sandstone, shale, and subordinate coal beds, and has a maximum total thickness of 500 m. It forms part of the Middle Ecca (Kent 1980). This formation has the largest coal reserves in South Africa. The pro-delta sediments are characterised by trace and plants fossils (Fourie, 2022).

Fossils in South Africa mainly occur in rocks of sedimentary nature and not in rocks from igneous or metamorphic nature. The Ecca Group, Vryheid Formation (Pv) may contain fossils of diverse non-marine trace, *Glossopteris* flora, mesosaurid reptiles, palaeoniscid fish, marine invertebrates, insects, and crustaceans. *Glossopteris* trees rapidly colonised the large deltas along the northern margin of the Karoo Sea. Dead vegetation accumulated faster than it could decay, and thick accumulations of peat formed, which were ultimately converted to coal. It is only in the northern part of the Karoo Basin that the glossopterids and cordaitales, ferns, clubmosses and horsetails thrived (Fourie, 2022).

According to the Palaeotechnical Report for the Mpumalanga Province (SAHRA), the paleontological sensitivity of the Vryheid Formation is Very High.

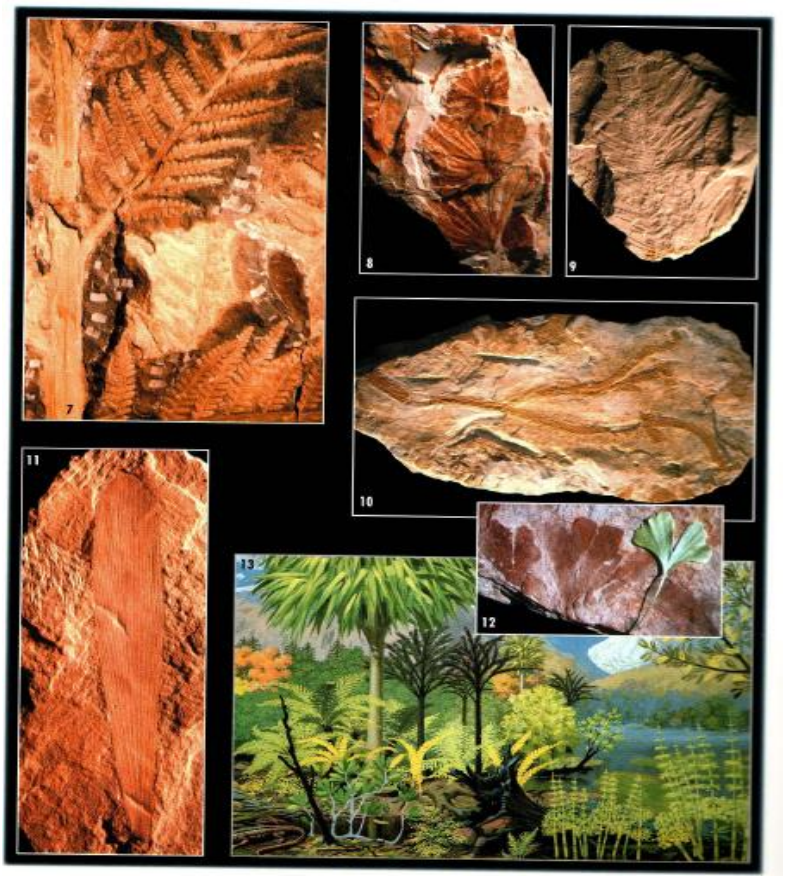


Figure 82: Examples of Vryheid Formation Fossils

8 DESCRIPTION OF POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

8.1 IMPACTS ASSOCIATED WITH EXISTING OPERATIONS AND PROPOSED CHANGES

8.1.1 Soils and Land Capability

The proposed change in activities will not result in any additional impacts to the soils and land capability as soils within the footprint area of the incline shafts and supporting surface infrastructure will have already been lost during preparation for the preceding opencast mining. The cumulative impact on soils is addressed below:

8.1.1.1 Land Capability

Land capability is largely determined by soil properties. Any permanent removal of topsoil will cause the existing pre-mining arable and grazing land capabilities to cease completely. The opencast areas will be transformed by mining or infrastructure development. The area will be rehabilitated concurrent to mining.

It is doubtful that any mitigation and/or rehabilitation procedures will lead to a situation where the area can be re-created to a to its current land capability. Nonetheless, it is imperative that an effort be made in this regard. At best the area will be restored to grazing land capability.

Limited impact on land capability is expected at the areas earmarked for underground mining. There is a potential for subsidence to occur pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow. The geotechnical investigation by Bare Rock Consulting (2022) recommended that no underground mining be conducted in areas where the mine roof is <20m deep to prevent surface subsidence.

8.1.1.2 Compaction, Consistence and Hard Setting

Heavy machinery traffic on the soil surface during and after mining can lead to compaction and this will adversely affect the land capability of the area. Fine sand and silt are more prone to compaction. The soils of the area exhibit a sandy, sandy loam or sand clay loam texture and may be subject to compaction.

Hard setting is a definite concern. If the E-horizons, and especially the soft plinthic B-horizons and G-horizons, are stockpiled with the red and yellow brown apedal B-horizons the changes of hard setting will increase. In cases where organic matter breakdown occurs during stockpiling, hard setting will almost definitely occur. Compaction and hard setting hampers root growth and root development, surface runoff increases and the hydropedological functioning of the area is hampered.

8.1.1.3 Erosion

Erosion of the rehabilitated areas will lead to soil loss and impact the land capability of the area adversely. If hard setting occurs, sheet erosion could be a significant concern on the site. In areas that exhibit steep slopes, erosion may occur even if hard setting does not. It is advised that where the high potential soils (Arable) are used in rehabilitation the slope not exceed 15 % or 8.5 degrees. A slope of 8.0 to10 % (4.5 to 8.5 degrees) should not be exceeded when the low agricultural potential soils (grazing) and wetland soils are used in rehabilitation. There should be strived that to recreate the pre-mining topography of the area, especially in the areas surrounding the wetland soils as this will ensure water draining to the natural occurring wetland areas. Convex slopes should be minimised as this could restrict drainage to the wetland systems.

8.1.2 Terrestrial Biodiversity

8.1.2.1 Impact on Habitat and Diversity

The proposed change in activities will not result in the clearance of additional indigenous vegetation as all habitat and floral species within the footprint area of the incline shafts and supporting surface infrastructure will have already been lost during preparation for the preceding opencast mining. Indirect impacts from mining activities on the surrounding natural habitat may arise from poor AIP management, increased movement of personnel and sound and lighting impacts. Underground mining will pose low risks to floral communities.

Negative impacts likely to be associated with the floral ecology within the MRA include, but are not limited to, the following:

- Placement of infrastructure and/or construction material within natural habitat outside of the authorised footprint.
- Failure to implement rehabilitation efforts in disturbed areas surrounding the proposed footprint areas.
- AIP proliferation in disturbed areas and subsequent spread into surrounding natural and more sensitive habitat.
- Increased ambient lighting, notably at night impacting faunal species behaviour, notably invertebrates.
- Increased noise impacts resulting in fauna vacating the surrounding habitats but also impacting on species who rely on sound or vocalisations to hunt and/or avoid predation.

8.1.2.2 Impacts on Floral SCC

No direct risk of impact on floral SCC is anticipated from the proposed change in activities. However, given that there have been several changes to the environmental legislation since the previous authorisation of infrastructure and mining activities for GGV, especially regarding floral SCC, it is recommended that a walkdown of the mining footprints for the already authorised activities take place prior to vegetation clearing. The walkdowns will only be applicable to the Natural Grasslands, Natural Wetlands, and Dams. No site walkdowns for floral SCC is required for the Modified Wetlands and the Transformed Habitat units.

Before any construction or further mining activities can occur a detailed walk down of the area must take place, during which all floral SCC should be identified and marked by a suitably qualified specialist. Surveys to conducted within the correct flowering season for all potentially occurring SCC – especially species in the Orchidaceae family and in the *Aloe* and *Gladiolus* genera. The MTPA recommends that surveys for SCC must occur during winter, and twice in the rainy season (November/December and February/March); however, since there is a small list of anticipated floral SCC in the remaining natural area in the MRA, restricting walkdowns to the flowering season in question should suffice.

Prior to construction or further mining activities, floral SCC that will be directly impacted upon need to be removed, where feasible. This will include species belonging to groups that have underground rhizomes or bulbs, as well as most of the succulent species. Ideally species should be moved to suitable similar habitat outside of the direct footprint, but without causing harm to undisturbed areas. MTPA recommends that all protected flora that can be successfully relocated should be used as part of rehabilitation – intact vegetation outside of the mine footprint should not be disturbed by the planting of rescued SCC. The use of a nursery to aid in the rescue and relocation of floral SCC should only be used if necessary, and only for a short time, so that potential risk of introducing pathogens and exotic earthworms into a natural area is avoided. Successes and/or failures of the relocation of SCC must be documented.

The removal and/or rescue and relocation should be planned before construction and further mining activities commence and must be set up by a suitably qualified and experienced specialist in association with a suitably qualified horticulturist. Permits from the relevant authorities, i.e. MTPA, should be obtained before removal, cutting or destruction of protected species or floral SCC before any proposed mining activities may take place.

8.1.2.3 Impact on Faunal SCC

Several faunal SCC have an increased POC for the MRA, with signs of one SCC namely *Leptailurus serval* (Serval) being observed. As the proposed incline shafts will be located within the existing open cast pits, the proposed additional activities are not anticipated to pose a direct risk to faunal SCC. Cognisance of edge effects and indirect impacts however needs to be taken as these may pose a risk to potential faunal SCC in the adjacent sensitive habitats where no mining is planned. Should the proposed mitigation measures be implemented, the risks to such species is likely to be low, however it is important that a designated Environmental Specialist continue to monitor such edge effects and note any degradation of the habitats surrounding the active mining footprint.

8.1.2.4 Loss of or modification to sensitive wetland habitat

Potential inadequate planning of infrastructure placement and design (e.g. inappropriate placement of inclines within any remaining extent of sensitive habitat) could lead to:

- Further loss of sensitive wetland habitat, as well as unnecessary edge effect impacts on areas outside of the authorised mining footprint.
- Potential degradation and modification of the remaining extent of the receiving freshwater environment.
- Further loss of wetland ecological structure and related ecological service provisioning.

Potential failure to set up an Erosion Control Plan and Stormwater Management Plan could lead to:

- Soil compaction leading to increased flood peaks into the remaining channel valley bottom wetland because of formalisation and concentration of surface runoff.
  Exposure of soil, leading to increased runoff from cleared areas and erosion of the remaining extent of wetlands, and thus increased potential for sedimentation of the wetlands.
- Potential for erosion of terrestrial areas because of the formation of preferential flow paths, leading to sedimentation of the remaining channel valley bottom wetland.
  Increased sedimentation of the wetlands potentially leading to areas within the wetlands more suited to terrestrial vegetation.

8.1.2.5 Impact on CBAs, ESAs, Threatened Vegetation and Protected Areas

The proposed development will not impact on any CBAs, ESAs, or protected areas. There is, however, potential for indirect impacts to habitat representative of the VU Eastern Highveld Grassland ecosystem (mainly confirmed for the Natural Wetlands adjacent to Incline 2). As such, edge effects to the Natural Wetlands outside of the footprint areas must be managed, and AIP proliferation and encroachment by especially *Seriphium plumosum* must be controlled.

8.1.2.6 Cumulative Impacts

Apart from the mining activities, the greatest threat to the floral ecology within the MRA is the continued proliferation of AIP species and the encroachment of indigenous woody species, resulting in the overall loss of native floral communities within the remaining natural areas. The proposed development is unlikely to result in large increases of human movement within the MRA due to strict access control of the mine and hence, cumulative loss of SCC due to harvesting is unlikely.

Further potential loss of faunal habitat in the remaining natural areas through AIP proliferation and edge effects poses a significant risk to the remaining faunal assemblages in the area. Further loss of habitat and species diversity will compound and add to the localised loss that is anticipated from the opencast activities, whilst failure to suitably rehabilitate will lead to long-term and possibly permanent reductions in faunal habitat, species diversity and SCC in and surrounding the MRA.

8.1.2.7 Probable Residual Impacts

Even with extensive mitigation, residual impacts on the receiving floral ecological environment are deemed likely because of the mining activities. The following points highlight the key residual impacts that have been identified:

- Permanent loss of and altered faunal and floral species diversity in the surrounding habitats.
- Permanent loss of protected floral species and suitable habitat for such species.
- Reduction of faunal abundance in the surrounding areas.
- Loss of faunal SCC occurrence in the surrounding habitats.
- Edge effects such as habitat fragmentation and AIP proliferation.

Decant of contaminated water from the rehabilitated mine area and the underground workings into the receiving environment could lead to:

- Contamination of water within the receiving environment, and subsequent reduction in water quality (increase in salts and specific contaminants of concern and reduced pH).
- Subsequent negative impacts on biota and vegetation.
- Altered flow regimes (increased hydroperiod).
- Habitat degradation.

8.1.3 Surface Water

8.1.3.1 Catchment yield and hydrology

During the mine's life there will be a negative impact on the catchment yield and hydrology (J&W, 2013). The LOM as approved in the 2016 EMPr covers approximately 1.6% of the Witbank Dam catchment and some 0.47% of the Loskop Dam catchment.

The proposed underground activities will not increase the impact on the surface yield in the catchment; however, potential subsidence of the surrounding environment if pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow could lead to inflows into the underground workings, which may drain water from surrounding wetland habitats. Reduction in the volume of water entering the remaining wetland systems could result in a loss of recharge (and thus potential desiccation) of the wetland system and downstream surface water resources, decreased ecoservice provision and further altered vegetation communities due to moisture stress.

8.1.3.2 Water quality

The main issues of concern in respect of potential impacts at the GGV Complex on the water quality of the surface water resources include opencast pits, the CHPP area, conveyance of piped water and construction of the new areas.

Water quality within the opencast pits can be expected to deteriorate compared to the background groundwater qualities and there is a risk that the water can through seepage to aquifers or decant into surface water affect the surrounding clean water system. Opencast mining activities could also result in soil and stormwater contamination from oils and hydrocarbons.

Water entering the underground mining area because of ingress into underground mine workings may necessitate dewatering of the underground mining area, which may result in the discharge of dirty water into the surrounding wetland environment if not managed properly.

The hard rock removed from opencast mining areas will be placed in rock dumps in overburden stockpiles along the mining areas and will remain in this location for long periods of time. If not properly managed, erosion of these areas can result in sedimentation in streams and rivers, which affects water chemistry and stream flow and negatively impacts aquatic habitat and impairs wetland functioning.

During the backfilling, topsoiling and grassing process, as part of the rehabilitation process, there will be a period of time where there is a relatively large area with limited grass cover, which could lead to erosion and subsequently an increase in suspended solids in the clean water system.

The impact of the CHPP is primarily through spillage of water potentially reaching the Zaaiwaterspruit. The highest risks are probably associated with pollution control facilities and the potential for spillages into the clean water system. Accidental fuel, lubrication or other hazardous material spills, n has the potential to reach the clean water systems and ultimately the Zaaiwaterspruit, adversely impacting on fish and/or downstream habitats and wetlands.

There is also a risk of seepage to aquifers and contamination of the soil through leakages at the WWTP and discharge of affected water to watercourse during peak flow.

Spillage from the various pumping lines carrying dirty water from the opencast mining areas to the PCDs, from GGV to Waterpan/South Witbank and back again and from Ogies underground can spill onto the surface or into watercourses due to leaks in pipeline. This has the potential to pollute soils as well as underground and surface water sources with a negative effect on ecosystems, habitats and species.

Erosion in the clean water diversion canals can result in elevated suspended solids and siltation in watercourses if poorly designed and / or managed and maintained. Dragline, haul road crossings and conveyor crossings over the clean water diversion canal and Zaaiwaterspruit have the potential to impact on water quality.

8.1.3.3 Wetlands

Should the existing approved mine plan for opencast mining be followed, namely, to develop the incline shafts into the high wall of the opencast pits, the development of the proposed shafts and underground mining areas will have a negligible additional impact on the receiving freshwater environment, provided that sufficient pillar safety factors are employed to prevent subsidence in the undermined landscape. On this basis the risk is deemed to be of low significance since the majority of the wetlands associated with the proposed underground mining and infrastructure will be completely lost assuming that opencast mining proceeds as per the approved mine plan.

However, in the event that opencast mining does not proceed, it will be necessary to revise the risk assessment accordingly to adequately consider the impact of the proposed development, and to ensure that appropriate mitigation measures are implemented to ensure that the significance of potential impacts are minimised as much as possible. There are four key ecological impacts on the wetlands that are anticipated to occur namely:

- Loss of wetland habitat and ecological structure;
- Changes to the sociocultural and service provision;
- Impacts on the hydrology and sediment balance of the wetlands; and
- Impacts on water quality.

8.1.4 Groundwater

GGV Complex has developed a groundwater model for its operations to determine the potential impact on groundwater levels and quality and the long-term decant potential, which is updated on a regular basis. The groundwater model was recently updated by Groundwater Square (GW2, 2022) to include the proposed additional underground workings and determine the cumulative impacts of the overall mining plan – refer to ANNEX-5. The findings of the updated groundwater model are summarised below.

8.1.4.1 Operational Phase

Pertinent information on the pit geometry is listed in Table 30. The geotechnical engineering stability assessment by Bare Rock Consulting (ANNEX-11) recommended that no mining be conducted where the roof of the excavation is shallower than 20m below surface.

- The 4 LS varies in depth of between 10 and 25m with the average being 15m below surface in the area under the diverted river. In the eastern area where the wetland is located, the roof thickness of the 4LS varies between 15 and 30m with the average thickness of 20m.
- The roof of the 2 LS under the river diversion varies in thickness between 40m in the west and 20m in the east. In the eastern area under the wetland the seam varies in depth from north to south from 60m to 40m below surface. The geometry of the pillar designs is the same on both coal seams (3.5m mining height, 11.5m pillar width and 18m centre-to-centre distance).

The following conclusions were reached on the operational phase groundwater impacts (GW2, 2022):

Mine water balance – opencast mining:

- The main components of the opencast water balance are groundwater inflow and direct rainfall recharge on mined-out, rehabilitated and operational mining areas:
    - The volumes of water expected to flow into the opencast mining area are summarised in Table 31 and Figure 83 (seasonal variations will occur, but an average scenario is presented). Note that groundwater inflow will decrease in the North-pit and South-pit because of the expansion effect of the surrounding mines.
    - Higher inflow volumes can be expected for short periods (during excessively wet rainfall periods), and dryer conditions will typically prevail during the winter months.
    - The calculated volumes can serve as input to the detailed operational balance (to be performed by mining engineers), i.e. incorporating rainfall recharge, evaporation aspects and water use in the Operational Phase balance. Therefore, although the water engineers will calculate the water balance, a high-level estimate is provided of the total water balance, which accounts for groundwater inflow as well as rainfall recharge (to active areas and rehabilitated areas) and evaporation potential. See summary in Table 31 and presented in Figure 83.
- Average annual underground groundwater inflow volumes are presented in Table 32 and Figure 84. These volumes include the rainfall recharge component and may partially intercept

some groundwater inflow that would have occurred into the opencast pits. Calculations also provided for the correct allocation of water ingress for mining periods where the 2Seam will be mined before the 4Seam is mined.

- Because the two spruits will be undermined, the 3130m^3/d over almost 800ha equates to ±21% of the annual rainfall, which is considered relatively high.
    - Therefore Table 32 and Figure 84 also indicates the difference in the water balance if the Zaaiwaterspruit is not undermined, which can reduce the underground water balance by almost 75% (total water balance of 830m^3/d).
    - The mentioned geotechnical investigation by Bare Rock Consulting (Ref: BR_16_2021s March 2022) recommended that no mining be conducted in areas where the mine roof is <20m deep. This applies only to the 4Seam underneath the Zaaiwaterspruit and the southern portion of the eastern stream, tributary of Zaaiwaterspruit. The results for such a mining scenario are indicated in Table 32 and Figure 84 (85% reduction in underground water balance, total water balance of 480m^3/d). (The rates of groundwater inflow in shallow underground mining beneath the spruits may very hugely depending on whether subsidence occurs, rock hardness and fracturing.)
- Although a rainfall deficit applies on an annual basis (MAP<MAE), summer rainfall will create a positive balance during certain months, especially during “wet” rainfall cycles.

Decant and water storage:

- None of the three pits is expected to decant to surface during mining because excess water in the Pits will be pumped out to keep the workings dry, and the mine floors are below the decant elevation for each Pit.
- Given the slope of the coal floor and the LOM plan for which certain areas must be kept dry, it may be possible that portions of the underground can be used to store water in depressions or underground dams. However, these portions will not be fully flooded unless underground seals are installed (which may be impractical).
- Groundwater flow directions will be toward the opencasts and dewatered rock strata above underground mining areas (i.e. no sub-surface decant to the neighbouring aquifers).

Impact on groundwater levels:

- During mining, groundwater levels in the immediate vicinity of the open pits will be influenced (as numerically simulated and partially observed by GGV groundwater monitoring). This dewatering cone was probably limited to <200m from the Pit perimeter for the first few years (i.e. prior to the current situation), gradually expanding over time.
- The maximum groundwater level impact zone around the opencast will be <400m, except near wetlands and low-laying surface water drainage areas (see Figure 85). However, due to the compounded effect of neighbouring mining, the maximum dewatering cone/zone of influence around the opencast will be further to the north, west and south (not indicated).

- The drawdown beyond the indicated impact zones will not be distinguishable from seasonal groundwater trends. The biggest groundwater level drawdown effect will be observed at the Pit boundary, depending on the Pit floor depth below the groundwater table (≤50m).

Impact on groundwater quality:

- The aquifers surrounding un-flooded mining sections are not expected to be impacted in terms of groundwater quality due to groundwater flowing toward the dewatered mining area.
- The initial groundwater flow into the opencast would have been of similar quality to the background groundwater quality. At present, the groundwater inflow quality is a mixture of uncontaminated background quality and coal-related impacts by surface activities (e.g. coal crushing/processing and surface water dams). Khutala underground and Pit A opencast may contribute mine water to the North-pit (less likely) and South-pit if these areas flood before the completion of the GGV mining.
- If water is pumped from the opencast pits and underground areas, the SO_4 concentrations should be <800mg/L. However, after being in contact with acid generating material for some time, especially in the pits, SO_4 concentrations will increase (concentrations in the surface dam water circuit exceed 2000mg/L because of the influence of highly contaminated water in areas, such as the MRF.
- All water pumped from the opencast is expected to be of neutral pH.
- Where possible, coal discard from the Plant, and carbonaceous rocks should be placed in the deepest part of the pit (at least 20m deep) and covered as soon as possible.
- The geochemical model should be updated every 4 to 5 years by a hydro-geochemist.

Table 30: Pertinent opencast physical information relevant to the mine water balance (GW2, 2022)

Pit #	Avg. depth to 2Seam floor (m)		Decant elevation (mamsl)	Mining area (ha)	Water volume storage potential (Mm^3)	Flooded opencast backfill situation below decant elevation	
	Below pre-mining surface	Below decant elevation				Saturated	Unsaturated
North-pit	61.5	31.0	1554.1	613	26.4	50%	50%
South-pit	56.4	27.3	1551.2	1260	68.8	48%	52%
East-pit	56.9	27.1	1551.7	534	29.0	48%	52%
TOTAL				2407	124.2		

Table 31: Pertinent opencast water balance information – water-make operational phase

Pit #	Groundwater inflow into pits (m^3/d)				High-level estimate of all water (groundwater inflow, rainfall recharge and evaporation) pits (m^3/d)			
	Current mining		End of mining		Current mining		End of mining	
	Average *	Maximum	Average	Maximum	Average *	Maximum	Average	Maximum
North-pit	600	1300	230	500	1900	4200	2200	2900
South-pit	700	1500	500	1150	3000	6800	3600	4000
East-pit	300	600	600	1350	700	1600	2500	2700
TOTAL	1600	3400	1300	3000	5600	12600	9300	9600

* Mine water can dry up significantly during dry rainfall cycles

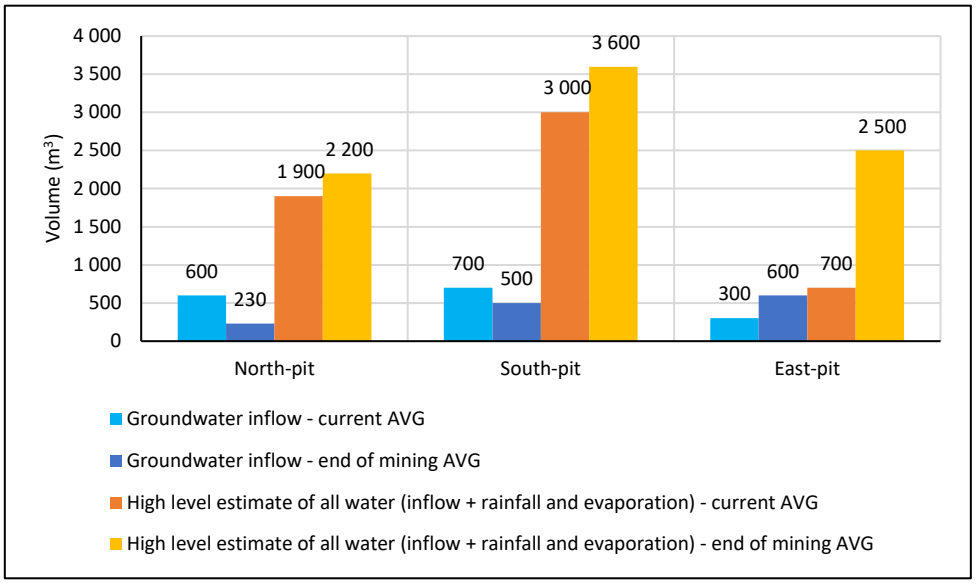


Figure 83: Groundwater inflow volumes (m^3) and high-level estimates of total water balance (groundwater inflow, rainfall recharge and evaporation – m^3) during the operational phase

Table 32: Groundwater inflow into the underground (m^3/d) during the operational phase for the scenarios where the Zaaiwaterspruit is 1) undermined and if it 2) is not undermined, as well as 3) undermined except where the 4Seam is shallower than 20m (GW2, 2022)

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8 = Total
UG mine plan	20	70	140	1 000	2 070	2 710	3 040	3 130
UG mine plan, but not Zaaiwaterspruit	20	70	110	140	200	410	740	830
UG mine plan, but not <20m under any stream	20	70	140	140	200	210	390	480

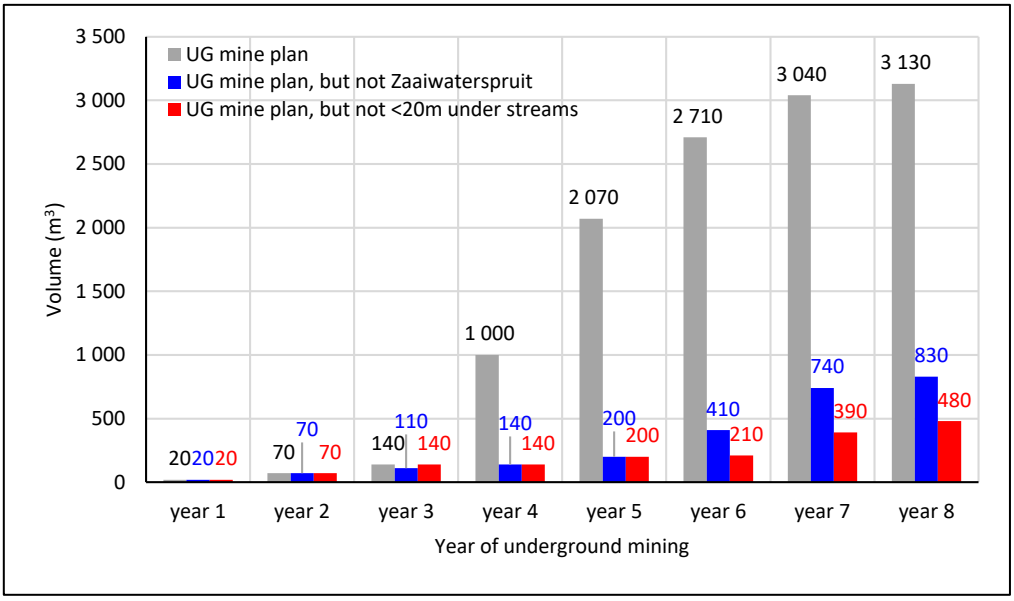


Figure 84: Groundwater inflow into the underground (m^3/d) during the operational phase for the scenarios where the Zaaiwaterspruit is 1) undermined and if it 2) is not undermined, as well as 3) undermined except where the 4Seam is shallower than 20m (GW2, 2022)

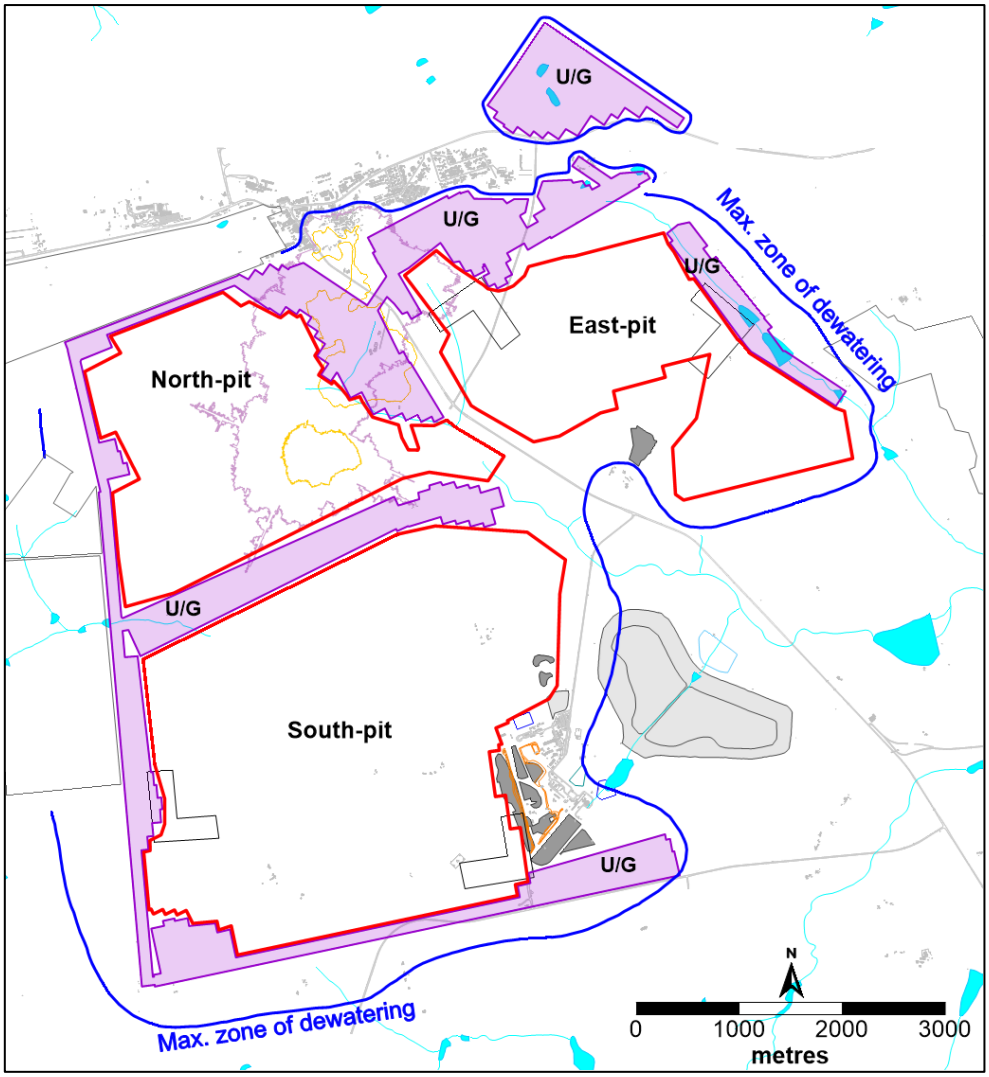


Figure 85: Groundwater level impact zones – maximum zone of dewatering (GW2, 2022)

8.1.4.2 Post-Mining Phase

Three modelling scenarios were performed for the post-mining situation:

- Model-1: Do not seal any adits/shafts to the underground.
- Model-2: Seal adits/shafts to the underground.
- Model-3: No undermining of the Zaaiwaterspruit between the North-pit and South-pit.

