

Date: 22 April 2022

Ref: UKW-REP-033_E



MINING
STUDIES



ON-SITE TECHNICAL
SERVICES



CPR/ITR

Technical Report

ENVIRONMENTAL MANAGEMENT PROGRAMME AMENDMENT
FOR THE PROPOSED PLATINUM FLOTATION PLANT EXTENSION
AND FINE CHROME RECOVERY PLANT ON PORTION 3 OF THE
FARM DE GROOTEBOOM 373 KT, LIMPOPO PROVINCE

Prepared for: Department of Mineral Resources & Energy

Applicant: Glencore Operations South Africa (Proprietary) Limited

Prepared by: Ukwazi Mining Studies (Pty) Ltd

GLENCORE

UKWAZI
advisory

www.ukwazi.com

ENVIRONMENTAL MANAGEMENT PROGRAMME AMENDMENT FOR THE PROPOSED PLATINUM FLOTATION PLANT EXTENSION AND FINE CHROME RECOVERY PLANT ON PORTION 3 OF THE FARM DE GROOTEBOOM 373 KT, LIMPOPO PROVINCE

Prepared for: Department of Mineral Resources & Energy (“DMRE”)

**Prepared by: Ukwazi Mining Studies (Pty) Ltd
DMRE Reference No: LP 30/5/1/2/3/2/1/(176) EM**

Report Authors:

JC Vivier (PhD Environmental Management, M Org Leadership, Pr.Sci.Nat)

HD Gildenhuys (MSc Environmental Ecology, Pr. Sci Nat, EAPASA registered)

In compliance with the Protection of Personal Information Act, No. 37067 of 26 November 2013, any personal information provided herein has been provided exclusively for use as part of the environmental impact assessment process, and may therefore not be utilised for any purpose, other than that for which it was provided. No additional copies may be made of documents containing personal information unless permission has been obtained from the owner of said information. All documentation containing personal information must be destroyed as soon as the purpose for which the information was collected has run out.



mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESMENT REPORT And ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

**SUBMITTED FOR ENVIRONMENTAL AUTHORIZATION IN TERMS OF
THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND IN
TERMS OF THE MINERAL AND PETROLEUM RESOURCES
DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED)**

Name of Applicant: Glencore Operations South Africa (Proprietary)
Limited

Tel No: 013 230 6788

Postal Address: PO Box 403, Lydenburg, 1120

Physical Address: Farm Thorncliffe 374KT, Lydenburg

File Reference Number: LP 30/5/1/2/3/2/1/(176) EM

PLEASE NOTE:

The outline of this report was compiled in terms of the official EIA&EMPR report template by the Department of Mineral Resources and Energy (“DMRE”). Where repetition occurs as a result of the template being used, the relevant information will be cross referenced. An executive summary of the most important aspects of the report is provided in order to assist the reader.

IMPORTANT NOTICE:

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (“NEMA”), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of regulation 16(3)(b) of the EIA Regulations, 2014 (as amended), any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable, or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

The objective of the environmental impact assessment process is to, through a consultative process—

- (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- (b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- (c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- (d) determine the—
 - (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
 - (ii) degree to which these impacts—
 - (aa) can be reversed;
 - (bb) may cause irreplaceable loss of resources, and
 - (cc) can be avoided, managed or mitigated;
- (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- (g) identify suitable measures to manage, avoid or mitigate identified impacts; and
- (h) identify residual risks that need to be managed and monitored.

Table of contents

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT	9
1. Contact Person and correspondence address	9
1.1. Contact details of the EAP.....	9
1.2. Expertise and qualifications of the EAP.....	9
1.3. Summary of the EAP's past experience	9
2. Description of the property	9
2.1. Property details	9
2.2. Locality Map.....	10
3. Description of the scope of the proposed activity	15
3.1. Project background.....	15
3.2. Description of the activities to be undertaken.....	15
4. Existing authorisations	17
5. Authorisations required	17
5.1. Environmental Authorisation	17
6. Policy and Legislative Context	22
7. Need and desirability of the proposed activities	30
8. Motivation for the preferred development footprint within the approved site	35
8.1. Process to assess alternatives	35
8.2. Details of all alternatives considered	35
9. Details of public participation process	41
9.1. Site notices	41
9.2. Newspaper advertisement	41
9.3. Direct notification of identified I&AP's	41
9.4. Draft EIA & EMPR	41
9.5. Final EIA & EMPR	41
9.6. Summary of issues raised by I&APs	42
10. The Environmental attributes associated with the development footprint alternatives	43
10.1. Baseline environment	43
11. Impacts, risks and mitigation identified	64
11.1. Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts	64
11.2. Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	71

11.3. The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected 72

11.4. The possible mitigation measures that could be applied and the level of risk 72

11.5. Motivation where no alternative sites were considered..... 85

11.6. Statement motivating the alternative development location within the overall site 85

11.7. Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity 85

11.8. Assessment of each identified potentially significant impact and risk..... 86

11.9. Summary of specialist reports 89

12. Environmental impact statement 92

12.1. Summary of key findings of the environmental impact assessment..... 92

12.2. Final Site Map 92

12.3. Summary of the positive and negative implications and risks of the proposed activity and identified alternatives 92

12.4. Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr..... 93

12.5. Final proposed alternatives..... 93

12.6. Aspects for inclusion as conditions of authorisation 93

12.7. Description of any assumptions, uncertainties and gaps in knowledge..... 94

12.8. Reasoned opinion as to whether the proposed activity should or should not be authorised 94

12.9. Period for which the Environmental Authorisation is required..... 95

13. Undertaking..... 95

14. Financial Provision..... 95

14.1. Explain how the aforementioned amount was derived 95

14.2. Confirm that this amount can be provided from operating expenditure 95

15. Deviations from the approved scoping report and plan of study 96

15.1. Deviations from the methodology used in determining the significance of potential environmental impacts and risks 96

15.2. Motivation for the deviation..... 96

16. Other Information required by the competent Authority 96

16.1. Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998) 96

17. Other matters required in terms of sections 24(4)(a) and (b) of the Act..... 96

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT 97

18. Environmental management programme	97
18.1. Details of the EAP	97
18.2. Description of the aspects of the activity.....	97
18.3. Composite Map.....	97
18.4. A sensitivity map is included in	97
18.5. Description of impact management objectives including management statements.....	97
18.6. Impact Management Outcomes	109
18.7. Impact Management Actions	112
18.8. Financial provision.....	113
20. Undertaking	119
21. References	119
23. Appendices	120
23.1. Appendix 1: EAP’s curriculum vitae & qualifications	120
23.3. Appendix 2: Company profile.....	121
23.5. Appendix 3: Locality map	122
23.7. Appendix 4: Site plan	123
23.9. Appendix 5 Public Participation Documentation.....	124
23.10. Appendix 6: Specialist Reports.....	125

List of figures

Figure 2-1: Thorncliffe mine topographic locality map	11
Figure 2-2: Aerial locality map 1	12
Figure 2-3: Aerial locality map 2	13
Figure 2-4: Aerial locality map showing the surrounding farms and portions	14
Figure 3-1: FCR plant process flow diagram	15
Figure 3-2: PGM plant schematic diagram	16
Figure 3-3: PGM plant process flow diagram	16
Figure 5-1: The existing PGM plant.....	18
Figure 5-2: Site proposed for the FCR plant showing existing stockpiles and the chrome recovery plant	18
Figure 5-3: Site proposed for the FCR plant showing the boom stacker that will in future still be used	19
Figure 5-4: Site proposed for the PGM plant – view towards the south-west.....	19
Figure 5-5: Site proposed for the PGM plant – view towards the north-east	20
Figure 5-6: Site proposed for the PGM plant – view towards the east	20
Figure 8-1: Plant alternative locations considered.....	39
Figure 10-1: Period, day- and night-time wind rose (MM5 data for the period 2013 – 2015) (Airshed, 2022).	45
Figure 10-2: Seasonal wind rose (MM5 data for the period 2013 – 2015) (Airshed, 2022).	46
Figure 10-3: Wind rose for Thorncliffe Mine as per the weather station on site.....	47
Figure 10-4: Quarternary catchment map	49
Figure 10-5: Vegetation types identified in 2014 and 2021	51
Figure 10-6: Aerial photo showing the footprint area of the proposed FCR plant site and views of the site showing that no natural vegetation remains on site	51
Figure 10-7: Aerial photo showing the footprint area of PGM plant extension site Alternative 1 (preferred) and views of the site showing the disturbed nature of the site	52
Figure 10-8: Aerial photo showing the footprint area of PGM plant extension site Alternative 2 (not preferred) and views of the site showing the lack of vegetation except for the narrow strip of vegetation on the north-eastern boundary	52
Figure 10-9: Ecological sensitivity map	53
Figure 10-10: Education levels in GTLM (StatsSA, 2011)	60

Figure 10-11: Average household income in GTLM (StatsSA, 2011).....	61
Figure 10-12: Employment status of people aged 15-64 in GTLM (StatsSA, 2011).....	61
Figure 10-13: Regional Land Cover Map	63

List of tables

Table 1-1: Environmental Assessment Practitioner Details.....	9
Table 1-2: EAP Qualifications and Experience.....	9
Table 2-1: Property Details.....	9
Table 3-1: Key plant design criteria.....	16
Table 6-1: Project related legislation	22
Table 7-1: Need and desirability according to the 2014 EIA regulations	30
Table 8-1: Site selection matrix	38
Table 9-1: Table summarising comments and issues raised, and reaction to those responses.....	42
Table 10-1: Minimum, maximum and mean temperature and humidity measured at Lydenburg (weather station 0554816A7).....	43
Table 10-2: Rainfall figures recorded on site over the past 18 years	44
Table 10-3: Sekhukhune district population group by gender (FGTLM IDP, 2016/17)	59
Table 10-4: Frequently spoken languages in households in GTLM (StatsSA, 2011)	59
Table 10-5: Gender and age distribution within former GTLM (GTLM IDP, 2016/17)	59
Table 11-1: Impact Assessment Matrix	68
Table 11-2: Criteria used for rating impact significance.....	71
Table 11-3: Mitigation measures	73
Table 11-4: Assessment of identified impacts	86
Table 11-5: Summary of specialist recommendations	89
Table 12-1: Summary of activities and anticipated potential impacts	92
Table 18-1: Mitigation Measures to rehabilitate the environment.....	99
Table 18-2: Impact Management Outcomes	109
Table 18-3: Calculation of quantum for the FCR plant	113
Table 18-4: Calculation of quantum for the PGM plant extension	114

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1. Contact Person and correspondence address

1.1. Contact details of the EAP

Ukwazi Mining Studies (Pty) Ltd ("Ukwazi") assigned the environmental practitioners listed in Table 1 to undertake the required authorisation process for the EMPr Amendment.

Table 1-1: Environmental Assessment Practitioner Details

Consultant Name	Designation	Contract Number	Fax Number	Email
Dr. Christine Vivier	Environmental Assessment Practitioner	012 665 2154	012 665 1176	christine@ukwazi.com
Herman Gildenhuys	Environmental Assessment Practitioner	012 665 2154	012 665 1176	herman@ukwazi.com

1.2. Expertise and qualifications of the EAP

The Environmental Assessment Practitioner 's ("EAP") qualifications are indicated in Table 1-2.

Table 1-2: EAP Qualifications and Experience

Consultant Name	Qualifications	Years' Experience
Dr. Christine Vivier	PhD Environmental Management M Org Leadership MSc Medical Virology BSc Hons (Human Genetics) Pr. Sci Nat	20 years
Herman Gildenhuys	MSc Environmental Ecology B.Sc. Hons. Wildlife Management B.Sc. Agric Pr. Sci Nat EAPASA registered	15 years

1.3. Summary of the EAP's past experience

Please refer to Appendix 1 for the EAP's Curriculum Vitae & Qualifications and Appendix 2 for Ukwazi's Environmental Company Profile.

2. Description of the property

2.1. Property details

Glencore Eastern Mines is situated on the farm Thorncliffe 374 KT, the farm Helena 6JT and a portion of portion 3 of the farm De Grootboom 373KT in the Limpopo Province.

Glencore Eastern Mines consists of Thorncliffe, Magareng and Helena mines. The proposed project is located on Thorncliffe mine on a portion of portion 3 of the farm De Grootboom 373KT (Table 2-1).

The centre coordinates of the site are as follows:

Lat: -24.963507

Long: 30.126908

Table 2-1: Property Details

Aspect	Description
Farm Name:	A portion of portion 3 of the farm De Grootboom 373KT
Application area (ha)	1.6
Magisterial district:	Fetakgomo Tubatse Local Municipality
Distance and direction from nearest town	35 km south of Steelpoort and 33 km northwest of Lydenburg in the Limpopo Province
21-digit Surveyor General Code for each farm portion	T0KT0000000037300003

2.2. Locality Map

The site locality is indicated in Figure 2-1 to Figure 2-4.

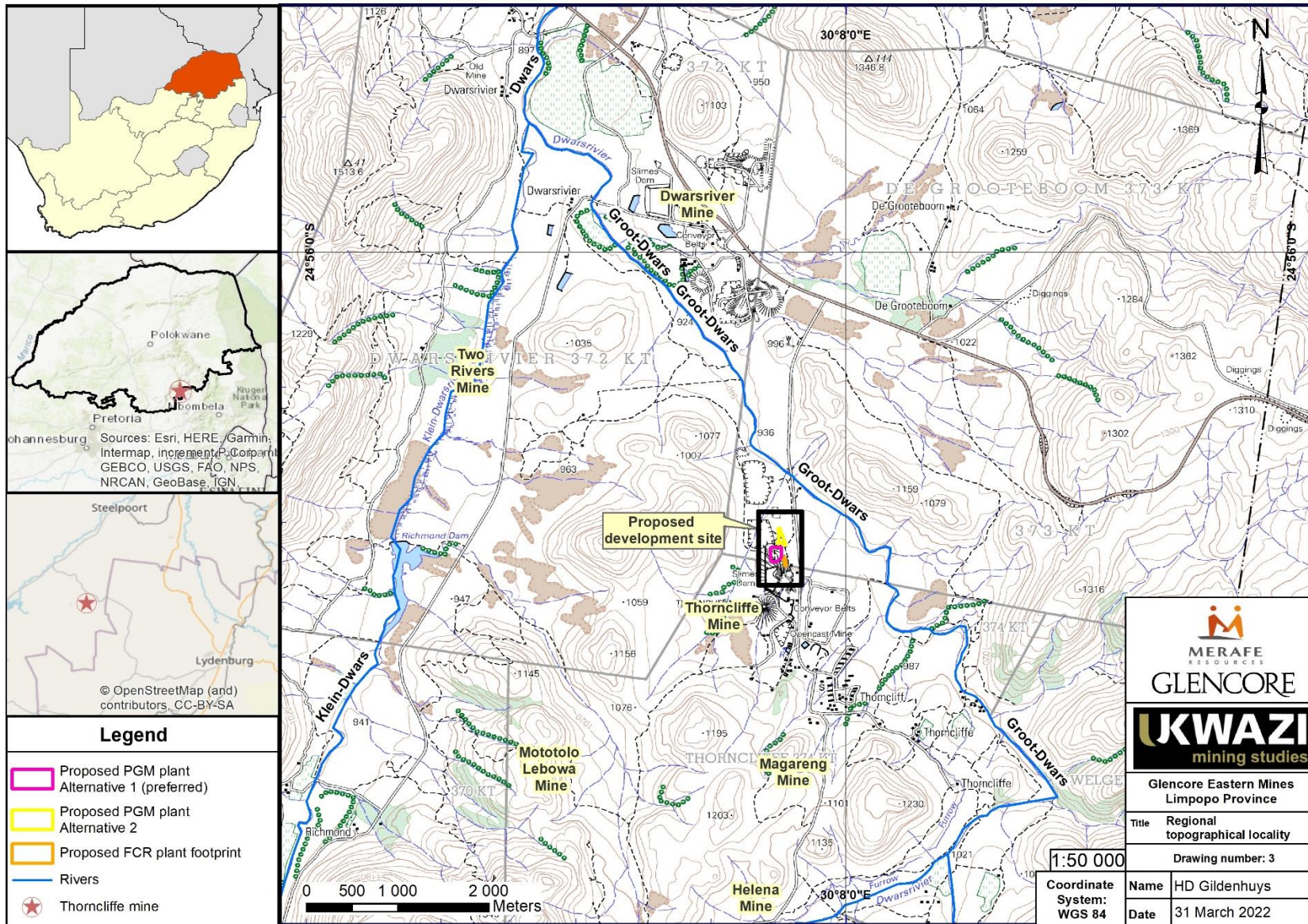


Figure 2-1: Thorncliffe mine topographic locality map

✉ info@ukwazi.com
 ☎ +27 (0)12 665 2154
 ☎ +27 (0)12 665 1176
 🌐 www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046
DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/
 Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07