The effect of the wet rainfall cycle since 2019 on the mine water balance was evident. It is possible that a large component of the water balance was due to surface water runoff. Both the wet periods each summer and the longer-term cycles over multiple years, are important.

The revised mine design includes underground areas, which will influence the mine water balance. In addition, the LOM plans by neighbouring mining companies, especially to the west, south and north, also affect the mine water balance. These LOMs were deduced from original mine plans in possession of *Groundwater Square* and interpretations of Google Earth images over recent years.

Considering that all three opencast pits will be directly connected to underground mining, the following conclusions were reached:

Time to decant (assuming all underground target areas are mined):

- Calculations took account of depth to pit floor, the presumption on the moisture content of backfill material, soil subsidence, in-pit water volume at the end of mining, and natural rainfall recharge at 12% of MAP to the opencast and 21% recharge to the underground and because of the undermining of the two spruits (ranging between 5% and >100% in areas underlying the two spruits and between 1% and 5% for the rest of the underground mining area, depending on the depth to the 2Seam and 4Seam). The indicated times to decant in Table 33 is 15years-20years after mining for the entire area due to being interconnected and having similar decant elevations.
    - If the Zaaiwaterspruit is not undermined, or shallow underground beneath both streams (<20m deep) are not mined, the first decant will be delayed by a 5years to 10years.
    - With ineffective drainage, surface water will pond on top of the backfill material, and flooding will occur much earlier.
- Decant will occur directly to the surface at the areas indicated in Figure 88.
- Sub-surface decant will occur as groundwater contamination plumes and base-flow/seepage migration in the groundwater flow direction.

Flooding status at the time of decanting:

- As indicated in Table 30, ±50% of the backfill material in all three pits will be flooded.

Impact on groundwater levels:

- The anticipated zone of influence for the operational zone, as indicated in Figure 85, may shrink over a period of decades after mining. Due to the compounding effect of neighbouring mining (and their duration of mining), the maximum dewatering cone/zone of influence is difficult to indicate. Given the nearby opencast-mining by Khutala to the west and south (future), opencast-mining to the west and north of the North-pit, and Tweefontein to the east, the current operational phase dewatering zone will continue to expand until all mining have ceased.
- The in-pit groundwater levels will establish at the decant elevations of 1554.1mamsl, 1551.2mamsl and 1551.7mamsl for North-pit, South-pit and East-pit, respectively.
- Groundwater flow will essentially be toward the opencast or into active/new mining areas until groundwater levels reach the flooding elevation.
- As far as could be determined, no other privately-owned boreholes are located within the indicated groundwater level impact zone.

Mine water balance and decant volumes/quality:

- Table 36 and Figure 87 serves as a summary of the expected mine water quality.
- Table 34 and Table 35, as well as Figure 88 and Figure 89 serve as a summary of the expected decant volumes for the three modelling scenarios (Note that if subsidence occurs where the 4Seam mining is too shallow (modelling scenarios 1&2), then all decant might occur in the streams):
    - Due to having the lowest decant elevation, the South-pit may decant the highest volume, irrespective of the modelling scenario, but in the vicinity of the North-pit and Zaaiwaterspruit decant points (see Figure 89).
    - Some decant might occur from the North-pit if the Zaaiwaterspruit is not undermined.
    - If the adits are sealed, less water will flow into the South-pit, which explains the lower projected decant volume from the pit, compared to when the adits are not sealed.
- A distinction was made between decant to the surface and sub-surface decant. While most water might typically decant at the pit perimeter (within approximately 50m from the edge of mining along the downslope of the topography), a component of the pit water will also flow laterally away from the pit beneath the land surface. This contamination plume will eventually daylight a few hundred metres from the pit at lower surface topography, or in a local stream. This sub-surface decant will be less contaminated than the decant at the pit perimeter because the plume will mix with aquifer groundwater and there will also be rainfall recharge. Therefore, a distinction was made between the following decant components, all with different volumes for the three modelling scenarios:
    - Decant to surface at the Pit perimeters.
    - Decant to surface in low-lying areas, 50m and 200m from the Pit perimeter.
    - Groundwater flow can develop contamination plumes in the groundwater flow direction.
- As can be seen in Table 33, the natural rainfall recharge to the three GGV pits will equate to 5540m^3/d, which is less than 60% of the expected decant volumes. A significant component can be contributed from rainfall recharge to the underground and mine water inflows from neighbouring mines (discussed below).
- Evaporation and transpiration by plants in areas where the mine water is decanting and where the groundwater table will be shallow (i.e. adjacent to the decant areas) will reduce the volumes. Contaminated groundwater decanting to surface as base-flow can manifest as contaminated surface water run-off or salts precipitating on surface (which may, in turn, be transported further by rainfall run-off).
- Decant will vary seasonally.

Inter-mine flow volumes:

- The anticipated rates at which mine water flow will occur to/from neighbouring mines are summarised in Figure 90 for the modelling scenario where the adits are not sealed. The results of all three modelling scenarios are summarised in Figure 91. The biggest inter-mine flow interaction will be with Khutala from the west with long-term average inflows of ±557m^3/d.
- The total inflow from surrounding areas into the North-pit and South-pit over the long-term cannot be determined accurately because the inflow component from the Khutala 2Seam and 4Seam underground to the south, west and southeast could not be extracted accurately with a high degree of uncertainty, from the numerical model, due to the manner in which it is calculated in the numerical model.
- Except for the contamination plumes into the Zaaiwaterspruit, downstream of the North-pit and South-pit, and the Zaaiwaterspruit tributary, downstream of the East-pit, the only outflow from GGV mining is expected east of the East-pit underground (44m^3/d).

Impact on groundwater quality:

- Model results in the shallow weathered zone aquifer after 20/50/200 years, are included in Figure 92.
- Until flooding occurs, the contamination plume will be restricted to the immediate vicinity of mining.

Table 33: Pertinent decant information for the scenario where adits are not sealed (GW2, 2022)

Pit #	Decant elevation (mamsl)	Time to flood (years)		Post-mining decant volumes (m^3/d)	
		Min	Max	Expected rainfall recharge	Simulated decant
North-pit	1554.1	15 – 20 *		1 411	0
South-pit	1551.2			2 900	6 720
East-pit	1551.7			1 230	2 210
Zaaiwaterspruit tributary at East-pit				3 132	130
Zaaiwaterspruit between North-pit and South-pit					260
All other underground areas					
TOTAL				5 540 for pits 8 672 for all mining	9 320

* 5years to 10years longer if the 4Seam underground beneath the streams, which are <20m deep, are not mined.

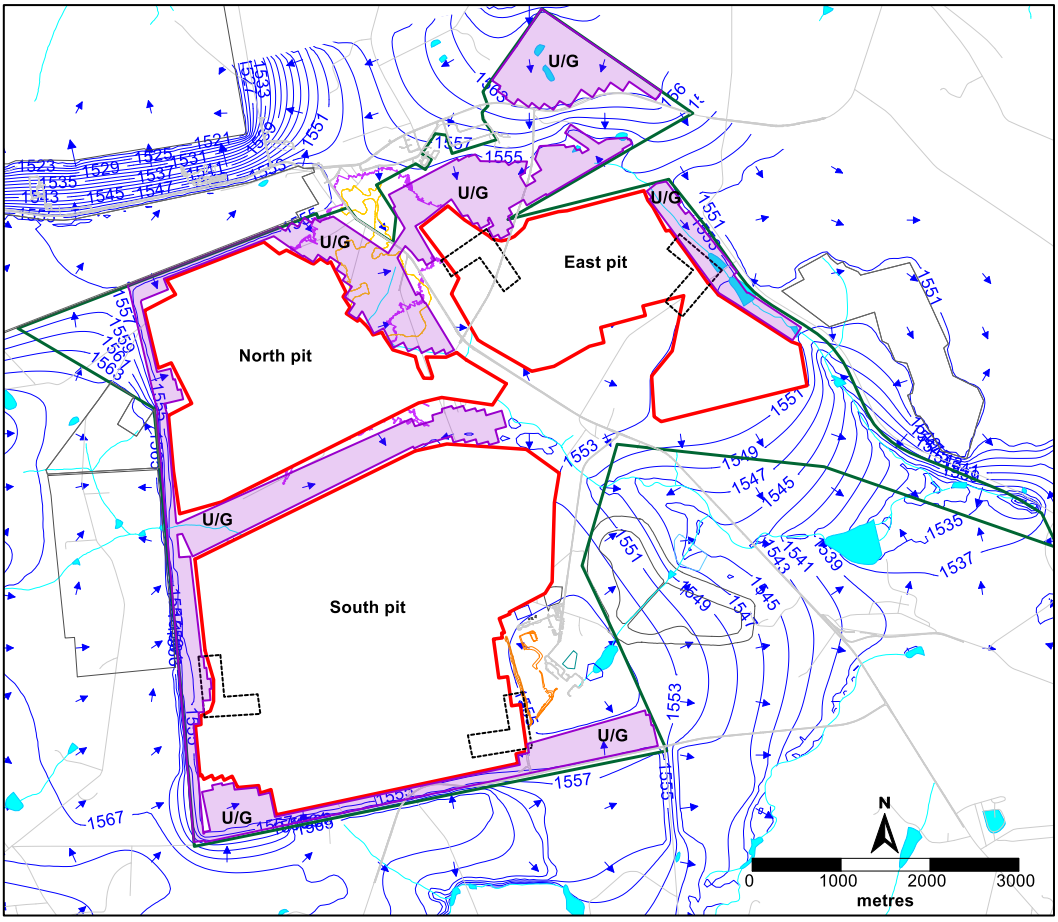


Figure 86: Groundwater level elevations – post-mining (GW2, 2022)

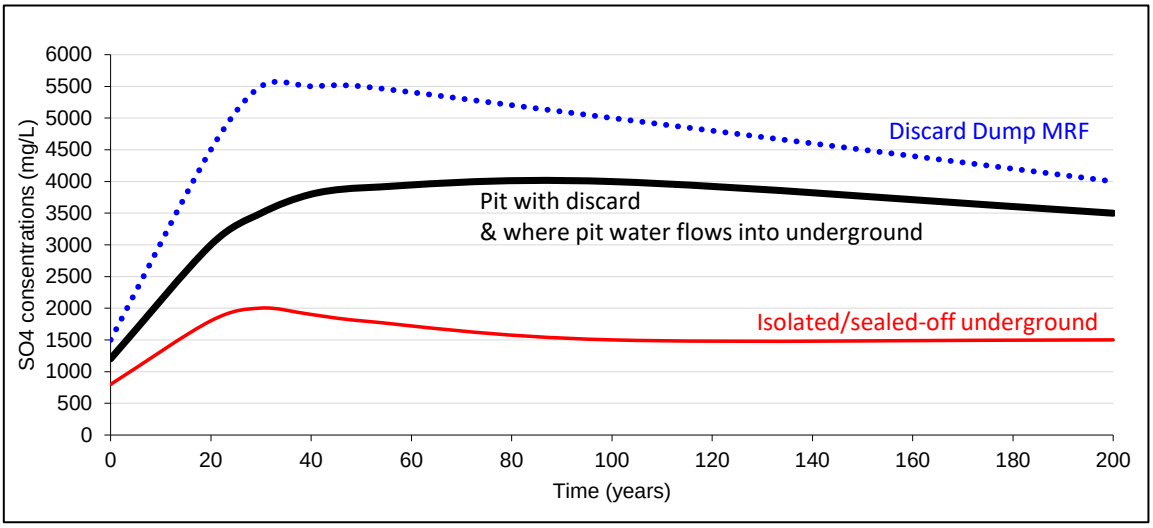


Figure 87: Mine water quality trend predictions – post-mining (GW2, 2022)

Table 34: Long-term post-mining groundwater base-flow/decant interaction with surface environment for the scenario where the adits are not sealed (GW2, 2022)

Base-flow/decant zone		Volume (m^3/d)		SO_4 conc. (mg/L)
Decant at pit perimeter	North-pit-	0	Mine water Total = 8930	4000
	South-pit	6 720		4000
	East-pit	2 210		4000
Decant seeping from underground into river	Zaaiwaterspruit tributary at East-pit	130 *	Underground mining seepages Total = 389 *	1500 - 4000
	Zaaiwaterspruit between North-pit and South-pit	260 *		
Sub-surface decant	Downstream from Nort-pit and South-pit	<100	Mixture of pit water base-flow and groundwater in local aquifers	250 - 1000
	Downstream from East-pit			

* If subsidence occurs where the 4Seam mining is too shallow, then all decant might occur in the streams.

Table 35: Comparison of long-term post-mining groundwater base-flow/decant volumes (m^3/d) of the three modelling scenarios (GW2, 2022)

Base-flow/decant zone		Model-1: Do not seal any adits/shafts to the underground		Model-2: Seal adits/shafts to the underground		Model-3: No undermining of the Zaaiwaterspruit between the North-pit and South-pit.	
		Volume (m^3/d)	Total (m^3/d)	Volume (m^3/d)	Total (m^3/d)	Volume (m^3/d)	Total (m^3/d)
Decant at pit perimeter	North-pit-	0	8930	0	7500	970	8570
	South-pit	6720		4940		4940	
	East-pit	2210		2560		2660	
Decant seeping from underground into river	Zaaiwaterspruit tributary at East-pit	130 *	390 *	130 *	350 *	130 *	370 *
	Zaaiwaterspruit between North-pit and South-pit	260 *		220 *		240 *	

* If subsidence occurs where the 4Seam mining is too shallow, then all decant might occur in the streams.

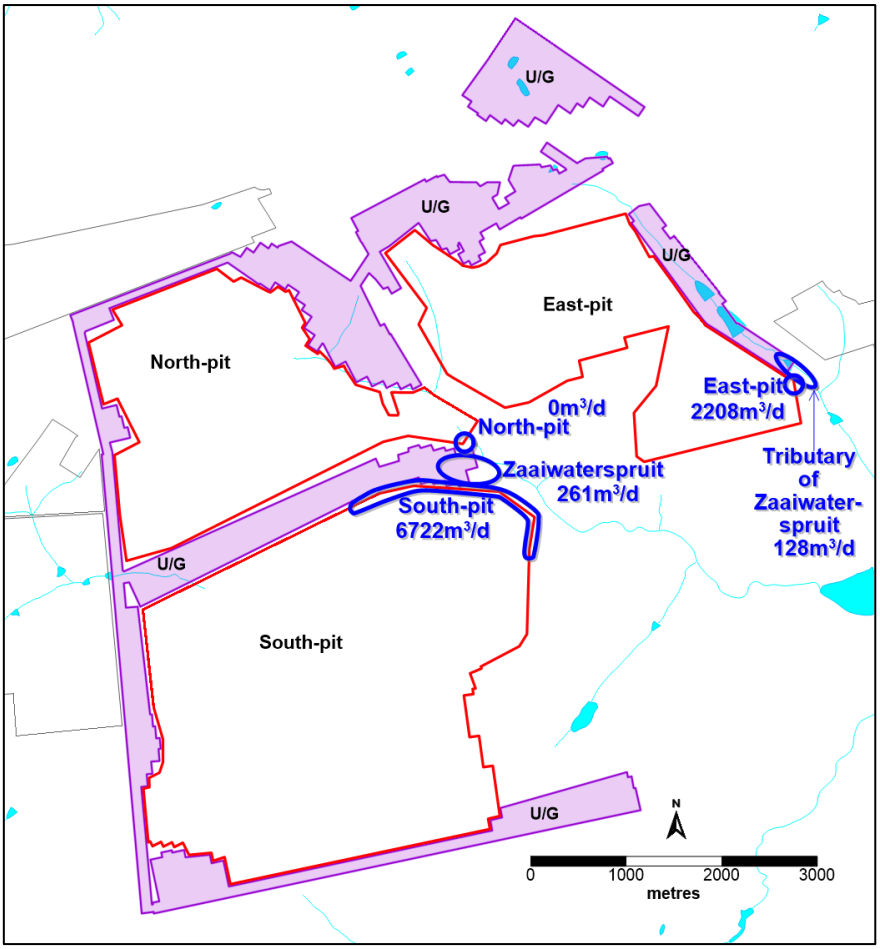


Figure 88: Decant summary for the scenario where the adits are not sealed (GW2, 2022)

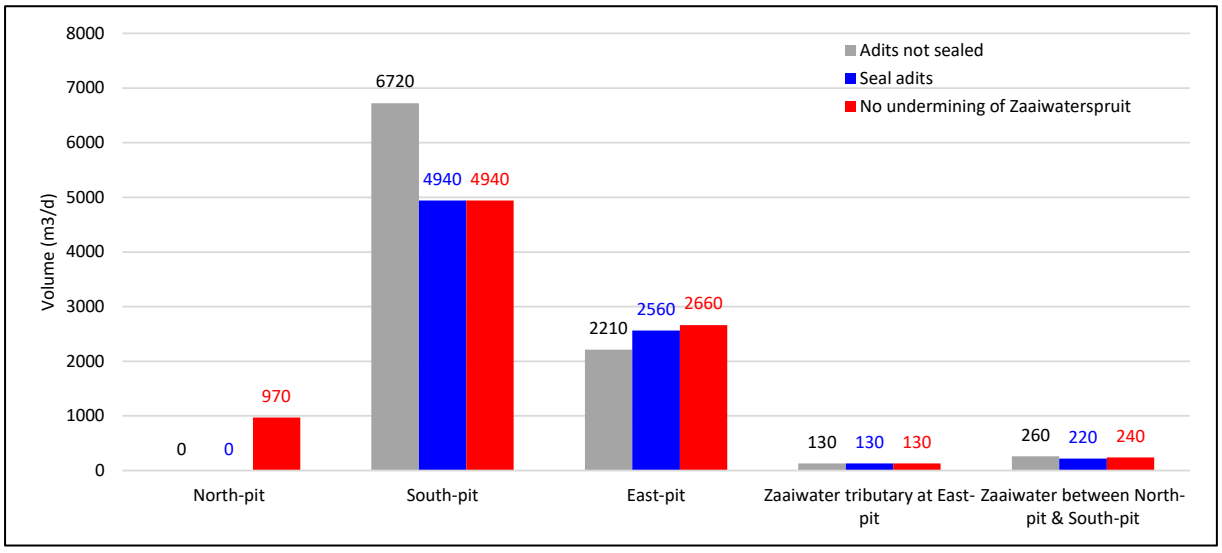


Figure 89: Decant volume (m^3/d) summary for the three modelling scenarios (GW2, 2022)

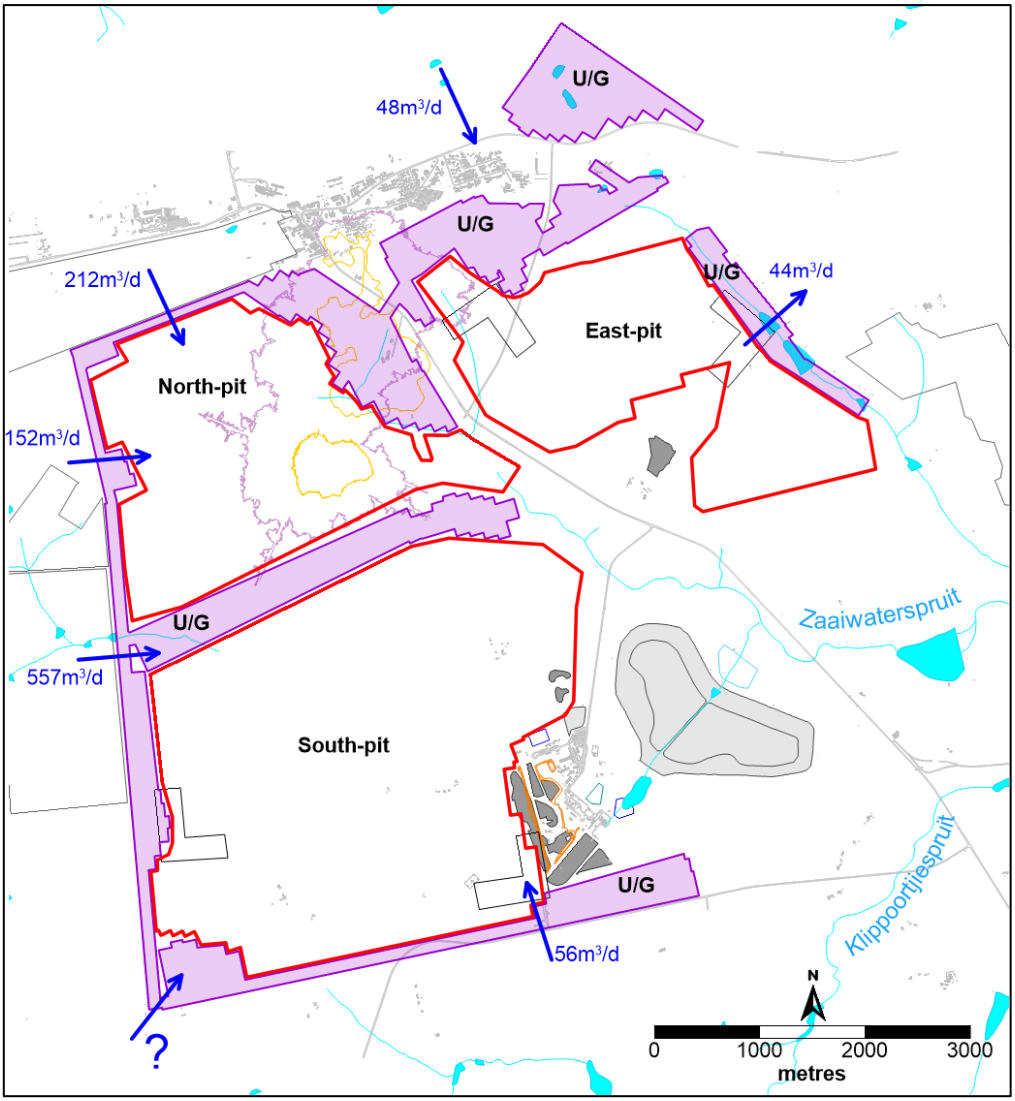


Figure 90: Inter-mine flow rates (m^3/d) for Model-1 scenario where no adits are sealed (GW2, 2022)

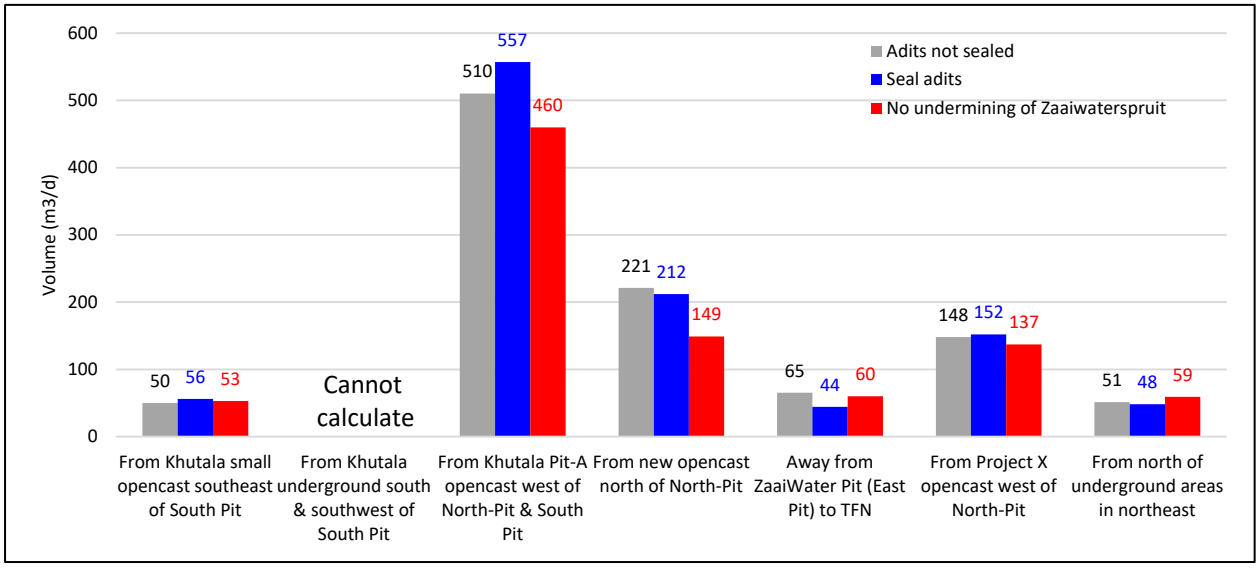


Figure 91: Inter-mine flow rates (m^3/d) for all three modelling scenarios (GW2, 2022)

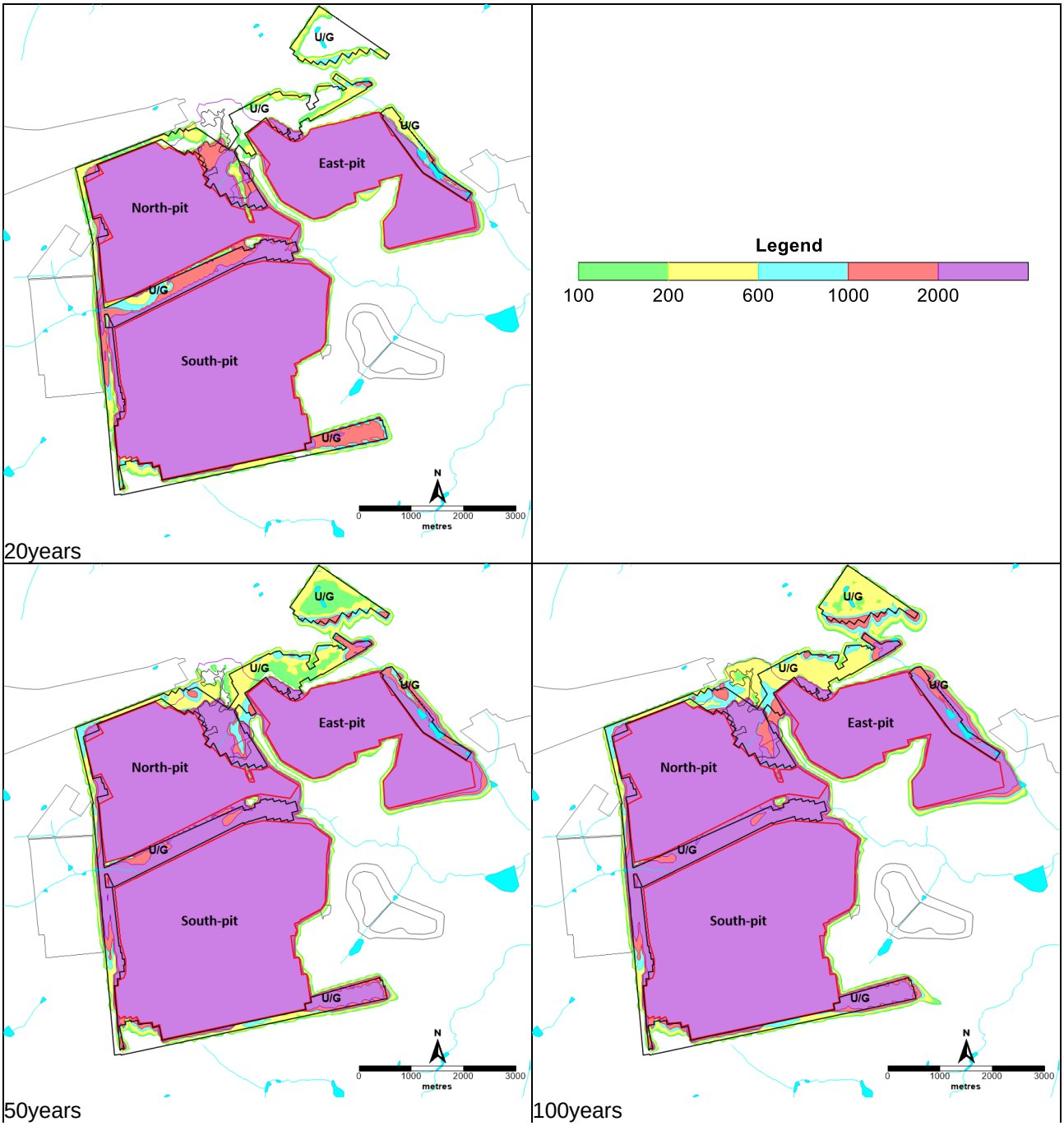


Figure 92: Numerically simulated SO_4 contamination plume (mg/L), 20/50/100years after flooding for Model-1 scenario where no adits are sealed (GW2, 2022)

8.1.4.3 Assessment of potential impacts associated with MRF

Given the observed impact that the MRF is having on the receiving groundwater system and possibly the surface water environment, a discussion on the expected water qualities from this facility is important.

8.1.4.3.1 Results – Operational Phase

The current potential to contaminate the local aquifers will remain until the MRF is closed. The active mine water circuit is influencing the water qualities in the return water dam that is associated with the MRF.

8.1.4.3.2 Results – Post-Mining Phase

Table 36and Figure 87 serve as a summary of the expected seepage water quality from the MRF.

Coal discard contains a significant pyrite content and will generate a sulphate concentration of between 500mg/L to 4000mg/L over the short term (<15years). However, all indications are that, over the long-term, the seepage water will remain at 4000mg/L to 5000mg/L in the anoxic zone, while the concentration will further increase in the oxic zone above 5000mg/L to 8000mg/L.

Therefore, the water balance of the MRF will be important during the post-closure phase.

8.1.4.4 Assessment of Potential Impacts Associated with Ogies Dump and Overburden Dumps

The Old Ogies Dump is located south of Ogies Town, North of the East-Pit (see Figure 93). It was used decades ago during the mining of the Old Ogies Underground, which targeted the 5 Seam and 2 Seam. The earliest Google Earth image indicates the dump as rehabilitated with a soil cover and vegetation in 2006. The Old Ogies Dump was not remined after 2006, but an Overburden Dump, consisting of white overburden material, was developed to the east of the Ogies Dump, which expanded and started covering the Ogies Dump towards the end of 2018. One year later, darker type rock material was placed on this Dump, which now covers almost 70% of the Ogies Dump.

Due to the expanding opencast and underground mining, the East-pit extends to 150m from the Ogies Dump and it will overlap with the planned underground delineation.

Fortunately, one groundwater monitoring borehole, GOGW-6, that was monitored until 2017 (when it was covered by mentioned overburden material – see Figure 93) could provide information on groundwater quality. Assuming that the borehole was sampled correctly between 2012 and 2016, the main indicator parameters reflected only marginal contamination (EC = 80 mS/m to 100mS/m, SO_4 = 270mg/L to 470mg/L at neutral pH).

Several Overburden Dumps, which contain very little acid-generating rock, have been placed around the opencast mining area.

8.1.4.4.1 Results – Operational Phase

The current potential to contaminate the local aquifers will be limited given the relatively uncontaminated groundwater system, assuming that non-carbon material will continue to be dumped on the Ogies Dump or the operation ceases. Groundwater flow is expected from the Ogies Dump vertically down into the underground workings at a low rate of infiltration and should not impact groundwater in Ogies Town.

The Overburden Dumps should have limited potential to increase groundwater recharge on the footprint areas of these Dumps. Due to the dewatering of the aquifers around the pits and above underground areas, the Overburden Dumps should not result in rising groundwater levels. Given the low recharge potential, little or no acid-generating material, and the relatively short period before the Dumps are placed back into the pits, the potential to contaminate the groundwater system is very small. Groundwater flow is expected from the Overburden Dumps vertically down into the underground workings or toward the pits at a low rate of infiltration and should not impact groundwater.

8.1.4.4.2 Results – Post-Mining Phase

After the Overburden Dumps areas are rehabilitated by placing this material back into the pits, the water balance of the Ogies Dump will continue as before the additional storage of overburden rock on the Dump. Eventually, groundwater flow is expected from the Ogies Dump in the direction of the East Pit (i.e. south), and should not influence groundwater in Ogies Town. Groundwater in the aquifers beneath all footprint areas of the Discard Dumps will flow in the direction of the three pits.

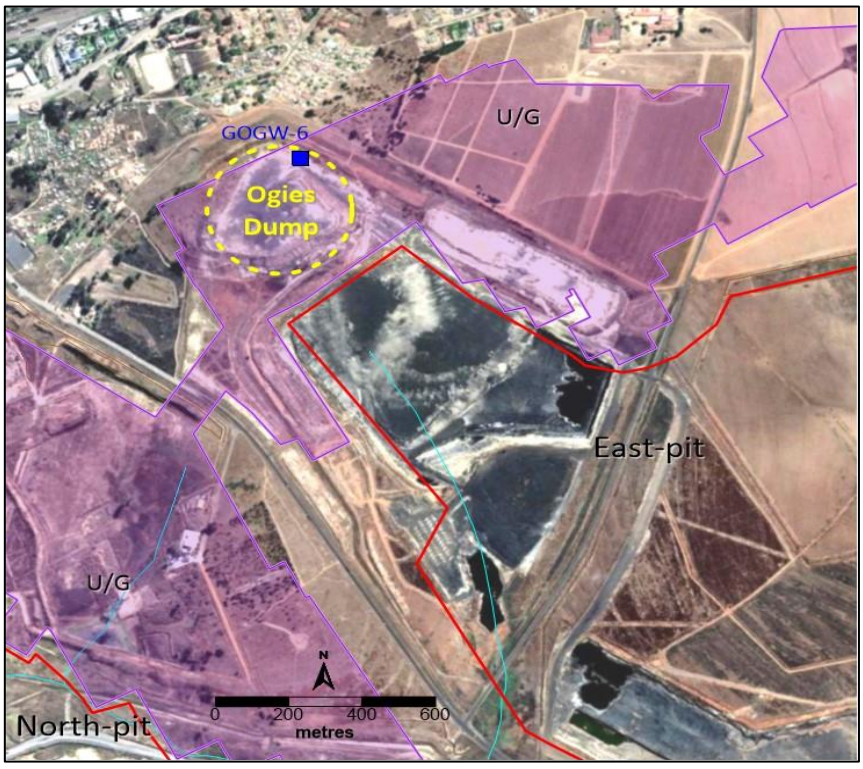


Figure 93: Google Earth images of Ogies Dump, also indicating the LOM and destroyed monitoring borehole GOGW-6 (GW2, 2022)

8.1.4.5 Geochemistry

Geostratum performed an environmental geochemical assessment for the 2019 GW2 groundwater impact assessment, specifically to determine the potential for Acid Mine Drainage (AMD) and to estimate major element concentrations in mine water. Numerical geochemical modelling was undertaken to simulate the long-term post-mining mine water quality trends of the three pits and the MRF. Based on numerical geochemical modelling at neighbouring GOSA iMpunzi and Tweefontein Collieries, the geochemical trends for coal discard backfill into the pits and underground mining, which took account of interflow between opencast and underground sections, could be determined.

The following was concluded from the original models (note that both waste rock and coal discard will be backfilled into the pits – the following comments address the individual characteristics of each – this is important for the geochemical model to calculate the contributions and interaction so each):

- ***Changes in major ions:***
    - Alkalinity is the dominant anion in the infiltrating groundwater into the backfilled opencast and in the rainwater in the coal discard dump but is quickly replaced by sulphate as the dominant anion due to sulphide oxidation. Sulphate is a conservative (mobile) chemical in the surface and groundwater environment and the first indicator of sulphide oxidation in mine drainage.
    - Waste rock: The waste rock backfill contains some pyrite and will generate sulphate concentrations above 500mg/L over the short term, which will increase to 2500mg/L within about 15years to 25years, remaining at 2500mg/L to 3200mg/L over the long term.
    - Coal Discard: The coal discard contains a significant pyrite content and will generate sulphate concentrations of 500mg/L to 4000mg/L over the short term, remaining at 2500mg/L to 5000mg/L between 15years to 75years. Over the long term, the sulphate is expected to range between 4000mg/L to 5000mg/L in the anoxic zone, while the concentration will further increase in the oxic zone above 5000mg/L to 8000mg/L.
    - Calcium and magnesium will be the dominant cations in the interstitial water due to the initial neutralization reactions of carbonate minerals. In hotspots in the oxic zone where carbonate minerals become depleted, aluminium, iron and manganese will become major cations in acidic seepage from the material as not enough calcium and magnesium are present.
- ***Changes in pH conditions:***
    - Waste rock: The average backfill composition in the pits will have a pH of 6.5-7.5. The carbonate minerals will become depleted at the top of the unsaturated zone but not in the average backfill and the pH will remain at these levels over the long term if only waste rock (and no coal discard) is backfilled above the long-term decant elevation.
    - Coal Discard: Discard in the oxic zone (e.g. outer layer of dump) will have a pH of 3-5, while coal discard at the centre of the dump in the anoxic zone will be circum-neutral.

- ***Metals in seepage/mine water:***
    - In neutral pit water, aluminium, iron and manganese will mostly be present at concentrations of below 5mg/L. Where slight to moderate acidification occurs, seepage will have aluminium, iron and manganese concentrations above 10mg/L. In acidic drainage, the concentration of trace metals cobalt and nickel will also become elevated (0.1mg/L to 2mg/L).
    - However, metal concentrations under highly acidic conditions can be very erratic and will change significantly between each monitoring run.
- ***AMD evolution:***
    - The geochemistry of AMD will change over time as summarized in Table 36. During the first stage of AMD, pyrite oxidation takes place, but enough calcite and dolomite minerals are available to neutralise the acid generated. If enough calcium (from calcite) is present to remove sulphates from solution (as gypsum precipitation), SO_4 will remain at approximately 2000mg/L. If magnesium becomes a dominant cation (due to more dolomite present) sulphate might increase to approximately 3000mg/L.
    - During the second AMD stage pyrite oxidation will take place, but carbonate minerals will be depleted. Gypsum will not precipitate anymore as no calcium is generated (from carbonates anymore), and gypsum will rather begin to dissolve, contributing to the sulphate in solution. Acidic conditions will be reached, with sulphate concentrations rising well above 2500mg/L. Aluminium and iron will become major cations, and Al-Fe-sulphates will then start to precipitate.
    - Pyrite will be depleted in the upper oxidation zone during the third AMD stage but may still be present deeper in the rock pile. Gypsum will also be depleted, and sulphate concentrations will decrease. Metal concentrations will also start to decrease, resulting in a change in the secondary Al-Fe-sulphates. Conditions will remain acidic as silicate minerals are usually not able to neutralise the long-term acidity.
    - It is noted that all three stages may eventually be present as different parts of mine waste are subjected to unique oxidation degrees. The upper oxic zone of a dump will reach Stage 3 quicker, while deeper saturated parts will remain as Stage 1.
    - Only AMD Stage 1 will be reached in the average backfill. However, carbonaceous material in the unsaturated oxic zone may reach Stage 2. The neutral coal discard at the centre of the dump will remain at Stage 1, while discard in the outer oxic rim will reach stage 2 and 3.

The following were concluded if 70% of the Plant coal discard is placed back into the pits:

- Pyrite as %S for the average waste rock in the original 2019 models was 0.13%. However, if 70% of the Plant coal discard is mixed into the waste rock backfill at each pit, the average pyrite could increase to 0.4% if mixed evenly throughout the 30m unsaturated profile. In a worst-case scenario, based on slurry pyrite, the pyrite content could increase to 0.85%.

- Note that the SO_4 concentrations would be approximately 1.3x higher (4000mg/L) compared to only waste rock. In hot-spot areas, the concentrations can exceed 5000mg/L.
- The pH levels may drop as low as 4, compared to portions of the pit where pH of 6.5-7.5 is possible in the absence of coal discard. The carbonate minerals will become depleted at the top of the unsaturated zone.
- In neutral pit water Al, Fe and Mn will mostly be present at concentrations of below 5mg/L. Where slight acidification occurs, seepage will have Al, Fe and Mn concentrations above 10mg/L. In acidic drainage the concentration of trace metals Co and Ni will also become elevated (0.1mg/L to 2mg/L).

A major assumption is that an effort will be made to place the Plant coal discard below the decant elevation as much as possible.

Discard in the oxic zone of the MRF (e.g. outer layer of dump) will have a pH of 3-5, while coal discard at the centre of the dump in the anoxic zone will be circum-neutral. Discard contains a significant pyrite content and will generate a sulphate concentration of between 500mg/L to 4000mg/L over the short term. Over the long-term the sulphate will remain at 4000mg/L to 5000mg/L in the anoxic zone, while the concentration will further increase in the oxic zone above 5000mg/L to 8000mg/L.

It is likely that the opencast areas will freely interact with the underground. Because the underground groundwater ingress through the mine roof will be much smaller than the volume of water that flows into the underground through access from opencast areas, the underground mine water qualities will be similar to the opencast mine water qualities. Assuming that underground areas can be sealed off entirely, Stage 1 conditions will be present over the long-term and SO_4 concentrations will reach 2500mg/L.

Table 36: Estimated range for pH and SO_4 concentrations in seepage (GW2, 2022)

Pit	**Average seepage from material over model time**			
	Term	**Short term**	**Medium term**	**Long term**
No coal discard	**AMD Stage**	**Stage 1**	**Stage 1 & 2**	**Stage 1 & 2**
North-pit South-pit East-pit	Time	0-25 years	25-100 years	100-200 years
	pH (range)	6.5-7.5	7.5-6.0	7.0-6.0
	SO_4 (range)	500-2 500	2 500-3 200	2 500-3 200
Coal discard	**AMD Stage**	**Stage 1**	**Stage 1 & 2**	**Stage 1 & 2**
North-pit South-pit East-pit	Time	0-25 years	25-100 years	100-200 years
	pH (range)	5.5-7.0	4.0-5.5	
	SO_4 (range) *	500-3500	3500-4000	4000-3500
Discard Dump	**AMD Stage**	**Stage 1 - 2**	**Stage 1 – 3**	**Stage 1 – 3**
	Time	0-15 years	15-75 years	75-100 years
	pH (range)	7.0-8.0 (anoxic) 7.0-5.0 (oxic)	7.0-8.0 (anoxic) 5.0-4.0 (oxic)	7.0-8.0 (anoxic) 4.0-3.0 (oxic)
	SO_4 (range)	2 000-4 000	2 000-5 000	4 000-5 000 (anoxic) 5 000-8 000 (oxic)
Underground	SO_4	2500		

8.1.5 Blasting

Blasting activities would take place during the construction of the incline portals, concurrently with existing and future opencast activities. Enviro-Acoustic Research (EAR) conducted a blasting assessment to determine the potential impact resulting from the cumulative blasting activities at the GGV Complex. The report is attached as ANNEX-7.

The potential impacts of ground vibration, air blast levels and fly rock risks were determined using methods provided by the USBM. A blast design was provided by the mine and evaluated in this assessment. The assessment considered the potential blasting impact from:

- an average blast, with 10 m deep blastholes, using a 6 x 6 m pattern for burden and spacing with a 5 m stemming; and
- a worst-case blast, with blastholes up to 24 m deep, using a 7 x 8 m pattern for burden and spacing with a 5 m stemming.

8.1.5.1 Projected magnitude of ground vibration

The assessment indicated that:

- That ground vibration levels may be unpleasant to Blast Sensitive Receptors (BSRs) when blasting take place within approximately 1,000 m from structures used for residential, worship or business activities. The impact is of a potential medium significance and mitigation required and proposed that could reduce the vibration levels.
- That ground vibration levels could be of medium significance to potential Blast Sensitive Structures (BSSs) in the vicinity of the mining area.

Potential buffers are illustrated for the evaluated blast parameters, indicating the buffer areas:

- Figure 94: Buffer area where vibration levels of 2.54 mm/s may result in a response from receptors.
- Figure 95: Buffer area where vibration levels of 6.0 mm/s may result in potential damage to sensitive structures (buildings such as informal, mud or adobe houses – while not identified on site it was included).
- Figure 96: Buffer area where vibration levels of 25.0 mm/s may result in potential damage to sensitive plant equipment, pipelines or brick houses.
- Figure 97: Buffer area where vibration levels of 150.0 mm/s may result in potential damage to tar roads or railway lines.

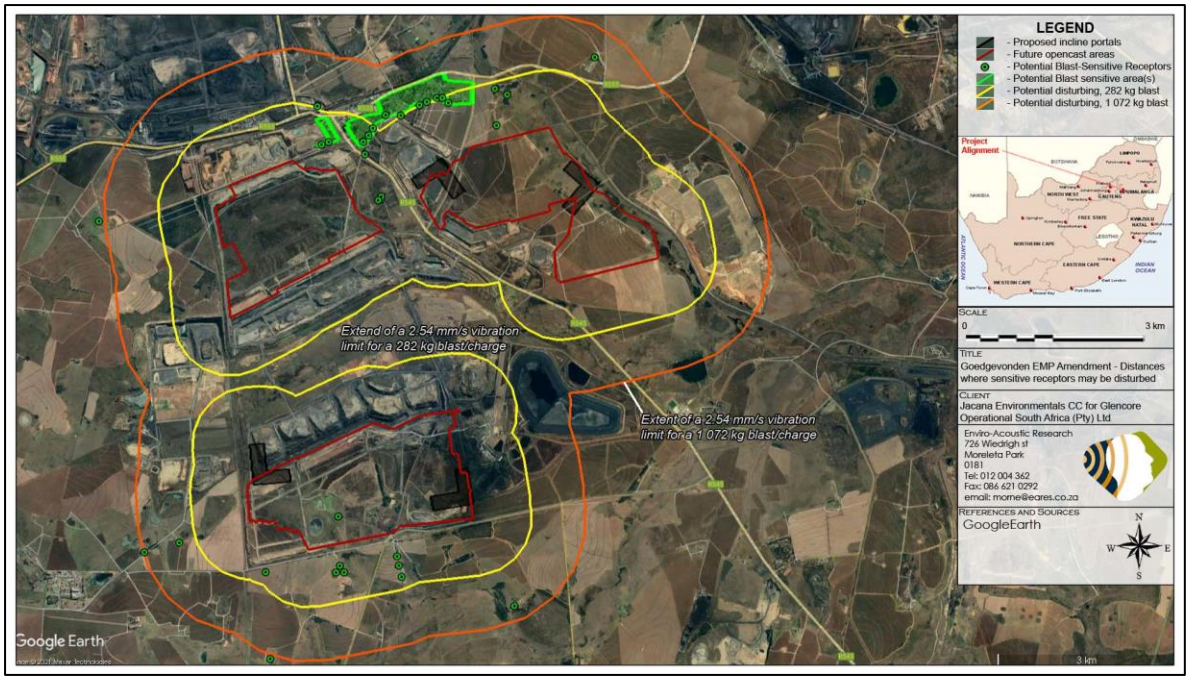


Figure 94: Projected Extent of Blasting Vibration Impacts – Potential area where people may respond to blasting vibration for the assessed blast parameters (EAR, 2021)

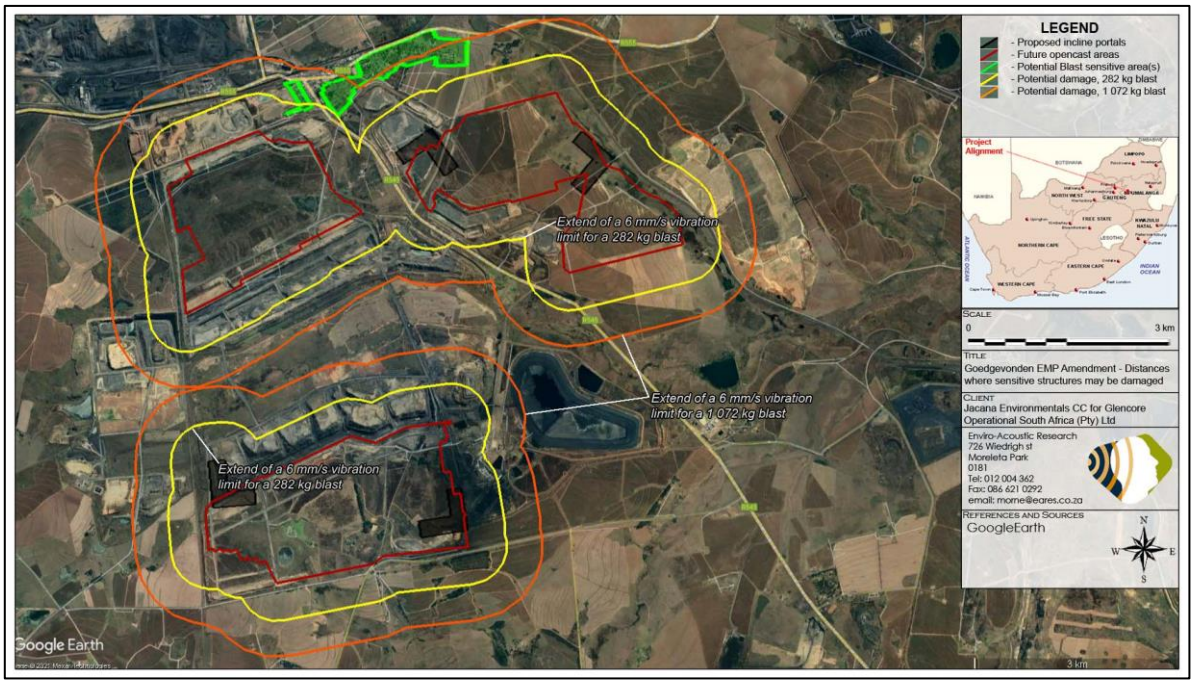


Figure 95: Projected Extent of Blasting Vibration Impacts – Potential area where sensitive structures (informal, mud or adobe) may be damaged (EAR, 2021)

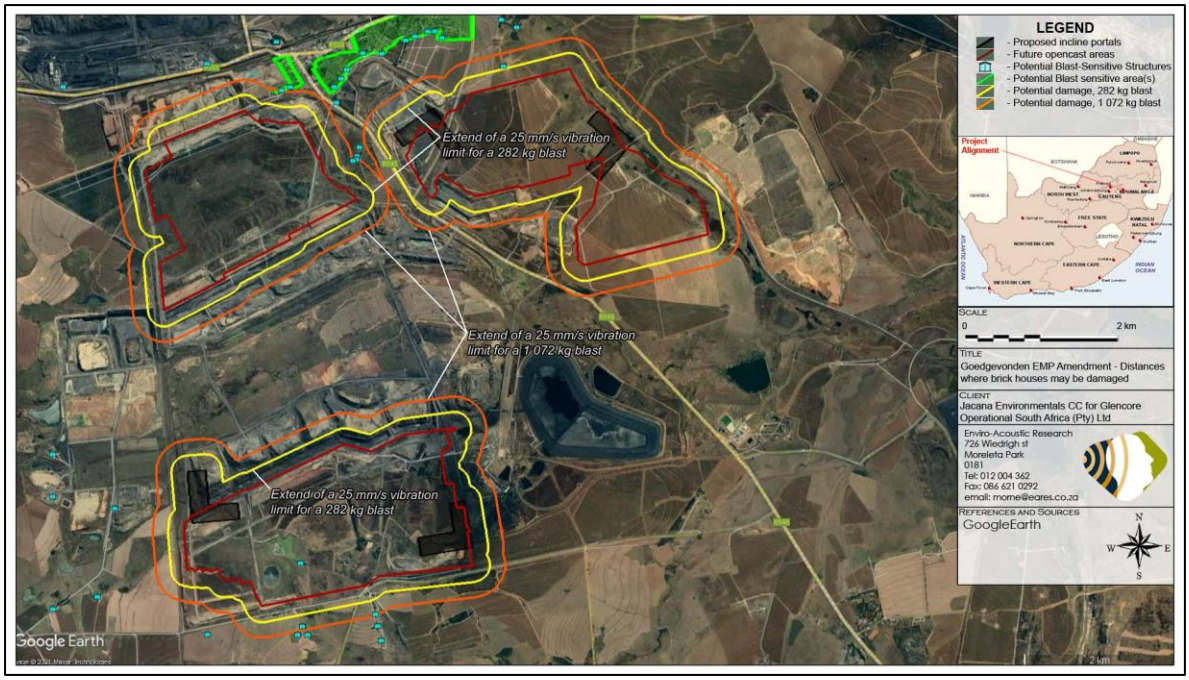


Figure 96: Projected Extent of Blasting Vibration Impacts – Potential area where brick houses may be damaged or sensitive plant equipment influenced (EAR, 2021)

Figure 97: Projected Extent of Blasting Vibration Impacts – Potential area where roads and railway lines may be damaged (EAR, 2021)

8.1.5.2 Projected magnitude of air blast level

The assessment indicated that:

- Air blast levels will be clearly audible to surrounding receptors and the significance may be Medium for the closest sensitive receptors. Mitigation is required and measures are proposed that could reduce the air blast levels.

- Due to the sensitivity of people to the significant loud noise as well as secondary vibration of large surfaces (due to the change in air pressure), sensitive receptors must be informed about the potential impacts.

The potential extent of the impact (120 dBA noise limit) is illustrated on an aerial image in Figure 98. Blasting noises may exceed 120 dB at a distance of 768 m for a 1073 kg charge per delay.

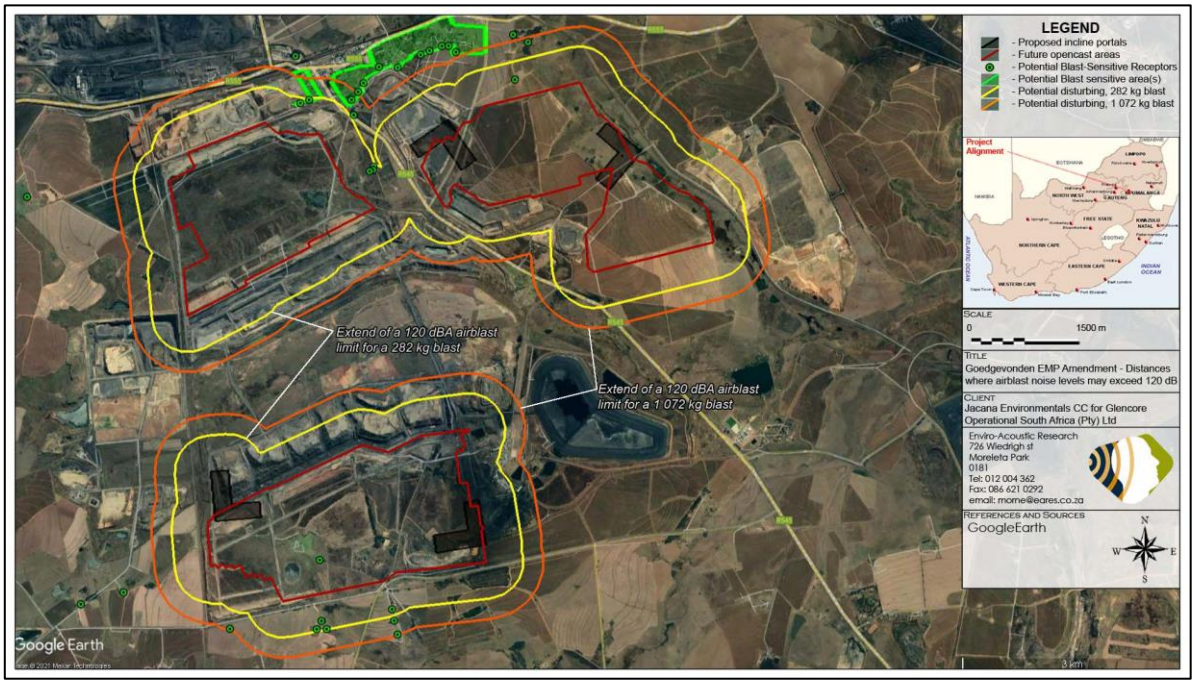


Figure 98: Projected Extent of Blasting Impacts – Air blast level for the selected blast parameters (EAR, 2021)

8.1.5.3 Projected Magnitude of Fly rock Risks

The assessment indicated that:

- The potential unsafe zone from the active blasting area was calculated as 214m. Using a minimum safety factor of 2 would set a minimum unsafe zone of 428 m from the active blasting area, although it is critical to note that the occurrence of fly rock can never be excluded. It is recommended that the mine at all times use a minimum exclusion zone of 500 m (equipment, people or livestock).
- There are no risks of fly rock to BSRs or BSSs but blasting close to the mine infrastructure may result in fly rock damage. Management measures are available to ensure the risks are minimised.