MERAFE RESOURCES
GLENCORE
UKWAZI
 mining studies

Glencore Eastern Mines
 Limpopo Province

Title: Regional topographical locality
 Drawing number: 3

Name: HD Gildenhuis
 Date: 31 March 2022

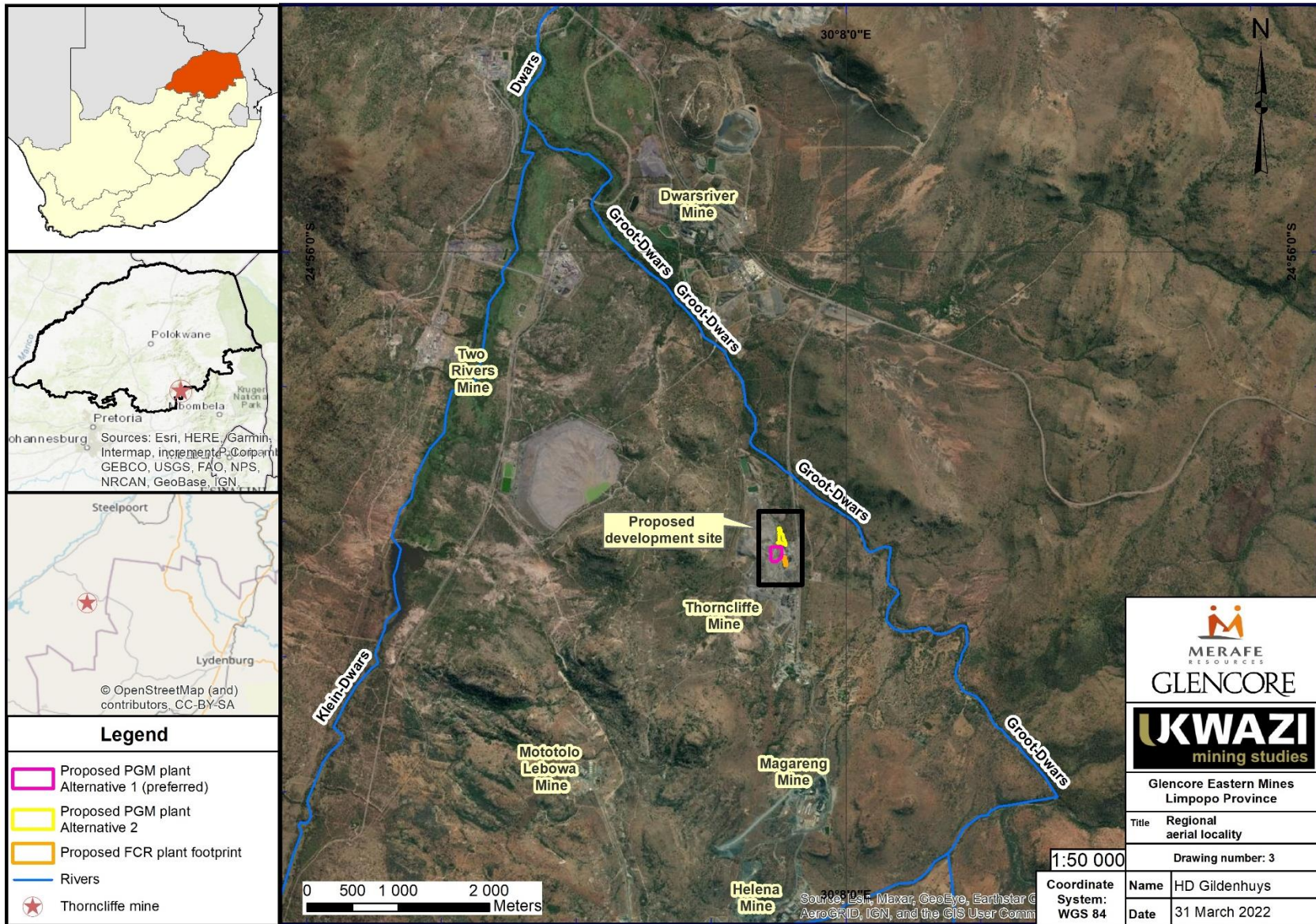


Figure 2-2: Aerial locality map 1

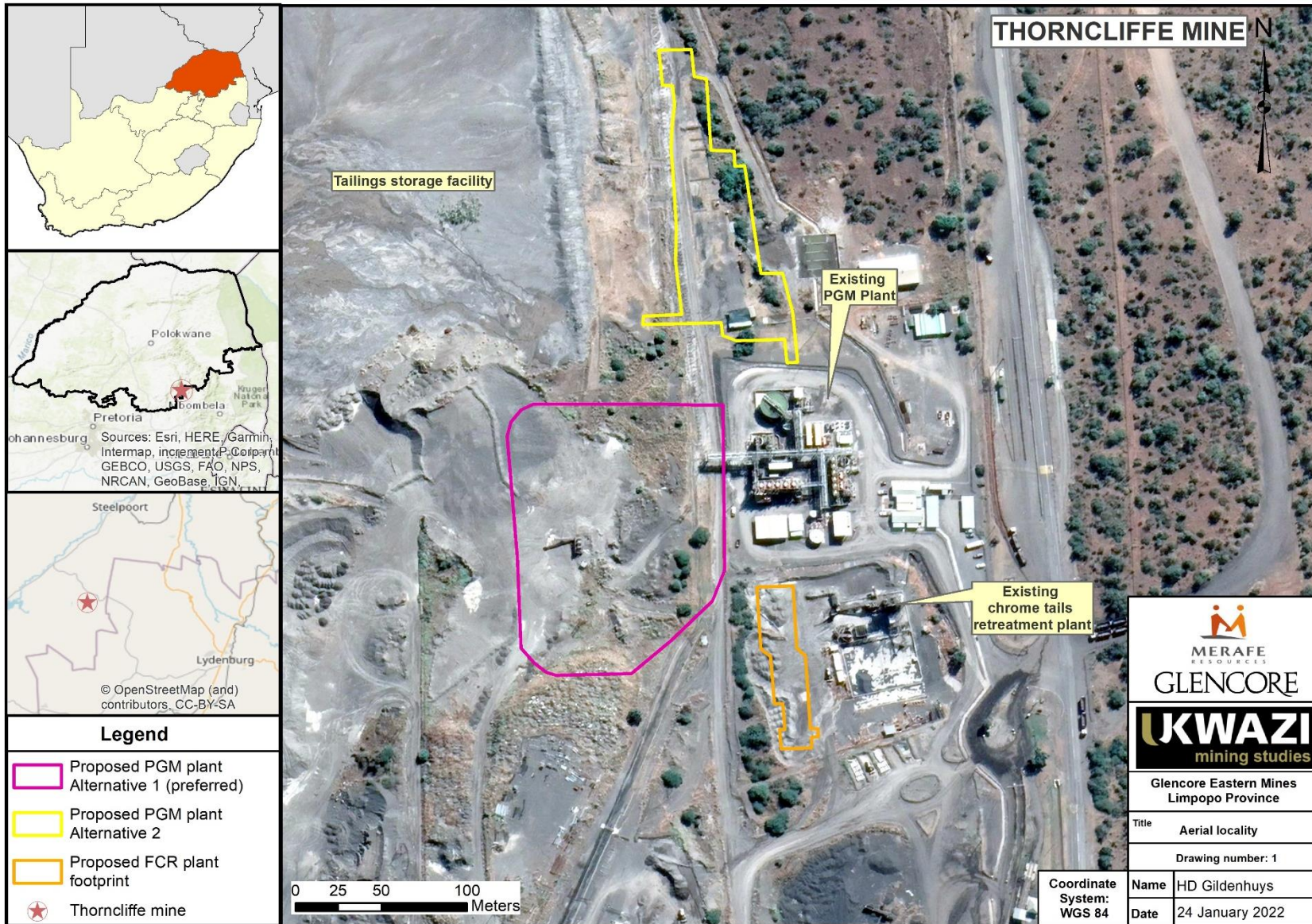


Figure 2-3: Aerial locality map 2

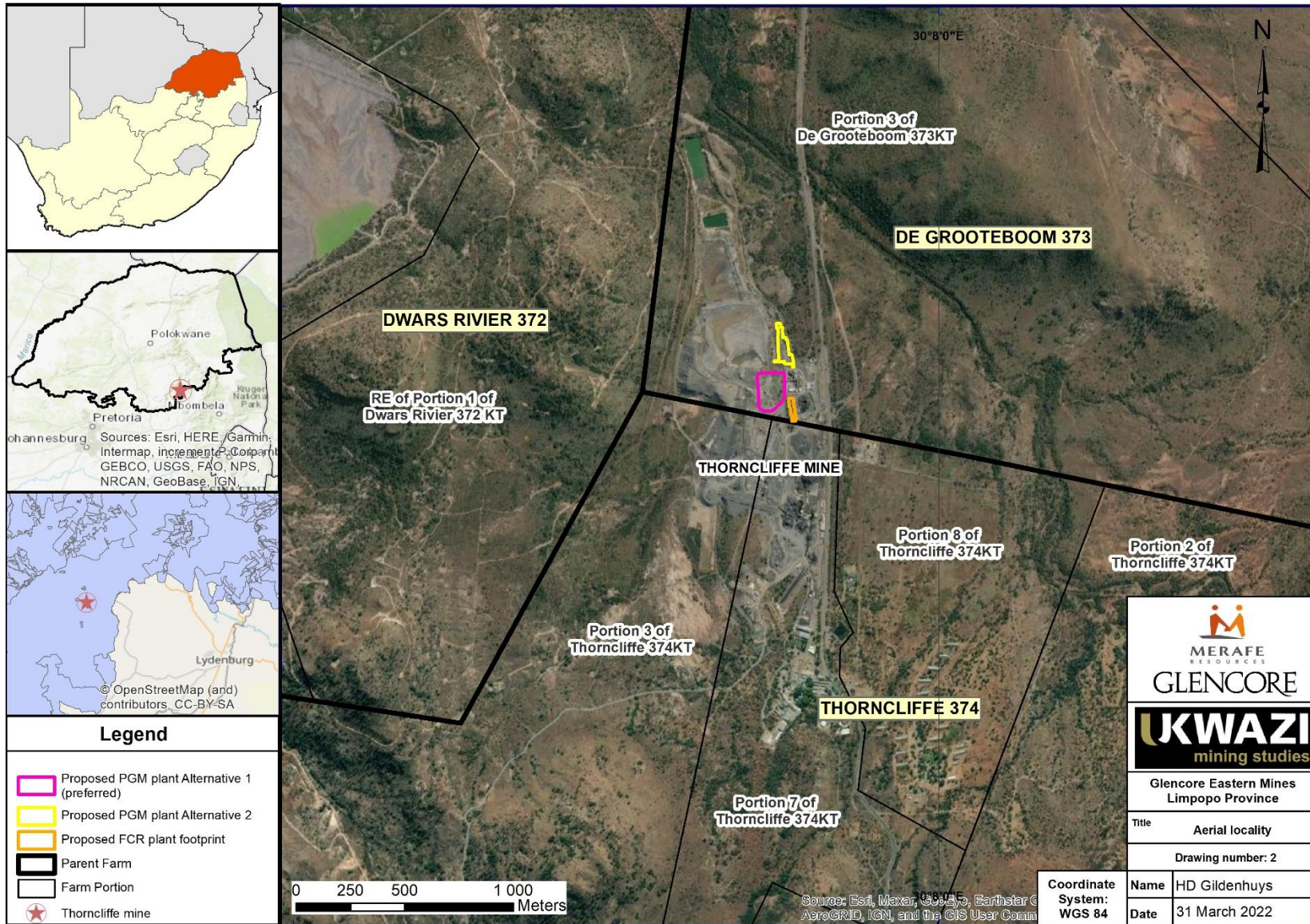


Figure 2-4: Aerial locality map showing the surrounding farms and portions

3. Description of the scope of the proposed activity

3.1. Project background

The Platinum Group Metals (“PGM”) flotation plant (also known as the Thorncliffe Tailings Treatment Facility) is an existing plant at Thorncliffe Mine for which an environmental authorization (“EA”) was awarded on 23 July 2010 from the Limpopo Department of Economic Development, Environment and Tourism (“LEDET”). The EA was amended by the LEDET for a revised footprint area on 13 September 2013.

The Environmental Management Programme “EMPr” amendment for the PGM flotation plant was approved by the Department of Mineral Resources on 15 January 2015.

3.2. Description of the activities to be undertaken

3.2.1. Proposed fine chrome recovery plant

Feed will be re-mined and transported from the Helena and Thorncliffe mine old slime dams. The feed will first be subjected to a trash screen to remove debris. The debris from the trash screen overflow will be discarded on the waste stockpile. The trash screen undersize will be pumped to a desliming cyclone, cyclone overflow will report to a thickener and then to the flotation plant.

The Fine Chrome Recovery (“FCR”) plant will be located on a disturbed footprint (0.17 ha) next to the existing chrome tailings retreatment plant. The cyclone underflow will be pumped to the belt magnets at the Fine Chrome Recovery (“FCR”) plant for chrome extraction. The FCR tails, which are non-magnetics, will then be pumped back to a thickener and then to flotation plant. The belt magnet concentrate, which are magnetics, will be pumped to the already existing boom stacker cyclone as a final product.

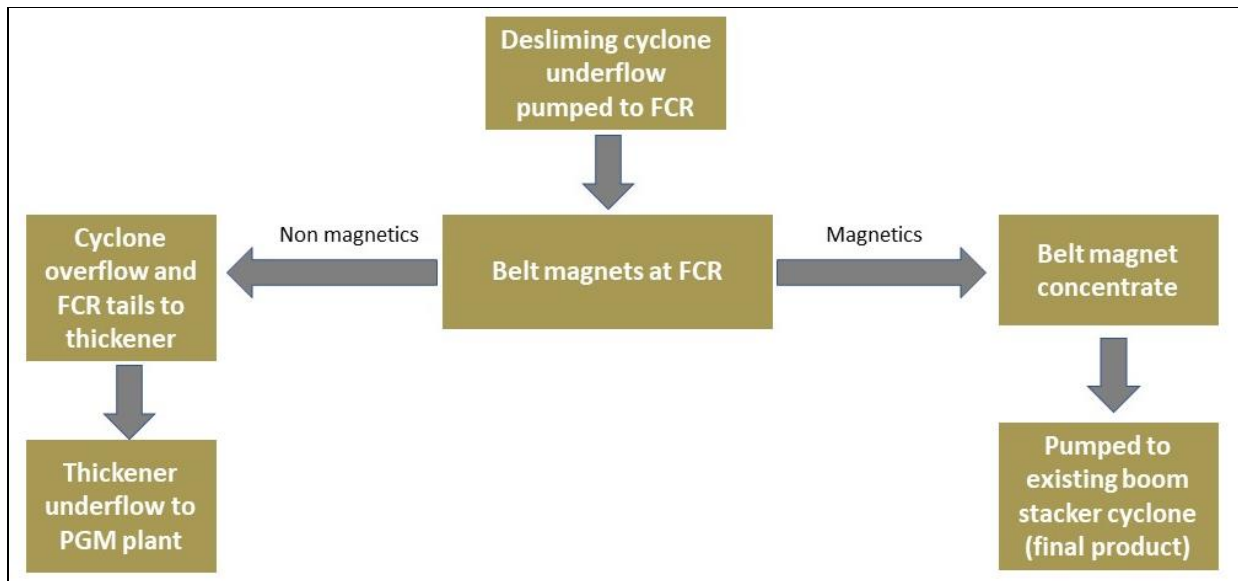


Figure 3-1: FCR plant process flow diagram

3.2.2. Proposed extension to the existing platinum flotation plant

3.2.2.1. Design criteria

The extension to the existing PGM plant will treat both current arising tails from the concentrators and material from the tailings dam as well as from external sources in order to recover platinum group metals and produce a saleable PGM concentrate. The plant will also treat tailings from the proposed FCR plant. The plant schematic diagram is detailed in Figure 3-2, while a more detailed plant process flow diagram is provided in Figure 3-3.

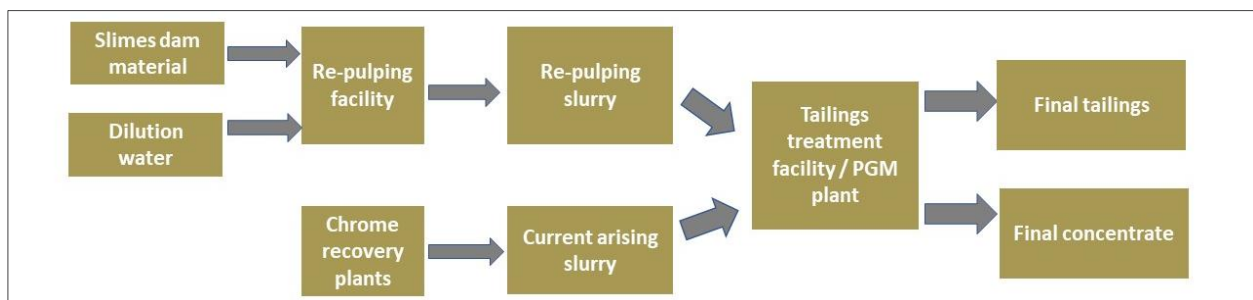


Figure 3-2: PGM plant schematic diagram

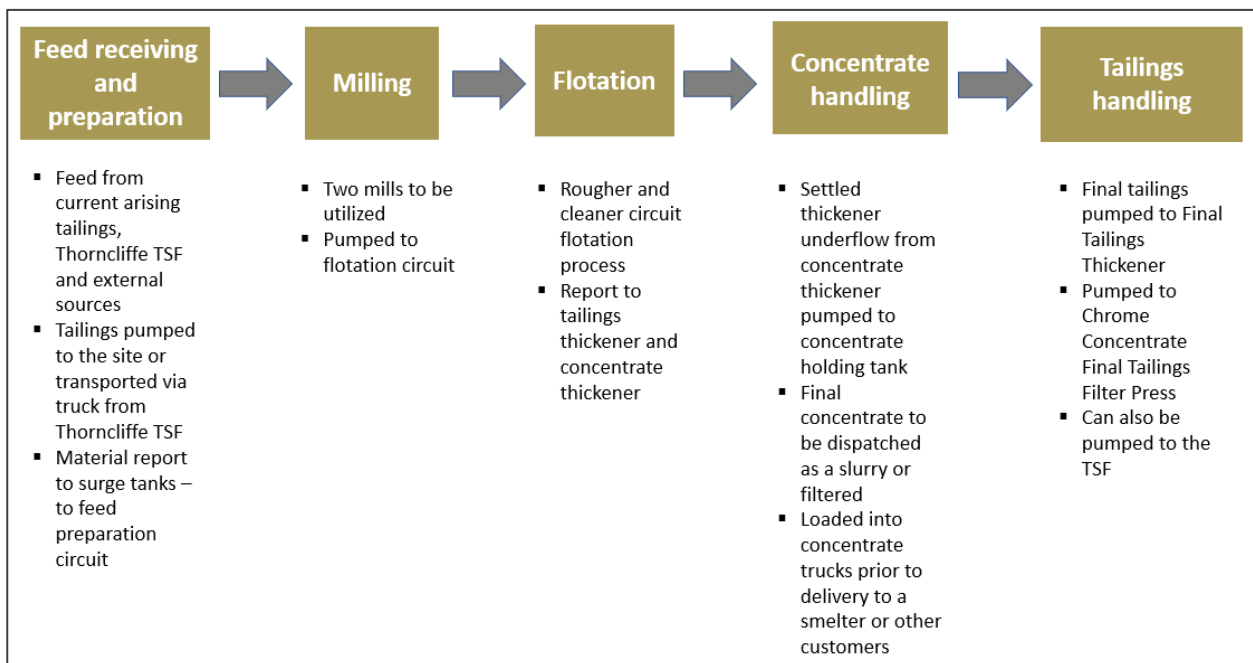


Figure 3-3: PGM plant process flow diagram

The key design criteria of the plant are indicated in Table 3-1 below. The table also compares the plant design approved in the 2013 EA with the proposed extension.

Table 3-1: Key plant design criteria

Design criteria	Original Plant (approved)		With extension (original + new) (proposed)	
	Design value	Units	Design value	Units
Days per month	30	days	30	days
Hours per day	24	Hrs	24	Hrs
Availability	90	%	90.1	%
Plant throughput	52	tph	80.2	tph
Monthly throughput	33 696	tpm	52 000	tpm
Annual throughput	404 352	tpa	624 000	tpa
Head grade	4-5	g/t	4 – 6	g/t
Mass pull	0.92	%	< 4.8	%
Recovery	50-65	%	50 – 65	%
Footprint	1.26	ha	1.6 (extension) 2.86 (total with existing plant)	ha

3.2.2.2. Feed Receiving and Preparation

The Thorncliffe PGM Plant will receive current arising tailings as feed from Thorncliffe, Helena and Magareng chrome concentrator plants, from external sources and from the Thorncliffe Tailings Dam. All feed tailings material received

as feed will be varied to suit the plant capacity. Ore will be received via pumping from Thorncliffe, Helena, and Magareng Chrome Plants current arising tailings and Thorncliffe re-mined tailings dam. The re-mined tailings from Thorncliffe will be transferred from the re-mining site to a wash/stock pad area next to the plant where it is washed into the process feed surge tank using high pressure monitor guns. All incoming material will report to the surge tanks. Slurry from the surge tanks will be fed to a feed preparation circuit to render the feed properties suitable for milling.

3.2.2.3. Milling

Mills or attritioners will be utilised to pre-treat the PGM plant feed. Due to the varying feed characteristics of the feed streams, two mills will be utilised. The mill products will then be pumped to the flotation circuit.

3.2.2.4. Flotation

The primary rougher flotation circuit will receive its feed from the conditioning Mills or attritioners. The primary rougher circuit concentrate will feed the cleaner flotation circuit for further upgrading. Primary rougher tails are discharged to the final tailings thickener. Cleaner concentrate will be pumped to the re-cleaner flotation circuit as well as final concentrate handling circuit. Cleaner tailings will then be recycled to the rougher feed tank. Feed to the re-cleaners will comprise of concentrate generated from the cleaner flotation circuit. The concentrates will be pumped to the concentrate thickener. The re-cleaner tailing will be recycled back to the cleaner feed.

3.2.2.5. Concentrate Handling

Final concentrate will be pumped into a concentrate thickener. The settled thickener underflow will be pumped to a concentrate holding tank. The final concentrate will have an option to be filtered or dispatched as slurry. Either in cake or slurry form, it will be loaded into concentrate trucks and then sampled and weighed on a weigh bridge prior to delivery to a smelter or other customers. The concentrate thickener overflow water will be reused in the process.

3.2.2.6. Tailings Handling

Final tailings will be pumped to the Final Tailings Thickener. The thickener underflow will then be transferred via pumping to the Thorncliffe Chrome Concentrator Final Tailings Filter Press. The PGM Plant will also be able to transfer the final tails thickener underflow material to the nearby tailings disposal facility, which utilises cycloning deposition techniques to conserve water and permit an increased rate of rise.

3.2.2.7. Reagents Handling

Five different reagents will be dosed in the plant, namely: Frother, Collector, Dispersant, Depressant and Flocculent. Dosing will take place at different points. Frother, Dispersant and Collector will be delivered in ISO Bulk Containers (IBCs) and distributed via chemical dosing pumps to various points of the flotation circuit. Depressant and flocculent will be delivered via road or rail and will be made through a mixing and hydration system. All dosing pumps will be controlled through the process control system.

4. Existing authorisations

As mentioned in Section 3.1 above, the PGM flotation plant was awarded an EA on 23 July 2010 from the LEDET. The EA was amended by the LEDET for a revised footprint area on 13 September 2013 (Reference number: 12/1/9-6/GS4). The Environmental Management Programme "EMPr" amendment for the PGM flotation plant was approved by the Department of Mineral Resources on 15 January 2015.

A Consolidated EMPr that included all previously authorised EMPrs (including the PGM Flotation Plant EMPr) was submitted in November 2018 and approved by the DMRE on 18 September 2020.

5. Authorisations required

5.1. Environmental Authorisation

5.1.1. Listed and specified activities

No NEMA or NEM:WA listed activities will be triggered as a result of the proposed project. The PGM and FCR plants will be located on areas previously disturbed by previous mining activities. The PGM plant is proposed to be extended to the west, with the extension covering an area of 1.6 hectares ("ha") that has been completely transformed by historical mining activities. The FCR plant will cover 0.17 ha and will be located on an area next to the existing chrome tailings retreatment plant.



Figure 5-1: The existing PGM plant



Figure 5-2: Site proposed for the FCR plant showing existing stockpiles and the chrome recovery plant



Figure 5-3: Site proposed for the FCR plant showing the boom stacker that will in future still be used



Figure 5-4: Site proposed for the PGM plant – view towards the south-west



Figure 5-5: Site proposed for the PGM plant – view towards the north-east



Figure 5-6: Site proposed for the PGM plant – view towards the east

No listed activities in terms of Government Notice Regulation (“GNR”) 983, 984 or 985 (EIA Listing Notices 1, 2 and 3) could be identified. The areas have been disturbed by historical mining activities and the proposed development area is not located in environmentally sensitive areas listed in GNR. 985 (such as critical biodiversity areas). The plants will also not release emissions requiring an atmospheric emission licence as identified according to the listed activities identified in terms of section 21 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (“NEMAQA”).

The project will not require changes to any mine residue stockpiles or deposits, nor will it require new stockpiles or deposits as the residue will be deposited at existing facilities. The plant thus does not trigger any waste management activities listed in Category A or B of GNR 921 of 29 November 2013 (as amended), published in terms of section 19 of the National Environmental Management: Waste Act (Act No. 59 of 2008) (“NEMWA”).

5.1.2. Water use licence application

Thorncliffe mine is in possession of a water use licence (“WUL”) in terms of Section 40 of the NWA. The WUL was issued to Glencore Eastern Mines on 26 April 2019 with Licence no. 06/B42H/IAGJ/8931. The WUL authorises water

uses in accordance with Section 21 a, Section 21 b, Section 21 c, Section 21 g, Section 21 i and Section 21 j of the NWA.

The plant will not require a water use licence as no water uses requiring authorisation in terms of Section 21 of the National Water Act (Act No 36 of 1998) (“NWA”) will be triggered. The plant will not release any effluent. No additional water uses requiring authorisation in terms of Section 40 of the NWA are triggered by the proposed project.

6. Policy and Legislative Context

The following legislation, policies and guidelines were considered during the compilation of this report:

Table 6-1: Project related legislation

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>The Constitution of the Republic of South Africa (Act No. 108 of 1996) (Constitution) Section 2 of the Constitution states that: <i>“This Constitution is the supreme law of the Republic; law or conduct inconsistent with it is invalid, and the obligations imposed by it must be fulfilled.”</i> It therefore emphasises the supremacy of the Constitution above all other laws and government actions.</p> <p>Chapter 2 of the Constitution provides for the Bill of Rights, which sets out the fundamental rights of all South Africans. Amongst those, Section 24 of the Constitution sets out several environmental rights. It is mentioned that everyone has the right:</p> <p>(a) <i>to an environment that is not harmful to their health or well-being; and</i> (b) <i>to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that-</i></p> <p>(i) <i>prevent pollution and ecological degradation;</i> (ii) <i>promote conservation; and</i> (iii) <i>secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</i></p> <p>Section 24 thus provides for the protection of the environment through reasonable legislative (and other measures).</p> <p>Section 32 in turn provides for the right to access records and/or information held by the state and any information held by another person and that is required for the exercise or protection of any rights. The Promotion of Access to Information Act (PAIA) (Act No. 2 of 2000) gives effect to the provisions of this right.</p> <p>Section 33(1) concerns administrative justice, which includes the constitutional right to administrative action that is lawful, reasonable and procedurally fair. The Promotion of Administrative Justice Act (Act No. 3 of 2000) gives effect to the provisions of this right.</p>	<p>The EMPr Amendment was accordingly prepared, submitted, and considered within the constitutional framework set by inter alia sections 24, 32 and 33 of the Constitution.</p>	<p>The EMPr Amendment was compiled keeping in mind the rights of those affected by the mining development, including surrounding landowners as well as sensitive environments.</p>
<p>Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) The MPRDA is the act that governs mining in South Africa. The DMRE is the competent authority that approves applications under the MPRDA.</p> <p>The Preamble to the MPRDA inter alia affirms the State’s obligation to:</p> <ul style="list-style-type: none"> <i>protect the environment for the benefit of present and future generations;</i> <i>ensure ecologically sustainable development of mineral and petroleum resources; and</i> <i>promote economic and social development.</i> <p>The aforesaid preamble affirms the general right to an environment provided for in section 24 of the Constitution (as set out hereinabove).</p>	<p>The legislation will be taken into account throughout the mining operations and were considered in the compilation of the EMPr Amendment.</p> <p>The report includes a description of the environmental impacts of the development, management measures required to mitigate the identified impacts and includes an updated cost estimate for mine closure.</p>	<p>The mine currently holds a mining right that have been granted under Section 23 of the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA).</p> <p>The mine has an approved Social and Labour Plan.</p>

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
 ☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