The potential extent of the impact is illustrated on an aerial image in Figure 99.

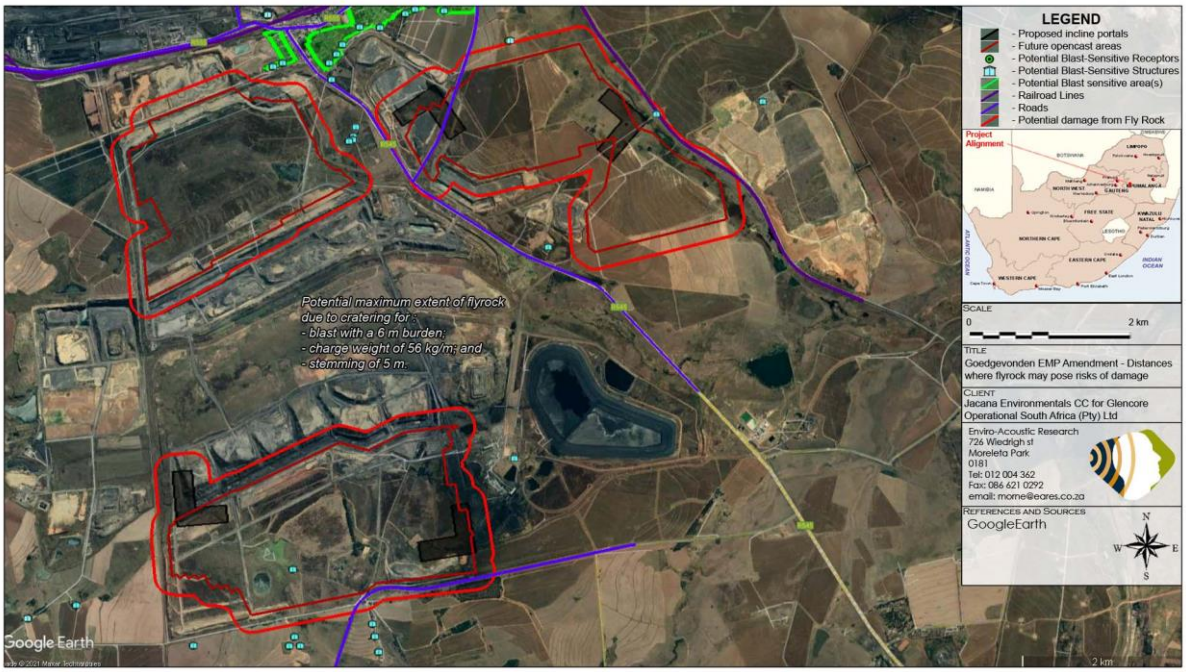


Figure 99: Projected Extent of Blasting Impacts – Fly rock risks on surrounding Blast Sensitive Structures (EAR, 2021)

8.1.5.4 Potential Decommissioning, Closure and Post-closure Blasting Impacts

There is no, or small blasting impact risks once the operational phase is completed. At worst, a small blast may be required to ensure that the highwalls of the incline portals isn't too steep and dangerous, but the impact will be less than a typical overburden or interburden blast (associated with the construction of the incline portals). This risk is therefore significantly lower than construction or operational (existing opencast mining activities) blasting.

8.1.6 Air Quality

EBS Advisory conducted an Air Quality Impact Assessment to determine the potential air quality impacts resulting from the cumulative mining and infrastructure activities at the GGV Complex. The report is attached as ANNEX-5.

8.1.6.1 Operational Phase

Dispersion modelling simulations were undertaken by EBS Advisory (2022) to determine the potential air quality impacts associated with the proposed operations. These impacts are reflected as isopleths plots. The isopleth plots reflect the gridded contours (lines of equal concentration) of zones of impact at various distances from the contributing sources. The patterns generated by the contours are representative of the maximum predicted ground level concentrations for the averaging period being represented.

Table 37 indicates the maximum ambient annual ground level concentration of $PM_{2.5}$ and PM_{10} for the GGV operations. This impact takes into account the current and the proposed operations that will take place and the associated impacts arising from the activities on site. The predicted concentration falls

below the annual standard of 40 µg/m^3 for PM_{10} (Figure 101) and 20 µg/m^3 for $PM_{2.5}$ (Figure 100) respectively. The highest contributor to these annual concentrations were the bulldozing and materials handling operations.

Table 37: Maximum predicted annual ambient ground level concentrations for particulate matter

Source	Maximum annual ambient ground level concentration (µg/m^3)	Ambient annual air quality standard (µg/m^3)	Impact as % of ambient standard
Cumulative impact PM_{10}	2.00E+01	4.00E+01	50%
Cumulative Impact $PM_{2.5}$	1.50E+01	2.00E+01	75%

The maximum predicted daily ground level concentration of PM_{10} and $PM_{2.5}$ is presented in Table 38. The maximum predicted PM_{10} concentration falls above the daily standard of 75 µg/m^3 at the site boundary (Figure 103). Similarly predicted $PM_{2.5}$ concentrations fall above the daily standard of 40 µg/m^3 at the site boundary (Figure 102). For $PM_{2.5}$ this is mainly noted along the R545 access road and rail siding, with dust generated from entrained dust from trucks making use of these haul roads, as well as tipping activities at the rail siding. PM_{10} Exceedances are noted at the same place, as well as to the northern boundary adjacent to the town of Ogies.

Table 38: Maximum predicted daily ambient ground level concentrations for particulate matter

Source	Maximum daily ambient ground level concentration (µg/m^3)	Ambient daily air quality standard (µg/m^3)	Impact as % of ambient standard
Cumulative impact PM_{10}	10.00E+01	7.50E+01	133%
Cumulative impact $PM_{2.5}$	4.50E+01	4.00E+01	113%

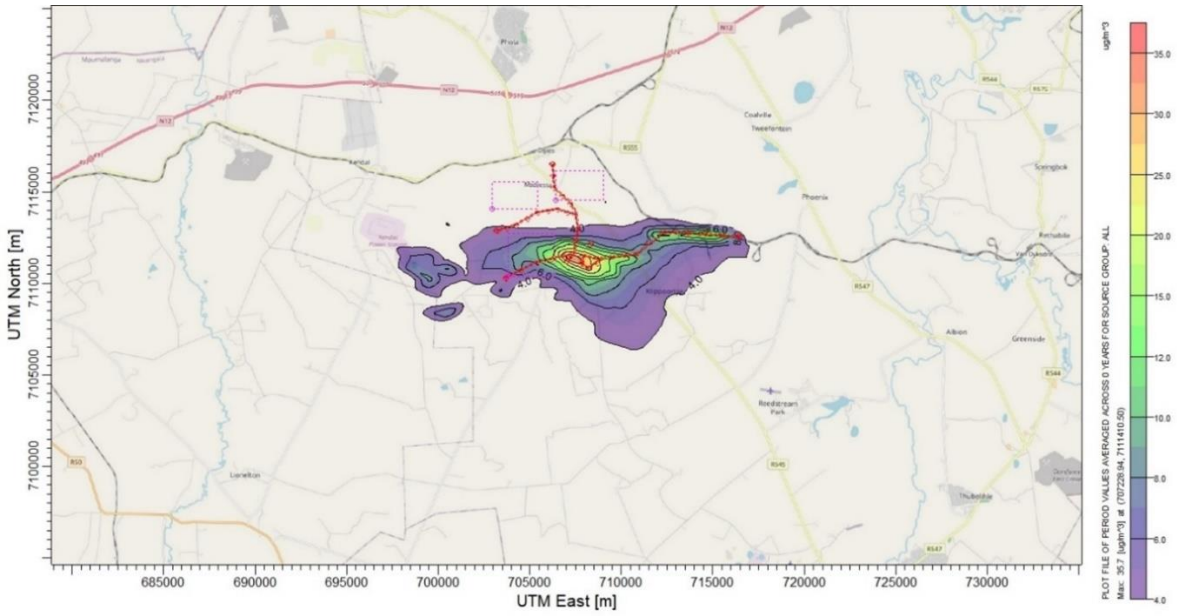


Figure 100: Maximum predicted annual $PM_{2.5}$ ground level concentration (µg/m^3)

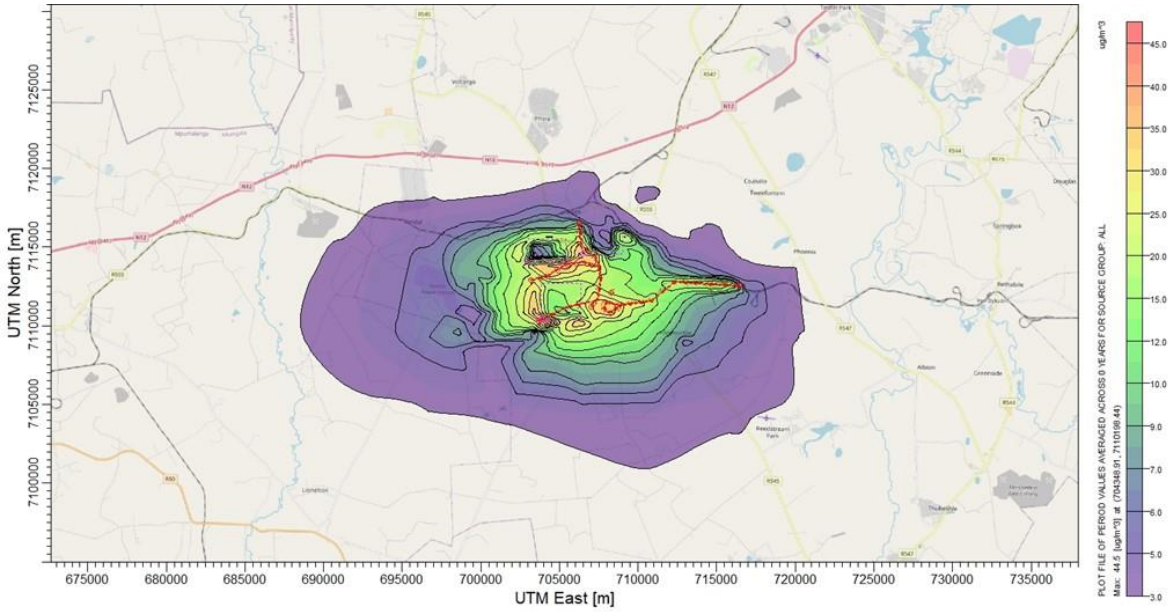


Figure 101: Maximum predicted annual PM_{10} ground level concentration (µg/m³)

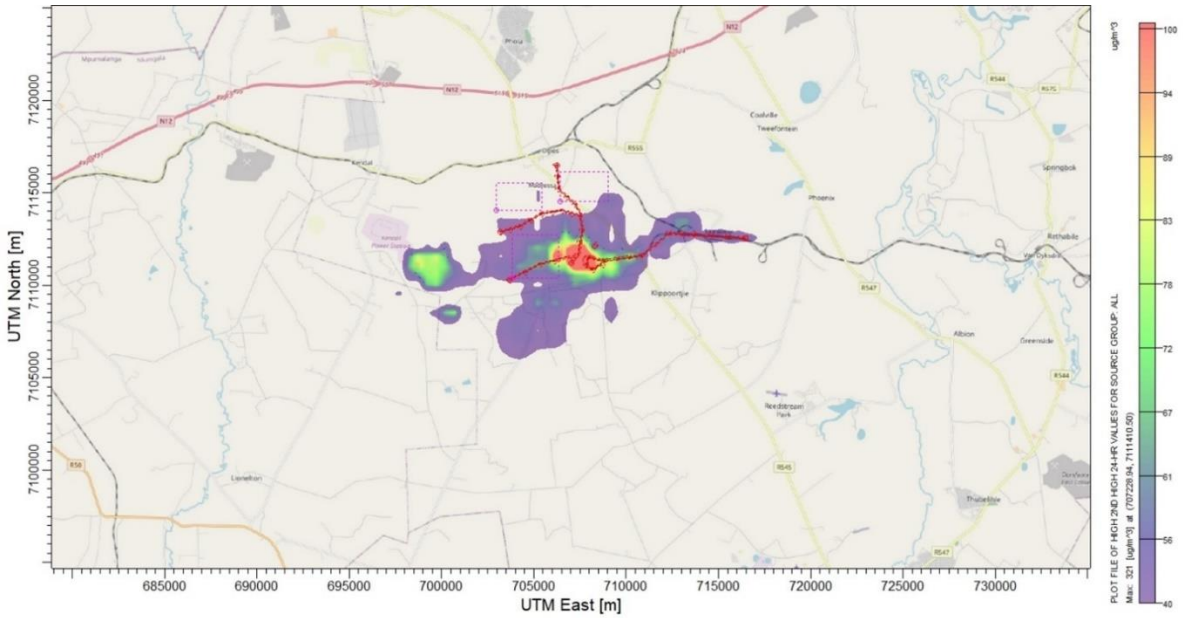


Figure 102: Maximum predicted daily $PM_{2.5}$ ground level concentration (µg/m³)

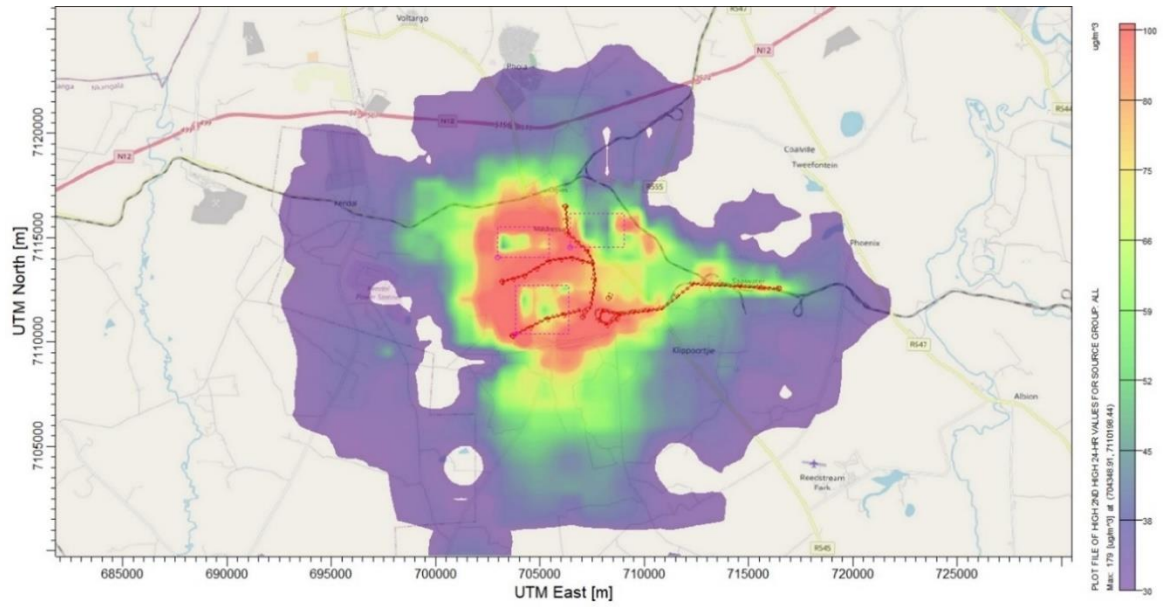


Figure 103: Maximum predicted daily PM_{10} ground level concentration (µg/m^3)

Dust fallout impacts remain within the residential and industrial limit at the site boundary. Exceedances of the industrial limit are noted close to material handling activities and open piles. These areas will require additional mitigation measures implemented to reduce these impacts on site (Figure 104).

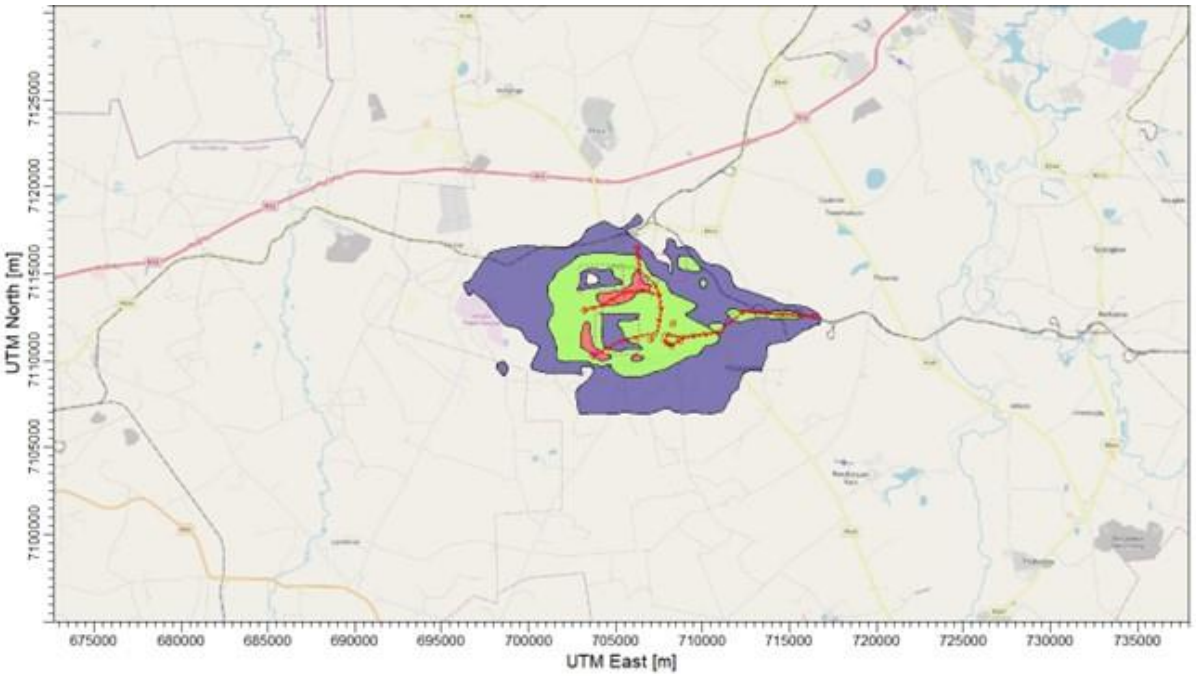


Figure 104: Dustfall out impacts (mg/m^2/day)

Dust fallout concentration in mg/m^2/day	300	600	1200

8.1.6.2 Decommissioning Phase

The decommissioning phase is associated with activities related to the demolition of infrastructure and the rehabilitation of disturbed areas. The total rehabilitation will ensure that the total area will be a free draining covered with topsoil and grassed. The following activities are associated with the decommissioning phase (US-EPA, 1996):

- Existing buildings and structures demolished, rubble removed and the area levelled;
- Remaining exposed excavated areas filled and levelled using overburden recovered from stockpiles;
- Stockpiles and tailings impoundments to be smoothed and contoured;
- Topsoil replaced using topsoil recovered from stockpiles; and
- Land and permanent waste piles prepared for revegetation.

Possible sources of fugitive dust emission during the closure and post-closure phase include:

- Smoothing of stockpiles by bulldozer;
- Grading of sites;
- Transport and dumping of overburden for filling;
- Infrastructure demolition;
- Infrastructure rubble piles;
- Transport and dumping of building rubble;
- Transport and dumping of topsoil; and
- Preparation of soil for revegetation – ploughing and addition of fertiliser, compost etc.

Exposed soil is often prone to erosion by water. The erodability of soil depends on the amount of rainfall and its intensity, soil type and structure, slope of the terrain and the amount of vegetation cover (Brady, 1974). Revegetation of exposed areas for long-term dust and water erosion control is commonly used and is the most cost-effective option. Plant roots bind the soil, and vegetation cover breaks the impact of falling raindrops, thus preventing wind and water erosion. Plants used for revegetation should be indigenous to the area, hardy, fast-growing, nitrogen-fixing, provide high plant cover, be adapted to growing on exposed and disturbed soil (pioneer plants) and should easily be propagated by seed or cuttings.

8.1.6.3 Methane emissions

Methane is formed in coal during coalification. The quality and the quantity of methane created depend on the composition of the organic matter. Methane is retained within the coal bed and surrounding strata. As long as the gas remains under pressure and assuming there are no geological processes to influence the reservoir, mining activities releases the pressure and methane escapes. In area where miners are working, methane level are required to be at 0.5%, this can be achieved by continuous ventilation. Methane in general is not toxic to humans but it is of concern in terms of its

explosive potential and its impact on the global climate. The most common accepted flammability range for methane in air mixtures are given as 5.3% to 14%. The flammability range becomes slightly extended to 5.0% - 15% when mixtures of methane in air are retained. Methane is one of the most significant greenhouse gases (21 times stronger than carbon dioxide).

8.1.6.4 Spontaneous Combustion

The presence of sulphates contributes to the process of changing the internal heat profile of the material leading to a rise in temperature. This can eventually lead to open flame and burning of the material. The whole process mentioned is called spontaneous combustion.

Spontaneous combustion is witnessed at various mines including GGV Complex. At the GGV Section spontaneous combustion was experience in several stockpiles and the decision was taken to suppress the burning of coal. There is a risk for spontaneous combustion to occur when the pillar areas are totally dewatered and exposed for mining purposes.

8.1.7 Ambient Noise

Enviro-Acoustic Research (EAR) conducted a Noise Impact Assessment to determine the potential impact resulting from the cumulative mining and infrastructure activities at the GGV Complex. The report is attached as ANNEX-6.

8.1.7.1 Operational Phase

A noise model was developed considering the conceptual operational activities as per the existing operations (2022) as well as the future operations (2040). This noise model did include the cumulative impact of the traffic volumes in the area.

The potential noise rating level contours associated with existing day- and night-time activities are illustrated in Figure 105 and Figure 106, respectively. The projected future noise rating level contours with planned future day- and night-time activities are illustrated in Figure 107 and Figure 108, respectively.

8.1.7.2 Decommissioning, Closure and Post-closure Phases

The potential for a noise impact to occur during the decommissioning and closure phase will be much lower than that of the operational phase. This is because:

- Rehabilitation normally takes place concurrently with the normal mining activities, and at decommissioning there are minimal activities to take place;
- Decommissioning activities normally are limited to the daytime period, due to the lower urgency to complete this phase; and
- Decommissioning activities normally use smaller and less equipment, generating less noise than the typical construction or operational phases.

The noise impact assessment concluded that:

- The area has a complex sound character, with elevated sound levels in and around Ogies, as well as close to the various public haulage roads in the area.
- The mining area was previously authorised, and the ambient sound levels will remain as is.
- The proposed amendment will not significantly change the future noise levels in the area and the area would keep the existing noise character.
- If anything, the proposed amendment will reduce the opencast areas with the subsequent reduction in the extent of future noise levels.

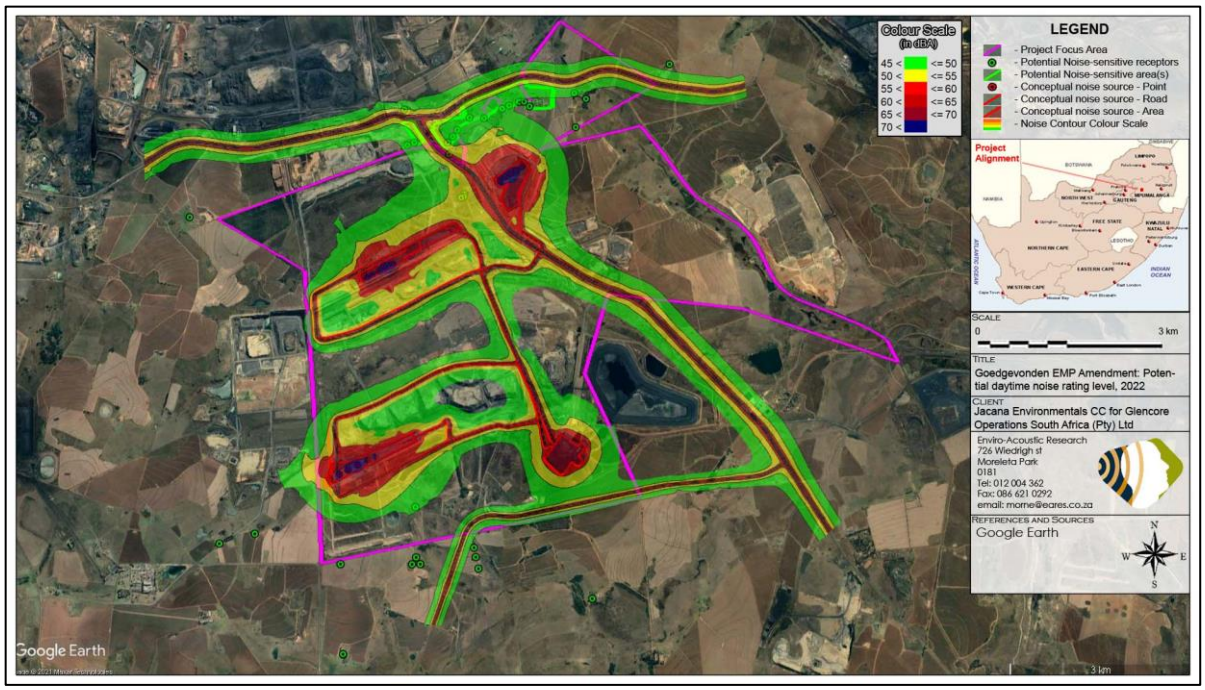


Figure 105: Projected daytime noise rating levels relating to existing activities (2022)

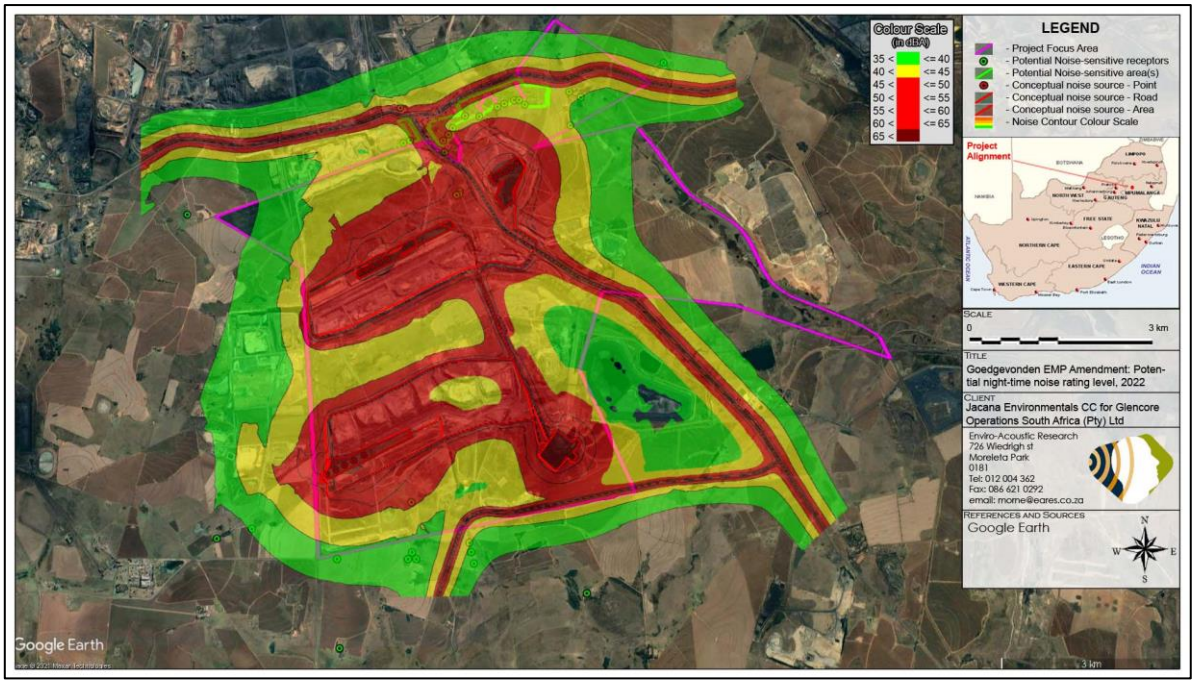


Figure 106: Projected night-time noise rating levels relating to existing activities (2022)

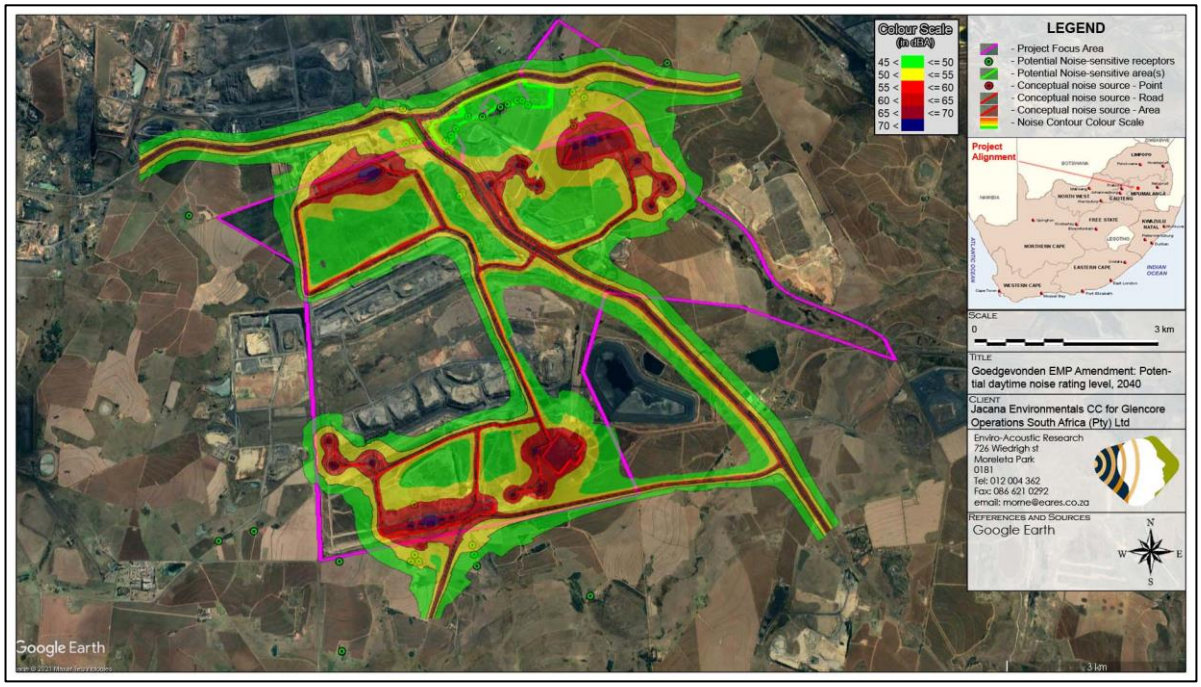


Figure 107: Projected future daytime noise rating levels relating to potential activities in 2040

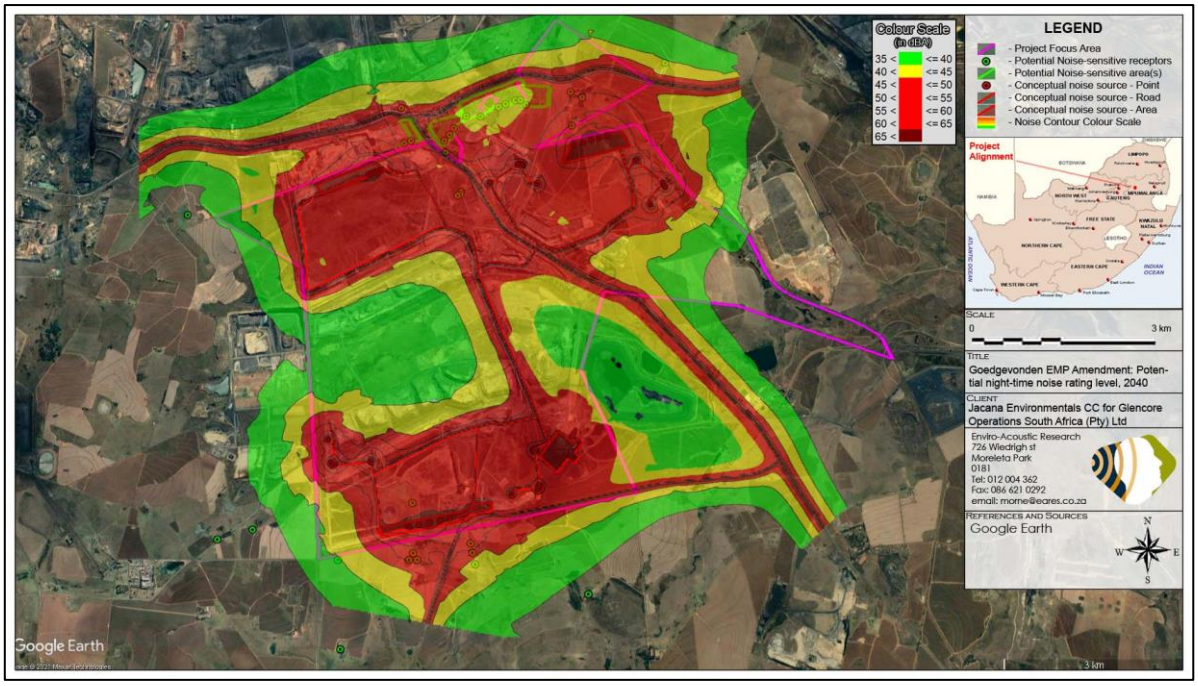


Figure 108: Projected future night-time noise rating levels relating to potential activities in 2040

8.1.8 Visual and Aesthetic Impacts

Scientific Aquatic Services conducted a Visual Impact Assessment (VIA) for the proposed scope changes associated with this amendment application. The full report is attached as ANNEX-8.