UKWAZI
 advisory

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>The national environmental management principles provided for in section 2 of the NEMA apply to all prospecting and mining operations and any matter relating to such operation. These principles apply throughout the Republic to the actions of all organs of state including inter alia the Department of Mineral Resources that may significantly affect the environment.</p> <p>Any prospecting or mining operation must be conducted in accordance with generally accepted principles of sustainable development by integrating social, economic and environmental factors into the planning and implementation of prospecting and mining projects to ensure that exploitation of mineral resources serves present and future generations.</p> <p>According to the MPRDA any person who wishes to apply for a new Mining Right must conduct an Environmental Impact Assessment (EIA) and submit an Environmental Management Programme Report (EMPr) to the Minister. In terms of Section 102 of the MPRDA, amendments to an approved EMPr will need an EIA process to be undertaken in terms of the NEMA.</p> <p>The EMPr has two main functions: (1) it describes the mitigation measures required to mitigate the impacts identified in the EIA and (2) it provides the financial provision for mine closure to ensure adequate rehabilitation and ongoing post-closure decommissioning management.</p> <p>Any significant changes to the mine's operations will require an amendment to the EMPr in line with Section 102 of the MPRDA. This amendment must assess the environmental impacts of the proposed changes, update the management measures required to mitigate the identified impacts and revise the financial provision for closure to ensure that the mine has sufficient funds available.</p> <p>Section 39 of the MPRDA furthermore outlines specific information requirements for an EMPr.</p>		
<p>Minerals and Petroleum Resources Development Regulations, Government Notice Regulation (“GNR”) 527 of 2004</p> <p>Although various sections of the MPRDA itself have been repealed, several sections remain in force. The Regulations make specific provision regarding matters such as:</p> <ul style="list-style-type: none"> • Social and Labour Plans • Pollution Control, including Noise, Waste, Soil Conservation, Blasting, Vibration and Shock Management. <p>The MPRDA Regulations must be read in conjunction with the NEMA and NEMWA.</p>		
<p>The National Environmental Management Act (NEMA) (Act No. 107 of 1998), Environmental Impact Assessment Regulations, 2014 (as amended)</p> <p>The National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) provides the framework for environmental legislation in South Africa. It includes a set of principles that govern environmental management and against which all Environmental Management Programmes (EMPrs) and actions are measured.</p> <p>The overarching principle of the NEMA is sustainable development, which is defined in NEMA as: “<i>the integration of social, economic and environmental factors in the planning, implementation and evaluation of decisions to ensure that development serves present and future generations</i>”.</p>	Refer to Section 5.1.1	<p>A Regulation 31 (Part 2) EIA amendment is being undertaken as part of this authorisation process.</p> <p>The proposed project does not trigger any listed activities in terms of the NEMA regulations but will result in a change of scope and change the impacts previously assessed.</p>

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>Further principles of NEMA include the protection of the natural environment, environmental justice, waste minimisation, public consultation, the right to an environment that is not harmful to one's health or wellbeing, and a general duty of care.</p> <p>The NEMA requires that a development should be socially, environmentally and economically sustainable (section 2(3)) and gives effect to the precautionary principle in section 2(4)(vii). This principle requires the consideration of all relevant factors including that: a risk-averse and cautious approach" is applied, which considers the limits of current knowledge about the consequences of decisions and actions.</p> <p>Section 24N of the NEMA states, amongst others, that the "<i>Minister responsible for mineral resources or an MEC may require the submission of an environmental management programme before considering an application for an environmental authorisation</i>".</p> <p>According to Section 24N(7), the holder of the environmental authorisation:</p> <ul style="list-style-type: none"> • <i>must consider, investigate, assess and communicate the impact of his or her prospecting or mining on the environment;</i> • <i>must manage all environmental impacts-</i> <ul style="list-style-type: none"> ○ <i>in accordance with his or her approved environmental management programme, where appropriate; and</i> ○ <i>as an integral part of the prospecting or mining, exploration or production operation, unless the Minister responsible for mineral resources directs otherwise;</i> • <i>must monitor and audit compliance with the requirements of the environmental management programme;</i> • <i>must as far as is reasonably practicable, rehabilitate the environment affected by the prospecting or mining operations to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and</i> • <i>is responsible for any environmental damage, pollution, pumping and treatment of polluted or extraneous water or ecological degradation as a result of his or her operations.</i> <p>The EIA regulations GNR.982, as well as notices containing listed activities (GNR.983, GNR.984 and GNR.985) were promulgated on 4 December 2014 in terms of Sections 24(2) and 24D of the NEMA. These regulations were amended on 7 April 2017 and again on 11 June 2021. GNR.982 defines the EIA processes that must be undertaken when applying for an Environmental Authorisation. GNR.983 lists those activities for which a basic assessment is required, while GNR.984 lists activities requiring a full Scoping and EIA process. Activities listed in GNR.985 are relevant to specifically identified geographical areas and also requires a basic assessment process to be undertaken.</p>		
<p>National Water Act (Act No 36 of 1998) ("NWA")</p> <p>The NWA provides the overarching legislation for the sustainable and equitable use, and protection of water resources in South Africa. In terms of the NWA, the national government, acting through the Minister of Water and Sanitation, is the public trustee of South Africa's water resources, and must ensure that water is protected, used, development, conserved, managed, and controlled in a sustainable and equitable manner for the benefit of all persons (section 3(1)). Section 19 of the NWA places an obligation on landowners, persons in control of land, occupants of land and land users of land to take all reasonable measures to prevent pollution from occurring, continuing or recurring.</p>	Refer to Section 5.1.2	<p>The proposed project does not require authorisation in terms of Section 20 of the NWA as no new water uses will be triggered.</p> <p>The requirements of regulation GN704 will be adhered to. Clean and dirty water</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>The NWA specifies that a person may only use water without a license under certain specified circumstances. All other water uses require a water use license, provided that the use qualify as a use listed in section 21 of the Act. Water uses are permissible without a licence under the following circumstances:</p> <ul style="list-style-type: none"> • If the water use is specified under Schedule 1 (generally domestic type use). • If it is an existing lawful water use, meaning that it was undertaken prior to the commencement of the NWA, and was undertaken in terms of the Water Act of 1956. • if the water use is permissible in terms of a general authorisation issued under section 39, subject to specified criteria and thresholds. <p>Water uses requiring authorisation in terms of Section 21 of the NWA includes:</p> <ul style="list-style-type: none"> • <i>taking water from a water resource</i> (section 21(a)); • <i>storing water</i> (section 21(b)); • <i>impeding or diverting the flow of water in a water course</i> (section 21(c)); • <i>engaging in a stream flow reduction activity</i> (section 21(d)); • <i>engaging in a controlled activity which has either been declared as such or is identified in section 37(1)</i> (section 21(e)); • <i>discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit</i> (section 21(f)); • <i>disposing of waste in a manner which may detrimentally impact on a water resource</i> (section 21(g)); • <i>disposing in any manner of water which contains waste from, or which has heated in, any industrial or power generation process</i> (section 21 (h)); • <i>altering the bed, banks, course or characteristics of a water course</i> (section 21(i)); • <i>removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people</i> (section 21(j)); and • <i>using water for recreational purposes</i> (section 21(k)). <p>Regulations on Use of Water for Mining and Related Activities aimed at the Protection of Water Resources (GNR. 704 of 1999) GNR. 704 provides for amongst others; restrictions on the locality of a mine or mining infrastructure (regulation 3), restrictions on the use of certain material that could cause pollution of a water resource (regulation 4), capacity requirements of clean and dirty water systems (regulation 6), reasonable measures for the protection of water resources (regulation 7), security and additional measures (regulation 8) and temporary or permanent cessation of a mine or activity (regulation 9). Exemption from the requirements of the regulations is possible in terms of an application in line with Regulation 3 of GNR. 704.</p> <p>Regulations regarding the procedural requirements for Water Use Licence Application and Appeals, (GNR. 267 of 2017) The Regulations serve to prescribe the procedure and requirements of water use licence applications as contemplated in Sections 41 of NWA, as well as appeals in terms of Section 41(6) of the NWA.</p>		<p>management structures will be constructed in accordance with section 6 of the GN704.</p>
<p>National Heritage Resources Act (Act No. 25 of 1999) (“NHRA”) The South African Heritage Resources Agency (SAHRA) was established as the statutory organisation in terms of the NHRA and identified as the national body tasked with the protection of South Africa’s cultural heritage resources.</p>	<p>The first cultural heritage survey for the PGM flotation plant project was compiled in 2008</p>	

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>The NHRA specifies that no person may destroy, damage, alter etc a heritage site or protected area unless a permit is issued by the SAHRA. Immovable property older than 60 years is likewise also protected by the NHRA. Archaeological, palaeontological sites and meteorites are also protected under the act, as are graves and burials.</p> <p>The NHRA states that any person who intends to undertake developments categorised in section 38 of the NHRA must at the very earliest stages of initiating such development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development. The developments referred to in section 38 of the NHRA include:</p> <ul style="list-style-type: none"> • the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300 metres in length; • the construction of a bridge or similar structure exceeding 50 metres in length; • any development or other activity which will change the character of a site – <ul style="list-style-type: none"> ○ exceeding 5000 m² in extent; or ○ involving three or more existing erven of subdivisions thereof; or ○ involving three or more erven or divisions thereof which have been consolidated within the past five years; or ○ the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority; • the re-zoning of a site exceeding 10 000 m² in extent; or • any other category of development provided for in regulations by SAHRA or the provincial heritage resources authority. 	<p>by Mr Francois Coetzee from the Department of Anthropology & Archaeology at the University of South Africa. A heritage note was compiled in 2014 by Mr Neels Kruger as part of the EA amendment. The study area for these reports included the site now proposed to be developed for the PGM plant expansion.</p> <p>A Heritage Memorandum was compiled in 2022 by Mr Neels Kruger for the proposed PGM plant expansion and FCR plant.</p> <p>A Palaeontological Desktop Study was compiled for Glencore Eastern Mines in 2018 by Dr Francois Durand.</p> <p>The findings of these reports were incorporated into this EMPr. Refer to Section 10.1.9 and Section 10.1.10.</p>	<p>No confirmable archaeological sites or palaeontological resources were identified during desktop and field survey.</p> <p>The overall heritage and palaeontological sensitivity of the site is negligible to low.</p> <p>Mitigation measures were written into the EMPr should previously unknown archaeological sites or fossils be found in future.</p>
<p>National Environmental Management: Biodiversity Act (Act 10 of 2004) (“NEMBA”)</p> <p>The NEMBA aims to provide for the management and conservation of South Africa’s biodiversity, the protection of species and ecosystems that warrant national protection, the sustainable use of indigenous biological resources, the fair and equitable sharing of benefits arising from bio-prospecting involving indigenous biological resources, etc.</p> <p>According to the NEMBA, species and ecosystems lists may be published by the Minister and an MEC for Environmental Affairs in relation to which certain activities may not be undertaken without a permit. In terms of section 57 of the NEMBA, no person may carry out any restricted activity involving any species which has been identified by the Minister as “critically endangered species”, “endangered species”, “vulnerable species” or “protected species” without a permit. The NEMBA defines “restricted activity” in relation to such identified species so as to include, but not limited to, “hunting, catching, capturing, killing, gathering, collecting, plucking, picking parts of, cutting, chopping off, uprooting, damaging, destroying, having in possession, exercising physical control over, moving or translocating”.</p> <p>Regulations have been published in terms of section 97 of the NEMBA with reference to Threatened and Protected Species, including critically endangered, endangered, vulnerable and protected species in terms of section 56(1) of the NEMBA.</p> <p>Alien and Invasive Species Regulations (GNR. 590 of 2014) and the Alien and Invasive Species Lists (GNR. No 1003 of 2020)</p>	<p>The footprint proposed to be developed was surveyed by ecologist Dr Buks Henning as part of the PGM plant EIA in 2008 and 2013.</p> <p>A terrestrial biodiversity memorandum was compiled by Dr Henning for the proposed development site in 2022. The findings of this survey were incorporated into the EMPr. Refer to Section 10.1.5.</p>	<p>Dr Henning found the site to be largely in a degraded state. No natural vegetation remains on the preferred development sites. A thin strip of natural vegetation is present on the PGM alternative site (not preferred) although it is in a highly degraded state due to dust, alien species invasion and the surrounding mining operations.</p> <p>A few individuals of the protected tree species <i>Sclerocarya birrea</i> (marula) was documented on the alternative site. The species is listed as protected under the National Forest Act and a permit should be obtained from the Department of Forestry, Fisheries and the Environment before any of the trees can be eradicated.</p>

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>Section 73 of the NEMBA states that a person who is the owner of land on which a listed invasive species occurs must notify any relevant competent authority in writing of the listed invasive species occurring on that land. Organisations have a duty of care relating to listed invasive species. In this regard organisations are expected to:</p> <ul style="list-style-type: none"> take steps to control and eradicate the listed invasive species and to prevent it from spreading; and take all the required steps to prevent or minimise harm to biodiversity. <p>A list of these category species can be found under the Alien and Invasive Species List, 2020 published under GNR. 1003 of 2020.</p> <p>In terms of the regulations, any person in control of a Category 1a, Category 1b, Category 2 and Category 3 Listed Invasive Species must comply with the provisions under section 73 (a) - (c). Note where an Invasive Species Management Programme has been developed, combatting must take place in accordance with the programme.</p>		
<p>Protected Areas Act (Act No. 57 of 2003) The Protected Areas Act provides for: <i>The protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas.</i></p>	No protected areas occur within close proximity to the mine.	No protected areas occur within proximity to the mine.
<p>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) ("NEMAQA") The object of the National Environmental Management Air Quality Act (Act 39 of 2004) (NEMAQA) is to regulate air quality in South Africa in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation.</p> <p>The List of Activities and associated Minimum Emission Standards identified in terms of section 21 of the NEMAQA provides a list of activities that may cause atmospheric emissions, which have or may have a significant detrimental effect on the environment as well as the minimum emission standards ("MES") for these activities as contemplated in section 21 of NEMAQA.</p> <p>The effect of the commencement of the NEMAQA and the listed activities, listed in GN 893 (as amended), is that an atmospheric emission licence (AEL) is required for conducting the listed activities.</p> <p>The National Dust Control Regulations (GNR 827 of 1 November 2013) were published on 1 November 2013 and prescribes general measures for the control of dust in all areas and the standard for acceptable dustfall rate for residential and non-residential areas.</p> <p>Furthermore, the National Ambient Air Quality Standards were published in GNR 1210 of 24 December 2009. In accordance with section 9 of the NEMAQA, the National Ambient Air Quality Standards identifies substances or mixtures of substances in ambient air which present or may present a threat to health, well-being, or the environment.</p> <p>Annexure I of the National Atmospheric Emission Reporting Regulations (GNR 283 of 2 April 2015) specifies that any person that holds a mining right or permit in terms of the MPRDA, must register and report on emissions in the format as required on the South African National Atmospheric Emissions Inventory System (NAEIS).</p>	Monthly dust monitoring is taking place in accordance with the National Dust Control Regulations.	The current dust fallout network consists of 11 dust buckets. The network is still valid and no additional monitoring sites are required. In addition, there is also a PM ₁₀ monitoring station at Thorncliffe mine.

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

UKWAZI
advisory

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>National Environmental Management: Waste Act (Act No. 59 of 2008) (“NEMWA”) The NEMWA commenced on 1 July 2009 and as a result of its commencement, the relevant provisions in the Environment Conservation Act 73 of 1989 (ECA) in respect of waste management, were repealed.</p> <p>The NEMWA sets out to reform the law regulating waste management and deals with waste management and control more comprehensively than was dealt with in the ECA. It also introduces the concept of contaminated land and extended producer responsibility and provides for more elaborate definitions to assist in the interpretation of the Act.</p> <p>Section 19 of the NEMWA provides for listed waste management activities in terms of section 19(1), that have, or are likely to have a detrimental effect on the environment and for which a licence needs to be obtained beforehand. Such a list was published in GNR 921 of 29 November 2013 (as amended). Section 20 of the NEMWA states that no person may commence, undertake or conduct a waste management activity, except in accordance with the requirements or standards for that activity as determined by the Minister or in accordance with a waste management licence issued in respect of that activity, if a licence is required.</p> <p>In accordance with section 19(3), the Schedule to GNR 921 provides that a waste management licence is required for those activities listed in Category A and B thereof. Category A waste management activities require the undertaking of a basic assessment process and Category B waste management activities require the undertaking of a scoping and environmental impact assessment process. Those activities listed in Category C does not require authorisation prior to commencement, however need to comply with the National Norms and Standards for the Storage of Waste (GNR 926 of 29 November 2013) published in terms of the NEMWA.</p> <p>Since the publication of the National Environmental Management: Waste Amendment Act (Act 26 of 2014) (NEMWAA) on 2 June 2014, and the National Environmental Laws Amendment Act (NEMLAA, Act 25 of 2014) on 2 September 2014, the NEMWA now finds application to mine residue stockpiles and residue deposits. Consequently the ‘One Environmental System’ was implemented as from 8 December 2014. Amendments to GNR 921 were promulgated in GNR 633 of 24 July 2015 to include the establishment and/or reclamation of residue stockpiles and residue deposits as Category A and B listed activities requiring a waste management licence.</p> <p>The Waste Classification and Management Regulations (GNR 634 of 23 August 2013) were published on 23 August 2013. These regulations require waste to be classified and must be read together with the National Norms and Standards for the Assessment of Waste for Landfill Disposal (GNR 635 of 23 August 2013). The waste classification requires that a leach test and a total concentration analysis need to be conducted. The leach test requires the leaching of a solid sample of waste with reagent water and the subsequent analysis of the leachate for specific components. The total concentration analysis involves the analysis of the solid material for the total concentration of specific components that are present in the waste sample. The results of these two tests are compared to regulatory criteria and a classification is done based on the results of this comparison.</p> <p>In addition, all generators of hazardous waste must ensure that a safety data sheet for the hazardous waste is prepared in accordance with SANS 10234. If the Minister reasonably believes that a waste has not been classified correctly, he or she may require that the classification be peer reviewed to confirm the classification.</p>	<p>The proposed project will not trigger any waste management activities as listed in GNR 921 of 29 November 2013 (as amended).</p>	<p>No approval in terms of the NEMWA required.</p>

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046



DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba


🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

UKWAZI
advisory

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<p>Once waste has been classified, disposal methods must be decided on in accordance GNR 636. Residue stockpiles and residue deposits need to be managed in the prescribed manner on any site demarcated for that purpose in the EMPr for the mining operation (section 43A of the NEMWA).</p> <p>On 24 July 2015, the Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 (GNR 632) were published in terms of the NEMWA. The purpose of GNR 632 is to regulate the planning and management of residue stockpiles and residue deposits from, amongst others, a mining operation. GNR 632 further provides for the characterisation and classification of residue stockpiles, the investigation and site selection and the design of residue stockpiles, impact management and monitoring and reporting systems for residue stockpiles.</p>		

 info@ukwazi.com
 +27 (0)12 665 2154
 +27 (0)12 665 1176

www.ukwazi.com
 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

 www.linkedin.com/company/ukwazi/

 Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

UKWAZI
 advisory

7. Need and desirability of the proposed activities

The Bushveld Igneous Complex, which extends for 400 kilometres in the Limpopo Province, contains the world's largest known deposits of platinum group metals (PGMs) - platinum, palladium, rhodium, ruthenium, iridium and osmium. The Bushveld Igneous Complex consists of the Merensky and UG2 Reefs as well as the Platreef in the northern extension. The Merensky Reef accounts for over 80% of the platinum mined in South Africa, with the highest PGM values being associated with the UG2 Reef which lies about 200 m to 300 m below the Merensky Reef.

Mining a critical sector of the economy of the Limpopo Province, contributing 22% to its GDP. Unemployment in the region is high, with the latest census information from 2011 indicating that 50.3% of the population in the Fetakgomo Tubatse Local Municipality (FTLM) being unemployed, while employment in the youth (15 – 34 years of age) was even higher at 59.6%.

Although there are several mines in the area, the existing resources remain unexploited. Investment in this sector is important as it brings with it investment in infrastructure, results in creation of job opportunities and generates many other economic spin-offs. The lack of economic growth in the region warrants special attention and support to optimize the available opportunities. However, cognizance should be taken of the outflow of money from the mines in FTLM to other regions.

FTLM has significant mining and manufacturing (ferrochrome smelters) sectors, but unemployment is still significantly above the provincial average. Information from different sources previously suggested that the new mining developments reduced unemployment from 73% (expanded unemployment rate definition) in 2001 to 44% in 2010 and 23% in 2015 (Greater Tubatse Draft IDP 2015/2016). The unemployment rate according to the 2020/2021 Draft IDP was 19,9% in April/June 2018. A reduction in the unemployment rate will depend on effective intervention by public sector institutions to facilitate economic sector diversification through competitive cluster value-chain development. This implies upstream development in the manufacturing and trade sector to provide essential items in the mining supply chain by local entrepreneurs. It also implies side-stream development in the form of construction and Urban renewal. This approach is consistent with the Limpopo Employment Growth and Development Plan (Greater Tubatse Draft IDP 2015/2016).

According to the Guideline on Need and Desirability in terms of the EIA regulations 2014 the following questions need to be addressed:

Table 7-1: Need and desirability according to the 2014 EIA regulations

How will this development (and its separate elements/aspects) impact on the ecological integrity of the area?	Please explain
Henning (2022) stated that the project will not result in additional impacts on the biodiversity that have not been identified before in the ecological report (2008) and memorandum (2013) compiled for the original PGM plant environmental authorisation processes.	
No natural vegetation remains on the proposed FCR Plant site. PGM Plant Alternative site 1 (preferred) is basically completely disturbed and is currently utilised as a stockpile area. The sites are of low to zero ecological sensitivity. PGM Plant Alternative site 2 (not preferred) is also largely disturbed, but a thin strip of indigenous vegetation can be found on its eastern edge. The site is in a degraded state due to mining disturbance and due to the presence of alien invasive species such as <i>Tecoma stans</i> and encroachers such as <i>Dichrostachys cinerea</i> . A few individuals of the protected tree species <i>Sclerocarya birrea</i> (marula) was documented on site. The species is listed as protected under the National Forest Act and a permit should be obtained from the Department of Forestry, Fisheries and the Environment before any of the trees can be eradicated. Due to the presence of the trees PGM Plant Alternative site 2 is therefore not preferred and PGM Plant Alternative site 1 is the preferred development site.	
How were the following ecological integrity considerations taken into account? :	
Threatened Ecosystems	Please explain
The Sekhukhune Mountain Bushveld has a least threatened conservation status with 0.4% conserved and nearly 15% transformed. Transformation is mainly through dryland subsistence cultivation and urban built up.	
Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure	Please explain
The site is largely disturbed. No sensitive ecosystems occur on site.	
Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs")	Please explain
The proposed plant expansion areas are located in an Ecological Support Area ("ESA2") according to the Limpopo Conservation Plan 2.	
Conservation targets	Please explain
The National Protected Areas Expansion Strategy ("NPAES") identifies areas designated for future incorporation into existing protected areas (both National and informal protected areas). These areas are large, mostly intact areas required to meet biodiversity targets, and suitable for protection. They may not necessarily be proclaimed as protected areas in the future and are a broad scale planning tool allowing for better development and conservation planning.	
The proposed development site is not located in an area identified in terms of the NPAES. The Mpumalanga Mesic Grasslands NPAES area is situated approximately 1.3 km to the south of the project area.	
Ecological drivers of the ecosystem	Please explain

The site is largely disturbed. Refer to Section 10.1.5 below.		
Environmental Management Framework (“EMF”)		Please explain
<p>According to the 2009 EMF for the Olifants and Letaba Rivers the mayor opportunities in the area include:</p> <ul style="list-style-type: none"> • Extensive platinum and related mineral deposits; and • Potential conservation areas with high ecosystems values. <p>The mining is therefore in line with the current opportunities of the specific zone in the EMF.</p>		
Spatial Development Framework (“SDF”)		
<p>The published SDF for the Greater Tubatse Local Municipality (which now forms part of the Fetakgomo Tubatse Local Municipality) dates to 2007 and is therefore quite outdated. Thorncliffe mine is located in the mining belt as defined in the SDF, which is described as being an important structuring element of the Greater Tubatse Municipality spatial development. The SDF expected that the retail and the service businesses will respond to the opening of mines and that housing developments will be located close to these areas. In time, this may eventually alter the current fragmented spatial pattern by creating few large urban settlements, if the expected scale of mining activities materialises.</p> <p>According to the SDF the increased development of mines and associated concentrator plants in the municipality have positive spin offs in terms of job creation and economic growth. The potential of the mining sector to create direct jobs exceeds any other sector. For this reason, the SDF stresses the importance of prioritising the platinum rich eastern limb of Bushveld Complex for mining development.</p>		
Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.)		Please explain
<p>Thorncliffe mine is not located in a geographic area with global or international responsibilities relating to the environment (such as a RAMSAR site). In terms of climate change impacts; the site is already largely disturbed and according to the air quality professional opinion by Airshed (2022), air quality impacts during all phases of the project will be localised, with the significance of the air quality impacts due to the project considered to be low.</p>		
How will this development disturb or enhance ecosystems and/or result in the loss or protection of biological diversity? What measures were explored to firstly avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		Please explain
<p>The site is already disturbed and adjacent to an existing plant, thereby keeping impacts localised. Refer to Section 10.1.5 below.</p>		
How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		Please explain
<p>Please refer to sections 12 and 18. An already disturbed site was chosen. The project will enhance the mine’s positive socio-economic impact.</p>		
What waste will be generated by this development? What measures were explored to firstly avoid waste and where waste could not be avoided altogether, what measures were explored to minimise, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?		Please explain
<p>The plant will not generate effluent. Waste at the mine is managed according to a waste management plan with salvage yards located on site to enhance the reuse and/or recycle the waste. Awareness training is done to emphasise the concepts of minimising, reuse and/or recycle.</p>		
How will this development disturb or enhance landscapes and/or sites that constitute the nation’s cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		Please explain
<p>According to the heritage memorandum by Mr Neels Kruger (2022) it is highly unlikely that sensitive heritage receptors or remnants remain at the site and the proposed project and related construction activities will have no significant impact on heritage resources or the larger heritage landscape.</p>		
How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?		Please explain
<p>The project is an extension of existing beneficiation process at the mine. The project aims to further extract the PGM and chrome resources present in tailings material that would otherwise go to waste, thereby making sure that those non-renewable resources (minerals) are extracted optimally.</p> <p>Please also refer to the alternatives considered for the proposed development which evaluated the following to assist with minimising environmental impacts:</p> <ul style="list-style-type: none"> • Site location alternatives • The “no-go” alternative 		
How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardise the integrity of the resource and/or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts?		Please explain
<p>Refer to Table 11-3: Mitigation measures.</p>		
Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)?	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Please explain
<p>The natural resource dependency in terms of water and power will increase, however the proposed development will promote economic development. The project will ensure that resources are optimally utilised as it involves the extraction of minerals from mine waste</p>		

(tailings). Furthermore, the project will not require additional abstraction of water from natural resources, as the plant's water supply will be obtained from the De Grooteboom open pit (pollution control dam).			
Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this proposed development alternative?)	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	Please explain
Reuse of process water is being undertaken at the mine.			
Do the proposed location, type and scale of development promote a reduced dependency on resources?	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	Please explain
The natural resource dependency in terms of water and power will increase, however the proposed development will promote economic development. As mentioned above, the project aims to further extract the PGM and chrome resources present in tailings material that would otherwise go to waste. The optimal extraction of resources will place less pressure on other greenfields sites where mineral resources are not yet exploited.			
How were a risk-averse and cautious approach applied in terms of ecological impacts	Please explain		
An ecological memorandum was compiled to determine the impact significance on the fauna and flora of the study area. The area has been thoroughly investigated. Ecological impact assessments that included the current footprint area were also compiled for the original PGM plant EIA in 2008 and 2013.			
What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Please explain		
Refer to Section 12.7.			
What is the level of risk associated with the limits of current knowledge?	Please explain		
Refer to Section 12.7.			
Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Please explain		
Even though the project is an expansion of an existing facility on a largely disturbed footprint where one would expect environmental impacts to be minimal, specialists were appointed to determine the impacts of the proposed project. This included the following specialist fields: stormwater, air quality, heritage, ecology and hydrogeology.			
How will the ecological impacts resulting from this development impact on people's environmental right in terms following:			
Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Please explain		
The site is already disturbed by historical mining activities. Refer to Section 10.1.5.			
Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	Please explain		
Refer to Table 11-3: Mitigation measures.			
Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	Please explain		
The ecological impacts are not expected to result in socio-economic impacts.			
Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	Please explain		
The site is disturbed and is not expected to result in significant impacts on ecological integrity objectives/targets/considerations of the area. The site is not a CBA or within an area identified in terms of the NPAES. Refer to Section 10.1.5.			
Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option (BPEO)" in terms of ecological considerations?	Please explain		
Please refer to Section 8. An area that was already disturbed was selected and not one of the adjacent greenfield sites.			
Describe the positive and negative cumulative ecological/biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area?	Please explain		
The project will not result in significant cumulative impacts. The proposed footprint area of 1.8 ha is located within an existing mine where an area of approximately 92 ha has already been disturbed. Please refer to section 1.			
What is the socio-economic context of the area based on, amongst other considerations, the following considerations?			
The Integrated Development Plan ("IDP") (and its sector plans' vision, objectives, strategies indicators and targets) and any other strategic plans, frameworks of policies applicable to the area,	Please explain		
According to the 2020/2021 Draft IDP for Fetakgomo Tubatse Local Municipality ("FTLM"), mining investment opportunities are one of the main contributors to the GDP and continued investment in the mining industry is one of the main opportunities for the municipality. The IDP also states that mining still presents the largest economic development opportunity in the area.			
Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.),	Please explain		
The FTLM still has a very rural character and various plans are currently in place to alleviate backlogs on homes and services. Mining is one of the main contributors to the economy in the area and assist with some of the unemployment in the area.			
Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and	Please explain		
The surrounding land uses comprise mostly of mining and associated activities with some tourism and community settlements.			
Municipal Local Economic Development Strategy ("LED Strategy").	Please explain		

According to the 20120/21 Draft IDP for FTLM, the municipality is characterized by the presence of mining activities along the R555 and R37 provincial roads. This sector includes the extracting and beneficiating of minerals such as platinum, lead, chrome, black chrome and other precious minerals. The municipality's LED strategy focuses on coordinating public and private investment in flagship projects focusing on economic drivers that includes mining and beneficiation.

Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area?			Please explain
The socio-economic impacts relate mostly to job creation and economic benefits due to optimised mineral extraction from mine waste (tailings). Current indications are that 54 jobs will be created at the PGM plant extension and 28 at the FCR plant during the operational phase. The project will also increase the mine's revenue that should have a positive impact on the municipality through commitments in the SLP. Please refer to Section 12.			
Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	YES		Please explain
The development will complement the current projects identified in the approved Social and Labour Plan.			
How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?			Please explain
The project will also increase the mine's revenue that should have a positive impact on the municipality through commitments in the SLP. From a psychological perspective it will create hope for a better future by creating economic opportunities, much needed given the high unemployment and lack of opportunity in the area.			
Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	YES		Please explain
Without the implementation of this project, the mentioned benefits would not be realised. In addition to the socio-economic benefits associated with the mine will also provide the local communities with various benefits relating mainly to employment and skills development. Unemployment in the area is high and mining development holds major possibilities for the area.			
In terms of location, describe how the placement of the proposed development will:			
result in the creation of residential and employment opportunities in close proximity to or integrated with each other,			Please explain
The mine aims to employ local labour as far as is feasible and thus the place of work will be in close proximity to place of residence.			
reduce the need for transport of people and goods,			Please explain
Not applicable ("N/A").			
result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport),			Please explain
Not applicable ("N/A").			
compliment other uses in the area,			Please explain
The proposed project is located within an existing mining area and within the mining belt area as identified in the FTLM IDP.			
for urban related development, make use of underutilised land available with the urban edge,			Please explain
The area is located outside of the urban area in the mining belt.			
optimise the use of existing resources and infrastructure,			Please explain
The area is characterised by rich with mineral deposits, therefore the project will serve to optimise the existing mineral resources.			
opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement),			Please explain
N/A			
discourage "urban sprawl" and contribute to compaction/densification,			Please explain
N/A			
contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs,			Please explain
The mine has an approved SLP to deal with the upliftment of historical disadvantages persons.			
encourage environmentally sustainable land development practices and processes,			Please explain
The proposed development site is located next to an existing plant and within a disturbed footprint area that is already included in the mine's existing stormwater management plan.			
take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.),			Please explain
The mine is located on the eastern limb where the chrome and platinum minerals are found.			
the investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential),			Please explain
The mine has an approved SLP			
impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and			Please explain.
Refer to Section 10.1.10.			
in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?			Please explain
The construction and operation could stimulate economic activities of directly and indirectly affected businesses, which could subsequently lead to the creation of new businesses.			
How were a risk-averse and cautious approach applied in terms of socio-economic impacts?			Please explain
The proposed site is located in an existing mining area and within a disturbed footprint area. The specialist studies (memoranda) conducted, specifically the hydrogeological investigation and air quality assessment, concluded that the proposed project is not expected to increase impacts on the nearest receptors.			

What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)?	Please explain
Refer to Section 13.7.	
What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	Please explain
The project is perceived to have low socio-economic risk.	
Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	Please explain
A conservative approach was used in the estimation of impacts.	
How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:	
Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts?	Please explain
To reduce or avoid negative impacts specialist studies have been conducted for the proposed development. The mine has an approved social and labour plan where these aspects are addressed	
Positive impacts. What measures were taken to enhance positive impacts?	Please explain
Refer to Table 11-3: Mitigation measures.	
Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)?	Please explain
The construction and operational phases stimulates economic activities of directly and indirectly affected businesses which translate into the creation of new employment opportunities and creation of businesses. These results in increased household income and subsequently increased household expenditure, through this, an additional round of value adding is created.	
What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	Please explain
Please refer to Section 8.	
What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	Please explain
The mine has an approved SLP.	
What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	Please explain
The mine has an approved SLP.	
What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	Please explain
Refer to Table 11-3: Mitigation measures.	

8. Motivation for the preferred development footprint within the approved site

8.1. Process to assess alternatives

The EIA Regulations 2014 (as amended) requires that several possible proposals or alternatives for accomplishing the same objectives be considered. Various alternatives have been assessed for the project by means of input by the project ecologist and heritage specialist. The location alternative was investigated and compared to the No-Go alternative.

The following alternatives were considered:

- Location alternatives
 - Location alternative 1
 - Location alternative 2
- No-go alternative

8.2. Details of all alternatives considered

8.2.1. Site location alternatives

The site proposed for the FCR plant is on a disturbed area next to the existing chrome tailings retreatment plant. Two different sites have been evaluated to determine the best possible area for the PGM plant extension. The preferred site is located directly to the west of the existing PGM plant. The site is indicated as 'PGM Plant Alternative Site 1' in Figure 8-1.

The alternative site evaluated for the proposed PGM plant is located to the north of the existing PGM plant site in a largely disturbed area that only has a narrow strip of indigenous vegetation on its eastern border. This site is indicated as 'PGM Alternative Site 2' in Figure 8-1.

Table 8-1 below summarises the various advantages and disadvantages of each alternative site. Alternative Site 1 was found to have a negligible ecological impact as no natural vegetation remains. Alternative Site 2 will have a low to medium ecological impact as it is largely disturbed, however the thin strip of natural vegetation (that contains a few protected trees) that remains on the eastern edge makes the site less favourable from an ecological perspective. Alternative Site 2 is expected to have similar noise and air quality impacts compared to Alternative Site 1. Alternative Site 2 is however expected to have a slightly higher visual impact since it will be closer to the tar road running past the mine.

Both sites are situated within an existing disturbed area and inside of the mine’s dirty water management area and will not require the mine’s stormwater management plan to be updated.

Alternative site 1 is therefore the preferred site from an environmental perspective.

Table 8-1: Site selection matrix

Site selection matrix	Biodiversity	Surface and groundwater	Heritage	Air quality	Noise	Visual
PGM Plant Alternative Site 1 (preferred)	<ul style="list-style-type: none"> The vegetation on the site is completely modified. The site is of negligible ecological sensitivity. 	<ul style="list-style-type: none"> This site is within an existing disturbed area and within an existing dirty water management area. The runoff from the footprint is already accounted for in the water balance of the Storm Water Dam ("SWD") that contains all runoff from the disturbed footprint. The proposed new development may have a positive impact on runoff to be contained and the sediment load, because the paved footprint of the PGM plant will generate less sediment. The process and contact water that will be contained within the plant footprint will reduce runoff to the SWD and the load on the system. The new planned activities are not expected to increase the existing impacts to groundwater receptors. 	<ul style="list-style-type: none"> No heritage resources found. 	<ul style="list-style-type: none"> The increased air quality impacts during all phases of the project for this site will be localised and is unlikely to increase ambient concentrations at the closest sensitive receptors to the project. The significance of the air quality impacts are considered to be low. 	<ul style="list-style-type: none"> Low noise impact anticipated as the plant will be within an existing mining area and next to existing plants. 	<ul style="list-style-type: none"> Low to negligible visual impact is anticipated as the plant will be within an existing mining area and next to existing plants and other mining infrastructure. The view from the public tar road to the PGM plant extension will be obstructed by the existing PGM and tailings retreatment plants.
PGM Plant Alternative Site 2 (Not preferred)	<ul style="list-style-type: none"> The PGM plant site is largely disturbed, with only a narrow strip of isolated natural vegetation remaining. The vegetation that remains is in a degraded state and is classified as having a Low to Medium sensitivity. Alien invasive plant species such as <i>Tecoma stans</i> and encroachers such as <i>Dichrostachys cinerea</i> are present. A few individuals of the protected tree species <i>Sclerocarya birrea</i> (marula) was documented on site. A permit will need to be obtained from the Department of Forestry, Fisheries and the Environment before any of the trees can be eradicated. 	<ul style="list-style-type: none"> This site is within an existing disturbed area and within an existing dirty water management area. The runoff from the footprint is already accounted for in the water balance of the Storm Water Dam ("SWD") that contains all runoff from the disturbed footprint. The new planned activities are not expected to increase the existing impacts to groundwater receptors. 	<ul style="list-style-type: none"> No heritage resources found. 	<ul style="list-style-type: none"> The increased air quality impacts during all phases of the project for this site will be localised and is unlikely to increase ambient concentrations at the closest sensitive receptors to the project. The significance of the air quality impacts is considered to be low. 	<ul style="list-style-type: none"> Low noise impact anticipated as the plant will be within an existing mining area and next to existing plants. 	<ul style="list-style-type: none"> Low visual impact anticipated as the plant will be within an existing mining area and next to existing plants and other mining infrastructure. The view from the public tar road to the PGM plant extension will be obstructed by indigenous trees and the tailings dam and waste rock dumps will be in background views.

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

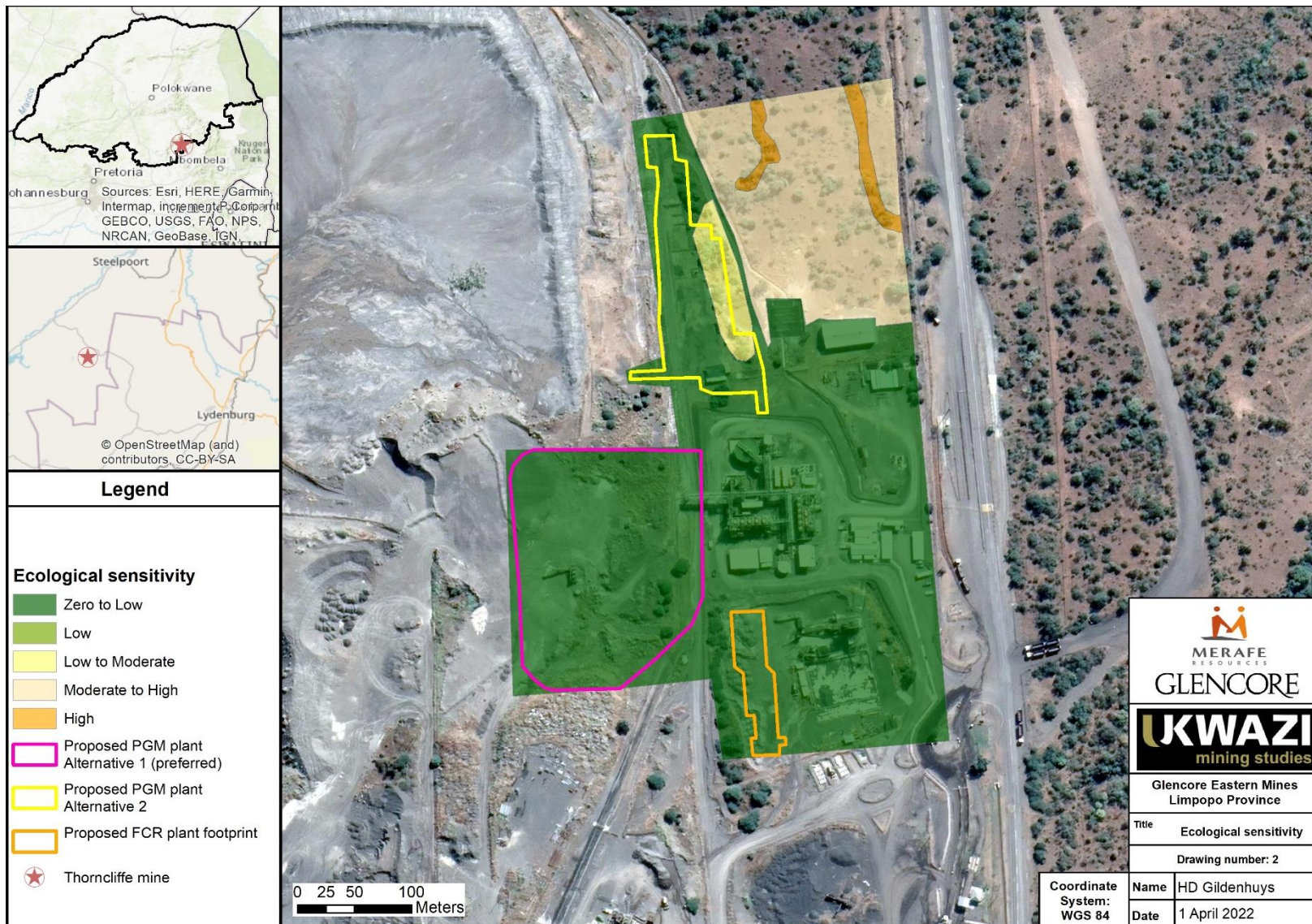


Figure 8-1: Plant alternative locations considered.

8.2.2. No-go alternative

The assessment of the “no-go” alternative is a legal requirement according to NEMA and the EIA Regulations. In this scenario no development will take place. The environment will remain and the impact on the area and potential benefits will not realise.

If the proposed PGM plant extension and FCR plant is not built the status quo will be maintained. The no-go alternative will imply that virtually none of the identified impacts (positive and negative) of proceeding with the project will be incurred. The sites identified for both plants are void of natural vegetation due to historical mining activities.

The impacts from the existing mining activities will continue even without the PGM plant expansion being implemented. However, without the project being implemented the mentioned socio-economic benefits from the proposed project will not be realised. This includes positive impacts such as job creation and economic benefits due to optimised mineral extraction from mine waste (tailings). Current indications are that 54 jobs will be created at the PGM plant extension and 28 at the FCR plant during the operational phase. Please refer to Section 12.

For the above reasons, the development and operation of the PGM plant extension and FCR plant is considered suitable and the “no-go” alternative is not a recommended option.

9. Details of public participation process

The public participation process (“PPP”) initiated for this project satisfied the requirements stipulated in Chapter 6 of GNR 982 of the NEMA EIA Regulations 2014 (as amended), promulgated in terms of the NEMA. Interested and/or affected parties (“I&APs”) were notified of the PPP and requested to provide comments on the draft EMPr amendment by newspaper advertisement, site notices, direct notification by email and registered mail. The draft EMPr was placed out for review for a period of 30 days. The proof of correspondence and notification will be attached in Appendix 5 in the final EMPr Amendment report to be submitted to the DMRE.

The public participation process was initially commenced with in January 2022 with the placement of a newspaper advertisement in the Steelburger on 13 January 2022. At the time of placing the advertisement PGM Plant Site Alternative 2 was the preferred site identified for the PGM plant (as per Section 8 above). The Applicant however realised at the time that PGM Plant Site Alternative 1 would be better suited and changed the preferred locality shortly after the advertisement was placed. The Draft EMPr compiled at the time therefore had to be updated. The document was however never provided to Interested and/or Affected Parties (“I&APs”). Site notices were briefly displayed on site, but taken down within a day of erecting them. No further actions were taken to notify I&APs, however those I&APs that asked to be registered were added to the Interested and Affected Party (“I&AP”) database.

9.1. Site notices

Notice boards were erected at key locations surrounding the project site at the start of the public participation period. Two notice boards of A2 size were placed on site at the following locations:

- On site visible from the main tar road past the mine
- Thorncliffe mine entrance

9.2. Newspaper advertisement

Advertisements, notifying the public of the Environmental Authorisation process were placed in the Steelburger on 13 January 2022 and 21 April 2022.

9.3. Direct notification of identified I&AP's

Identified stakeholders were directly informed by post, email, fax or sms on 22 April 2022. The stakeholders included:

- The owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site
- Limpopo Department of Economic Development, Environment and Tourism (“LEDET”)
- Department of Mineral Resources (Limpopo)
- Department of Water and Sanitation (“DWS”)
- Department of Agriculture, Forestry and Fisheries (“DAFF”)
- Department of Land Affairs
- Department of Rural Development and Land Reform: Limpopo
- South African Heritage Resources Agency (“SAHRA”) (Limpopo)
- Municipal Manager from the Sekhukune District Municipality
- Municipal Manager from the Fetakgomo Tubatse Local Municipality
- Ward councillor of Ward 27 of the Fetakgomo Tubatse Local Municipality
- ESKOM
- Other mines in the area
- Other stakeholders.

The site where the activity is proposed is owned by the applicant.

9.4. Draft EIA & EMPR

The draft EMPr Amendment will be subjected to a public review process of more than 30 days (from 21 April until 25 May 2022). The draft EIAR & EMPr was distributed for comment as follows:

- An electronic copy was made available on Dropbox;
- Electronic copies and hard copies will be made available to stakeholders (if requested).

9.5. Final EIA & EMPR

All comments received from I&APs will be incorporated into the final EMPr amendment report that will be submitted to the DMRE.

9.6. Summary of issues raised by I&APs

A record of the issues raised by I&APs, as well as the response by the applicant and EAP will be attached to the final EMPr Amendment.

Table 9-1: Table summarising comments and issues raised, and reaction to those responses.

This table will be included in final report to be submitted to the DMRE once comments have been received.

10. The Environmental attributes associated with the development footprint alternatives

10.1. Baseline environment

10.1.1. Climate

10.1.1.1. Temperature

The climate in the Thorncliffe mining area can be characterised as a warm-temperate summer-rainfall region. Meteorological data were obtained from the closest South African Weather Service Station (SAWSS) in Lydenburg, as well as on site from the Central Management Office (CMO).

The average daily temperature ranges from 24.1°C in January to 12.4°C in July. The mean annual temperature is 19.5°C. Minimum, mean and maximum temperatures and humidity for Lydenburg (weather station 0554816A7, period 2013) are provided in Table 10-1 below.