The VIA concluded as follow:

- The GGV Complex is located within an area that is dominated by mining operations interspersed with isolated farmsteads and the town of Ogies. The existing mining activities have altered the character of the landscape from a rural setting to a mining setting. As such, the visual impact associated with mining activities are already present in the area, and receptors within the vicinity thereof have grown accustomed to it. As such it can be considered that the proposed incline shaft areas and additional proposed mining operations will not have a negative effect on the landscape character of the area.
- The proposed underground blocks will not have any surface infrastructure associated with it, so no additional visual impacts will be associated with the underground mining areas.
- The proposed new road re-alignment is situated within the active mining area of GGV; hence the dumps are screening the view thereof and no additional visual impact is expected.
- The Visual Absorption Capacity (VAC) of the area is considered medium, indicating that the proposed project will be moderately absorbed in the area resulting in a relatively low visual intrusion, thus the proposed project will blend in with the surroundings. The existing mining operations are the main contributing factor to the medium VAC and with the relatively low height of the proposed infrastructure in comparison to the already existing mining structures, the proposed incline shaft areas are insignificant.

- The sense of place associated with the proposed incline shaft areas are related to the landscape character type, defined as a mining setting interspersed with farmsteads and cultivated fields with gently undulating terrain. With the proposed incline shaft areas situated within an active mining area the sense of place of the area can further be described as busy with mining operations taking place 24 hours a day 7 days a week. The sense of place extends to a large portion of the Mpumalanga Province especially within the surrounding towns – Coalville, Kendal, Kriel, Delmas etc. As the landscape is already accustomed to mining activities, the proposed project will not have a significant effect on the sense of place of the larger area.
- Taking the VAC (vegetation and topography) of the surrounding environment into consideration, the proposed incline shaft areas will not be highly visible to sensitive receptors situated further than 2 km. The proposed project is therefore considered to be in the moderately low visibility zone to any receptors situated further than 2 km, predominantly due to the backdrop of the existing mining infrastructure.
- From the viewshed analysis (Figure 109), it was found that the proposed incline shaft areas will be visible from receptors or vantage points situated in all directions and within 2 km of the proposed incline shaft areas, which included farmsteads and portions of the town of Ogies. Since the viewshed analysis does not take into account the existing anthropogenic structures such as all the latest GGV dumps and opencast areas and vegetation, the viewshed analysis indicated that the proposed infrastructure is highly likely to be visible from portions of R545 road. Based on the field assessment, the view towards the proposed incline shaft areas from portions of the R545 are screened due to existing mining infrastructure and the undulating topography of the area. The viewshed becomes scattered from 2 km onwards, indicating that receptors located further than 2 km will not have a clear line of sight towards the proposed incline shaft areas. Beyond 3 km, the proposed incline shaft areas will definitely not be visible, due to visual exposure and visibility expected to significantly and exponentially decrease with objects being difficult to distinguish from the background at such significant distances.
- The existing mining activities act as an extensive source of high-level night-time lighting. Medium level light sources impacting on the area also originate from the town of Ogies located 1 km north northwest and the farmsteads in the surrounding area. The lighting environment of the region is therefore considered Suburban with medium district brightness. As a result of the existing night-time light sources, lighting levels are not expected to significantly increase in this area due to the proposed infrastructure.
- Should the existing approved mine plan for opencast mining be followed, namely, to develop the proposed incline shafts into the high wall of the opencast pits, the development of the proposed incline shafts and underground mining areas will have a negligible additional visual impact on the receiving environment. On this basis, the outcome of the risk assessment indicated that the risk is deemed to be of 'low' significance, since the elevation of the proposed incline shafts are reduced and the area is already significantly disturbed from the opencast mining activities, thus the visual intrusion and visual exposure of the proposed incline shafts are negligible.

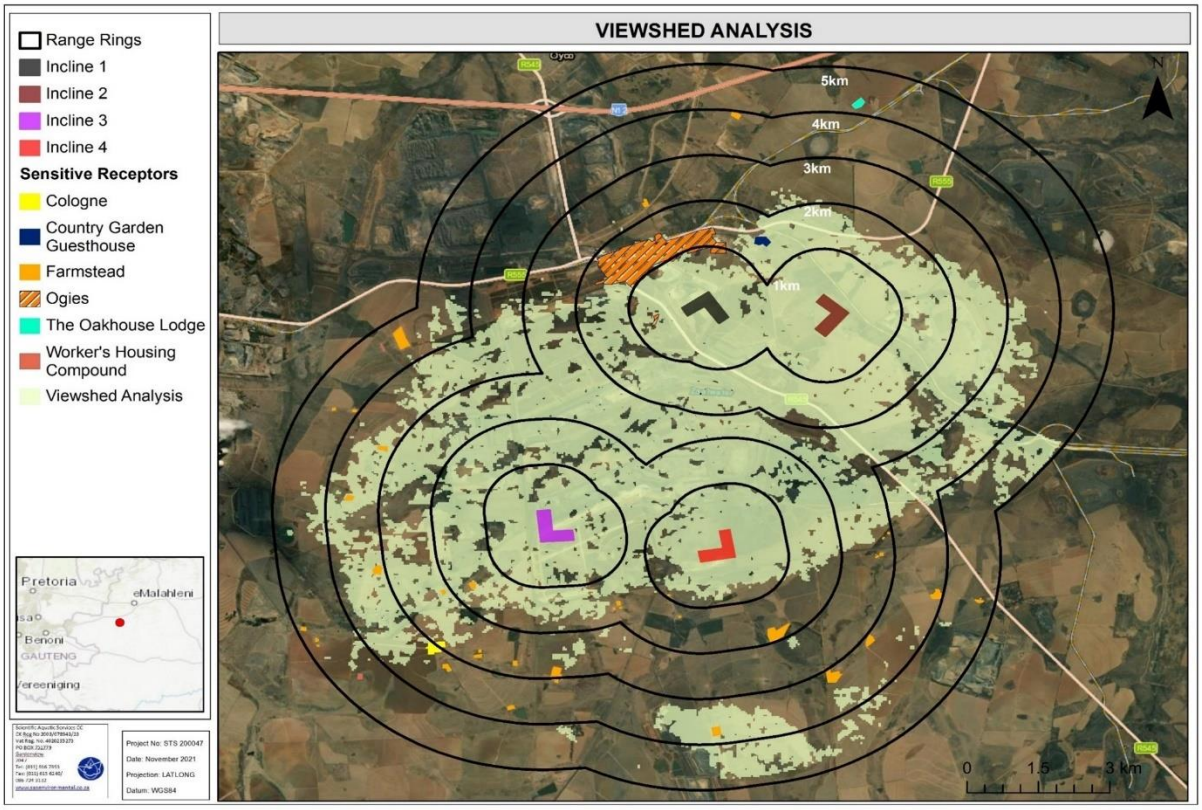


Figure 109: Viewshed (indicated as shaded areas) of the proposed incline shaft areas overlaid onto digital satellite imagery

8.1.9 Socio-Economic Impacts

Diphororo Development conducted a Socio-Economic Impact Assessment for the GGV Complex, inclusive of the proposed changes to the mining plan. The report is attached as ANNEX-9. The findings of the assessment are summarised below.

8.1.9.1 Operational Phase

8.1.9.1.1 Impact on existing community structures and social capital

Communities' perceptions and attitudes towards mining companies are often based not only on their local experiences of a specific operation, but also on their perception of the history of mining in a specific region or country as a whole. Thus, although mining companies have made great progress in their development focus over the past few years, the general perceptions do not necessarily agree due to our legacy of social and environmental ills.

The World Bank defines social capital as "the relationships between people to enhance collective action". Social Capital is an intangible resource embedded in the features of social organizations and networks that facilitates action and improve efficiency in society that would not have been in its absence. Strong social capital is therefore not only seen as a resource in community development, but also a vital prerequisite for development. It is entrenched in principles and values such as goodwill, trust, solidarity, general reciprocity, and civic engagement.

In relation to GGV, social capital presents itself in the organisations that represent stakeholders from the surrounding area. Based on an overview of current organisations it is clear that there are broad representation in various organisations that engage with GOSA on issues of concern within the neighbouring area.

It is however not anticipated that there will be any change in the impacts on Social Capital due to the amendment application, as the impacts are associated with the overall operation that is ongoing regardless of the amendment.

8.1.9.1.2 Disruption of daily living and movement patterns

Currently landowners have two main access points to the privately held properties, with smaller internal access routes. These same roads are being utilised by mining companies in the surrounding area for product transport, goods and services and staff. Landowners have already expressed a concern regarding the congested nature of the roads in the surrounding area due to the cumulative effect on an increase in traffic to and from mining operations.

This is an existing cumulative impact experienced by local communities that will continue into the future. The increase of production levels has a direct influence over product transport and the increase of this impact.

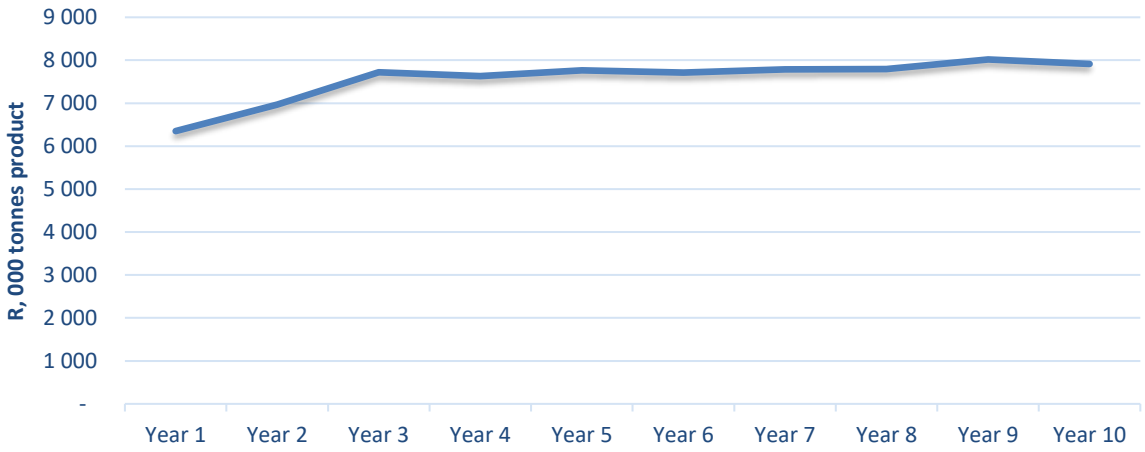


Figure 110: Estimated production for the next 10 years

Based on the planned moderate increase in production anticipated around Year 3, there might be a need for increased product transport, which may have a slight increase in the impact on local daily living and movement patterns. Seeing that this impact is already causing discomfort additional mitigation measures would be required.

8.1.9.1.3 Population influx and formations of informal settlements near operation

Typically, demographic change moves through three major phases commencing with construction of the project and movement to the area of a construction workforce (which took place in 2009), followed by the operational workforce and then the additional multiplier effects. The currently sustains 962 employees with an additional 461 contractor staff. The multiplier effects are estimated

at another 8 228 indirect and induced workers of which a portion is located within the local environment.

Even though GOSA sources most of its workers from the local area, there will also be people looking for opportunities that enter the area. This process of in-migration affects both Ogies and Phola and has a cumulative effect due to other mining in the area.

Impacts on population influx and demographic change is because of the overall GGV operation and other mining operations. It is however not anticipated that there will be any change in the impacts on crime due to the amendment application, as the impact is associated with the overall operation that is ongoing regardless of the amendment.

8.1.9.1.4 Deterioration of the local sense of place

Changes to the physical environment have an impact on people's daily lives and sense of place. Sense of place is an important consideration because sprawl development tends to eliminate unique features of the landscape. The notion that places are more than just locations is at the core of ideas about place and sense of place. In its simplest form, sense of place encompasses the idea that each person forms close relationships with the spaces and settings in which he or she interacts. As they work, play, spend time with their families and friends, travel in their neighbourhoods and immediate environments individuals have positive and negative experiences in, and of, places and as a result ascribe meaning to them.

The deterioration of sense of place coincides with impacts on the physical environment such as the following:

- Exposure to decreased air quality and nuisance dust formation on surfaces at businesses and households
- Exposure to continued nuisance noise especially related to alarms, truck movements and reverse hooters
- Increased risk due to traffic increases within the towns as well as on main roads utilised between towns
- Deterioration of public infrastructure such as water supply, road maintenance and road reserve management (hawkers) due to increase activity and use of the public infrastructure
- Increase in informal settlements neighbouring mine activity
- Visual intrusion caused by large stockpiles on the edge of the Ogies town and artificial lighting on the mine's operational area
- Vibration caused by blasting activities.

With any single mining operation, it is estimated that there would be a decrease over time of the quality of the physical environment. This is exacerbated with the cumulative situation of a number of mining operations, power generation plants and other associated developments.

The Mosque and Madrassah are located within the MRA, and although attempts have been made by GOSA to negotiate relocation, this has been refused due to religious and cultural reasons. Both the Mosque and the Madrassah are affected by blasting, air quality, noise and visual impacts described above.

As the sense of place has already been affected by the GGV operations, the additional infrastructure will not have an increased effect on the sense of place.

8.1.9.1.5 Operational Worker Health Impacts

On the health front, miners have long been aware of the hazards posed by the gases, dusts, chemicals, and noise in the work environment and in working in extreme temperatures (hot or cold).

The primary occupational health concerns associated with coal mining in South Africa are:

- *Dust-induced occupational lung diseases:* Dust exposure in coal mines is a risk factor for occupational lung diseases such as coal workers' pneumoconiosis (CWP), also known as black lung; chronic obstructive airways disease (COAD); and lung function deficiency. Employee exposure varies considerably as some employees are continuously exposed while others are exposed for short periods of time.
- *Noise induced hearing loss:* Noise-induced hearing loss (NIHL) has been recognised as a significant occupational health risk in the South African coal mining industry. Prolonged exposure to hazardous noise of more than 85 dBA causes loss of hearing acuity, which occurs gradually. The Mine Health and Safety Council set occupational health and safety targets in 2014 to eliminate NIHL by establishing limits on employee's standard Threshold Shift and reducing total operational or process noise emitted by equipment.

The industry is guided by extensive health and safety legislation and regulations when dealing with occupational health. Government authorities monitor and enforce compliance with mines' health and safety measures, and audits and inspections are conducted to ensure compliance with legal provisions. The audits evaluate mine management systems for the prevention of exposure of employees to noise and dust.

8.1.9.2 Decommissioning and Closure Phase

8.1.9.2.1 Loss of job opportunities due to downscaling of the mine employment

At the end of the LOM, a period of downscaling and retrenchment will follow that will reduce employment and have an economic impact.

8.1.9.2.2 Dependence on mine operations for economic function

GGV operations have a definite impact on economic activities within Ogies and to a larger extent a cumulative impact with other mining operations in the region. The indirect and induced economic benefits stimulates a number of other sectors that will be impacted when mine operations start to close in the region, including GGV. Although this is not foreseen for another 20 years in GGV's circumstances it is necessary to already plan for the closure of the operation.

8.1.10 Cultural and Heritage Resources

The potential impacts on known cultural and heritage resources are summarised in Table 39. A Cultural Heritage Management Plan (CHMP) was developed to manage the potential impacts on the known as well as unidentified, subsurface sites of cultural value or graves (Appendix 4 of the EMPr).

Table 39: Potential impacts on cultural hertiage resources

Status Category	Site ID	Potential impact
Gravesite: Graves exhumed and relocated	GY-03 (Mbila Estate) GY-04 GY-05 (Grave Site 5) GY-10 (Site G) GY-12 GY-13 GY-14 (GY-MK"B") GY-15 (Grave Site 18) GY-17 Site B	• No direct impact as graves have been exhumed and relocated. • Future queries or disputes may ensue.
Gravesite: Remaining gravesites	GY-01 (Site C) GY-02 (GY-02B) (Site D) GY-02A (Site E) Site A1 Site A2	• No direct impact is envisaged as no mining is scheduled in the location of the gravesites. • Blasting and infrastructure development in the North Pit opencast may however have an indirect impact on the sites.
Gravesite: Remaining gravesites	GY-16 (OFT GY-01)	• No direct impact is envisaged as no mining is scheduled in the location of the gravesites. • Blasting and infrastructure development in the Zaaiwater Pit opencast may however have an indirect impact on the site. • The road re-alignment is in proximity to the gravesite and may impact on the site.
Gravesite: Remaining gravesites	G-01 (OFT) GY-02 (OFT)	• No direct impact is envisaged as only underground mining is scheduled on the farm Grootpan 7 IS. • Underground blasting and/or surface subsidence may however impact on the integrity of the gravesites.
Gravesite: Disputed graves	GY-06 GY-MK "A" GY-11 MHC031 GY-18	• Limited or no records are available for these sites which can potentially result in damage to the gravesites because of mining and construction activities in proximity to the sites if they are still in existence. • Discrepancies in respect of the family names and/or location of the sites exist that need to be resolved.
Gravesite: Outside of GGV area	GY-09 (Site F)	• No direct impact is envisaged as the gravesite is outside of the GGV area. • Blasting in the South Pit opencast in proximity of the site which may have an indirect impact on the site. • The development of ancillary infrastructure outside of the GGV area may impact on the gravesites.
Gravesite: Remaining gravesites	GY-i, GY-ii, GY-iii (Ogies)	• No direct impact is envisaged as the gravesite is outside of the GGV area.

Status Category	Site ID	Potential impact
		• Underground blasting in proximity to the sites may however impact on the integrity of the gravesites.
Gravesite: Remaining gravesites	GY-07 GY-08 GY-vii, GY-viii, GY-ix, GY-x, GY-xi (Tweefontein MRA)	• No direct impact envisaged. • Future expansion or development of ancillary infrastructure outside of the GGV area may impact on the gravesites.
Historical structure: Demolished, no historical value	F1, V3, V4	• None.
Historical structure: Demolished, historical value	F3, F4	• None.
Historical structure: Remaining, no historical value	F2	• None.
Historical structure: Remaining, historical value	H3	• No direct impact is envisaged as no mining is scheduled in the immediate area. • Blasting and infrastructure development in the Zaaiwater Pit opencast may however have an indirect impact on the site.
Historical structure: Remaining, historical value	V2	• No direct impact is envisaged as only underground mining is scheduled in the area. • Blasting and infrastructure development in the North Pit opencast may however have an indirect impact on the site. • Underground blasting and/or surface subsidence may also impact on the integrity of the Mosque and Madrassah.
Historical structure: Remaining, historical value	HH01, O1, O2 (OFT)	• No direct impact is envisaged as only underground mining is scheduled on the farm Grootpan 7 IS. • Underground blasting and/or surface subsidence may however impact on the integrity of the historical structures.
Historical structure: Outside of GGV area	F5, H1, H2, V1, MHC026, HSRa1, HSRa2	• None.
Unidentified, subsurface sites of cultural value or graves	-	• Uncovering of unknown or invisible, subterranean sites during any development actions.

8.1.11 Paleontology

The potential impact of the mine and associated activities on fossil heritage is very high (Fourie, 2022). Threats are earth moving equipment/machinery (for example haul trucks, front end loaders, excavators, graders, dozers) during construction, the sealing-in, disturbance, damage or destruction of the fossils by development, vehicle traffic, and human disturbance. Special care must be taken during the digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden not to intrude fossiliferous layers.

8.2 LIST OF SIGNIFICANT IMPACTS AND PROPOSED MITIGATORY MEASURES

The list of significant impacts identified for the mining and associated activities (existing and future), together with the proposed mitigation measures to prevent and/or reduce these impacts, are provided in Table 40.

Table 40: List of significant impact identified during the EIA, together with proposed mitigation measures