Table 10-1: Minimum, maximum and mean temperature and humidity measured at Lydenburg (weather station 0554816A7)



Month	Minimum Humidity	Maximum Humidity	Average Temperature	Maximum Temperature	Minimum Temperature
January	46.8	94.9	24.1	31.4	18.1
February	46	95.8	23.8	31.6	17.6
March	37.3	94.2	22.7	30.2	16.2
April	43.7	94.8	19.9	27.7	12.9
May	36.5	94.5	15.9	25.5	7.4
June	37	94.8	13.2	23.2	4.5
July	31.9	91.5	12.4	23.2	3.5
August	27.5	89.5	15.9	26	7.3
September	27.2	88.1	21.5	29.8	14.2
October	32.5	88.1	21.5	29.8	41.2
November	41.8	91.5	22.2	29.2	16.1
December	40.4	93.1	23.6	31	17.8
P Max	72.5	99.3	24.9	33.2	18.5
P Min	20.7	82.9	12.3	22.4	2.7


10.1.1.2. Rainfall

The study area falls within a summer rainfall region, with over 96% of the annual rainfall occurring during the months from October to April. Rainfall data was received from Glencore as collected on site at the Central Management Office (Table 10-2). January is the wettest month, with 120 mm being the average rainfall recorded over the past 18 years, while July is typically the driest month with an average of only 0.95 mm having been recorded. An average of 632.33 mm of rain per year was recorded.

Table 10-2: Rainfall figures recorded on site over the past 18 years

Month	Year																			Average
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
January	63	62	48	35	281	47	154	231	144	298	145	75	78	65	60	118	57	205	123	120,47
February	39	0	59	40	139	75	99	91	15	80	170	48	91	55	113	238	104	57	121	86,00
March	84	23	102	10	151	30	99	127	84	90	99	64	173	80	109	28	122	55	23,4	81,76
April	0	0	33	0	17	76	16	0	148	101	49	99	72	30	0	15	39	110	35,2	44,22
May	0	0	0	0	5	0	0	33	11	5	0	18	0	0	8	32	20	0	0	6,95
June	0	0	0	0	0	10	0	16	0	13	0	0	0	0	0	0	0	0	0,4	2,07
July	0	0	0	0	0	10	0	0	0	2	0	0	0	0	6	0	0	0	0	0,95
August	0	0	0	0	9	0	0	22	0	0	0	0	0	0	0	0	0	0	0	1,63
September	0	0	0	0	7	0	0	20	0	0	100	22	4	0	0	1	7	8	4,2	9,12
October	39	0	63	4	12	180	98	56	42	70	125	136	34	25	58	67	39	47	53,4	60,44
November	0	211	0	86	179	271	133	179	116	81	92	75	102	50	184	48	82	102	56,4	107,76
December	116	5	67	94	131	39	58	76	220	242	207	129	94	72	206	114	134	45	59,2	110,96
Total	341	301	372	269	931	738	657	851	780	982	987	666	648	377	744	661	604	629	476,2	632,33

 info@ukwazi.com
 +27 (0)12 665 2154
 +27 (0)12 665 1176

 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

 www.linkedin.com/company/ukwazi/

 Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

www.ukwazi.com
DIRECTORS: JJ Lothringen, SA Eckstein, NE Xaba

UKWAZI
 advisory

10.1.1.3. Wind

Airshed Planning Professionals did an analysis of the wind data available for the area from MM5 data (refer to Appendix 6.1). The MM5 (short for Fifth-Generation Penn State/NCAR Mesoscale Model) is a regional mesoscale model used for creating weather forecasts and climate projections. It is maintained by Pennsylvania State University and the National Center for Atmospheric Research in the United States.

The wind roses compiled by Airshed are indicated in Figure 10-1 and Figure 10-2. The wind roses comprise of 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated (Airshed, 2022).

The period wind field and diurnal variability in the wind field are shown in Figure 10-1, while the seasonal variations are shown in Figure 10-2. The wind regime for the area is dominated by south-easterly flow fields. The northerly wind flow is more dominant during day-time conditions, with south-easterly wind flow more dominant during the night. Calm conditions occurred 2.85 % of the period summarised. During the summer months, wind from the southeast sector dominates, with stronger winds of more than 6 m/s occurring. Infrequent but strong winds occur from the northerly and north-easterly sectors. During autumn, the winds are more frequent from the south-easterly sector. Winter months reflect an increase in flow from the south. During the Spring wind flow is still predominant from the south-easterly with an increase in winds from the northern sector (Airshed, 2022).

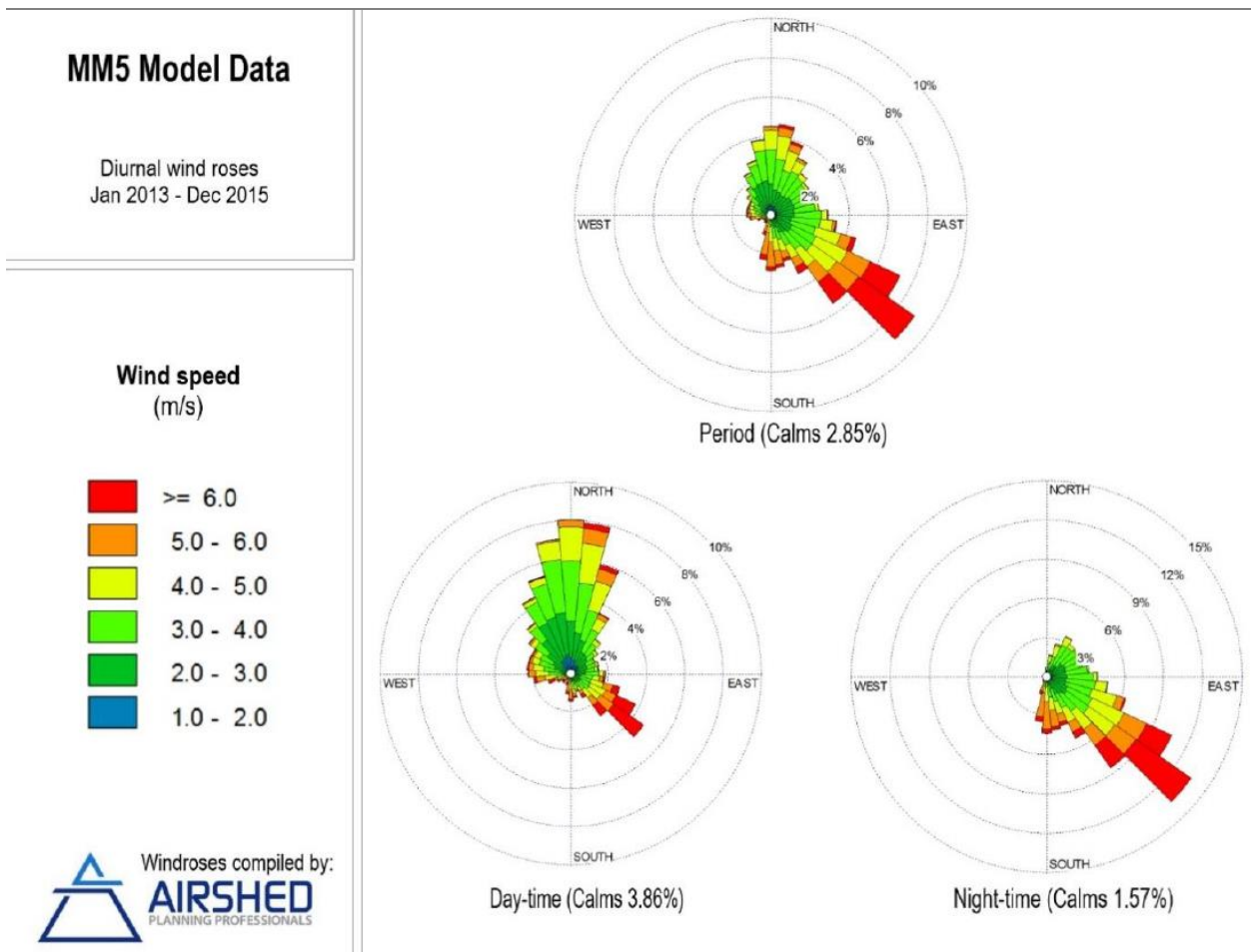
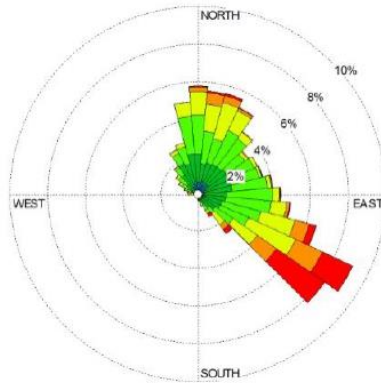


Figure 10-1: Period, day- and night-time wind rose (MM5 data for the period 2013 – 2015) (Airshed, 2022).

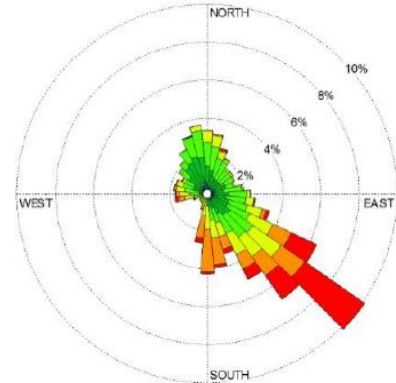
MM5 Model Data

Seasonal wind roses
Jan 2013 - Dec 2015

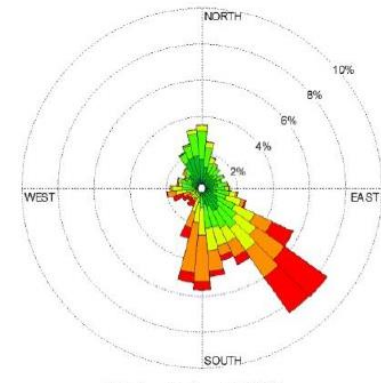
Wind speed
(m/s)



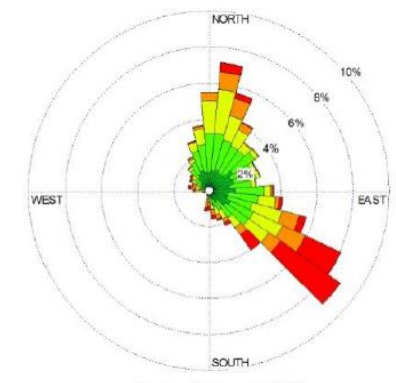
Summer (Calms 3.09%)



Autumn (Calms 3.64%)



Winter (Calms 2.58%)



Spring (Calms 2.09%)

Figure 10-2: Seasonal wind rose (MM5 data for the period 2013 – 2015) (Airshed, 2022).

A weather station has been erected on site at Thorncliffe Mine. The wind rose for Thorncliffe Mine is provided in Figure 10-3 below. The wind direction is predominantly from the east north-east to west north-west. The wind speed generally varies between 0.5 and 3.6 m/s.

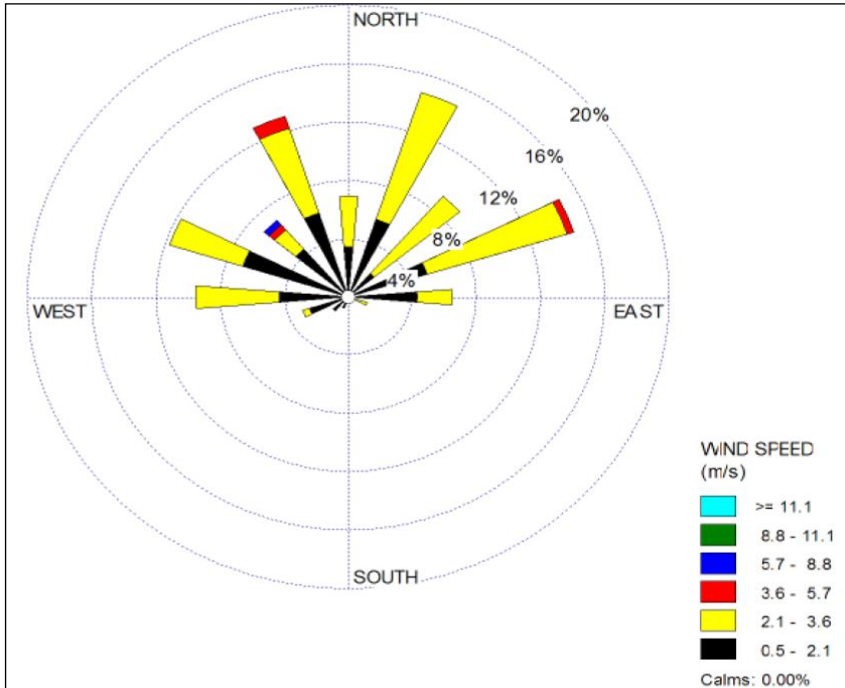


Figure 10-3: Wind rose for Thorncliffe Mine as per the weather station on site.

10.1.2. Topography

The topography of the area is influenced by the underlying geology of the area, as well as the climatic conditions and is characterised by rugged areas and steep gradients. The valleys are characterised by norites and anorthosites that are well fractured and in places faulted, while the ridges and high lying areas are associated with the more resistant lithological units.

The regional topography is rugged with steep slopes and incised valleys that strike east to west and north-east to south-west. The highest elevation is at 1230 mamsl at the mountain directly to the east of Magareng Mine (3km to the south-west), while the lowest is at 924 mamsl along the Klein- and Groot Dwars Rivers to the north of the study area. The proposed development site is situated at an elevation of 980 mamsl. The site slopes to the northeast and north towards the Groot Dwars River at a slope of about 4%.

10.1.3. Soil and land capability

Regionally the geology, landscape and topography of the area dominate the distribution of soil associations on the site. Two very distinct soil zones, one with hills and rocky slopes of more than 5 % and one in valley bottom depositional and floodplain areas with slopes of less than 5 %, were identified. The transition between these areas is often not very clear as rocky soils still occur on the edge and within the flatter areas. The flotation plant is proposed in an area where the slope is less than 5%.

Regionally this area is characterized by the accumulation of weathering products (both physical and chemical) from higher lying areas, often into deep soils. Even though deep soils are expected on the flatter parts of the landscape, rocky soils still occur extensively. The site is situated in landtype Dc31. The most dominant soils in this area include shallow Glenrosa and Mispah soils to deeper red Hutton soil form, while the substrate in the drainage channels is much more clayey and of the Rensburg or Arcadia soil forms.

The soils at Thorncliffe mine are brown, weakly structured sandy loams to sandy clay loams with clay content between 15 % and 30 %. The majority of the soils are too rocky to be of agricultural significance. Such rocky soil can be used for rehabilitation where no other soil is available.

The current land use in this area, outside of dedicated mining infrastructure areas, consists mainly of game farming or grazing. Riparian zones and very limited occurrence hydromorphic soils are the only wetland areas. Although the topography allows, the area is not particularly suitable for cultivation due to soil and climatic restrictions. The proposed site is currently used for mining related purposes.

10.1.4. Surface water

The Groot Dwars River flows past Thorncliffe mine on the northern boundary of the mine (Figure 10-4). The confluence of the Groot and Klein Dwars Rivers is approximately 8 km north of Thorncliffe Mine. The study area falls within the B41G Quaternary Catchment of the Olifants River Water Management Area. The site proposed for development is approximately 640 metres from the Groot Dwars River.

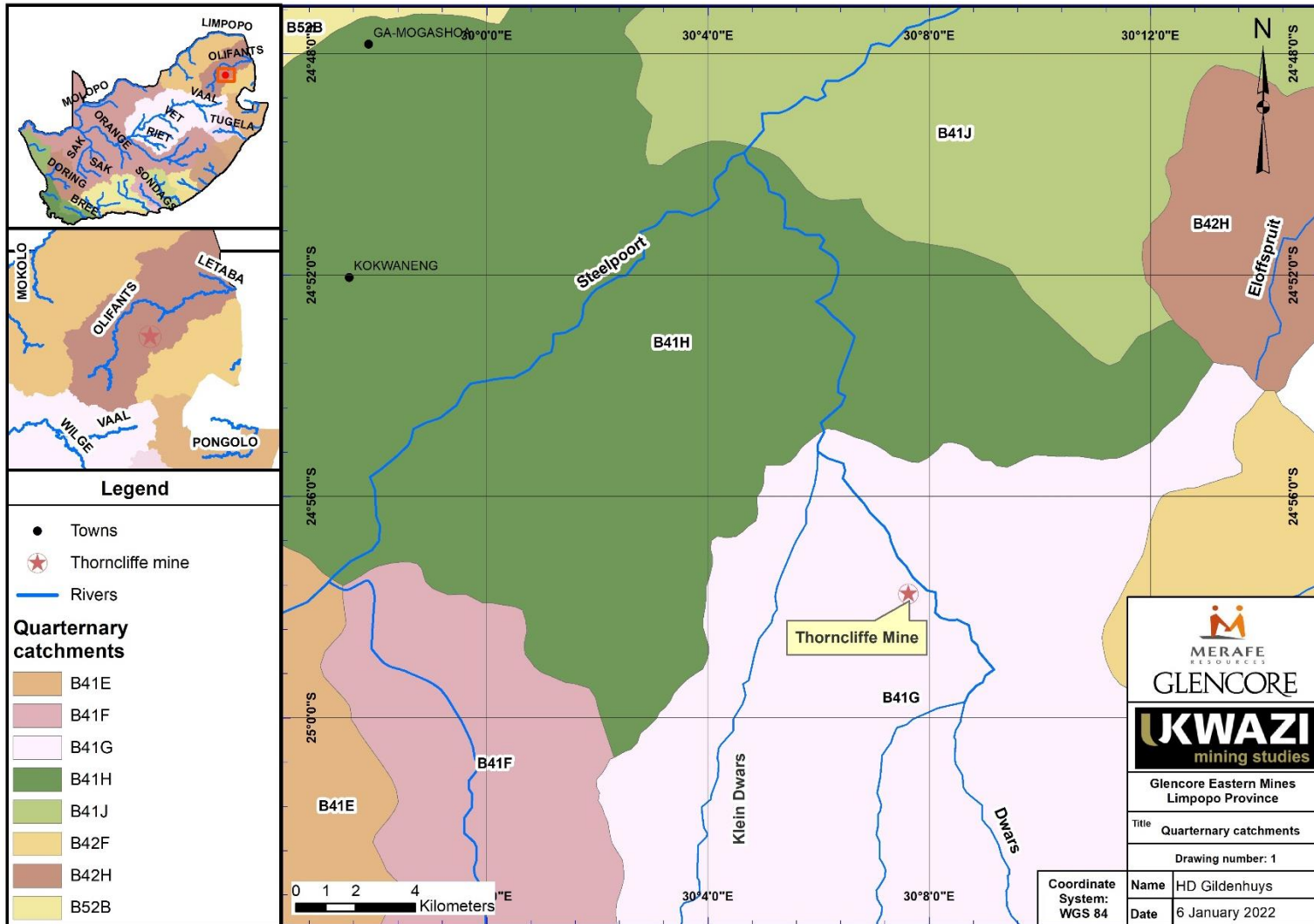


Figure 10-4: Quarternary catchment map

10.1.5. Biodiversity

An ecological impact assessment study was undertaken by Dr. Buks Henning as part of the original PGM plant EIA in 2008 and 2013. A terrestrial biodiversity memorandum was furthermore compiled by Dr Henning for the proposed development site in 2022.

The project area lies within the Savanna Biome. The Savanna Biome is the largest biome in Southern Africa. It is characterized by a grassy ground layer and a distinct upper layer of woody plants (trees and shrubs). The most recent classification of the area by Mucina & Rutherford shows that the proposed development site is located in an area classified as Sekhukhune Mountain Bushveld. The Sekhukhune Mountain Bushveld has a least threatened conservation status with 0.4% conserved and nearly 15% transformed. Transformation is mainly through dryland subsistence cultivation and urban built-up areas. The vegetation structure of the Sekhukhune Mountain Bushveld varies from open to dense woody layer, with associated woody and herbaceous shrubs and closed to open grass layer. The landscape topography is mainly moderate to steep slopes on mountainsides and sometimes deeply incised valleys. Flat terrain occurs dispersed in between the sloping terrain.

Henning (2022) found the proposed expansion sites to be in a degraded state. No natural vegetation remains on the proposed FCR Plant site (Figure 10-6). PGM Plant Alternative site 1 (preferred) is basically completely disturbed and is currently utilised as a stockpile area (Figure 10-7). PGM Plant Alternative site 2 is also largely disturbed but some natural vegetation remains on the north-eastern border – including protected tree species. The degraded state of the site varies from bare ground (cleared areas), with surrounding vegetation in a degraded state due to dust, alien species invasion and surrounding mining operations.

The ecological impact assessment undertaken by Henning in 2008 and 2014 as part of the original PGM plant EIA identified a number of vegetation types in the area of which only a narrow strip of the Open *Bolusanthus Peltophorum* Woodland remains on PGM Plant Alternative Site 2 (Figure 10-5). The vegetation classifies as having a low to medium sensitivity due to the presence of alien invasive species such as *Tecoma stans* and encroachers such as *Dichrostachys cinerea*. A few individuals of the protected tree species *Sclerocarya birrea* (marula) was documented on site. The species is listed as protected under the National Forest Act and a permit should be obtained from the Department of Forestry, Fisheries and the Environment before any of the trees can be eradicated. Since PGM Plant Alternative Site 1 to the west of the existing plant is basically completely disturbed, this site was selected as the preferred development site.

The preferred development sites for the FCR Plant and PGM Plant extension are of low to zero ecological sensitivity (Figure 10-9).

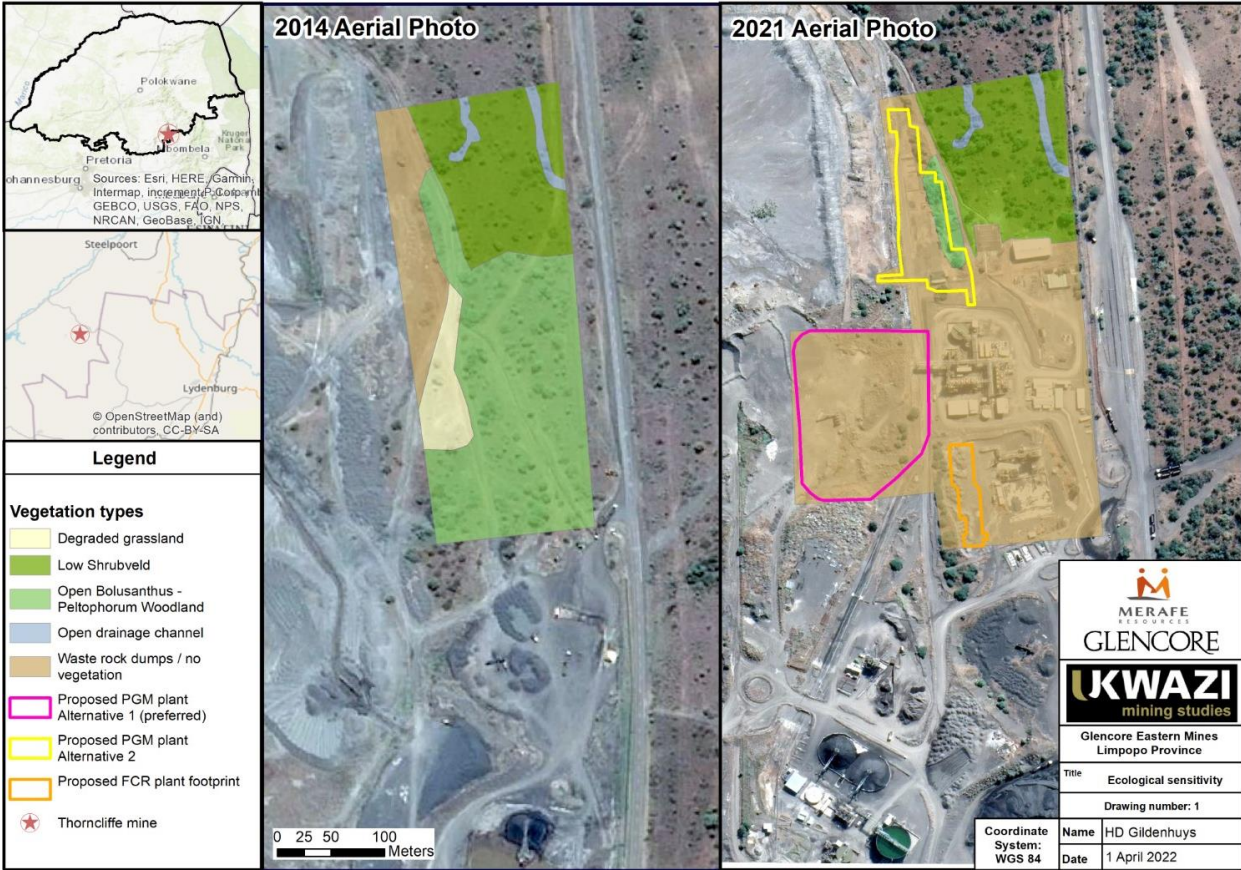


Figure 10-5: Vegetation types identified in 2014 and 2021



Figure 10-6: Aerial photo showing the footprint area of the proposed FCR plant site and views of the site showing that no natural vegetation remains on site



Figure 10-7: Aerial photo showing the footprint area of PGM plant extension site Alternative 1 (preferred) and views of the site showing the disturbed nature of the site



Figure 10-8: Aerial photo showing the footprint area of PGM plant extension site Alternative 2 (not preferred) and views of the site showing the lack of vegetation except for the narrow strip of vegetation on the north-eastern boundary

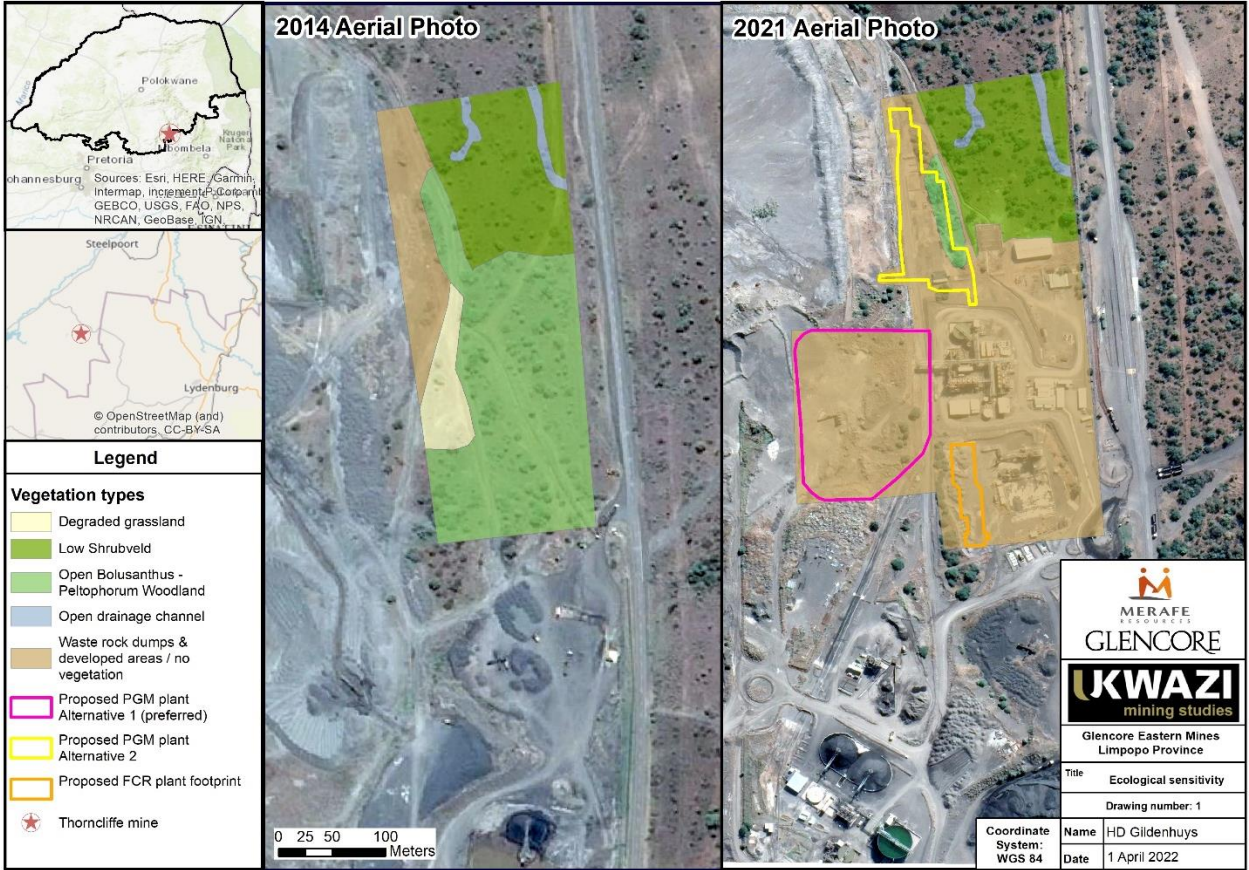


Figure 10-9: Ecological sensitivity map

10.1.6. Geology

Thornccliffe mine is located in the Dsjate Subsuite (Vdj) of the Rustenburg Layered Suite (“RLS”) that consists of coarse grained norite, anorthosite in the upper zones and medium to coarse grained pyroxenite in the lower zones. The mines exploit the chrome layers in the UG1, UG2, Dwars River Chromite layer, MG4, MG3, MG2, MG1 and LG7, LG6, LG5, LG3, LG1.

10.1.7. Hydrogeology

According to Delicado & Vivier (2021) the mean annual precipitation for the area is approximately 641 mm/annum with an average recharge percentage of between 2.0 to 3.5 percent of the Mean Annual Precipitation (“MAP”). The hydrogeology is controlled by the subsurface geology which includes the following important geological layers and features:

- Upper soil zone that is almost absent in the mountainous areas but vary to a thickness of 0.1 - 2 m in the low lying areas.
- The weathered, layered norite/anorthosite is present at a vertical depth of 5 - 20 m which is more pronounced in the topographic low-lying areas.
- The fractured/solid bedrock aquifer that underlies the weathered zone, formed by the basal pyroxenite and gabbro, norite and anorthosite at depths of 10 m to more than 50 m.
- Dyke structures and dykes – contact zones occur and they strike north-north-east and east-west.
- Localised alluvial and deep weathering zones along the Dwars River.

The solid/fractured bedrock zone is a non-aquifer as evidenced by the fact that Thornccliffe underground mine does not experience any fissure water inflow. The aquifers are classified as Minor with yields ranging from <0.5 ℓ/s to 2.5 ℓ/s and are formed by the weathered zones/basins that are controlled by local relief with deeper weathering in the low-lying areas.

Groundwater monitoring data aided the interpretation of the current groundwater regime. The topography indicates an elevated hill and mountainous area located to the south of Thornccliffe mine. The surface elevation decreases towards the north and east in the direction of the Groot Dwars River and to the west in the direction of the Klein Dwars River. The groundwater flow pattern follows the elevation regime as indicated from the observed water levels and shows a limited impact from small scale mine-dewatering (Delicado & Vivier, 2021).







From a review of the water level monitoring information, the following findings were made (Vivier & Delicado, 2022):

1. The water monitoring data from 2007 to 2019 has indicated that the mine has a negligible impact on the groundwater system in terms of mine dewatering in a regional context. At Thornccliffe mine, the mean water level is at 9.40 m, ranging between 3.41 m to 16.63 m, which proves that the underground mining activities has an insignificant impact on groundwater levels.
2. Even with the mine operating for more than 20 years, the shallow groundwater levels in Figure 6 1 confirm the limited impact from mine dewatering. The deeper water levels are associated with production boreholes used (and licensed) for water supply.
3. Only one borehole (BHT16) indicated groundwater levels exceeding the P95 measured from all groundwater levels (KC Vivier, 2021).

The proposed final mining depth for the Thornccliffe mine is planned for 600 m below surface. The future underground mining developments could increase mine dewatering as well as water supply to the mining operations. From the estimated abstraction data, Thornccliffe mine contributes the most to groundwater abstraction via water supply boreholes (362 m³/d). The borehole abstraction rates are however low, which points to the low permeability at depth and limited seepage from the shallow aquifer system to the deep underground. The extension of the existing PGM plant and construction of the FCR plant will not result in a significant increase in the abstraction of groundwater or impact on groundwater levels (Vivier & Delicado, 2022). The water supply for the proposed plant will be obtained from the mine’s Storm Water Dam (“SWD”), also known as the DeGrootboom Pit and the volume will be within the existing allocation specified in the mines approved Water Use Licence (“WUL”). Should the mine in future require additional water to be abstracted a new Water Use Licence Application (“WULA”) will need to be submitted to the Department of Water and Sanitation (“DWS”).

Apart from Thornccliffe’s licensed abstraction from the Dwars River of 500 m³/d for mine water, the Thornccliffe mining operations do not have a significant negative effect on the flow of the Groot Dwars River. The combined impact on the Groot Dwars River represents a flow reduction of ±1% (KC Vivier, 2021; Vivier & Delicado, 2022).

At Thornccliffe mine, the monitoring program was conducted from as early as 2007. Prior to the monitoring program a hydrocensus was done in 2003, which provided baseline data for both surface water as well as groundwater quantity

 info@ukwazi.com  +27 (0)12 665 2154  +27 (0)12 665 1176 www.ukwazi.com	 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park, 22 Karee Street, Southdowns, Centurion, 0157 Private Bag X159, Centurion, 0046	 www.linkedin.com/company/ukwazi/ Reg. No. 2016/224365/07 Reg. No. 2016/268801/07	
DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba			

and quality. The major chemical parameters that were analysed were total dissolved solids (TDS), nitrate (NO₃-N), and sulphate (SO₄). Nitrate, TDS, and sulphate increased in the process water and in groundwater close to mine residue facilities over the past ±10 years. This is due to improved water management with process water that is being recycled and kept in a closed circuit. Elevated nitrate and TDS observations cluster in the immediate mining area, which is due to the low transmissivity in the subsurface geology (Vivier & Delicado, 2022).

10.1.8. Hydrochemistry

The tailings storage facility to which the material from the PGM plant extension and FCR plant will report has already been authorised as part of the initial EIA for the PGM plant. Another facility for the codisposal of waste rock and tailings is currently in the planning phase and the environmental authorisation and water use licence process has been initiated. The process of the new PGM plant will be similar to the existing plant and the FCR plant will not change the chemical characteristics of the tailings material as it only uses a magnetic separation process.

For the purposes of providing an overview of the hydrochemistry of the material that will be deposited on the mine residue facility, a geochemical specialist investigation by Exigo Sustainability (Pty) Ltd (“Exigo”) in 2018 is referenced below (Ferreira, *et al.*, 2018). Exigo conducted the geochemical specialist investigation to determine the leachate potential and waste classification of the Glencore Eastern Chrome Mining operations’ mine residue. This included samples from Thorncliffe, Magareng and Helena mines. The objective of the study was to conduct a hydro-geochemical leaching potential assessment, verification with monitoring data and waste classification on the mine residue material. The geochemical specialist investigation by Ferreira *et al* (2018) was also used in the hydrogeological investigation for the proposed mine residue co-disposal facility at Thorncliffe mine (Delicado & Vivier, 2021). The tailings material emanating from the PGM and FCR plants will report to the existing and approved TSF, as well as the proposed (authorisation pending) co-disposal facility at Thorncliffe mine.

The GNR 635 analysis parameters were used for the geochemical leach tests. It indicated that the results of both the leachate assessment and the total (solid) assessment need to be considered.

A total of 37 samples of 1 kg each were taken from mine residue and stockpile facilities as follows:

1. Helena: 10 samples were composited and 4 were sent for laboratory analyses
2. Magareng: 14 samples were composited and 5 were sent for laboratory analyses
3. Thorncliffe: 13 samples taken and composited of which 5 were sent to the laboratory
4. One composite sample from Helena, Magareng and Thorncliffe tailings were taken as these 3 mine sections tailings are deposited on the same facility at Thorncliffe.

The composite samples were sent to Waterlab for the following analyses:

- X-ray diffraction analysis (“XRD”) analysis for mineralogical composition
- Aqua regia whole rock digest and ICP-MS analysis of the leachate to determine the metal and macro-chemical composition
- A distilled water leach was done to simulate leaching potential from rainfall.

A waste classification on the mine residues were conducted in line with GNR 635, pertaining to NEMWA on the samples sent to the laboratory for analysis. Reagent water leach tests, in accordance with the GNR 635, were used to determine the leachate composition.

The XRD analysis indicated that the mineralogical chemical composition consisted mainly of chromite (48%), enstatite (28%), talc (8.8%), plagioclase feldspar (7.4%) and biotite (4.8%).

The macro-chemical leachate (LCT) analysis of the stockpiles and waste rock samples at Thorncliffe mine indicated the following:

1. The leachate pH is close to neutral at 7.1 to 7.7 for all samples.
2. The TDS for the waste rock and stockpile areas is low, ranging from 22 mg/l to 166 mg/l (the SANS 241-2015 drinking water quality standard for TDS is 1200 mg/l).
3. The sulphate concentrations are low, ranging from 2 mg/l to 14 mg/l.
4. Nitrate (as N) concentrations are moderate to elevated at the stockpiles and range between 7 mg/l to 12 mg/l and elevated above at the SANS 241-2015 drinking water quality standard at the PGM plant (17 mg/l).

The metal leach analysis confirmed that the material at the PGM plant has the potential to leach low levels of Cr, which is not mobile in the groundwater as confirmed by the monitoring data. Due to the neutral pH, no leaching of metals is expected. There is no risk for acid rock drainage (ARD) as the sulphide content is far exceeded by the alkaline buffer

capacity. The nitrate originates from explosives as the XRD analyses confirmed that there is no nitrate bearing minerals in the mined material (Delicado & Vivier, 2021).

The macro leachate results of the composite sample of the tailings material from all three mines (Thornccliffe, Magareng and Helena) indicated the following:

1. The leachate pH is close to neutral at 7.6.
2. The TDS concentration is elevated at 1158 mg/l, but still below the SANS 241-2015 drinking water quality standards.
3. Chloride concentrations are moderate at 26 mg/l.
4. The sulphate is low (49 mg/l).
5. The nitrate concentration is high at 137 mg/l. This far exceeds the SANS 241-2015 drinking water quality standard but is expected due to blasting of the ore.

The leach analysis confirmed that the inorganic anions such as NO₃-N have the potential leach out (Ferreira, *et al.*, 2018; Delicado & Vivier, 2021).

The assessment of the total concentration values according to GNR 635 requires analysis of the total (solid) concentration of specific chemical constituents in the waste rock solid phase. The results are compared to the Total Concentration Threshold ("TCT") values stipulated in GNR 635. The whole rock total concentration ("TCT") analyses indicated B, Ba, Co, Cr, Cu, Ni, Mn, V, Zn and Total fluoride exceeds the threshold values for TCT0. Delicado & Vivier (2021) however considers the TCT concentrations to be irrelevant for water pathways, with the LCT concentrations (leachable component) considered to be the more relevant of the two indicators. The leachable concentration (LCT) analyses showed that TDS and NO₃-N exceed the threshold values for LCT0 in the tailings material.

Delicado & Vivier (2021) did the waste classification according to GNR 635, but further classified the material by incorporating the LCT0 (long term ground- and surface water monitoring data).

The following conclusions were derived from the analysis of the material at the PGM plant and the composite tailings sample from all three mines (Delicado & Vivier, 2021):

- The whole rock total concentration threshold (TCT) the analyses indicated that the stockpile material at the PGM plant classify as a Type 3 waste based on the exceedance of the TCT0 of numerous chemical constituents.
- The leachate assessment of the mine residue indicated that the PGM plant material exceeded the lowest regulatory (LCT0). In accordance with GNR 635 the sample sites classify as Type 3 waste.
- From the monitoring data no Cr (IV) and Cr (III) are present in the ground- or surface water. This is most likely due to the adsorption potential of clays weathered from mafic and ultramafic igneous rocks for metals and metalloids.
- The TCT for the analyses of the composite tailings material indicated the threshold values for TCT0 was exceeded and thereby classified as a Type 3 waste.
- In terms of the leachate assessment, i.e., the liquid phase, the results show that TDS and NO₃-N exceeds the leachable concentration threshold (LCT0).
- From the detailed analysis conducted on the long-term surface- and groundwater, TDS and NO₃-N was detected at moderate to high concentrations exceeding the baseline and SANS 2015 drinking water quality standard. These exceedances are however localised around mining activities, and additionally nitrate decays naturally as it moves through the sub surface with passing time. A half-life of ± 300 days was calculated considering the long-term monitoring data (2007 to 2021).
- Based on the above, Delicado & Vivier (2021) argued that the monitoring data provided the basis for re-classifying the waste as a Type 4 waste, as a source. The risk-based modelling approach incorporates an analysis of a multi barrier approach as to ensure the main downstream receptor (Dwars River) is not notably affected/impacted.

In summary, the material sampled at the PGM plant and the composite tailings material classified as a Type 3 waste in terms of GNR 635, but was reclassified as a Type 4 waste by Delicado & Vivier (2021) by evaluating the long-term surface- and groundwater monitoring results.

The TSF where the tailings material is currently disposed of has an approved EMPR, environmental authorisation and waste use licence. In future the material will be disposed of at the proposed combined tailings and waste rock co-disposal facility. This facility is currently in the planning phase and the relevant environmental approvals is still pending. In addition to tailings material from Thornccliffe, Helena and Magareng mines, Glencore also proposes to process tailings material from external sources at the PGM and FCR plants. Where material from external sources is received and processed, Glencore will need to ensure that the material has been classified in terms of GNR 635, and that the design

criteria of the facility where the tailings is disposed is such that it can receive the type of waste to be deposited at the site.

10.1.9. Palaeontology

Dr JF Durand conducted a palaeontological desktop assessment for the Glencore Eastern mines in 2018 that is also valid for this study area.

The study area is underlain by norite and pyroxenite of the Dwars River Subsuite of the Rustenburg Layered Suite of the Bushveld Igneous Complex and is therefore of no palaeontological importance. Parts of the Thorncliffe study site are overlain by Quaternary sediments, however. There is a very low probability that these sediments may be fossiliferous.

Dr Durand (2018) recommended that the mine should be exempted from further palaeontological studies due to the very low probability of fossils occurring in the study area.

10.1.10. Heritage and cultural environment

A Cultural Heritage Survey was conducted by Coetzee (2008) of the site initially proposed for the flotation plant and tailings dam. A follow up survey was compiled by Mr Neels Kruger in 2013 as part of the PGM plant amendment project and another site survey was undertaken as part of the PGM extension and FCR plant project in October 2021.

No heritage or archaeological remains were found to occur in the area. Mr Kruger confirmed that the project areas have been transformed by past and ongoing mining activities and no sites of archaeological and historical value were documented within the proposed project footprints. It is also probable that no heritage resources were impacted upon during site clearing and initial construction, based on observations made on historic recordings. Kruger (2022) found that the proposed project and related construction activities will have no significant impact on heritage resources or the larger heritage landscape.

10.1.11. Air quality

Glencore's Thorncliffe Mine operates eight single dust fallout buckets. At Thorncliffe mine the only bucket at a residential area is located at the Thorncliffe guest farm. The guest farm is located approximately 1.5 km south-east of the project area. The measured dustfall from the mine for the period February 2021 to January 2022 was provided for four of the eight sites. The dust bucket at Thorncliffe guest farm was sampled each month. The dustfall measured was evaluated in terms of the National Dust Control Regulations ("NDCR") acceptable dustfall rates. No exceedances of the NDCR non-residential standard of 1200 mg/m²/day and residential standard of 600 mg/m²/day was measured during this period.

10.1.11.1. Existing Sources of Emissions near the proposed project

The sources of SO₂ and oxides of nitrogen (NO_x) that occur in the region include blasting operations at mines, veld burning, vehicle exhaust emissions and household fuel burning.

Various local and far-a-field sources are expected to contribute to the suspended fine particulate concentrations (which would include PM₁₀ and PM_{2.5}) in the region. Local sources include wind erosion from exposed areas, fugitive dust from agricultural and mining operations, vehicle entrainment from roadways and veld burning. Long-range transport of particulates, emitted from remote tall stacks and from large-scale biomass burning in countries to the north of South Africa, has been found to contribute significantly to background fine particulate concentrations over the interior (Airshed, 2018).

10.1.11.1.1. Materials handling

Materials handling operations associated with mining activities in the area include the transfer of material by means of tipping, loading and off-loading of trucks. The quantity of dust that will be generated from such loading and off-loading operations will depend on various climatic parameters, such as wind speed and precipitation, in addition to non-climatic parameters such as the nature (i.e. moisture content) and volume of the material handled (Airshed, 2018).

10.1.11.1.2. Household Fuel Burning

Despite the intensive national electrification program, a large number of households continue to burn fuel to meet all or a portion of their energy requirements. The main fuels with air pollution potentials used by households within the study region are coal, wood and paraffin.

Coal burning emits a large amount of gaseous and particulate pollutants including sulfur dioxide, heavy metals, total and respirable particulates including heavy metals and inorganic ash, carbon monoxide, polycyclic aromatic hydrocarbons, and benzo(a)pyrene. Polyaromatic hydrocarbons are recognised as carcinogens. Pollutants arising due to the combustion of wood include respirable particulates, nitrogen dioxide, carbon monoxide, polycyclic aromatic hydrocarbons, particulate benzo(a)pyrene and formaldehyde. The main pollutants emitted from the combustion of paraffin are NO₂, particulates carbon monoxide and polycyclic aromatic hydrocarbons (Airshed, 2018).

10.1.11.1.3. Biomass Burning

The biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity, crop-residue burning and wild fires (locally known as veld fires) may represent significant sources of combustion-related emissions.

The biomass burning is an incomplete combustion process, with carbon monoxide, methane and nitrogen dioxide gases being emitted. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left in the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds. The visibility of the smoke plumes is attributed to the aerosol (particulate matter) content. In addition to the impact of biomass burning within the vicinity of the proposed mining activity, long-range transported emissions from this source can be expected to impact on the air quality between the months August to October. It is impossible to control this source of atmospheric pollution loading; however, it should be noted as part of the background or baseline condition before considering the impacts of other local sources (Airshed, 2018).

10.1.11.1.4. Vehicle Exhaust Emissions

Air pollution from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere, and secondary, those pollutants formed in the atmosphere as a result of chemical reactions, such as hydrolysis, oxidation, or photochemical reactions. The significant primary pollutants emitted by motor vehicles include carbon dioxide (CO₂), CO, hydrocarbon compounds (HC), SO₂, NO_x and particulate matter (PM). Secondary pollutants include NO₂, photochemical oxidants (e.g. ozone), HC, sulfuric acid, sulfates, nitric acid and nitrate aerosols (Airshed, 2018).