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
PRE-CONSTRUCTION PHASE (PLANNING PHASE)				
1	Re-alignment of Road P53-1 over mined out area	• Subsidence of road. • Impact on long-term stability of road.	Safety and Risk Exposure	• All proposed road upgrades and improvements are to be designed by a professional engineer and submitted for official approval by the Mpumalanga Provincial Roads Department, prior to implementation. • The necessary engineering design criteria must be considered during the design to ensure long-term stability of the road. • Surfacing of road re-alignment with suitable black top specification as agreed to with the Mpumalanga Provincial Roads Department. • A road maintenance system will be implemented in conjunction with the provincial roads agency.
2	Unsafe intersection of the re-alignment with Provincial Road R545	• Safety of road users may be compromised. • Increase in road accidents.	Safety and Risk Exposure	• All proposed road upgrades and improvements are to be designed by a professional engineer and submitted for official approval by the Mpumalanga Provincial Roads Department, prior to implementation. • The provision of traffic warning signs and decrease in speed limit for all vehicles over the affected sections. • Include speedbumps to control speed. • Develop a Traffic Management Plan for implementation during construction of the re-alignment and associated intersections.
3	Construction and operational activities, including future opencast mining and infrastructure development	• Potential degradation and modification of the remaining extent of the receiving freshwater environment, further loss of wetland ecological structure and related ecological service provisioning.	Wetland/aquatic habitat Floral habitat, diversity, SCC	• Minimise loss of indigenous vegetation and remaining natural habitat where possible through adequate planning and ensuring that the inclines and associated surface infrastructure remain within the disturbed (opencast) areas. No additional vegetation clearance should be allowed. • It must be ensured that, as far as possible, all proposed infrastructure, including temporary infrastructure, is placed outside of remaining extent of wetland/sensitive habitat units as well as the 1:100 year floodline where applicable. • Access roads should be kept to existing roads to reduce fragmentation of wetland/sensitive habitat outside of the authorised footprint. Sensitive areas outside of the planned mining activities must be demarcated as no-go zones, including the interflow soil areas. • It is recommended that prior to the commencement of construction activities that the construction servitude be demarcated off.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
		• Degradation of remaining floral habitat, terrestrial diversity. • Impact on Species of Conservation Concern (SCC).		• Prior to the commencement of new construction and mining activities, a Rescue and Relocation Plan for floral SCC should be in place for implementation. • The necessary permits should be obtained from the MTPA prior to the relocation of the SCC.
4	Undermining of main river diversion and remaining wetlands	• Potential subsidence of surrounding environment if pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow. • Alteration of hydropedological flow drivers of the wetlands.	Wetland/aquatic habitat Catchment yield	• Mining plan should adhere to proposed design as investigated by the Geotechnical specialist, i.e. pillar size of 11.5m skin to skin, bord width of 6.5m with a maximum mining height of 3.5m. Should the mine design be changed, further geotechnical investigations should be conducted to determine the possibility for subsidence. • Due to the potential for unstable roof conditions and the formation of sinkholes, no underground mining should occur within areas associated with the main river diversion and remaining wetlands at depths of less than 20m. • A management plan for mining under the main river diversion and wetland areas must be developed prior to mining. • The vadose zone of shafts should be sealed as soon as possible after construction to limit the hydropedological losses to ensure that the PES category remains unchanged.
5	Construction and operational activities, including future opencast mining and infrastructure development	• Spread of AIPs, leading to potential loss of floral habitat and species diversity from surrounding natural habitat outside of the footprint areas. • Indirect impact on watercourses due to AIP removal.	Terrestrial biodiversity Wetland/aquatic habitat	• Develop and implement an AIPCP for known alien and invasive plants in the GGV area (Appendix 2). • The AIPCP should be implemented by a qualified professional (i.e., the person must have a good record of experience in AIP management and control). • No chemical control of AIPs to occur within 32 m of a watercourse. • No vegetation cuttings from AIP removal may be left to accumulate in watercourses. • As far as possible, it must be ensured that no AIP propagules are spread with construction rubble, or soils contaminated with AIP seeds/propagules. • Discard cleared vegetation at a registered waste facility (or in a secluded area designated by the mine). Particular attention to be paid to potential spread of AIPs. • AIP control measures should ideally be done by hand and not involve heavy machinery which may lead to compaction of soils and the trampling / compacting of vegetation, notably in sensitive habitats.
CONSTRUCTION PHASE – ADDITIONAL INFRASTRUCTURE, INCLINE SHAFTS & ROAD-RE-ALIGNMENT				
6	Vegetation clearing for the purpose of establishing a construction camp	• Soil erosion and dust generation during vegetation clearance activities. • Habitat destruction.	Erosion Air quality Biodiversity	• Laydown areas, storage areas and ablution facilities must be located within the existing disturbed mining area, no additional disturbance or vegetation clearance should be allowed. • The road leading to the construction site must be demarcated to prevent more than one road from being formed. • All disturbed and compacted footprint areas must be rehabilitated and landscaped after construction is complete and left for natural vegetation.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
				• Exposed soils to be protected by means of a suitable geotextile covering such as hessian sheeting until adequate vegetation has established. • Special attention should be paid to alien and invasive plant control within these areas.
7	Construction of road re-alignment	• Exposure of soils, leading to increased runoff, erosion and increased potential for sedimentation. • Proliferation of alien vegetation because of disturbances.	Soils Biodiversity	• All development footprint areas to remain as small as possible. • Temporary erosion control measures must be implemented to protect the disturbed soils during the construction phase until adequate vegetation has established. • Exposed soils to be protected by means of a suitable geotextile covering such as hessian sheeting until adequate vegetation cover is achieved. • Monitor and fix any erosion. • Implement an AIPCP. • Once construction activities have been completed, it must be ensured that all temporary and construction-related infrastructure are removed, and that efficient rehabilitation takes place within these areas.
8	Construction of road re-alignment	• Construction activities will generate noise.	Ambient noise Socio economic: Health and well-being	• Ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures. • Ensure a good working relationship between mine management and all potentially noise-sensitive receptors in the surrounding area. • Establish and implement a Complaints and Grievance Procedure.
9	Construction of road re-alignment	• Construction activities resulting in open, unprotected soils which are prone to wind erosion leading to an increase in dust and a reduction in ambient air quality in the MRA area and along the re-alignment.	Air quality Socio economic: Health and well-being	• Set the speed limit for construction vehicles to as low a speed possible and enforce the speed limits specified. It is recommended the speed limit be set to 40 km/h on unpaved roads. • Include a program of wet suppression of unpaved roads with major vehicle activity. The wet suppression can typically be grey water from the mine, or the water can contain a chemical that will increase the dust trapping capability once sprayed over a surface. • Limit the load size of the vehicles to ensure the wind in transit does not pick up more dust that need be. • Exposed soils to be protected by means of a suitable geotextile covering such as hessian sheeting until revegetated. • Bare soils must be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast. • Early paving of permanent roads. • Complaints and Grievance Procedure available to local people.
10	Increased vehicle movements within the construction areas	• Indiscriminate driving through the open veld leading to increased vehicle related mortalities of faunal species.	Terrestrial Biodiversity	• Make use of existing roads as far as possible. • Vehicles should be restricted to travelling only on designated roadways. • Speed restrictions to be placed on all vehicles and monitored to ensure compliance. • Drivers to be educated through the Environmental Awareness Programme about the presence and importance of faunal species and instructed to actively avoid collisions with faunal species, regardless of size.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
11	Waste/Hydrocarbon handling	• Accidental spills and/or leakages of hazardous chemicals and hydrocarbons resulting in soil contamination. • Contamination of water resources due to spillage of construction material and waste and/or poor management of sewerage waste at construction sites. • Poor handling of waste and the transport of building material can cause various types of spills (especially hydrocarbons) that may potentially infiltrate and contaminate the underlying groundwater system.	Soils Water resources	• No fuel must be stored at the construction sites and no refuelling or servicing of construction plant must take place at the construction sites. • All vehicle re-fuelling is to take place within the contractor laydown area only, within a bunded area. • All vehicles are to be serviced in a correctly bunded area or off-site. • Leaking vehicles should have drip trays placed under them where the leak is occurring. • Drip trays must be placed under any vehicles/machinery requiring active lubrication or oiling. • Spill clean-up kits must be available on site for immediate remediation of any spills and removal of contaminated soils. • A Spill Management and Emergency Contingency Plan should be put in place to address clean-up measures should a spill and/or a leak occur, as well as preventative measures to prevent ingress to groundwater. • Regular monitoring of soil contamination levels at construction sites. • All construction related waste and material is to be disposed of at a registered waste facility, no waste or construction rubble is to be dumped in the surrounding natural habitats. • Solid waste must either be stored on-site in an approved waste disposal area or removed by credible contractors. • All waste material to be removed to a licensed waste disposal facility if it cannot be re-used or recycled. • Chemical toilets to be provided at various sections along the route, as required. • The appointed contractor must ensure that these facilities are emptied on a regular basis and maintained as required. No chemical toilets to be placed in close proximity of watercourses. • A Construction Method Statement must be compiled and approved prior to the commencement of construction activities. The Environmental Control Officer (ECO) must ensure that the contractor adheres to the above-mentioned documents. • The relevant authorities should be notified in the event of a significant spill.
12	Increased personnel on site	• Increased risk of veld fires leading to loss of faunal and floral species as well as alteration of plant diversity in the surrounding areas. • Hunting/collection of common faunal species.	Biodiversity	• No indiscriminate driving through the veld is allowed. As far as possible vehicles are to utilise the existing roads. • No illicit fires must be allowed during any phases of the proposed mining development. • A Fire Management Plan should be set in place to ensure that any fires that do originate can be managed and / or stopped before significant damage to the environment occurs. • No hunting or trapping of faunal species is to be allowed. Access control to the property must be implemented and perimeter fences are to be regularly inspected for signs of damage by poachers. • Roadsides and if applicable burrows under fences used by fauna are to be inspected for snares, which if found are to be removed and destroyed.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
13	Construction activities Removal of topsoil	• Impact on cultural and heritage significance within close proximity of construction activities. • Recovery of sub-surface sites during construction and/or excavation. • Loss of fossil heritage.	Cultural heritage Fossil heritage	• Activities must cease immediately upon any discovery of cultural or heritage resources and a qualified archaeologist informed to do further assessment and reporting. • Any discovery of artifacts, graves or other remains of archaeological interest should be reported to SAHRA. • Identified sites of cultural and heritage significance within close proximity to the construction activities must be clearly demarcated and declared as no-go areas to prevent any damage thereto during construction. • The mining personnel together with the mine geologist and contractor must survey for fossils before and/or after clearing or excavating. • For a chance fossil find, the protocol is to immediately cease all construction activities, construct a 30 m no-go barrier, and contact SAHRA for further investigation.
14	Need of human resources and recruitment	• Creation of temporary construction employment.	Human capital	• Prioritise employment from local communities with the development of recruitment procedures. • Implementation of practical skills programmes.
15	Construction of intersections with R545 and existing P53-1	• Disruption in daily living and movement patterns. • Traffic congestion. • Safety of road users may be compromised. • Increase in road accidents.	Safety and Risk Exposure Socio economic: Health and well-being	• Develop a Traffic Management Plan for implementation during construction of the re-alignment and associated intersections. • Limit disruption to the flow of traffic. • Limit construction to day-light hours. • The provision of traffic warning signs and management measures. • Decrease in speed limit for all vehicles over the affected sections. • Clear notification and early warning of road closures. • Complaints and Grievance Procedure available to local people.
OPERATIONAL PHASE				
16	Surface disturbance caused by ongoing mining and infrastructure development	• Loss of topsoil due to incorrect stripping and stockpiling.	Soils / Land Use & Capability	• “Live” placing of topsoil material. • Minimise the size of the topsoil stockpiles. • Reclaim or apply protective covering on disturbed soils as quickly as possible. • Apply erosion controls relative to possible soil erosion from vehicular traffic and during mining activities. • Avoid creating excessive slopes during excavation operations.
17	Surface disturbance caused by ongoing mining and infrastructure development	• Spread of AIPs, leading to potential loss of habitat and species diversity from surrounding natural habitat. • Loss of favourable floral/ faunal habitat outside of the direct mining footprint due to poorly managed	Terrestrial Biodiversity	• No additional habitat outside of the approved footprint areas may be disturbed during the operational phase of the project. The approved mining footprint is to be clearly demarcated and all mining activities are to remain within this boundary. • Edge effects of all activities which may affect floral/faunal habitat within surrounding areas must be strictly managed, e.g. implement an AIPCP, mitigate soil erosion by reducing soil compaction caused by movement of construction personnel and vehicles, suppress dust in order to mitigate the impact of dust on flora within a close proximity of activities. • Ongoing removal of the AIPs, with specific emphasis on Category 1b alien species, encountered within the footprint areas and immediate surrounds (approximately 30 m buffer around

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
		edge effects, including a decrease in diversity and loss/decline of potentially occurring SCC.		activities) must take place (following the NEMBA: Alien and Invasive Species Regulations of 2020). • No indiscriminate driving through surrounding natural veld is allowed. As far as possible vehicles are to utilise the existing roads. Where this is not feasible, new roads are to be located in areas of existing high disturbance, and not encroach upon sensitive habitats. • Harvesting of protected floral species by mining and operational personnel should be strictly prohibited. • No collection or hunting/snaring of faunal may be allowed by mine personnel in the areas surrounding the mine. • No informal fires by mine personnel are to be allowed on site, notably in close proximity of the adjacent natural areas. • Ongoing implementation of a Rescue and Relocation Plan for floral SCC. Ensure that the necessary permits is obtained from the MTPA prior to the relocation of the SCC.
18	Surface disturbance caused by ongoing mining and infrastructure development	• Potential degradation and modification of the remaining extent of the receiving freshwater environment. • Further loss of wetland ecological structure and related ecological service provisioning. • Alteration of hydropedological flow drivers of the wetlands. • Increased flood peaks into the wetlands because concentration of surface runoff. • Potential for erosion of terrestrial areas because of the formation of preferential flow paths, leading to sedimentation of the wetlands. • Increased sedimentation into the Zaaiwaterspruit	Wetland/aquatic habitat	• No additional habitat outside of the approved footprint areas may be disturbed during the operational phase of the project. The approved mining footprint is to be clearly demarcated and all mining activities are to remain within this boundary. • Retain as much indigenous wetland vegetation as possible within the remaining extents of wetlands. • Placement of shallow berms between the opencast footprint and downslope wetlands to prevent sediment-rich runoff from entering the wetlands. • Maintenance of the clean water run-off systems to avoid siltation. • Canals, berms and watercourse crossings must be inspected annually, preferably before the start of the rainy season, by a Registered Professional Engineer to note any flood damage as well as to determine if the system is able to function as per the design. • Implementation of strict erosion control measures to limit loss of soil and sedimentation of the wetlands adjacent to the operational activities. • Landscaping of the rehabilitated areas will be done, avoiding steep slopes and concentrated runoff to prevent erosion and increased sediment transport into water resources. • All exposed soil must be protected to prevent erosion and sedimentation of the downgradient wetlands. • Construction of gabions at storm water discharge points to contain erosion. • Ensure that the inclines and associated surface infrastructure for the underground mining remain within the disturbed (opencast) areas, outside of the remaining sensitive and wetland systems. • Excavation activities and removal of soil within the wetlands and hydropedologically important soils should remain as small as possible and strict control of edge effects must take place. • The vadose zone of the incline shafts should be sealed as soon as possible after construction to limit the hydropedological losses to ensure that the PES category remains unchanged.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
		due to uncontrolled surface run-off.		• Annual biomonitoring (aquatic and terrestrial assessment) to be undertaken. • Implementation of wetland offset mitigation to compensate for the loss of wetland systems.
19	Operational activities, opencast mining and surface dumps	• Loss of catchment yield due to stormwater containment and decreased surface runoff. • Potential stream flow impact because of the stream diversions. • Reduction in volume of water entering the wetlands, leading to loss of recharge (and thus potential desiccation) of the wetland system. • Further altered vegetation communities due to moisture stress.	Wetland/aquatic habitat	• Flood diversion systems must be accompanied by an Operations, Maintenance and Emergency Preparedness Manual. • Development and implementation of a Stormwater Management Plan as part of the IWWMP (Appendix 3). • Clean and dirty water systems must be kept separate in line with GN704 as it relates to the NWA, as per the IWWMP. • Ensuring clean water from areas upslope of dirty areas is diverted around the dirty areas. • Minimising the footprint of dirty areas as far as is practical. • Construction of the outstanding diversion canals prior to mining the specific areas. • Route clean water runoff to a watercourse. • Canals, berms and watercourse crossings must be inspected annually, preferably before the start of the rainy season, by a Registered Professional Engineer to note any flood damage as well as to determine if the system is able to function as per the design. • Continuous rehabilitation of opencast areas, according to a defined schedule, to increase the clean water runoff. • Design of rehabilitated areas to ensure that they are free draining as far as is practicable, both during operations and post closure. • Sufficient compaction of the spoils and overburden should be ensured to limit surface water ingress, followed by a sufficient topsoil layer. • Annual biomonitoring (aquatic and terrestrial assessment) to be undertaken.
20	Operational activities, opencast mining and surface dumps	• Water quality impact on water resources due to uncontrolled dirty water runoff. • Water quality impacts due to infiltration of water from the dirty water facilities, CHPP and mine residue facilities.	Wetland/aquatic habitat Groundwater	• Development and implementation of a Stormwater Management Plan as part of the IWWMP (Appendix 3). • Ensure all potential polluting activities within the operational areas are demarcated as dirty water areas and managed accordingly. • Collect and contain contaminated runoff in appropriately lined facilities. • Re-use contaminated water where possible. • The MRF is equipped with a clay lining system, with sub-soil drainage to collect seepage from the facility. A seepage cut-off drain downstream of the MRF collects sub surface flows at the facility. The water collected by this drain must be pumped to a dirty water facility for reuse in the process. • Dirty water facilities must be accompanied by an Operations, Maintenance and Emergency Preparedness Manual. • Dirty water facilities must be inspected annually, preferably before the start of the rainy season, by a Professional Registered Engineer to note any flood damage as well as to determine if the system is able to function as per the design.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
				• Silt traps must be constructed upstream of the dirty water facilities to allow silt to settle out of the runoff water. Silt traps and dirty water canals must be cleaned regularly, and the silt dried within the dirty water footprint before placement on the MRF and/or within opencast voids. • Dirty water canals and silt traps associated with the dirty water facilities must be inspected annually, preferably before the start of the rainy season, by site personnel to note any flood damage as well as to determine if the system is able to function as per the design. • Water quality monitoring programme to be implemented to ensure early detection of any water contamination.
21	Undermining of main river diversion and remaining wetlands	• Potential subsidence of surrounding environment if pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow. • Potential creation of a cone of depression, which may drain water from surrounding wetland habitats, resulting in desiccation of the wetlands.	Wetland/aquatic habitat	• Due to the potential for unstable roof conditions and the formation of sinkholes, no underground mining should occur within areas associated with the main river diversion and remaining wetlands at depths of less than 20m. • Ensure that the incline shafts are properly sealed to avoid seepage and possible cone of depression impacts. • Any seepages and especially seepages from vertical to near vertical discontinuities in the roof must be mapped and monitored, and the inflow estimated. Periods of inflow and dry periods must be noted. • Underground sections where large groundwater inflows are observed should be grouted to reduce inflows. • Flow in the streams/wetlands upstream and downstream of the workings must be monitored and recorded. The water level and the discharge from the wetland just downstream wetland area must be monitored and recorded to define a base level flow. Any reduction in the ratio between rainfall and flow will indicate stream capture and underground ingress.
22	Dewatering of underground workings	• Water entering the underground mining area because of ingress into underground mine workings may necessitate dewatering of the underground mining area, which may result in the discharge of dirty water into the surrounding wetland environment.	Wetland/aquatic habitat Groundwater Safety and Risk Exposure	• Underground sections where large groundwater inflows are observed should be grouted to reduce inflows. • Water pumped from the underground workings must be stored in appropriately lined dirty water facilities for reuse in the process.
23	Mining activities On-site conveyance of ROM & product	• Spillages along haul roads could impact on water quality.	Wetland/aquatic habitat	• Prevent overloading of vehicles. • Polluted water must be captured in the dirty water system. • Immediate cleaning of spillages that may occur. • All conveyors to be fully enclosed for zero spillage over all crossings.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
24	Uncontrolled runoff from road re-alignment surface	• Increased flood peaks because of concentration of surface runoff leading to erosion and the formation of preferential flow paths. • Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable road surface).	Safety and Risk Exposure Water resources	• Construction should be immediately followed by rehabilitation. • Exposed soils to be protected by means of a suitable geotextile covering such as hessian sheeting until adequate vegetation cover is achieved. • Appropriate storm water management and erosion control measures should be included in the re-alignment engineering design. • Monitor and fix any erosion. • If spillages occur, these should immediately be cleaned up according to the Spill Management and Emergency Contingency Plan.
25	Opencast and underground mining	• Dewatering of aquifer because of mining.	Groundwater Socio economic: Health and well-being	• Quarterly monitoring of borehole levels to monitor the extent of the dewatering. • Compensation mechanisms need to be developed and agreed with landowners to compensate those who are impacted upon.
26	Operational activities, opencast mining and surface dumps	• Decrease in regional water quality.	Groundwater Socio economic: Health and well-being	• Quarterly monitoring of water qualities in boreholes. • Drains and cut-off trenches (stormwater management system) around the opencast pits must be implemented before commencing with pit development to prevent clean run-off water from entering the pit. • Contain dirty water runoff and water pumped from the pit in appropriately lined facilities for reuse in the process. • Ensure that barrier pillars with neighbouring mines are as wide as possible. • Effectively reduce the infiltration potential of opencast pits through good rehabilitation, shaping, vegetation and run-off designs. • Where possible, coal discard from the plant, and carbonaceous rocks should be placed in the deepest part of the pit (at least 20m deep) and covered as soon as possible. • Treatment of water prior to discharge – GOSA Treatment Strategy
27	Mining activities On-site conveyance of ROM & product	• Air quality impacts associated with mining and blasting activities and movement of vehicles, hauling of ROM coal.	Air quality Socio economic: Health and well-being	• Surfacing and/or chemical stabilisation of haul roads. • Limit speed of vehicles. • Implement appropriate maintenance management programme for vehicles. • Implement the GOSA Blasting Procedure.
28	Materials handling, processing	• Air Quality (dust) impact caused by materials handling, crushing and screening operations.	Air quality Socio economic: Health and well-being	• Increase the moisture content of the material being transported to limit the amount of material that can be liberated to atmosphere due to strong winds. • Reduction of drop height to reduce the dispersion of materials being transferred. • Wet suppression during tipping. • Ensure conveyors are covered especially where material is being transferred between conveyors.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
				• Installation of dust suppression or capture system to the crusher to contain and capture fugitive dust.
29	Mine residue facilities, product stockpiles	• Increased dust emissions from the surface dumps and stockpiles, MRF.	Air quality Socio economic: Health and well-being	• Dust suppression of material being dumped. • Decrease tipping height. • Make use of wet suppression or vegetation where required to reduce the amount of available dust which can be liberated during strong gusts of wind
30	Opencast and underground mining	• Methane emissions leading to air quality impacts.	Air quality Socio economic: Health and well-being Carbon footprint	• Ongoing methane monitoring.
31	Underground mining	• Air quality impacts associated with ventilation shafts.	Air quality Socio economic: Health and well-being	• Dust collection systems in ventilation shafts.
32	Mining activities, mine residue facilities and surface dumps	• Spontaneous combustion during pillar mining leading to air quality impacts. • Spontaneous combustion of surface dumps.	Air quality Socio economic: Health and well-being Carbon footprint	• Smaller diameter blast holes (160mm compared with 311mm) to be used, together with a loser spacing of holes to obtain better fragmentation of the overburden. • Temperature monitoring of the interburden is practised continually using available drill holes. • Buffer blasting methods to be reintroduced. • After blasting coal must be mined immediately. • The open voids to be clad by sub-soil (softs) to reduce the amount of oxygen getting through the mined-out areas. • Surface dumps must be compacted and cladded where appropriate to reduce the amount of oxygen from entering the waste rock dumps. • A spontaneous combustion team has been formed to plan and measure the awareness of spontaneous combustion throughout the mine. • Increased vigilance must be practiced in summer months as the risk of spontaneous combustion rises in wet conditions.
33	Operational activities, opencast mining and surface dumps	• Health impacts due to air pollution.	Health impacts due to air pollution Socio economic: Health and well-being	• Air Quality Monitoring programme. • Dust suppression on haul roads and stockpiles. • Dust suppression in CHPP and ROM Tip. • Required PPE is to be worn by employees working close to the site to reduce inhalation risk.
34	Operational and mining activities and surface dumps	• Elevated noise levels caused by mining operation, hauling of ROM and coal, processing coal) and blasting activities. • Noise impact (especially during the night) because	Ambient noise Socio economic: Health and well-being	• The design process must consider the insulation of particularly noisy plant and equipment. • The topsoil and overburden stockpiles from the opencast pit excavations should, where possible, be used as interim or long-term noise attenuation barriers. These berms should be as high as possible to break the line of sight from receptors to active mining activities. This is critical for all sensitive receptors located within 600 m from future mining activities. • All plant, equipment and vehicles are to be kept in good repair.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
		of the ventilation systems/ extractor fan.		• Where possible, very noisy activities should not take place at night (between the hours of 20h00 to 06h00). Specifically, blasting should take place to a regular programme and should be restricted to the period between 08h00 and 16h00. • Cladding of ventilation system/extractor fans – encapsulation in buildings, acoustic covers. • The applicant investigates any reasonable and valid noise complaints. A complaints register must be kept on site.
35	Operational activities, opencast mining and surface dumps	• Increased Visual Intrusion and Visibility of the mining operations and associated infrastructure.	Sense of Place Aesthetics Socio economic: Health and well-being	• Natural colours should be used in all instances and the use of highly reflective material should be avoided. Any metal surfaces should be painted to fit in with the natural environment in a colour that blends in effectively with the background. White structures are to be avoided as these will contrast significantly with the natural surroundings. • The identification of appropriate colours and textures for facility materials should consider both summer and winter appearance.
36	Night-time lighting	• Increased Visual Intrusion and Visibility of the proposed infrastructure due to night-time lighting.	Sense of Place Aesthetics Socio economic: Health and well-being	• Obtain guidance and advise from the Health Department on illumination in line with DMRE guidelines and regulations, as appropriate. • Minimum wattage light fixtures should be used, with the minimum intensity necessary to accomplish the light's purpose. The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent reduces skyglow and wildlife impacts. • Outside lighting should be designed to minimise impacts on fauna, especially invertebrates. All outside lighting should be directed away from sensitive areas.
37	Blasting operation within the open pit area	• Potential damage to road infrastructure. • Potential for fly-rock, impacting on the safety of the road users.	Safety and Risk Exposure	• Mine not to blast in adverse meteorological conditions (overcast, strong wind blowing in direction of the road, early in the mornings, late in the afternoon). • Mine to erect blasting notice boards in the area with blasting dates and times highlighted. • Road closures within 500m of the blast. • Any evidence of fly rock must be noted, and the blast design analysed for possible improvements. • Mine to implement a vibration and air blast measurement programme. This data must be analysed, and the blast impact assessment be reviewed and updated as required.

38	Blasting operation within the open pit area	• Impact on the communities because of blasting activities.	Safety and Risk Exposure
			Socio economic: Health and well-being
				• Implement the GOSA Blasting Procedure.
				• Implementation of an Evacuation Procedure:
				  ○ All receptors or livestock within 500 m from a blast should be moved before, and during a blast.
				  ○ The roads must be closed when blasting is to take place within 500 m from the roads.
				  ○ Trains on the railway line be stopped before and during a blast taking place within 500 m from such infrastructure.
				• Vibration and air blast monitoring will be needed for all blasts in close proximity to sensitive receptors to ensure that the limits are being achieved and to provide an indication of when modification are needed to the blasting method to correct for increased vibration and air blast levels.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
				• The mine must keep full records of each blast (blast design, timing, explosive mass per blast hole, stemming, subdrill, spacing, burden, meteorological conditions during the blast, etc.). • If any evidence of fly rock is noted, the blast be analysed for possible improvements. • The mine should discuss the blasting schedule when blasting is to take place within 1,000 m from the Mosque with the Muslim Iman of the Mosque. The mine should agree on the most appropriate time to blast. • The mine should erect clear signs indicating blast dates and times along the R545 road as well as agreed locations within Ogies. A blast schedule should be available to sensitive receptors. • Mine should initiate a forum to inform the close residents about the likely vibration and air blast levels, the proposed blasting schedule and warning methodology the mine will employ before a blast as well as a warning to residents that, when they are indoors during a blast, vibration of windows and ceilings may appear excessive. The local community members must be notified of times when blasts will be undertaken and the community must know that the potential impact of vibration was assessed. • Mine to prevent blasting in adverse meteorological conditions (overcast conditions, strong wind blowing in direction of local community, early in the mornings or late in the afternoon). • Communication and Grievance Mechanism.
39	Blasting operation within the open pit area Operational activities, opencast mining and surface dumps	• Destruction of heritage resources because of mining activities. • Impact on the Mosque and Muslim Graves. • Loss of fossil heritage.	Cultural heritage Burial sites Fossil heritage	• Development and implementation of a Cultural Heritage Management Plan (CHMP) – Appendix 4. • Ongoing monitoring during construction and/or mining will be done by a qualified heritage specialist for early detection of unidentified (sub-surface) sites or graves. • All activities shall cease immediately upon any discovery of cultural and heritage resources and a qualified archaeologist informed to do further assessment and reporting. The site where cultural and heritage have been discovered shall be cordoned until such time that an instruction to resume work is provided to the contractor in writing, following consultation with the regulating authorities. • Include national heritage and cultural issues in the environmental awareness programme. • Avoid and demarcate the Mosque area and Muslim Grave sites. • Regular monitoring of the site to identify impacts at an early stage. • Pre-blast structural surveys will be conducted of the Mosque and Madrassah before blasting commences within a radius of 1 km. • The mining personnel together with the mine geologist must survey for fossils before and/or after clearing, blasting, drilling or excavating. • For a chance fossil find, the protocol is to immediately cease all construction activities, construct a 30 m no-go barrier, and contact SAHRA for further investigation.
40	Blasting operation within the open pit area	• Water quality impacts (lowering of pH and increased nitrate levels)	Water resources Safety and Risk Exposure	• Emulsion silos to be placed within dirty water footprint. All surface water runoff from the emulsion silo area to be collected in dirty water management facilities. • Accidental spillages during off-loading and blast preparation should be cleaned immediately.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
	Emulsion silos	because of explosives dissolving in water. • Safety and health risk associated with handling and preparation of bulk explosives.	Socio economic: Health and well-being	• Appropriate PPE to be worn when handling emulsion and bulk explosives. • Health and safety procedures to be included in the Blasting Procedure. • Monitoring of surface and groundwater to detect unacceptable levels of ammonium nitrate concentrations (>2 mg/l). • Disposal of unused emulsion should be done in accordance with the relevant local, provincial or national legislation. Recover, reclaim or recycle if practicable.
41	Transport of product (Rail Loop) Truck transport	• Increase of ambient noise levels along the rail route and product transport route.	Ambient noise Socio economic: Health and well-being	• Noise suppression devices on heavy vehicles / conveying equipment. • Adhering to maximum speed limit of 80 km/h for coal trucks. • Maintenance of vehicles. • Communication and Grievance Mechanism.
42	Transport of product (Rail Loop) Truck transport	• Dust impacts caused by materials handling. • Material and product loss from load bins. • Increase in vehicle entrained dust.	Air quality Socio economic: Health and well-being	• Reduce tipping height. • The transport route must be surfaced to limit dust emissions. • Reduction of vehicle speeds on all unpaved roads. • If there is a spill this is to be cleaned up to avoid additional entrained dust from other vehicles. • Use wheel mudguards to reduce dispersion of dust from wheels when travelling on unpaved roads. • Ensuring coal is covered with a tarpaulin when travelling on off-site roads to reduce dust emissions. • Ensure vehicle bins are covered both when loaded and empty. • Communication and Grievance Mechanism.
43	Transport of product (Rail Loop) Truck transport	• Killing of animals crossing the railway, avifauna.	Terrestrial biodiversity	• The rail route will be fenced off to prevent animals from going onto the track. • Animal corridors underneath the railway to be included in the design.
44	Transport of product (Rail Loop) Truck transport	• Increased traffic leading to safety risk to other road users.	Safety and Risk Exposure Socio economic: Health and well-being	• Adhering to all road regulations, e.g. speed limits. Maximum speed limit of 80 km/h for coal trucks. • Ensuring headlights are on all the time to increase visibility. • Ensuring coal is covered with a tarpaulin when travelling on off-site roads. • Ensuring the coal trucks use only the designated routes. • Trucks fitted with tracking system for real-time reporting of speeding / deviation from route. • Trucks loaded and verified overweight bridge to prevent over-loading. • Traffic management where product transport coincides with local movement on roads, such as the roads to the south of GGV. Provision of additional “park lanes” for product transport trucks, and no allowance of trucks to park or wait on the existing road.
45	Transport of product (Rail Loop) Truck transport	• Spillages leading to environmental impact and safety risks.	Terrestrial biodiversity Water resources Safety and Risk Exposure	• Trailers of "side-tipper" design to ensure no spillage of coal or water on the road. • Ensuring coal is covered with a tarpaulin when travelling on off-site roads. • Cleaning up of any spillages that may have occurred. • Upgrading of transport routes as required.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
				• Ensuring a system of road maintenance is in place.
46	Waste management	• Poor waste management could lead to environmental impacts.	Terrestrial biodiversity Water resources	• Implementation and regular review of Waste Management Procedure. • Different waste streams will be segregated and disposed of in appropriate designated receptacles. • Hazardous substances will be stored on impervious surfaces that allows for the containment of spills/leaks. • In the case of accidental spillages, this will be cleaned-up immediately in line with the hydrocarbon management procedure. • Appoint an approved, registered waste contractor to manage the waste generation and safe disposal thereof. • No waste will be disposed of or buried on site, or in any other location that is not a licensed waste disposal site. • Waste tyres must be stored in dedicated, demarcated storage areas until reuse on site or recycling can be effected. Management of the waste tyre storage areas should confirm to the Waste Tyre Regulations (GN No. 1064 of 29 September 2017).
47	Hydrocarbon management	• Soil and water quality impacts because of poor hydrocarbon management and spillages.	Soils / Land Use & Capability Water resources	• Implement hydrocarbon management procedure. • Bulk facilities to be concrete lined and bunded to capacity of 110%. • Reclamation of soil in the event of accidental spillages.
48	Bulk electricity	• Further impact on over-allocated electricity reticulation system.	Carbon footprint	• Mine Engineer must identify and implement energy efficiency initiatives to reduce bulk electricity needs. • Develop and implement Pollution Prevention Plans (PPP). • Develop and implement carbon abatement strategies.
49	Bulk water	• Spills due to pipe leaks and spills.	Biodiversity / Soil, Land Use & Capability Water resources	• Regular inspection of the pipeline route. • Maintenance and operational manual for all valves and joints. • Implement emergency procedure to address major leaks and spills.
50	Socio-economic	• Influx of temporary workers.	Human capital	• Ensure, as far as possible, that contactors recruit local labour. • Establishing skills development programmes in areas where most employment opportunities will be available such as operators and artisans, e.g. learnerships and graduate training programmes.
DECOMMISSIONING AND CLOSURE				
51	Rehabilitation and decommissioning activities	• Ineffective removal of infrastructure and closure of opencast pit, resulting in a void in the landscape. • Ineffective rehabilitation leading to poor vegetation	Biodiversity / Soil, Land Use & Capability End land use	• Development of a Rehabilitation, Decommissioning and Closure Plan (GN1147), including but not limited to: o Concurrent rehabilitation and levelling of opencast pits. o Dismantling of infrastructure and rehabilitation of infrastructure areas post-mining. All surface infrastructure is to be removed and waste material disposed of at a registered dump site. Waste and remnant mine related material are not to be dumped or left within the footprint areas.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
		cover or and permanent scarring of the landscape.		○ Final rehabilitation of disturbed areas. Where soils have been compacted, they are to be ripped and where necessary reprofiled. ○ Rehabilitation and capping of the MRF post-mining. ○ Ongoing revegetation of levelled areas. Indigenous floral species are to be used for revegetation of disturbed areas. Where possible, reinstatement of floral communities similar to the reference vegetation type for the area must form the goal of rehabilitation activities. ○ Ongoing monitoring and assessment to ensure that rehabilitation and vegetation cover is sustainable. • Annual review of Rehabilitation, Decommissioning and Closure Plan (GN1147). • Decommissioning and demolition of footprints and adjacent disturbed areas should be kept as small as possible and no further vegetation should be cleared or soils exposed for this purpose. • As an overarching closure and rehab objective, the rehabilitation should aim to reinstate natural hydropedological processes. This can be achieved by replacing the soil material in the same sequence as in the pre-mining scenario. This will likely restore (to a degree) some functionality of the remaining wetlands as far as possible. • Continue monitoring of rehabilitation activities for a minimum period of 5 years following the mine closure or until an acceptable level of habitat and biodiversity re-instatement has occurred, in such a way as to ensure that natural processes and veld succession will lead to the re-establishment of the natural wilderness conditions which are analogous to the post-closure rehabilitation goal for the mine.
52	Rehabilitation and decommissioning activities	• Potential hard setting of soils post-reclamation. • Subsidence of rehabilitated areas. • Erosion.	Biodiversity / Soil, Land Use & Capability End land use	• Limit vehicular movement after topsoil placement. • Reclaim or apply protective covering on disturbed soils as quickly as possible. • Rehabilitation of disturbed areas to free-draining scenario, preventing ponding. • Regular monitoring to identify and rectify subsidence. • Apply erosion controls relative to possible soil erosion from vehicular traffic and during mining activities (e.g. jute netting, silt fences, and check dams). • Stabilise all areas of disturbed soil using weed-free native shrubs, grasses, and forbs. • Soil erosion will be mitigated by planting pioneer grass species to stabilise soil. • Ongoing soil fertility monitoring.
53	Rehabilitation and decommissioning activities	• Impacts on the hillslope processes supporting the watercourse downstream. • Alteration of hydropedological flow drivers of the wetlands.	Aquatic/wetland systems	• Reinstatement of hydropedologically important soils should be undertaken for the remaining wetland portions in the landscape. • Although subsidence and cracking are not expected to occur, monitoring is deemed essential to ensure that the wetlands as well as the wetland recharge mechanisms remain unimpacted during all phases of development.