10.1.11.1.5. Fugitive Dust Emissions from Open Cast Mining

Open cast mines are associated with significant dust emissions, sources of which include land clearing, blasting and drilling operations, materials handling, vehicle entrainment, crushing, screening (etc.).

Mining activities in the area include the Der Brochen Mine and Northam's Booyendal Mine to the south. In addition, the Mareesburg Platinum Joint Venture is adjacent Mareesburg farm to the southeast (Airshed, 2018).


10.1.11.1.6. Other Fugitive Dust Sources

Fugitive dust emissions may occur as a result of vehicle entrained dust from local paved and unpaved roads, wind erosion from open areas and dust generated by agricultural activities (e.g. tilling) and mining. The extent of particulate emissions from the main roads will depend on the number of vehicles using the roads and, on the silt, loading on the roadways.

Windblown dust generates from natural and anthropogenic sources. For wind erosion to occur, the wind speed needs to exceed a certain threshold, called the threshold velocity. This relates to gravity and the inter-particle cohesion that resists removal. Surface properties such as soil texture, soil moisture and vegetation cover influence the removal potential. Conversely, the friction velocity or wind shear at the surface is related to atmospheric flow conditions and surface aerodynamic properties. Thus, for particles to become airborne, its erosion potential has to be restored; that is, the wind shear at the surface must exceed the gravitational and cohesive forces acting upon them, called the threshold friction velocity. Every time a surface is disturbed, its erosion potential is restored. Erodible surfaces may occur as a result of agriculture and/or grazing activities (Airshed, 2018).

10.1.12. Socio-economic

The proposed site falls within the jurisdiction of the Fetakgomo Tubatse Local Municipality ("FTLM"). The Greater Tubatse Local Municipality ("GTLM") merged with the Fetakgomo Local Municipality ("FLM") in 2016 to form the Fetakgomo Greater Tubatse Local Municipality ("FGTLM"). The municipality's name was later changed to Fetakgomo Tubatse Local Municipality ("FTLM"). The statistics provided below are from various documents dating back to 2011 when the mine was still in the GTLM. The documents referenced therefore refer to different municipal names depending on what the municipality was called at the time. The municipality forms part of the Sekhukhune District Municipality.

✉ info@ukwazi.com	📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park, 22 Karee Street, Southdowns, Centurion, 0157 Private Bag X159, Centurion, 0046	🌐 www.linkedin.com/company/ukwazi/	
☎ +27 (0)12 665 2154 📠 +27 (0)12 665 1176	👤 DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba	Reg. No. 2016/224365/07 Reg. No. 2016/268801/07	

The area of jurisdiction of FTLM is approximately 4 550 km² (2016/17 Draft Consolidated IDP for FTLM). According to the IDP the northern part has inferior social and engineering infrastructure which impacts on the stability of the economy in this area. This may be attributed to the rural nature of the area. As such, upliftment in the area is of critical importance. There is also virtually no economic base in the northern part of the area and the area is solely dependent on government handouts and migrant labour income for survival.

10.1.12.1. Population Profile

According to the 2011 STASA information; the total population of the FTLM is approximately 429471, consisting of 106 050 households. The combined total number of households for the Fetakgomo and Tubatse Municipalities in 2011 was 106 050 and 125 454 in 2016, which makes the municipality the biggest municipality in the district. The municipality has shown a growth of 8% growth in 2016; this might be due to the mining activities taking place in the area.

The population in the Sekhukhune district per gender is shown below in Table 10-3. The figures show that there are more females in the district than males.

Table 10-3: Sekhukhune district population group by gender (FGTLM IDP, 2016/17)

2011 Statsa				2016 Community survey		
	Male	Female	Total	Male	Female	Total
Sekhukhune	497 648	579 191	1 076 840	548 463	621 299	1 169 762

10.1.12.2. Language

The languages that are spoken within the GTLM include Sepedi (94%) and isiZulu (1.2%). Other languages make up the remaining 4.8% (StatsSA, 2011). Table 10-4 below provides more detail the languages spoken by the people of GTLM.

Table 10-4: Frequently spoken languages in households in GTLM (StatsSA, 2011)

Afrikaans	English	IsiXhosa	IsiZulu	Sepedi	Sesotho	SiSwati	Xitsonga	Tshivenda	Others
0.5%	0.5%	0.3%	1.2%	0,94	0.1%	0.4%	0.6%	0.1	0.4

10.1.12.3. Gender & Age Distribution

Table 10-5 shows that the total population is dominated by young people below 18. The age categories below the age of 18 comprise 51% of the population. The ratio for females is almost equal at ages between 0-17 and then this makes a change. Male-female distribution is then dominated by females for example, from ages 19-65.

Table 10-5: Gender and age distribution within former GTLM (GTLM IDP, 2016/17)

Age	Male	Female	Grand Total
0-4	22878	21999	44877
5-9	20271	22517	42788
10-14	22440	23354	45794
15-19	19349	19811	39160
20-24	15907	19112	35019
25-29	13245	14505	27750
30-34	10667	11582	22249
35-39	7324	8828	16152
40-44	6076	9519	15595
45-49	4952	7109	12061
50-54	4180	6448	10628
55-59	3241	3993	7234
60-64	2552	4075	6627
65-69	2256	3015	5271
70-74	1484	3086	4570
75-79	1124	2618	3742
80-84	362	1322	1684
85+	335	1911	2266

Age	Male	Female	Grand Total
Grand Total	158663	184804	335 676

10.1.12.4. Education Levels

Education levels in the Limpopo province lag behind those of other provinces of South Africa. While average literacy levels for South Africa were 82.2%, literacy levels for Limpopo were 73.6% in 1991. The GTLM at the time had 163 primary schools, 92 secondary schools and 8 private schools with a total of 114 723 learners and 3689 educators. Burgersfort, Ohrigstad and Steelpoort each have a primary school and Burgersfort has additional private primary and secondary schools. Two state of the art schools have been developed by the Department of Limpopo, i.e. Nthame primary school at Riba and Batubatse primary school in Praktitiseer. In rural areas, an abundance of primary schools tends to be common as many pupils leave school early in search of employment in order to support their families. Those that can afford to continue to secondary school do so within the area or in more developed towns outside the municipality (GTLM IDP, 2016/17). 22.6% of people above the age of 20 have completed matric (grade 12); while 6.6% have higher education (STATSSA, 2011). Figure 10-10 shows education levels in Greater Tubatse Local Municipality.

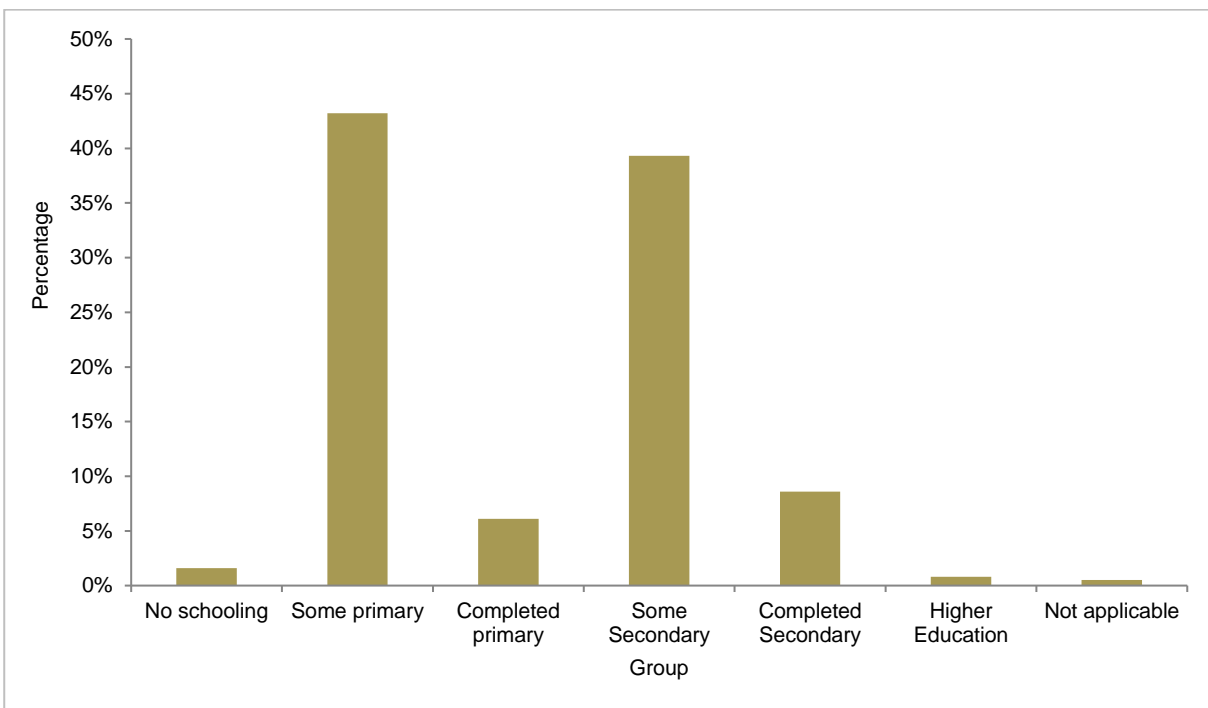


Figure 10-10: Education levels in GTLM (StatsSA, 2011)

The municipality has a weak economic base and high poverty levels. Approximately 15.7 % of individuals earn no income, while a further 6.5 % earn less than R4800 per month (Figure 10-11).

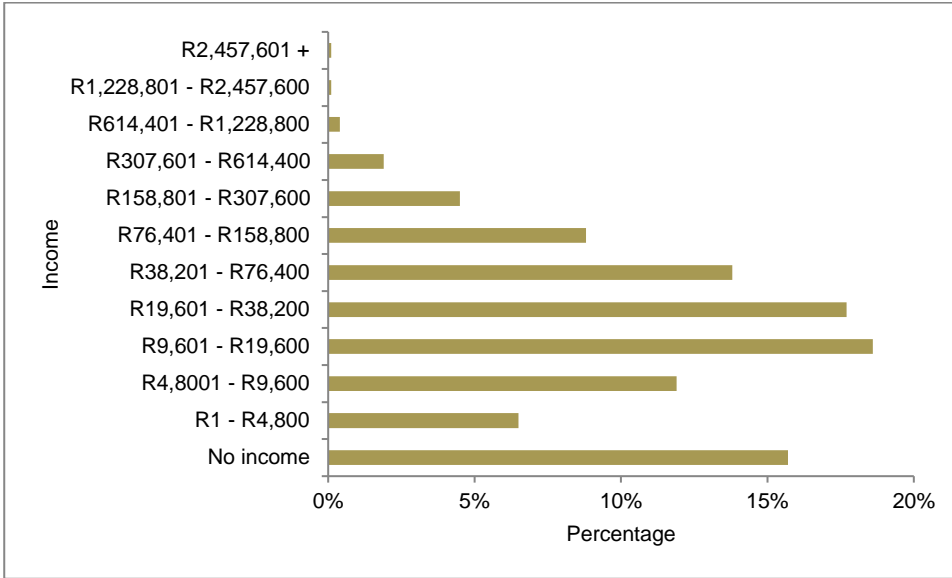


Figure 10-11: Average household income in GTLM (StatsSA, 2011)

10.1.12.5. Employment Status

The former GTLM has a youth unemployment rate of 59.6%. In 2009, the GTLM had the highest rate of unemployment in the district at 28 022 and in 2015 it still had the highest with 22 264 people unemployed. Figure 10-12 illustrates the employment status of the people of GTLM.

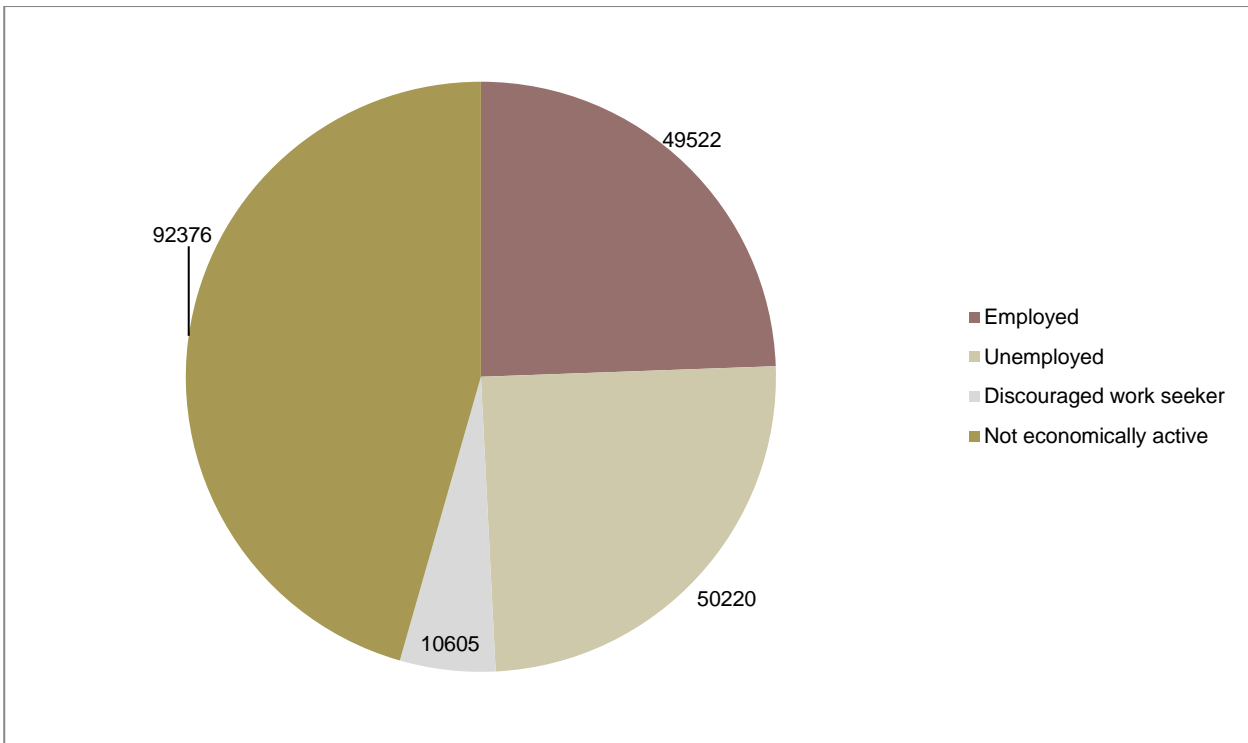


Figure 10-12: Employment status of people aged 15-64 in GTLM (StatsSA, 2011)

Owing to the municipality’s rural nature, the municipality is plagued by challenges of poor or backlogged service delivery. The provision and maintenance of services become costly because most of the settlements are situated far apart. Some areas are also not large enough to achieve the economic threshold required to make social facilities

available in a manner that is economically viable (FGTLM IDP, 2016/17). Majority of infrastructural projects within municipality are Expanded Public Works Programme related projects. Such projects aid in the generation of employment opportunities and the assurance of the improvement of the socio-economic conditions within the area. 800 jobs were created in the 2014/2015 financial year through the construction of the small access bridges and other related projects.

10.1.13. Sensitive landscapes

The Dwars River is situated approximately 640 metres north-east of the site proposed for development. An area of natural vegetation is located to the north-east of the existing PGM plant site across from the mine's dirty stormwater channel (approximately 130 north-east of the proposed PGM plant extension site). This area classifies as a CBA according to the Limpopo Conservation Plan. This area will not be impacted by the proposed development. The proposed development sites are all disturbed by historical mining activities. The sites are on an area classified by the Limpopo Conservation Plan as an ecological support area and is not located within the CBA.

10.1.14. Description of the current land uses

The site proposed for development is situated within an active mine site. The mine consists of historical opencast and current underground operations. A mined out open pit is also located in the northern section of Thorncliffe mine on the farm De Grootboom. The pit has been partially filled with overburden and partly used as a tailings storage facility. A mineral processing plant and two tailings treatment facilities (PGM flotation plant and the chrome recovery plant) are located on site. The PGM plant extension is proposed directly west of the existing PGM plant, while the FCR plant is proposed directly south of the PGM plant.

10.1.15. Description of specific environmental features and infrastructure on site

The site proposed for development of the FCR plant and extension of the PGM plant is void of vegetation, as it is currently used as a stockpile area. No heritage features can be found on site.

10.1.16. Environmental and current land use map

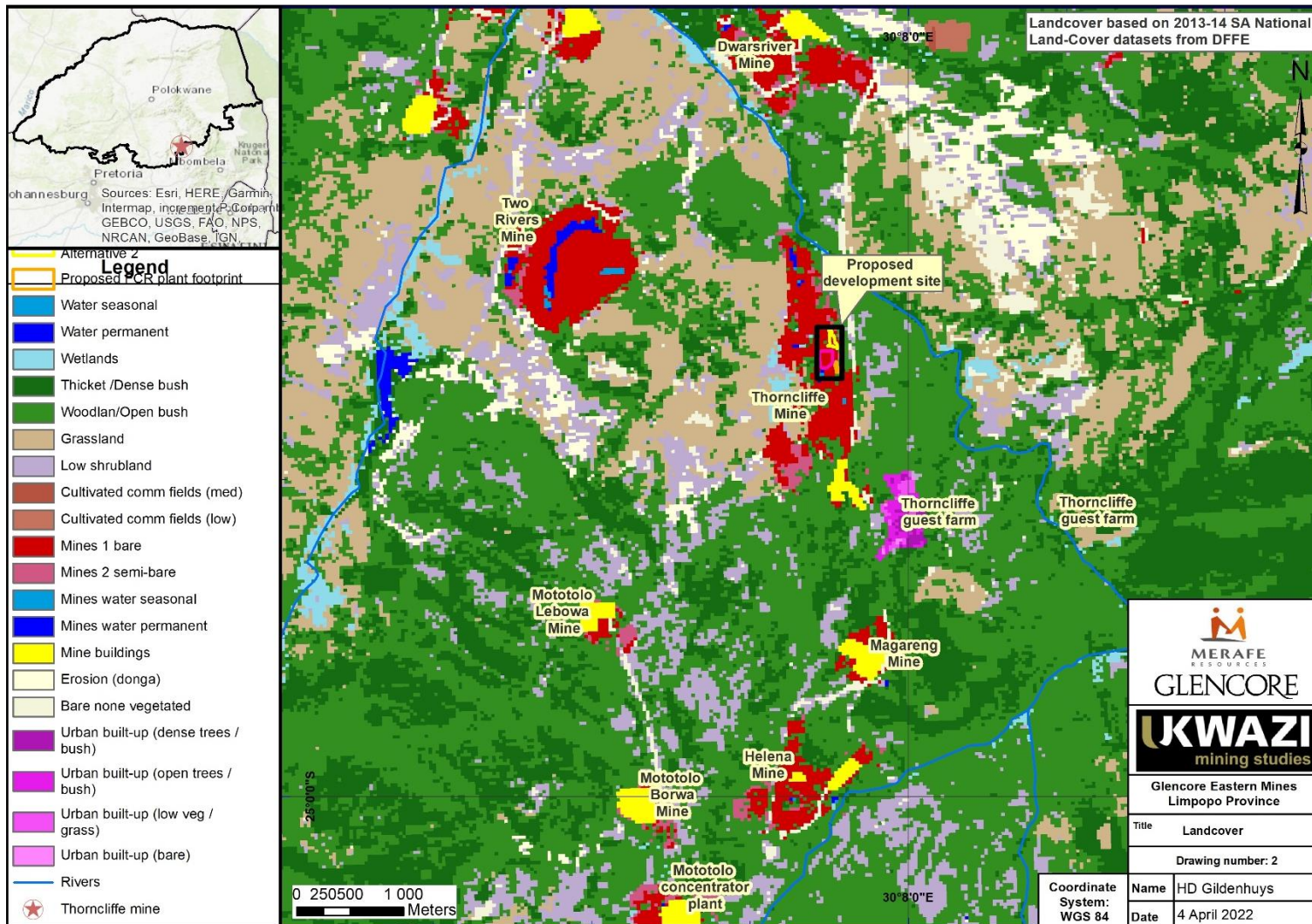


Figure 10-13: Regional Land Cover Map

11. Impacts, risks and mitigation identified

11.1. Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts

11.1.1. Biodiversity impacts

The following biodiversity impacts were identified

- Pre-construction and construction phase:
 - Fauna and flora habitat loss and disturbance
 - Proliferation of alien invaders
 - Increased siltation of surface water and impact on aquatic biota
- Operational phase:
 - Fauna and flora habitat loss and disturbance and proliferation of alien invaders
- Closure and decommissioning phase:
 - Re-establishment of flora and fauna on site after rehabilitation

Henning (2022) found the proposed expansion sites to be in a degraded state. No natural vegetation remains on the proposed FCR Plant site (Figure 10 6). The preferred site for the PGM Plant is basically completely disturbed and is currently utilised as a stockpile area. The preferred development sites for the FCR Plant and PGM Plant extension are of low to zero ecological sensitivity.

Significance Rating

The development of the flotation plant is expected to have a negligible impact on the ecology of the area as the site has already been modified. All the above-mentioned impacts can be reduced to negligible significance during the construction and operational phases.

During the closure and rehabilitation phase all impacts were rated to be of low positive significance with the implementation of adequate rehabilitation techniques.

11.1.2. Agricultural and soil impacts

The plants will be constructed within an open area on an existing mine site. The site is predominantly disturbed due to historical and existing mining activities.

The following agricultural and soil impacts are expected:

- Construction phase:
 - Increased erosion of site area
 - Potential contamination from fuel spills and leakages to soil
- Operational phase:
 - Potential contamination from reagent and fuel spills, and leakages to soil
- Closure and Decommissioning Phase
 - Land use capability restoration

Due to the disturbed nature of the site the impacts are expected to be limited. The broader area is dominated by predominantly shallow and rocky soils due to the hilly topography. Soils in lower lying areas and floodplains are deeper and generally structured and dominated by swelling clay minerals such as smectite. Due to the parent materials the soils are predominantly of above neutral pH and high in Ca and Mg. High Mg levels are often found in the soils of lower lying areas and this leads to their susceptibility to erosion. Management measures should be put in place to control and mitigate soil erosion.

Topsoil will be recovered where possible in areas that will be affected by mining and utilized for remedial actions. Topsoil collection will however be limited on site since it is already largely disturbed. The depth of the stockpile and the time it is stored affects the quality of the soil at replacement and therefore constitutes the greatest risk to future rehabilitation. Topsoil stockpiles exceeding 2 m, result in the formation of anaerobic conditions and subsequent reduced aerobic conditions. Changes in topsoil characteristics include the potential for increased acidity and salt content, development of nutrient deficiencies or imbalances, surface crustiness or desiccation, changes in vegetation cover and land use with the potential for production of atmospheric dust and other pollution. An increase in the movement of vehicles may result in fuel spills that may also have a localised impact on the soil, especially during the construction and operational phases of the mine. During the decommissioning phase the soil that has been stockpiled will be re-used during rehabilitation. This will allow the re-establishment of vegetation on the newly placed soils which will reduce erosion and allow these areas to be incorporated back into the surrounding environment.

Without proper rehabilitation taking place the proposed development will have a moderate to low impact on land capability; however the implementation of a closure plan and financial provision for closure will ensure a low to negligible impact on agriculture and land capability.