ID	Risk (impact) trigger	Potential Impact	Aspects affected	Impact Management Actions (Mitigation Measures)
54	Rehabilitation and decommissioning activities	• Demolition and removal of infrastructure leading to dust generation, erosion and changes in the visual character of the area.	Biodiversity / Soil, Land Use & Capability Aesthetics	• Revegetation of exposed areas for long-term dust and water erosion control. • Indigenous and locally occurring plant species for use in re-vegetation should be selected taken quick growth rates into consideration to cover bare areas and prevent soil erosion.
55	Post-closure residual impacts	• Migration of pollution plume after full recovery of groundwater levels (prior to decant).	Water resources Aquatic/wetland systems	• Treatment of water prior to discharge – GOSA Treatment Strategy. • Groundwater and geochemical models must be updated on a regular basis (at least every 2 years) to verify potential decant.
56	Post-closure residual impacts	• Impact of long-term decant on water quality.	Water resources Aquatic/wetland systems	• Managing dirty water make from the various point sources. • Ensure that the pit water levels remain below the decant levels through the extraction and treatment of water as and where required. • Ensure that barrier pillars with neighbouring mines are as wide as possible. • Effectively reduce the infiltration potential of opencast pits through good rehabilitation, shaping, vegetation and run-off designs. • Where possible, coal discard from the Plant, and carbonaceous rocks should be placed in the deepest part of the pit (at least 20m deep) and covered as soon as possible. • Treatment of water prior to discharge – GOSA Treatment Strategy.
57	Post-closure residual impacts	• Ongoing proliferation of alien vegetation.	Biodiversity / Soil, Land Use & Capability Aquatic/wetland systems End land use Aesthetics	• Ensure sound implementation of the AIPCP for up to 2 years after closure but preferably until all AIP species are under control and no risk of spread to adjacent, natural habitat remains. • Follow up with alien and invasive plant control measures for a period of 5 years post-closure.
58	Post-closure residual impacts	• Downscaling and retrenchment.	Human capital	• Implement portable skills development programmes to enable retrenched employees to find alternative employment. • Design and implement economic development programmes that will assist people being retrenched in sustaining their livelihoods. • Establish a future forum with representation from the workforce to discuss potential difficulties and solutions. • Implementation of programmes to minimise and mitigate the impact of downscaling and retrenchment. • Implementation of capacity building programmes to minimise and mitigate the impact of mine downscaling and closure. • Design and implement economic development programmes that will assist Ogies and Phola in sustaining their livelihoods. • Engage Emalahleni Local Municipality in the closure planning to provide support and inputs into the broader regional planning.

8.3 RISK ASSESSMENT

8.3.1 Risk Assessment Methodology

The Glencore Corporate Risk Matrix was applied to ascertain the potential risk significance of the proposed underground mining activities and related surface infrastructure on the receiving environment. Where applicable, the cumulative impacts of the existing operational activities were considered. The Glencore Corporate Risk Matrix is provided in Table 41.

Table 41: Glencore Corporate Risk Matrix

LIKELIHOOD [of the event occurring with that consequence]					
Basis of Rating	**E - Rare**	**D - Unlikely**	**C - Possible**	**B - Likely**	**A – Almost Certain**
Lifetime	Unlikely to occur during a lifetime	Could occur about once during a lifetime	Could occur more than once during a lifetime	May occur about once per year	May occur several times per year
OR	OR	OR	OR	OR	OR
Project or Trial or Fixed Time Period	Very unlikely to occur	More likely NOT to occur than to occur	As likely to occur as not to occur	More likely to occur than not occur	Expected to occur
OR	OR	OR	OR	OR	OR
New Process / Plant / R&D	No known occurrences in broader worldwide industry	Has occurred at least once in broader worldwide industry	Has occurred at least once in the mining / commodities trading industries	Has occurred at least once within Glencore	Has occurred several times within Glencore
	15 (M)	**19 (H)**	**22 (H)**	**24 (H)**	**25 (H)**
	10 (M)	**14 (M)**	**18 (H)**	**21 (H)**	**23 (H)**
	6 (L)	**9 (M)**	**13 (M)**	**17 (H)**	**20 (H)**
	3 (L)	**5 (L)**	**8 (M)**	**12 (M)**	**16 (M)**
	1 (L)	**2 (L)**	**4 (L)**	**7 (M)**	**11 (M)**

CONSEQUENCE [potential foreseeable outcome of the event]			
	Environment	**Image & Reputation Community**	**Legal & Comliance**
5 Catastrophic	• Unconfined and widespread. • Environmental damage or effect (permanent; >10 years). • Requires major remediation.	• Loss of multiple major customers or large proportion of sales contracts. • Sustained campaign by one or more international NGOs resulting in physical impact on the assets or loss of ability to operate. • Security incident resulting in multiple fatalities or major equipment damage. • Formal expression of significant dissatisfaction by government. • Grievance from internal or external stakeholder alleging human rights violation resulting in multiple fatalities. • Loss of multiple major customers or large proportion of sales contracts.	• Major litigation/ prosecution at Glencore corporate level. • Nationalisation / loss of licence to operate.

4 Major	• Long-term (2 to 10 years) impact. • Requires significant remediation.	• Security/stakeholder incident resulting in single loss of life or equipment damage. • Grievance from internal or external stakeholder alleging human rights violation resulting in single fatality or serious injuries. • Topic of broad societal concern and criticism. • Negative media coverage at international level resulting in a corporate statement within 24 hours. • Investigation from government and/ or international (or high-profile) NGOs. • Complaints from multiple "final" customers. • Loss of major customer. • Negative impact on share price.	• Major litigation / prosecution at Department level.
3 Moderate	• Medium-term (<2 years) impact (typically within a year) • Requires moderate remediation	• Negative media coverage at national level over more than one day. • Complaint from a "final" customer. • Off-spec product. • Local Stakeholder action resulting in national societal scrutiny.	• Major litigation / prosecution at Operation level.
2 Minor	• Near source • Short-term impact (typically <week) • Requires minor remediation	• Negative local/ regional media coverage. • Complaint received from an internal or external stakeholder.	• Regulation breaches resulting in fine or litigation.
1 Negligible	• Near source and confined • No lasting environmental damage or effect (typically <day) • Requires minor or no remediation	• Negligible media interest.	• Regulation breaches without fine or litigation.

8.3.2 Risk Assessment of Existing Operations and Proposed Changes

The proposed revised mining plan entails undertaking opencast mining prior to the proposed underground mining, and as a result the proposed incline shafts will be developed into the high walls of the opencast areas. The risk assessment was therefore undertaken based on the chronological order of the proposed mine plan, i.e. that the opencast mining will occur prior to the development of the inclines. Should the mine plan change, the risk assessment will need to be revised accordingly to adequately consider the impact of the proposed underground development and to ensure that appropriate mitigation measures are implemented to ensure that the significance of potential impacts are minimised as much as possible.

The impact risk matrix for the GGV Complex is provided in Table 42.

Table 42: Impact Risk Matrix for the GGV Complex

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
PRE-CONSTRUCTION PHASE (PLANNING PHASE)									
1	Re-alignment of Road P53-1 over mined out area	• Subsidence of road. • Impact on long-term stability of road.	Community	B	3	17 (H)	E	3	6 (L)
2	Unsafe intersection of the re-alignment with Provincial Road R545	• Safety of road users may be compromised. • Increase in road accidents.	Community	C	3	13 (M)	D	2	5 (L)
3	Construction and operational activities, including future opencast mining and infrastructure development	• Potential degradation and modification of the remaining extent of the receiving freshwater environment, further loss of wetland ecological structure and related ecological service provisioning. • Degradation of remaining floral habitat, terrestrial diversity. • Impact on Species of Conservation Concern (SCC).	Environment	C	3	13 (M)	D	1	2 (L)
4	Undermining of main river diversion and remaining wetlands	• Potential subsidence of surrounding environment if pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow. • Alteration of hydropedological flow drivers of the wetlands.	Environment	B	3	17 (H)	D	3	9 (M)
5	Construction and operational activities, including future opencast mining and infrastructure development	• Spread of AIPs, leading to potential loss of floral habitat and species diversity from surrounding natural habitat outside of the footprint areas. • Indirect impact on watercourses due to AIP removal.	Environment	C	2	8 (M)	D	2	5 (L)
CONSTRUCTION PHASE – ADDITIONAL INFRASTRUCTURE, INCLINE SHAFTS & ROAD-RE-ALIGNMENT									
6	Vegetation clearing for the purpose of establishing a construction camp	• Soil erosion and dust generation during vegetation clearance activities. • Habitat destruction.	Environment	B	2	12 (M)	D	2	5 (L)
7	Construction of road re-alignment	• Exposure of soils, leading to increased runoff, erosion and increased potential for sedimentation.	Environment	A	2	16 (M)	D	2	5 (L)

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
		• Proliferation of alien vegetation because of disturbances.							
8	Construction of road re-alignment	• Construction activities will generate noise.	Community	A	2	16 (M)	D	2	5 (L)
9	Construction of road re-alignment	• Construction activities resulting in open, unprotected soils which are prone to wind erosion leading to an increase in dust and a reduction in ambient air quality in the MRA area and along the re-alignment.	Environment	A	2	16 (M)	C	1	4 (L)
10	Increased vehicle movements within the construction areas	• Indiscriminate driving through the open veld leading to increased vehicle related mortalities of faunal species.	Environment	C	1	4 (L)	D	1	2 (L)
11	Waste/Hydrocarbon handling	• Accidental spills and/or leakages of hazardous chemicals and hydrocarbons resulting in soil contamination. • Contamination of water resources due to spillage of construction material and waste and/or poor management of sewerage waste at construction sites. • Poor handling of waste and the transport of building material can cause various types of spills (especially hydrocarbons) that may potentially infiltrate and contaminate the underlying groundwater system.	Environment	B	2	12 (M)	D	2	5 (L)
12	Increased personnel on site	• Increased risk of veld fires leading to loss of faunal and floral species as well as alteration of plant diversity in the surrounding areas. • Hunting/collection of common faunal species.	Environment	C	2	8 (M)	D	1	2 (L)
13	Construction activities Removal of topsoil	• Impact on cultural and heritage significance within close proximity of construction activities. • Recovery of sub-surface sites during construction and/or excavation. • Loss of fossil heritage.	Community	C	3	13 (M)	D	2	5 (L)
14	Need of human resources and recruitment	• Creation of temporary construction employment.	Community	A	2	16 (M) (positive)	A	2	16 (M) (positive)

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
15	Construction of intersections with R545 and existing P53-1	• Disruption in daily living and movement patterns. • Traffic congestion. • Safety of road users may be compromised. • Increase in road accidents.	Community	A	2	16 (M)	C	2	8 (M)
OPERATIONAL PHASE									
16	Surface disturbance caused by ongoing mining and infrastructure development	• Loss of topsoil due to incorrect stripping and stockpiling.	Environment	C	3	13 (M)	D	3	9 (M)
17	Surface disturbance caused by ongoing mining and infrastructure development	• Spread of AIPs, leading to potential loss of habitat and species diversity from surrounding natural habitat. • Loss of favourable floral/ faunal habitat outside of the direct mining footprint due to poorly managed edge effects, including a decrease in diversity and loss/decline of potentially occurring SCC.	Environment	C	3	13 (M)	D	2	5 (L)
18	Surface disturbance caused by ongoing mining and infrastructure development	• Potential degradation and modification of the remaining extent of the receiving freshwater environment. • Further loss of wetland ecological structure and related ecological service provisioning. • Alteration of hydropedological flow drivers of the wetlands. • Increased flood peaks into the wetlands because concentration of surface runoff. • Potential for erosion of terrestrial areas because of the formation of preferential flow paths, leading to sedimentation of the wetlands. • Increased sedimentation into the Zaaiwaterspruit due to uncontrolled surface run-off.	Environment	B	3	17 (H)	D	3	9 (M)
19	Operational activities, opencast mining and surface dumps	• Loss of catchment yield due to stormwater containment and decreased surface runoff.	Environment	C	3	13 (M)	C	2	8 (M)

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
		• Potential stream flow impact because of the stream diversions. • Reduction in volume of water entering the wetlands, leading to loss of recharge (and thus potential desiccation) of the wetland system. • Further altered vegetation communities due to moisture stress.							
20	Operational activities, opencast mining and surface dumps	• Water quality impact on water resources due to uncontrolled dirty water runoff. • Water quality impacts due to infiltration of water from the dirty water facilities, CHPP and mine residue facilities.	Environment	C	3	13 (M)	D	2	5 (L)
21	Undermining of main river diversion and remaining wetlands	• Potential subsidence of surrounding environment if pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow. • Potential creation of a cone of depression, which may drain water from surrounding wetland habitats, resulting in desiccation of the wetlands.	Environment	B	3	17 (H)	D	3	9 (M)
22	Dewatering of underground workings	• Water entering the underground mining area because of ingress into underground mine workings may necessitate dewatering of the underground mining area, which may result in the discharge of dirty water into the surrounding wetland environment.	Environment	C	3	13 (M)	D	2	5 (L)
23	Mining activities On-site conveyance of ROM & product	• Spillages along haul roads could impact on water quality.	Environment	B	2	12 (M)	D	2	5 (L)
24	Uncontrolled runoff from road re-alignment surface	• Increased flood peaks because of concentration of surface runoff leading to erosion and the formation of preferential flow paths.	Environment	B	2	12 (M)	C	2	8 (M)

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
		• Risk of contaminated stormwater runoff (e.g. hydrocarbons, sediment, originating from impermeable road surface).							
25	Opencast and underground mining	• Dewatering of aquifer because of mining.	Environment	A	2	16 (M)	B	2	12 (M)
26	Operational activities, opencast mining and surface dumps	• Decrease in regional water quality.	Environment	C	2	8 (M)	D	2	5 (L)
27	Mining activities On-site conveyance of ROM & product	• Air quality impacts associated with mining and blasting activities and movement of vehicles, hauling of ROM coal.	Environment	B	2	12 (M)	C	2	8 (M)
28	Materials handling, processing	• Air Quality (dust) impact caused by materials handling, crushing and screening operations.	Environment	B	2	12 (M)	C	1	4 (L)
29	Mine residue facilities, product stockpiles	• Increased dust emissions from the surface dumps and stockpiles, MRF.	Environment	B	2	12 (M)	C	2	8 (M)
30	Opencast and underground mining	• Methane emissions leading to air quality impacts.	Environment	C	2	8 (M)	C	1	4 (L)
31	Underground mining	• Air quality impacts associated with ventilation shafts.	Environment	C	2	8 (M)	D	2	5 (L)
32	Mining activities, mine residue facilities and surface dumps	• Spontaneous combustion during pillar mining leading to air quality impacts. • Spontaneous combustion of surface dumps.	Environment	B	2	12 (M)	D	2	5 (L)
33	Operational activities, opencast mining and surface dumps	• Health impacts due to air pollution.	Community	C	3	13 (M)	D	2	5 (L)
34	Operational and mining activities and surface dumps	• Elevated noise levels caused by mining operation, hauling of ROM and coal, processing coal and blasting activities. • Noise impact (especially during the night) because of the ventilation systems/ extractor fan.	Community	B	2	12 (M)	C	2	8 (M)
35	Operational activities, opencast mining and surface dumps	• Increased Visual Intrusion and Visibility of the mining operations and associated infrastructure.	Environment	D	2	5 (L)	D	1	2 (L)

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
36	Night-time lighting	• Increased Visual Intrusion and Visibility of the proposed infrastructure due to night-time lighting.	Environment	C	2	8 (M)	D	1	2 (L)
37	Blasting operation within the open pit area	• Potential damage to road infrastructure. • Potential for fly-rock, impacting on the safety of the road users.	Community	C	3	13 (M)	D	2	5 (L)
38	Blasting operation within the open pit area	• Impact on the communities because of blasting activities.	Community	C	3	13 (M)	D	2	5 (L)
39	Blasting operation within the open pit area Operational activities, opencast mining and surface dumps	• Destruction of heritage resources because of mining activities. • Impact on the Mosque and Muslim Graves. • Loss of fossil heritage.	Community	B	3	17 (H)	D	3	9 (M)
40	Blasting operation within the open pit area Emulsion silos	• Water quality impacts (lowering of pH and increased nitrate levels) because of explosives dissolving in water. • Safety and health risk associated with handling and preparation of bulk explosives.	Environment	C	2	8 (M)	D	2	5 (L)
41	Transport of product (Rail Loop) Truck transport	• Increase of ambient noise levels along the rail route and product transport route.	Community	B	2	12 (M)	C	2	8 (M)
42	Transport of product (Rail Loop) Truck transport	• Dust impacts caused by materials handling. • Material and product loss from load bins. • Increase in vehicle entrained dust.	Community	B	2	12 (M)	D	2	5 (L)
43	Transport of product (Rail Loop) Truck transport	• Killing of animals crossing the railway, avifauna.	Environment	C	2	8 (M)	C	1	4 (L)
44	Transport of product (Rail Loop) Truck transport	• Increased traffic leading to safety risk to other road users.	Community	B	2	12 (M)	C	2	8 (M)
45	Transport of product (Rail Loop) Truck transport	• Spillages leading to environmental impact and safety risks.	Environment	C	2	8 (M)	D	2	5 (L)
46	Waste management	• Poor waste management could lead to environmental impacts.	Environment	C	2	8 (M)	C	1	4 (L)

ID	Risk (impact) trigger	Potential Impacts	Consequence Category	Without Mitigation			With Mitigation		
				Likelihood	Consequence	Risk Rating	Likelihood	Consequence	Risk Rating
47	Hydrocarbon management	• Soil and water quality impacts because of poor hydrocarbon management and spillages.	Environment	C	2	8 (M)	D	2	5 (L)
48	Bulk electricity	• Further impact on over-allocated electricity reticulation system.	Community	B	3	17 (H)	C	2	8 (M)
49	Bulk water	• Spills due to pipe leaks and spills.	Environment	B	2	12 (M)	C	1	4 (L)
50	Socio-economic	• Influx of temporary workers.	Community	B	3	17 (H)	C	2	8 (M)
DECOMMISSIONING AND CLOSURE									
51	Rehabilitation and decommissioning activities	• Ineffective removal of infrastructure and closure of opencast pit, resulting in a void in the landscape. • Ineffective rehabilitation leading to poor vegetation cover or and permanent scarring of the landscape.	Environment	C	4	18 (H)	D	4	14 (M)
52	Rehabilitation and decommissioning activities	• Potential hard setting of soils post-reclamation. • Subsidence of rehabilitated areas. • Erosion.	Environment	C	3	13 (M)	D	3	9 (M)
53	Rehabilitation and decommissioning activities	• Impacts on the hillslope processes supporting the watercourse downstream. • Alteration of hydropedological flow drivers of the wetlands.	Environment	C	3	13 (M)	D	2	5 (L)
54	Rehabilitation and decommissioning activities	• Demolition and removal of infrastructure leading to dust generation, erosion and changes in the visual character of the area.	Community	C	2	8 (M)	D	2	5 (L)
55	Post-closure residual impacts	• Migration of pollution plume after full recovery of groundwater levels (prior to decant).	Environment	B	3	17 (H)	C	2	8 (M)
56	Post-closure residual impacts	• Impact of long-term decant on water quality.	Environment	A	4	23 (H)	C	3	13 (M)
57	Post-closure residual impacts	• Ongoing proliferation of alien vegetation.	Environment	B	3	17 (H)	C	2	8 (M)
58	Post-closure residual impacts	• Downscaling and retrenchment.	Community	A	3	20 (H)	B	2	12 (M)

8.4 ASSUMPTIONS, UNCERTAINTIES AND KNOWLEDGE GAPS

This EIA and specialist studies were carried out with the information available to the specialists at the time of executing the study, within the available timeframe and budget. The sources consulted are not exhaustive and additional information which might strengthen arguments or contradict information in this and supporting reports might exist. In addition, with the environment being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. It is, however, anticipated that the social and environment attributes that will be affected by the proposed amendment activities have been accurately assessed and considered, based on the site observations undertaken and is sufficient for the Competent Authority to make an informed decision.

The risk assessment is based on the following assumptions:

- No underground mining will be undertaken within areas associated with the main river diversion and remaining wetlands at depths of less than 20m.
- The existing approved mine plan for opencast mining be followed and the incline shafts will be developed into the highwall of the opencast pits.

Should a future decision be taken to mine the shallower seams, or if opencast mining does not proceed prior to underground mining, it will be necessary to revise the risk assessment accordingly to adequately consider the impact of the proposed development.

It was further assumed that the mitigation measures proposed in Table 40 will be considered during the planning phase, implemented during the construction phase, and continued during the operational phase.

The assumptions and limitations associated with the impact modelling are presented in the specialist reports and are not repeated here.

9 PUBLIC PARTICIPATION APPROACH AND METHODOLOGY

9.1 OBJECTIVES OF PUBLIC PARTICIPATION

The public consultation process is designed to provide information to and receive feedback from IAPs That feedback is in turn fed into the EIA process. This provides IAPs with the opportunity to raise concerns and make comments and suggestions regarding the proposed activity. Public participation is an essential and regulated requirement for an environmental authorisation process and must be undertaken in terms of the EIA Regulations.

The approach to engagement with stakeholders is conducted in terms of regulations 40 – 44 of the 2014 EIA Regulations, with a purpose of a process in which potential IAPs are given an opportunity to comment on or raise issues relevant to specific matters. Therefore, the objectives of the Public Participation Process are to:

- Provide IAPs with an opportunity to voice their support, concerns and comments regarding the project, application, or decision.
- Provide an opportunity for IAPs, the EAP and the CA to obtain clear, accurate and understandable information about the environmental, social, and economic impacts of the proposed activity or implications of a decision.
- Provide IAPs with the opportunity of suggesting ways of reducing or mitigating negative impacts of an activity and for enhancing positive impacts.
- Enable the applicant to incorporate the needs, preferences, and values of affected parties into the application.

9.2 INTERESTED AND AFFECTED PARTY REGISTER

According to the guidelines on public participation issued by the then Department of Environmental Affairs, over and above the placement of general notices on site or in the media inviting IAPs to participate in the application process, certain stakeholders should be specifically approached (organs of state, the owner or person in control of the land etc. are automatically regarded as IAPs). Further, the guideline indicates that the following means can be used, to identify stakeholders:

- social profiles or probes provide a comprehensive summary of the key characteristics of the people of a community or area and can serve as a starting point to identify stakeholders;
- brainstorming profiles or probes that provide a comprehensive summary of the key characteristics of the people of a community or area;
- established lists and databases, held by consultancies, authorities or research institutions, may hold additional contact details of residents, non-government organisations, community-based organisations or constituents; and
- network or chain referral systems according to which key stakeholders are asked to assist in identifying other stakeholders. In terms of this application, existing databases, land ownership

details, affected institutions, government departments and authorities shall form the initial basis of the IAPs to be engaged.

Due to past Public Participation Processes, an existing IAP list exists indicating potential IAPs for the project, including:

- Competent Authority, i.e., Department of Mineral Resources and Energy (DMRE)
- Organs of State (Provincial and Local), i.e., Mpumalanga Department of Agriculture, Rural Development, Land Reform, Environmental Affairs (MDARDLEA), Department of Water and Sanitation (DWS), South African Heritage Resources Agency (SAHRA), Nkangala District Municipality (NDM), eMalahleni Local Municipality (ELM)
- Mining Right Landowners
- Neighbouring Landowners
- Land Occupants
- Environmental Non-Governmental Organisations
- Business and Community Based Organisations

The IAP register was established during the pre-application phase and updated continuously throughout the process. A copy of this list is attached as Appendix 1-1.

9.3 PROJECT NOTIFICATIONS

9.3.1 Pre-Application Notification

To facilitate awareness of the project by IAPs as well as government departments that administer laws that might impact on the activity, the following was undertaken as part of the Pre-application Notification:

- Placement of an advertisement in the Witbank News on 3 June 2022 to invite potential IAPs to register and to submit comments on the proposed application within 14 days.
- Distribution of notices and a translated Background Information Document (BID) via email and/or sms to all parties included in the IAP register such as landowners and occupiers on and adjacent to the site, provincial and local government departments including ward councillors and Non-Governmental and Community Based Organisations.
- Site notices was placed on 2 June 2022 on the project boundary and at public places to notify potential IAPs of the application, see table below for detail placements.

Name of Location	**Coordinate of Placement**
GGV Main Entrance Security Notice Board	
Phola Engen Garage	-25.4019346°S 28.7710918°E
Phola Police Station	-25.9972435°S 29.0353389°E
Ogies Usave	-26.0534192°S 29.0482999°E
Bafana Bafana Cell phone Furniture and Electronics, Ogies	29.0497137°E 26.0554547°S

Name of Location	Coordinate of Placement
Lewis Furniture next to Caltex, Ogies	-26.0468405°S 29.0607428°E
Ogies Spar	-26.0514131°S 29.0477525°E
Springboklaagte Entrance	-26.1160271°S 29.0579197°E

A copy of the notification sent is contained in Appendix 1-2, a copy of the advert placed in Appendix 1-3, and the On-Site Notice Report in Appendix 1-4.

9.3.2 Availability of the BAR and updated EMPr

The registered IAPs were notified of the availability of the draft BAR and EMPr on 11 August 2022 and provided with 30 days to review the reports and provide comments on or before 12 September 2022. Registered IAPs will also be notified of the Final BAR & EMPr once it has been submitted to the Competent Authority.

A copy of the notification sent is contained in Appendix 1-2.

9.3.3 Notification of the EA Decision and Appeal Period

Once the Competent Authority has taken a decision on the amendment application, registered IAPs will be notified of the decision and the Appeal Process.

9.3.4 Translation of Project Notices and Documents

The on-site notices and the BID were translated into isiZulu for distribution. IsiZulu is the largest spoken language group in both Wards 30 (Ogies) and 31 (Phola) with 47% and 66% respectively. The second most spoken language is Ndebele at an average of 13%.

9.4 ENGAGEMENT SESSIONS AND MEETINGS

Two focus group meetings were scheduled for 24 August 2022. The first meeting was scheduled for all GGV registered organisations from the Ogies area and the second for those registered organisations in the Phola area. A request was made by the stakeholders to rather have one combined meeting.

Invitations were sent out to the identified participants on 2 August 2022, and an update after the above request on 17 August 2022. No further special requests were received.

The purpose of the meeting was to provide information on the legislative processes and project activities to be amended. The outcome of the meetings will be to answer clarification questions and record any comments or concerns raised by stakeholders on the amendment application. At the meeting a presentation was distributed which summarised the findings of the basic assessment report. The presentation was taken by participants.

The stakeholders demanded that DMRE be invited and attend these meetings to ensure the community's issues are heard. It was explained that all documentation is submitted to DMRE, but

stakeholders did not feel comfortable to continue with the meeting without DMRE's presence. A transcript of the meeting is contained in Appendix 1-5.

An attendance register was filled but taken by stakeholders. Below photos of the meeting

9.5 PUBLIC REPORTS AND DOCUMENTATION

The following reports was compiled and made available to registered IAPs throughout the process:

- Draft BAR and EMPr
- Final BAR and EMPr

The draft BAR and EMPr was made available to all registered IAPs for 30 calendar days. Comments received is included in the Comments and Response Report (CRR) and incorporated into the final report. The following methods was used to make the reports available:

- Distributing with the notification a download link that accesses the reports.
- Directing local IAPs to Glencore Free Wifi Hotspots to download or view reports allowing each user with 500 Megabyte to 1 Gigabyte of data per day at Phola Community Library, Phola SAPS, Phola Taxi Rank, Ogies SAPS, Ogies Mast/Tower Taxi Rank, Ogies Spar, Glencore Ogies Business Hub, Ogies Library.
- Delivering of hard copies to organs of state.
- Placement of hard copies at the Glencore Business Hub in the Main Road of Ogies and at the Phola Thusong Centre, 697 Mahlangu Street, Phola.

9.6 COMMENTS AND RESPONSE REPORT (CRR)

A CRR was compiled with comments and responses received to date, a summary is provided below and the full CRR is attached as Appendix 1-6.

9.6.1 Affected Parties

Party	Date	Issue Raised	Response
MMS Masakhane Mining Supply & Construction cc Ogies Muslim Jamaat Ogies Township Company Boetie Gani	8 June 2022	Neighbouring landowners to the P53-1 road must be consulted.	All neighbouring landowners will be consulted.
	9 Sept 2022	Consultation regarding blasting schedules. No blasting before 10h00 and after 16h00.	Blasting schedules to be discussed if blasting is to take place within 1km of Mosque. Communication with the affected parties will continue as per the current procedure.
		Photographic record of assets and graves.	Management measures provided include fencing, buffers, pre-blast surveys and monitoring.
		Impact on and monitoring (quantity & quality) of boreholes	In the case of depletion or contamination of water resources due to mining activities, alternative supplies of water to replace existing usage will be negotiated with affected groundwater users based on a structured compensation protocol.
Nenqe Advance Ogies town Rainbow Genie's Pre-School & Day Care Principal A Muller Anemerska Guesthouse / Lodge, Ogies	12 Sept 2022	No community meeting was held. Feedback to stakeholders.	The EIA Regulations 2014 stipulate minimum requirements for public participation, which was fully complied with. The EIA Regulations do not require that public meetings be held with IAPs. However, a Focus Group meeting was held with representatives of the registered forums of the Ogies, Phola and surrounding farming communities on 24 August 2022. The Ogies Business Forum, as well as Ward Councillors attended the meeting, amongst others.
		Realignment of road (Interdict & access impacts).	The approved and new road alignments are indicated below (Figure 9 in the EMPr). The total length of the proposed (revised) re-alignment is 1.25 km vs original alignment length of 1.28 km. This is a deviation of less than 5% on the total road alignment. It is not foreseen that the re-alignment of the P53-1 will have any impact on the businesses in Ogies. Access to Ogies Town remains unchanged, and no change in traffic volumes is envisaged. You are correct that an interim interdict was granted to the Distressed Mining Community of Ogies preventing the closure of the Provincial Road P53-1 between the R555 and the R545. The proposed alignment of the P53-1 forming the subject of the amendment application, has been updated and does not represent the alignment and closure which previously formed the subject of the litigation. Insofar as a portion of the P53-1 will be closed in future, relevant applications will be made for the closure of the relevant portion of the P53-1.
		Underground mining behind the Ogies Combined school, houses, guesthouse and pre-school (impact on structures and quality of life).	It is noted that the underground mining has been approved on 20 April 2010 and does not constitute new mining activities. This amendment only addresses very slight changes to the approved underground mining schedule that was previously approved. No additional impacts are envisaged due to the change in mining schedule. Structures will not be undermined. The status quo will remain. If anything, the proposed amendment will reduce the opencast areas, leading to a reduction in impacts (noise, dust, etc.) in close proximity to the communities.
		Dust monitoring (nuisance and health impacts)	GGV Complex has an established dust fall-out monitoring network. Settleable particles (mg/m^2/day) are monitored via ground-based dust outfall buckets. The monitoring programme is re-evaluated on a regular basis as mining and infrastructure development progresses. In addition to the dust fallout monitoring, a real-time Particulate Matter (PM) monitoring system has been installed in Ogies, at the church building, to measure inhalable dust that could cause respiratory health issues. The monitoring data indicates no exceedances in respect of the prescribed limits for the pollutants assessed.

Party	Date	Issue Raised	Response
		Borehole at the Pre-school	It is unlikely that mining would impact the water quality of boreholes whilst operational, as water flows towards the mining areas. The borehole should be included in an updated hydrocensus, and if agreed with the owner it will be tested and monitored.
		Access to reports (download link not working)	The download link was tested numerous times. No compliant was received during the commenting period. Other stakeholder such as Zehir Omar Attorneys (representing Ogies Distressed Forum) successfully downloaded the documents.
Distressed Mining Community of Ogies / Save the Maize Belt Society	22 Sept 2022 (outside the commenting period)	Distressed Mining Community of Ogies is not registered as an IAP.	Members being included under items 45 – 47 in the IAP register indicates that the organization is indeed registered and specifically listed as an IAP.
		Public Participation / Notification Period allowed for review not adequate. Access to information by poor, illiterate communities.	Various methods were utilised to encourage IAPs to register and participate in the amendment application. The methods used are in compliance with the legislation. The amendment application is required to provide 30 days for comments. IAPs are free to request additional time and motivate such a request. Unfortunately you refrained from engaging with the EAP regarding your concerns within the commenting period, or making such reasonable requests for consideration. Provision was made to engage poor communities through their registered representatives. The Background Information Document circulated was also translated into the predominant local language.
		Air pollution, water pollution and damage to the property – High Court case. Air Quality Assessment (independence & accuracy).	This application does not relate to existing environmental impacts, the management or monitoring thereof. These aspects raised all relate to the existing operation that is currently authorized in terms of the various applicable legislation. The concerns should be addressed through the established structures and channels of resolution, of which legal action is one. The application for amendment will most likely reduce and not increase some of the impacts currently being experienced, especially where opencast mining is changed to underground mining. The air quality monitoring data was sourced from Glencore. It is however noted that the data is collected and analysed by an independent laboratory, Aquatico. The Glencore data was supplemented by available regional data. With air quality being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. However, the risks that have been identified is considered to be accurately assessed and thought through based on the available data. The key findings from the Environmental Impact Assessment (EIA) indicate that there will be limited new impacts due to the amendment application, rather a continuation of existing impacts on the socio-economic and physical environment. GGV Complex has an established dust fall-out monitoring network. Settleable particles ($mg/m^2/day$) are monitored via ground-based dust outfall buckets. The monitoring programme is re-evaluated on a regular basis as mining and infrastructure development progresses. In addition to the dust fallout monitoring, a real-time Particulate Matter (PM) monitoring system has been installed in Ogies, at the church building, to measure inhalable dust that could cause respiratory health issues. The monitoring data indicates no exceedances in respect of the prescribed limits for the pollutants assessed.
		Reduction of coal mining vs expansion of GGV mine.	The application is for the amendment of an already authorised mine and is not a new application for the establishment or expansion of a mine. The existing mining activities will continue regardless of this amendment application.

Party	Date	Issue Raised	Response
		Realignment of road (Interdict).	An interim interdict was granted to the Distressed Mining Community of Ogies preventing the closure of the Provincial Road P53-1 between the R555 and the R545. The proposed alignment of the P53-1 forming the subject of the amendment application, has been updated and does not represent the alignment and closure which previously formed the subject of the litigation. Insofar as a portion of the P53-1 will be closed in future, relevant applications will be made for the closure of the relevant portion of the P53-1.
Mafufela Community / Sgesgede Farm	17 June 2022	Disruption of movement if road is diverted.	Road diversion will not have a negative impact on the Mafufela community (Zaaiwater area) as the diversion is a distance away from them and there will be no changes to the access to Ogies Town.
		Benefits to neighbouring farm communities.	Glencore provides community business opportunity through the Glencore Enterprise & Supply Development programme. The community can register and apply through the ESD portal and can get physical assistance at Glencore's Business Hub in Ogies.

9.6.2 Organs of State

Party	Date	Issue Raised	Response
DWS	12 Sept 2022	Water Uses	The applicant shall conduct a preliminary legal assessment to identify all the water use activities associated with the proposed project that will require authorisation by the DWS.
MDARDLEA	12 Sept 2022	No objection	The Department has no objection to the proposed amendment development.
SAHRA	9 Sept 2022	Field-based Palaeontological Impact Assessment (PIA) be conducted	Dr Heidi Fourie was appointed to conduct a desktop study explaining and outlining the application.
		Blasting impact Subsidence CHMP	No direct impact (blasting/subsidence) is envisaged on the sites of cultural heritage significance. The potential indirect impacts are addressed in the EIA and CHMP, with the necessary management actions required to prevent any impacts. The CHMP (Appendix 4 of the EMPr) was submitted on the SAHRIS system together with the HIA.
MTPA	15 Sept 2022	No objection Updated map indicating ecological sensitive areas, wetlands and areas already mined. Wetland delineation	Scientific Aquatic Services (SAS) updated the wetland delineation map in 2022, indicating the remaining wetland systems within the GGV MRA. The remaining wetlands consists of channelled valley bottom and hillslope seep wetlands and pans as indicated in the figure below. The remaining wetland systems amount to approximately 555 ha, of which a further 264 ha will be destroyed under previous authorisations in terms of the MPRDA and NWA.
		Flora Study	Following commitments are made within the EMPr include a) develop and implement a Rescue and Relocation Plan for floral Species of Conservation Concern (SCC) prior to construction and further mining and operational activities commencing; b) The necessary permits should be obtained from the MTPA prior to the relocation of the SCC; c) The revegetated and surrounding areas will be monitored for declared weeds and invasive plants. This will be controlled and managed as per the Alien and Invasive Plant Control and Management Plan (AIPCP).

9.6.3 Interested Parties

Party	Date	Issue Raised	Response
Francisco Vilanculo Siyabonga one for the unemployed	20 June 2022 5 Sept 2022	Impact on water, heritage sites, land including air quality & visual impacts	It is noted that this application is not for the renewal of the mining licence. GGV Complex is an existing operational mine and has an approved Environmental Management Programme (EMPr). The key findings from the Environmental Impact Assessment (EIA) indicate that there will be limited new impacts due to the amendment application, rather a continuation of existing impacts on the socio-economic and physical environment. If anything, the proposed amendment will reduce the opencast areas with the subsequent reduction in impacts in close proximity to the communities. The EIA indicated that the proposed changes to the mining schedule and methodology will have a limited impact on the water resources in the area, provided that the mitigation measures in the EMPr are implemented
		Blasting Impacts	Ground vibration and air blast monitoring is conducted for all blasts near sensitive receptors to ensure that the acceptable limits are being achieved and to provide an indication of when modification are needed to the blasting method to correct for increased ground vibration and air blast levels.
		Heritage sites including graves	Most of the gravesites within the GGV area have been exhumed and relocated as mining operations extended. Some gravesites remain, most notably three sites in proximity to the Mosque that comprise Indian and black graves. Only underground mining is scheduled in this area and these gravesites therefore does not have to be relocated. A Cultural Heritage Management Plan (CHMP) was developed for GGV, which will be implemented to prevent any impacts on the remaining gravesites.
		Failure to optimize benefits in the local community	The GGV operation is an important economic driver within the local area, and contributes to the economic growth, employment and indirect and induced economic benefits of not just the local area, but within the Mpumalanga Province. Mining activities and associated employment benefits and Social and Labour Plan (SLP) contribution will continue regardless of whether this amendment is approved of not. There is a CSI budget allocation yearly. This fund supports initiatives which benefits the larger community and not an individual, political organizations, churches, business etc. Proposals from a registered entity are submitted to the Community Department and reviewed by the CSI committee.
		Spontaneous combustion on the discard facility	This application is not for a discard facility. The Mine Residue Facility (MRF) has been approved in 2006 and has been operating since 2009. There is no spontaneous combustion in the existing Mine Residue Facility (MRF) at Goedgevonden. Ongoing monitoring of the MRF's stability is conducted monthly through external professional engineers.
		Waste Management and contribution to reduction of littering	Although waste management in the communities is the responsibility of the Local Municipality, Glencore does support initiatives/requests such as clean up campaigns in the surrounding communities. A recent example is the sponsorship of the clean-up campaign by Tshikovha Graduates Academy under the Leader's Eye concept. Glencore sponsored wheelie bins, refuse bags, trees, compost, fertilizers and cement for the project.
		Biodiversity impacts	The proposed changes associated with this amendment application will not have an increased impact on the biodiversity as all activities will be undertaken within the open pit areas that was approved previously. GGV has a rehabilitation plan which is reviewed on a regular basis as mining progresses.
		Continuous engagement	Communication with the community will continue as per the current stakeholder engagement procedure.

10 ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

10.1 SUMMARY OF KEY FINDINGS

The key findings of the potential impacts associated with the proposed changes to the mining and infrastructure layout for the GGV Complex are listed below:

i. The geotechnical assessment concluded that due to the potential for unstable roof conditions and the formation of sinkholes, no underground mining should occur within areas associated with the main river diversion and remaining wetlands at depths of less than 20m. The proposed mine plan was revised to exclude mining shallower than 20m in these areas; thus, no mining of the 4 Lower seam will occur under the water resources and therefore the risk of roof collapse between the pillars will be low. This will also result in a low risk of water inrush after mine closure and the subsequent contamination of surface and groundwater downstream.

ii. The proposed change in activities will not result in any additional impacts to the soils and land capability as soils within the footprint area of the incline shafts and supporting surface infrastructure will have already been lost during preparation for the preceding opencast mining.

iii. The proposed change in activities will not result in the clearance of additional indigenous vegetation as all habitat and floral species within the footprint area of the incline shafts and supporting surface infrastructure will have already been lost during preparation for the preceding opencast mining. Indirect impacts from mining activities on the surrounding natural habitat may arise from poor AIP management, increased movement of personnel and sound and lighting impacts. Underground mining will pose low risks to floral communities. Cognisance of edge effects and indirect impacts however needs to be taken as these may pose a risk to potential faunal SCC in the adjacent sensitive habitats where no mining is planned.

iv. No direct risk of impact on floral SCC is anticipated from the proposed change in activities. However, given that there have been several changes to the environmental legislation since the previous authorisation of infrastructure and mining activities for GGV, especially regarding floral SCC, a Rescue and Relocation Plan should be implemented prior to vegetation clearing. This is applicable to the Natural Grasslands, Natural Wetlands, and Dams, and not the Modified Wetlands and the Transformed Habitat units.

v. The proposed development will not impact on any CBAs, ESAs, or protected areas. There is, however, potential for indirect impacts to habitat representative of the VU Eastern Highveld Grassland ecosystem (mainly confirmed for the Natural Wetlands adjacent to Incline 2). As such, edge effects to the Natural Wetlands outside of the footprint areas must be managed, and AIP proliferation and encroachment by especially *Seriphium plumosum* must be controlled.

vi. Further potential loss of faunal habitat in the remaining natural areas through AIP proliferation and edge effects poses a risk to the remaining faunal assemblages in the area. Further loss of habitat and species diversity will compound and add to the localised loss that is anticipated from the opencast activities, whilst failure to suitably rehabilitate will lead to

long-term and possibly permanent reductions in faunal habitat, species diversity and SCC in and surrounding the MRA.

vii. The proposed underground activities will not increase the impact on the surface yield in the catchment; however, potential subsidence of the surrounding environment if pillars are insufficient or inadequate to support the ground or if the depth of mining is too shallow could lead to inflows into the underground workings, which may drain water from surrounding wetland habitats. Reduction in the volume of water entering the remaining wetland systems could result in a loss of recharge (and thus potential desiccation) of the wetland system and downstream surface water resources, decreased ecoservice provision and further altered vegetation communities due to moisture stress.

viii. Groundwater flow will essentially be toward the opencast or into active/new mining areas until groundwater levels reach the flooding elevation. As far as could be determined, no other privately-owned boreholes are located within the indicated groundwater level impact zone.

ix. Until flooding occurs, the contamination plume will be restricted to the immediate vicinity of mining. Long-term decant volumes will be determined by the final mining design and the level of sealing of the incline shafts.

x. Blasting activities would take place during the construction of the incline portals, concurrently with existing and future opencast activities. Ground vibration levels may be unpleasant to sensitive receptors when blasting take place within approximately 1,000 m from structures used for residential, worship or business activities. Air blast levels will be clearly audible to surrounding receptors and the significance may be medium for the closest sensitive receptors. Mitigation is required and measures are proposed that could reduce the ground vibration and air blast levels.

xi. The potential unsafe zone from the active blasting area was calculated as 214 m. Using a minimum safety factor of 2 would set a minimum unsafe zone of 428 m from the active blasting area, although it is critical to note that the occurrence of fly rock can never be excluded. It is recommended that GGV use a minimum exclusion zone of 500 m (equipment, people or livestock).

xii. This impact takes into account the current and the proposed operations that will take place and the associated impacts arising from the activities on site. The predicted maximum ambient annual ground level concentration falls below the annual standard of 40 µg/m^3 for PM_{10} and 20 µg/m^3 for $PM_{2.5}$ respectively. The highest contributor to these annual concentrations were the bulldozing and materials handling operations.

xiii. The maximum predicted daily ground level PM_{10} concentration falls above the daily standard of 75 µg/m^3 at the site boundary. Similarly predicted $PM_{2.5}$ concentrations fall above the daily standard of 40 µg/m^3 at the site boundary. This is mainly noted along the R545 access road and rail siding, with dust generated from entrained dust from trucks making use of these haul roads, as well as tipping activities at the rail siding. PM_{10} exceedances are also noted at the northern boundary adjacent to the town of Ogies.

xiv. Dust fallout impacts remain within the residential and industrial limit at the site boundary. Exceedances of the industrial limit are noted close to material handling activities and open

piles. These areas will require additional mitigation measures implemented to reduce these impacts on site.

xv. The area has a complex noise sound character, with elevated sound levels in and around Ogies, as well as close to the various public haulage roads in the area. The proposed amendment will not significantly change the future noise levels in the area and the area would keep the existing noise character. If anything, the proposed amendment will reduce the opencast areas with the subsequent reduction in the extent of future noise levels.

xvi. The existing mining activities have altered the character of the landscape from a rural setting to a mining setting. As such, the visual impact associated with mining activities are already present in the area, and receptors within the vicinity thereof have grown accustomed to it. As such it can be considered that the proposed incline shaft areas and additional proposed mining operations will not have a negative effect on the landscape character of the area with a negligible additional visual impact on the receiving environment.

xvii. The existing mining activities act as an extensive source of high-level night-time lighting. The lighting environment of the region is therefore considered suburban with medium district brightness. As a result of the existing night-time light sources, lighting levels are not expected to significantly increase in this area due to the proposed infrastructure.

xviii. Several sites of cultural heritage importance (grave sites, historical structures) remain situated within the MRA, and care should be taken to avoid any impact on these sites. The Cultural Heritage Management Plan should be implemented and audited on a regular basis.

xix. Mining activities and associated employment benefits and SLP contribution will continue regardless of whether this amendment is approved of not. However, if the decision is taken not to approve the proposed amendments, some of the benefits may reduce slightly, i.e. tax contribution, capital formation. The LOM may also reduce slightly, thereby reducing the supply to Eskom for power generation.

The environmental and social sensitivity map is indicated in Figure 111 and indicates sensitive features that should be avoided and conserved as far as possible. It includes the following:

Environmental sensitive features	• Remaining wetlands • Remaining natural habitats / vegetation • Floodlines
Social sensitive receptors	• Communities, settlements • Residential, farm houses, workers houses • Religious facilities, schools, tourism
Heritage sites	• Remaining graves • Historical structures of significance

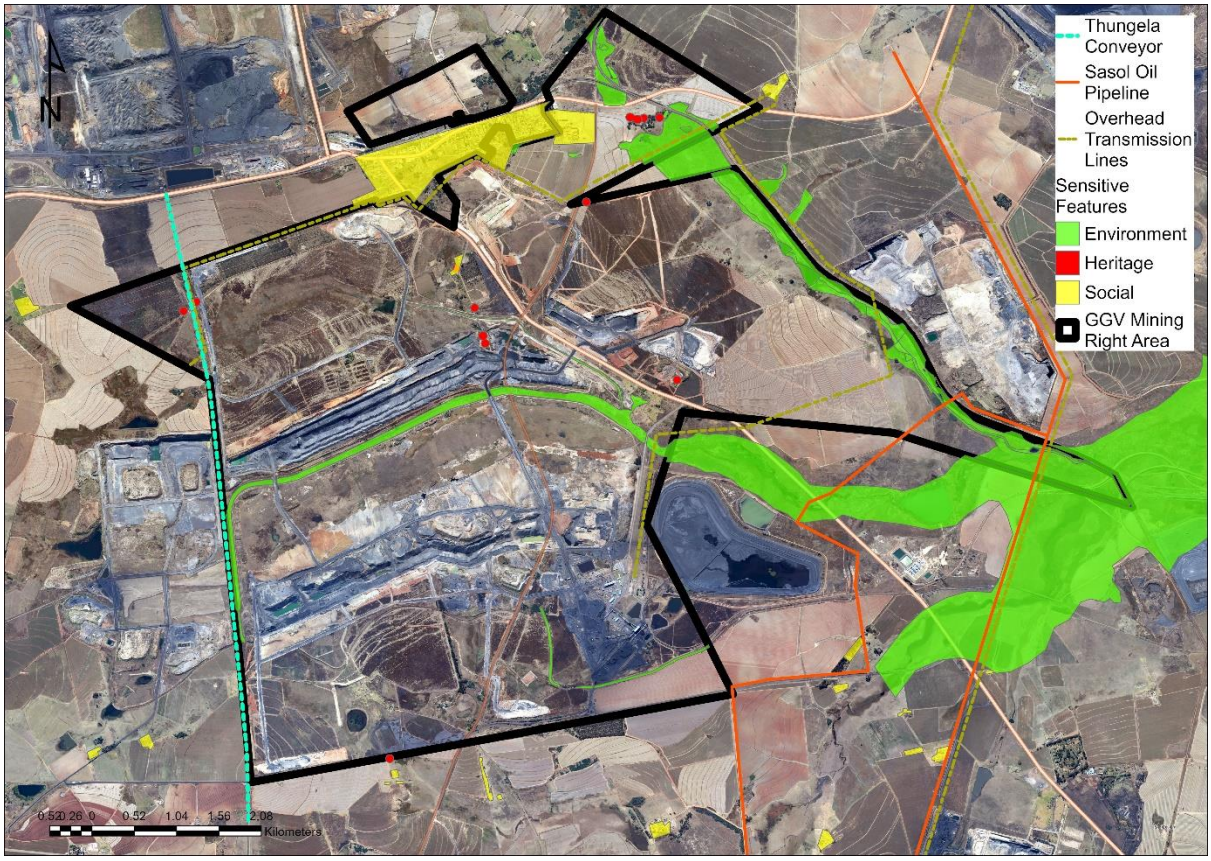


Figure 111: Environmental and Social Sensitivity Map

10.2 REASONED OPINION ON AUTHORISATION

The purpose of this application for an amendment is threefold:

- Introduction of additional underground areas and associated infrastructure
- Revision of the approved re-alignment of P53-1
- Reduction and/or extension of the GGV MRA

The main risk associated with the proposed underground mining is the potential for unstable roof conditions and the formation of sinkholes because of underground mining within areas associated with the main river diversion and remaining wetlands at depths of less than 20 m. The proposed mine plan was however revised to exclude mining shallower than 20 m in these areas and therefore the risk of roof collapse between the pillars will be low. Should a future decision be taken to mine the shallower seams, the risk assessment will need to be revised accordingly.

Should the existing approved mine plan for opencast mining be followed, namely, to develop the incline shafts into the highwall of the opencast pits, the development of the proposed shafts and underground mining areas will have a negligible, if any, additional impact in respect of most aspects. However, if opencast mining does not proceed, it will be necessary to revise the risk assessment accordingly to adequately consider the impact of the proposed development.

The revised re-alignment of Road P53-1 has been optimised to improve traffic safety in respect of the curvature back into the existing road, as well as to effect minimum impact on coal reserves. In addition, the approved re-alignment (EMPr, 2016) extends outside of GOSA's property boundary, whilst the proposed re-alignment remains on GOSA property.

The approval for the road re-alignment is in place and this application for an amendment is only a slight revision of the re-alignment of P53-1 that was approved in 2015. The total length of the proposed (revised) re-alignment is 1.25 km vs original alignment length of 1.28 km (2015). This is a deviation of less than 5% on the total road alignment. No additional impact is thus anticipated.

The reduction of the GGV MRA being negotiated with third parties will not change the impacts associated with the GGV operations. Similarly, the extension of the MRA to include the MRF will not result in any additional impacts, as these have been addressed and approved in the 2016 EMPr. If anything, it will positively mitigate mine health and safety aspects associated with the MRF which must be managed in terms of the Mine Health and Safety Act (MHSA), 1996 (Act 29 of 1996).

Mining activities and associated employment benefits and SLP contribution will continue regardless of whether this amendment is approved of not. The GGV operation is an important economic driver within the local area, and contributes to the economic growth, employment and indirect and induced economic benefits of not just the local area, but within the Mpumalanga Province. If the decision is taken not to approve the proposed amendments, some of the benefits may however reduce slightly, i.e. tax contribution, capital formation. The LOM may also reduce slightly, thereby reducing the supply to Eskom for power generation.

In conclusion, the key findings from the specialist studies and risk assessment indicate that there will be limited new impacts due to the amendment application, rather a continuation of existing impacts on the socio-economic and physical environment. If anything, the proposed amendment will reduce the opencast areas, leading to a reduction in impacts (noise, dust, etc.) in close proximity to the communities. Existing impacts on the environmental and local communities will continue regardless of this amendment. Having said this, appropriate mitigation measures have been identified to avoid and/or minimise the impacts associated with the existing approved activities.

In light of the above, it can be concluded that there are no environmental fatal flaws that should prevent the proposed amendment from proceeding provided that all the mitigation and management measures and conditions of authorisation are implemented.

10.3 CONDITIONS OF AUTHORISATION

The following conditions should apply in respect of the authorisation:

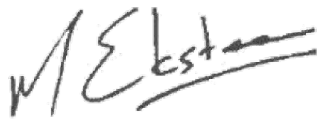
1. No underground mining is allowed within areas associated with the main river diversion and remaining wetlands at depths of less than 20 m.
2. All proposed road upgrades and improvements are to be designed by a professional engineer and submitted for official approval by the Mpumalanga Provincial Roads Department, prior to implementation.

3. The impact management actions (mitigatory measures) identified for the GGV Complex, as presented in Table 2 of the EMPr, should be implemented and audited on a regular basis.
4. The sensitive environmental and social sensitive features indicated in the Environmental and Social Sensitivity Map (Figure 111) that should be avoided and conserved as far as possible.
5. Prior to the commencement of new (future) construction and mining activities, a Rescue and Relocation Plan for floral SCC should be in place for implementation.
6. The Alien and Invasive Plant Control and Management Plan (Appendix 2 of the EMPr) should be implemented and audited on a regular basis.
7. The Integrated Water and Wastewater Management Plan (Appendix 3 of the EMPr) should be implemented and audited on a regular basis.
8. The Cultural Heritage Management Plan (Appendix 4 of the EMPr) should be implemented and audited on a regular basis.
9. Environmental monitoring, auditing and reporting as presented in Section 5 of the EMPr must be adhered to and review on a regular basis.
10. A Rehabilitation, Decommissioning and Closure Plan must be developed for the GGV Complex, in line with the *Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations* (GN No. R.1147 of 20 November 2015, as amended).

10.4 UNDERTAKING BY EAP

I, MC Eksteen (EAPASA No. 2020/1800) hereby confirms:

(i) the correctness of the information provided in the reports;
(ii) the inclusion of comments and inputs from stakeholders and IAPs;
(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and
(iv) any information provided by the EAP to IAPs and any responses by the EAP to comments or inputs made by IAPs.



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Signature

Date: 17 October 2022

11 TECHNICAL AND SUPPORTING INFORMATION

ANNEX-1	Public Participation Report	
ANNEX-2	Terrestrial Biodiversity Ecology Assessment	Scientific Terrestrial Services, 2022
ANNEX-3	Freshwater and Aquatic Ecology Assessment	Scientific Aquatic Services, 2022
ANNEX-4	Hydropedological Assessment	Zimpande Research Collaborative, 2022
ANNEX-5	Air Quality Impact Assessment	EBS Advisory, 2022
ANNEX-6	Noise Impact Assessment	Enviro-Acoustic Research, 2021
ANNEX-7	Blasting Impact Assessment	Enviro-Acoustic Research, 2021
ANNEX-8	Visual Impact Assessment	Scientific Aquatic Services, 2022
ANNEX-9	Socio-Economic Impact Assessment	Diphororo Development, 2022
ANNEX-10	Heritage Impact Assessment	A Pelser Archaeological Assessment, 2022
ANNEX-11	Geotechnical Assessment	Bare Rock Consulting, 2022
ANNEX-12	Groundwater Model Update	Groundwater Square, 2022
ANNEX-13	Desk-top Paleontological Impact Assessment	Dr Heidi Fourie