11.1.3. Surface water impacts

Potential surface water impacts identified during the construction phase due to stormwater runoff include increased erosion of site area, as well as increased siltation of surface waters and impact on aquatic biota. During the operational phase surface water impacts can result from contaminated surface water runoff. The site is however located in an already disturbed footprint area and within an existing dirty water management area. The runoff from the footprint is already accounted for in the water balance of the SWD that contains all runoff from the disturbed footprint.

All impacts from the plant during construction and operation were rated to be of negligible significance after the implementation of mitigation measures. These include preventing pollution from entering the environment by managing plant runoff and directing it to the mine's pollution control dam, as well as containing reagents and possible contaminants in approved bunded areas.

11.1.4. Hydrogeological impacts

Potential ground water impacts identified during the construction and operational phases relate to managing surface water runoff and directing surface water runoff to the mine's pollution control dam.

During the operational phase the impacts identified include impacts on groundwater quality (including contaminated surface water runoff), and an impact on the mine's water balance resulting in water quantity impacts due to abstraction should additional groundwater abstraction be required due to water shortage. This is however not anticipated as no new allocation will be required or applied for.

Both plants pose a low risk to groundwater quantity or quality. The plants are planned to be concrete lined during construction and there will be no disposal of mine waste on the extended footprints. The tailings from the plants will report to the approved tailings storage facility or the combined waste rock and tailings co-disposal facility that at the time of writing this report was still pending approval from the DMRE.

In terms of hydrogeology the preferred site for the PGM plant will be in an optimal position as, although unlikely, any spillage or seepage from the plant will report to the backfilled open pit area to the north, due to its larger permeability values. Any seepage at the mine is captured via boreholes and the De Grooteboom return water pit. This would also limit the likelihood of potential mass migration and contamination risks towards the Groot Dwars River. Any unlikely seepage or spillage from the plants will largely be contained within the disturbed open pit area and migrate in a northerly direction towards seepage capturing boreholes and the De Grooteboom return water pit, before the water is reused in the process.







The mine currently monitors 16 boreholes and 4 surface water locations on a monthly basis in terms of the commitments in its approved EMPr and water use licence. Biomonitoring is also undertaken in two locations along the Groot Dwars River. The nearest receptor to the mine, the Thorncliffe Guest Farm, is just over 1.5 km away and upstream of the proposed facilities. Therefore, no risk of groundwater impacts on the guest farm due to the construction of the new plants exist.

All impacts from the plant during construction and operations were rated to be of low to negligible significance after the implementation of mitigation measures. Through monitoring the groundwater quality and taking cognisance of the plant processes, impacts on the groundwater due to activities at the plant may be identified and pollution control methods may be put into place. The mitigation and monitoring network contained within the current EMPR is largely sufficient, but is proposed to be amended to include the drilling of one additional shallow monitoring borehole (165 mm diameter, 25 m deep) downstream of the plant extensions with monthly groundwater level and water quality monitoring. There are additional borehole monitoring locations directly east (BHT8), as well as downstream (BHT6, BHT7a and BHT10) of the planned new facilities that form part of the current monitoring network.

11.1.5. Heritage impacts

During the heritage survey it was found the project areas have been transformed by past and ongoing mining activities and no sites of archaeological and historical value were documented within the proposed project footprints. No heritage resources were impacted upon during site clearing and initial construction, based on observations made on historic aerial images and maps.

No heritage resources are present on site and the impact is of negligible significance.

 info@ukwazi.com  +27 (0)12 665 2154  +27 (0)12 665 1176	 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park, 22 Karee Street, Southdowns, Centurion, 0157 Private Bag X159, Centurion, 0046	 www.linkedin.com/company/ukwazi/ Reg. No. 2016/224365/07 Reg. No. 2016/268801/07	
www.ukwazi.com DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba			

11.1.6. Air quality impacts

The various construction activities may result in low to negligible off-site air quality impacts. The temporary nature of the construction activities, and the likelihood that these activities will be localised and for small areas at a time, will reduce the potential for significant off-site impacts.

The main wind direction is mainly from east north-east to west north-west. There are no sensitive receptors within 1 km from the proposed plants. The closest sensitive receptor is the Thorncliffe Guest Farm which is situated approximately 1.5 km south-east of the site proposed for the flotation plant.

The proposed project will result in an increase of particulate ambient concentrations from the original approved plant due to the potential increase in vehicle movement (viz. vehicle entrained dust). This is due to the increase in throughput of ~54%. Vehicle movement include:

- The trucking of re-mined tailings from the Thorncliffe re-mining site to a wash/stock pad area next to the plant;
- The transport of concentrate off-site.

Dust may also result from the trash screens at the proposed fine chrome recovery plant and the materials handling of the discarded material onto the waste stockpile, if the material is dry.

All other plant activities are wet and will not result in adverse ambient air quality.

Particulate ambient concentrations due to construction and decommissioning activities will increase due to increased plant footprints. The main activities during the construction phase that will cause ambient emissions will include clearing of vegetation for the floatation plant extension, site levelling, vehicle movement (resulting in exhaust emissions and vehicle entrainment), materials storage, handling and transfer operations and exposed open areas (resulting in windblown dust). The main sources of emissions during the closure phase will include dust generated during rehabilitation activities, demolition of the structure, vehicle emissions, and vehicle entrainment from vehicles utilised during this phase.

The increased air quality impacts during all phases of the project will be localised and is unlikely to increase ambient concentrations at the closest sensitive receptors to the project. The significance of the air quality impacts due to the project are therefore considered to be low, especially with the implementation of mitigation measures such as dust suppression and treatment with water sprays.

During the closure and rehabilitation phase all impacts are expected to be of negligible significance. If rehabilitation as indicated in the mine's rehabilitation plans takes place i.e. re-shaping and vegetation cover, the impacts should be limited to be within the site boundary. As vegetation cover increases, the potential for wind erosion will decrease.

11.1.7. Noise impacts

The background noise climate is dominated by local traffic noise emanating from the extensive mining activity in the area. Noise monitoring at the mine is taking place on an annual basis. The noise climate is mostly dominated by trucks on these routes as well as existing activities on Thorncliffe mine. Noise pollution relates mostly to the use of compressors, movement of vehicles, and the milling processes. The associated impacts are primarily related to hearing loss (if in very close proximity) and nuisance.

The milling processes may contribute to the cumulative noise effect. The proposed development is however situated within an existing mining area and the nearest sensitive receptors are approximately 1.5 km away. It is therefore not anticipated that the proposed noise impact will contribute significantly to the cumulative impact of the existing operations at the mine. In addition, the existing haul road is sufficiently trafficked by transport from other existing mines in the area that it is as significant a noise source.

It is anticipated that the impact will be of low to negligible significance if the distance to sensitive receptors are taken into account as well as the mitigation measures proposed (e.g. equipment noise audits, silencers etc.).

11.1.8. Visual impacts

The proposed flotation plant will be constructed and operated within an existing mining area and the site is surrounded by mining infrastructure such as waste rock dumps, tailings dams, a plant etc. The proposed plant will therefore not be out of character taking into account the existing visual environment of the site.

By taking this into account the significance of the visual impact of the proposed development can be considered to be low to negligible.

11.1.9. Socio-economic impacts

The proposed project will create additional jobs (both in the construction and operational phase of the project) that will have a positive impact on employment in the area as well as the local economy. The expectation from the community is that the project will provide employment opportunities for them, and inaccurate perceptions in this regard could cause disappointment if they are then not employed. Additionally, a number of the jobs created will be temporary, and it can have a negative impact on those who occupy the temporary positions when the project becomes operational.

Current indications are that 54 jobs will be created at the PGM plant extension and 28 at the FCR plant during the operational phase. Job creation will be a significant positive impact emanating from the proposed development.

Many of the impacts experienced in the construction phase will continue in the operational phase. The following generic impacts that can be expected, however the relative contribution of the proposed plants will be small considering the large workforce that is employed by the mine.

Once the mine closes there will be a migration out of the area due to the decrease in economic opportunities. The land use will change from mining to agriculture (grazing) or residential. There will be a change in economic activities that will cause a loss of employment opportunities. There will be a negative impact on the livelihoods of people who depended on the mining economy.

The creation of direct employment opportunities, and indirect economic opportunities, are rated as being of a moderate positive significance rating during the construction and operational phases. Negative perceptions regarding the number of people that will be employed and the economic benefits that the local community will receive is rated to be of low significance, however this impact can be reduced to being of negligible significance with open and honest communication as well as providing the necessary training.

During the closure phase the loss of employment and livelihoods as a result of the closing of the mine are impacts rated as having a moderate significance. However, by preparing the staff properly for closure and undertaking other employee wellness programmes, this impact can be mitigated to a low significance.

Refer to Table 11-1 below the impact assessment matrix.

Table 11-1: Impact Assessment Matrix

No	Activity	Impact	Without mitigation ("WOM") or With Mitigation ("WM")	Nature (Negative or Positive Impact)	Probability		Duration		Extent		Magnitude/Severity		Significance		Mitigation Effect	Time period for implementation
					Magnitude	Score	Magnitude	Score	Magnitude	Score	Magnitude	Score	Score	Magnitude		
BIODIVERSITY IMPACTS																
Pre-Construction and Construction Phases																
1	Stripping of vegetation for construction of facilities	Fauna and flora habitat loss and disturbance	WOM	Negative	Improbable	5	Long term	4	Footprint	1	Very Low	1	6	Negligible	Partly reversible	Pre-Construction and Construction Phases
			WM	Negative	Improbable	5	Long term	4	Footprint	1	Very Low	1	6	Negligible		
2	Stripping of topsoil for construction of facilities and disturbance of site	Proliferation of alien invaders	WOM	Negative	Probable	2	Long term	4	Footprint	1	Low	2	14	Negligible	Partly reversible	Pre-Construction and Construction Phases
			WM	Negative	Probable	2	Long term	4	Footprint	1	Low	2	14	Negligible		
3	Stripping of vegetation and topsoil for construction of facilities	Increased siltation of surface water and impact on aquatic biota	WOM	Negative	Improbable	1	Long term	4	Footprint	1	Low	2	7	Negligible	Partly reversible	Pre-Construction and Construction Phases
			WM	Negative	Improbable	1	Long term	4	Footprint	1	Low	2	7	Negligible		
Operational Phase																
4	Operation of the PGM Plant and FCR plant	Fauna and flora habitat loss and disturbance and proliferation of alien invaders	WOM	Negative	Highly probable	4	Long term	4	Site	2	Low	2	32	Low	Partly reversible	Operational phase
			WM	Negative	Probable	2	Long term	4	Site	2	Very low	1	14	Negligible		
Closure and Decommissioning Phase																
5	Closure and decommissioning of the PGM Plant and FCR plant	Re-establishment of flora and fauna on site after rehabilitation	WOM	Positive	Probable	2	Long term	4	Site	2	Low	2	16	Negligible	N/A	Decommissioning
			WM	Positive	Highly probable	4	Long term	4	Site	2	Low	2	32	Low		
AGRICULTURAL AND SOIL IMPACTS																
Construction Phase																
6	Stripping/storing of soil for construction of facilities	Increased erosion of site area	WOM	Negative	Probable	2	Long term	4	Footprint	1	Medium	6	22	Low	Partly reversible	Construction, Operation
			WM	Negative	Probable	2	Long term	4	Footprint	1	Low	2	14	Negligible		
7	Vehicle movement and maintenance	Potential contamination from fuel spills and leakages to soil	WOM	Negative	Highly probable	4	Long term	4	Footprint	1	Medium	6	44	Moderate	Partly reversible	Construction, Operation
			WM	Negative	Probable	2	Long term	4	Footprint	1	Medium	6	22	Low		
Operational Phase																
7	Operation of plants, vehicle movement and maintenance	Potential contamination from reagent & fuel spills and leakages to soil	WOM	Negative	Highly probable	4	Long term	4	Footprint	1	Medium	6	44	Moderate	Partly reversible	Construction, Operation
			WM	Negative	Probable	2	Long term	4	Footprint	1	Medium	6	22	Low		
Closure and Decommissioning Phase																
10	Rehabilitation of PGM and FCR plant areas	Land use capability restoration	WOM	Positive	Highly probable	4	Long term	4	Footprint	1	Medium	6	44	Moderate	N/A	Decommissioning
			WM	Positive	Highly probable	4	Long term	4	Site	2	Medium	6	48	Moderate		
SURFACE WATER IMPACTS																
Construction and Operational Phase																
11	Operation of the PGM Plant and FCR plant	Impact on surface water quality due to stormwater runoff	WOM	Negative	Probable	2	Long term	4	Local	3	Medium	6	26	Low	Reversible	Construction and Operation
			WM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible		
Closure and Decommissioning Phase																
12	Rehabilitation of PGM and FCR plant areas	Impact on surface water	WOM	Negative	Probable	2	Medium term	3	Local	3	Medium	6	24	Low	Reversible	Decommissioning
			WM	Negative	Probable	2	Medium term	3	Local	3	Low	2	16	Negligible		
HYDROGEOLOGICAL IMPACTS																
Construction and Operational Phases																
13	Operation of the PGM Plant and FCR plant	Impact on mine water balance – make up water requirements	WOM	Negative	Highly probable	4	Long term	4	Site	2	Low	2	32	Low	Reversible	Construction and Operation
			WM	Negative	Probable	2	Long term	4	Site	2	Low	2	16	Negligible		
14	Operation of the PGM Plant and FCR plant	Impact on groundwater quality	WOM	Negative	Highly probable	4	Long term	4	Site	2	Medium	6	48	Moderate	Reversible	Construction and Operation
			WM	Negative	Probable	2	Long term	4	Site	2	Medium	6	24	Low		
Closure and Decommissioning Phase																
15		Impact on groundwater	WOM	Negative	Probable	2	Medium term	3	Local	3	Medium	6	24	Low	Reversible	Decommissioning

No	Activity	Impact	Without mitigation ("WOM") or With Mitigation ("WM")	Nature (Negative or Positive Impact)	Probability	Duration	Extent	Magnitude/Severity	Significance	Mitigation Effect	Time period for implementation					
	Rehabilitation of PGM and FCR plant areas		WM	Negative	Probable	2	Medium term	3	Local	3	Low	2	16	Negligible		
HERITAGE IMPACTS																
Construction Phase																
16	Stripping/storing of soil for construction of facilities	Potential loss of heritage sites	WOM	Negative	Improbable	1	Permanent	5	Footprint	1	High	8	14	Negligible	Can be avoided, managed or mitigated	Implemented throughout all phases
			WM	Negative	Improbable	1	Permanent	5	Footprint	1	High	8	14	Negligible		
AIR QUALITY IMPACTS																
Construction Phase																
17	Stripping/storing of soil for construction of facilities	Impact on ambient air quality	WOM	Negative	Probable	2	Medium term	3	Site	2	Medium	6	22	Low	Reversible	Construction
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible		
Operational Phase																
18	Operation of the PGM Plant and FCR plant	Impact on air quality	WOM	Negative	Probable	2	Long term	4	Local	3	Medium	6	26	Low	Reversible	Operational
			WM	Negative	Probable	2	Long term	4	Local	3	Medium	6	26	Low		
19	Operation of the PGM Plant and FCR plant	Dust and fumes from mine vehicles	WOM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible	Reversible	Operational
			WM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible		
Closure and Decommissioning Phase																
20	Closure and decommissioning of the PGM plant and FCR plant	Dust and fumes from decommissioning, levelling, rehabilitation and mine vehicles	WOM	Negative	Highly probable	4	Medium term	3	Local	3	Low	2	32	Low	Reversible	Decommissioning
			WM	Negative	Probable	2	Medium term	3	Site	2	Low	2	14	Negligible		
NOISE IMPACTS																
Construction Phase																
21	Vehicle movement and maintenance	Raise in ambient noise levels	WOM	Negative	Highly probable	4	Medium term	3	Local	3	Low	2	32	Low	Reversible	Construction
			WM	Negative	Probable	2	Medium term	3	Local	3	Low	2	16	Negligible		
Operational Phase																
22	Operation of the PGM Plant and FCR plant	Impact on ambient noise levels due to milling	WOM	Negative	Probable	2	Long term	4	Local	3	Medium	6	26	Low	Reversible	Operational
			WM	Negative	Probable	2	Long term	4	Local	3	Medium	6	26	Low		
Closure and Decommissioning Phase																
23	Closure and decommissioning of the PGM plant and FCR plant	Impact on ambient noise levels from decommissioning, rehabilitation and mine vehicles	WOM	Negative	Highly probable	4	Long term	4	Local	3	Low	2	36	Low	Reversible	Once off and implemented throughout all phases
			WM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible		
VISUAL / AESTHETIC IMPACTS																
Construction Phase																
24	Stripping/storing of soil for construction of facilities	Decreased aesthetic appeal of site	WOM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible	Reversible	Construction
			WM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible		
Operational Phase																
25	Operation of the PGM Plant and FCR plant	Decreased aesthetic appeal of site	WOM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible	Reversible	Operational
			WM	Negative	Probable	2	Long term	4	Local	3	Low	2	18	Negligible		
Closure and Decommissioning Phase																
26	Closure and decommissioning of the PGM Plant and FCR plant	Increased aesthetic appeal of site upon closure	WOM	Positive	Highly probable	4	Permanent	5	Local	3	Low	2	40	Low	N/A	Decommissioning
			WM	Positive	Highly probable	4	Permanent	5	Local	3	Low	2	40	Low		
SOCIO-ECONOMIC IMPACTS																
Pre-construction and Construction Phase																
27			WOM	Negative	Highly probable	4	Medium term	3	Regional	4	Low	2	36	Low		

No	Activity	Impact	Without mitigation ("WOM") or With Mitigation ("WM")	Nature (Negative or Positive Impact)	Probability	Duration		Extent		Magnitude/Severity		Significance		Mitigation Effect	Time period for implementation	
	Increase in employment opportunities and economic benefits	Unrealistic pre-construction expectations regarding economic benefits and job creation	WM	Negative	Probable	2	Medium term	3	Regional	4	Low	2	18	Negligible	Can be avoided, managed or mitigated	Pre-construction and Construction Phase
28	Construction initiation	Increase in income and employment	WOM	Positive	Definite	5	Medium term	3	Regional	4	Low	2	45	Moderate	N/A	Construction
			WM	Positive	Definite	5	Medium term	3	Regional	4	Low	2	45	Moderate		
Operational Phase																
29	Operation of the PGM Plant and FCR plant	Increase in income and employment	WOM	Positive	Definite	5	Long term	4	Regional	4	Low	2	50	Moderate	N/A	Operational
			WM	Positive	Definite	5	Long term	4	Regional	4	Low	2	50	Moderate		
Decommissioning Phase																
30	Rehabilitation of PGM and FCR plant areas	Loss of employment and livelihoods	WOM	Negative	Highly probable	4	Medium term	3	Regional	4	Medium	6	52	Moderate	Can be avoided, managed or mitigated	Decommissioning
			WM	Negative	Highly probable	4	Medium term	3	Regional	4	Low	2	36	Low		

11.2. Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks

An impact can be defined as any change in the physical-chemical, biological, cultural and/or socio-economic environment that can be attributed to human activities. Assessment of impacts will be based on the Department of Environmental Affairs Guideline Document: EIA Regulations 2010. The significance of the aspects/impacts of the process will be rated by using a matrix derived from Plomp (2004) and adapted to fit this process. These matrixes use the consequence and the likelihood of the different aspects and associated impacts to determine the significance of the impacts.

The significance of the impacts was determined through a synthesis of the criteria described in below:

Table 11-2: Criteria used for rating impact significance

Probability: This describes the likelihood of the impact occurring.	
Improbable	There is a possibility that the impact might occur, however the likelihood is low, due to the circumstances, design or experience.
Probable	There is a probability that the impact will occur to the extent that provision must be made therefore.
Highly probable	It is most likely that the impact will occur at some stage of the development.
Definite	The impact will take place regardless of any prevention plans.
Duration: The lifetime of the impact.	
Very short term	The impact will be instantaneous and disappear almost immediately.
Short term	The impact is expected to last less than 2 years.
Medium term	The impact is expected to last between 2 and 10 years.
Long term	The impact will occur for the project duration but will cease after the operational life of the activity or once decommissioning and/or rehabilitation has taken place.
Permanent	The impact is expected to continue indefinitely beyond decommissioning. Mitigation either by man or natural processes for negative impacts will not occur in such a way or in such a time span that the impact can be considered transient.
Extent: The physical and spatial scale of the impact.	
Footprint	The impacted area could extend only as far as the activity, e.g. footprint within the site.
Site	The impact could extend to the property proposed for development.
Local	The impact could extend to the local area or district, including neighbouring properties, residential areas etc.
Regional	The impact could extend to the region or province.
National or International	The impact could affect the whole country and/or could have an international impact.
Severity: The intensity or amplitude of the impact on the socio-economic or environmental aspects	
Zero	Natural and/or social functions and/or processes remain unaltered.
Very low	Natural and/or social functions and/or processes are negligibly altered.
Low	Natural and/or social functions and/or processes are slightly altered.
Medium	Natural and/or social functions and/or processes are notably altered.
High	Natural and/or social functions and/or processes are severely altered.
Significance: This is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required.	
Negligible	The impact is non-existent or unsubstantial and is of no or little importance to any stakeholder and can be ignored.
Low	The impact is limited in extent, has low to medium intensity; whatever its probability of occurrence is, the impact will not have a material effect on the decision and is likely to require management intervention with increased costs.
Moderate	The intensity of the impact will be moderate to high; therefore, the impact may materially affect the decision, and management intervention will be required.
High	The impact could render development options controversial or the project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in mitigation.

The following weights were assigned to each attribute:

Aspect	Description	Weight
Probability	Improbable	1
	Probable	2
	Highly Probable	4
	Definite	5
Duration	Very short term	0,5
	Short term	1
	Medium term	3
	Long term	4
	Permanent	5
Extent	Footprint	0,5
	Site	1
	Local	2
	Regional	3
	National or International	4
Magnitude	Zero	0
	Very low	1
	Low	2
	Medium	6
	High	8
Significance	Negligible	</=20
	Low	</=40
	Moderate	</=60
	High	>60

The significance of each activity was rated without mitigation measures (“WOM”) and with mitigation (“WM”) measures for all phases of the development.

The mitigation effect of each impact was indicated without and with mitigation measures as follows:

- Can be reversed
- Can be avoided, managed or mitigated
- May cause irreplaceable loss of resources

11.3. The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected

Refer to Section 11.1 above for the positive and negative impacts that the proposed project (preferred alternative) is expected to have on the biophysical and socio-economic environment.

11.4. The possible mitigation measures that could be applied and the level of risk

The following mitigation measures table (Table 11-3) has been taken from the approved EMPR’s with additional mitigation measures added based on the most recent specialist studies conducted.

Table 11-3: Mitigation measures

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
BIODIVERSITY IMPACTS							
Pre-Construction and Construction Phases							
1	Stripping of vegetation for construction of facilities	Fauna and flora habitat loss and disturbance	<ul style="list-style-type: none"> The extent of the construction site should be demarcated on site layout plans and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as "no-go" areas for employees, machinery or even visitors; and The sites proposed for development have been disturbed and protected tree species are not known to occur on the preferred development sites. However protected tree species do occur on undisturbed areas to the north of the existing PGM plant site. Should protected tree species need to be removed at the mine site this can only happen after a permit is obtained from the Department of Forestry. Intentional killing of invertebrates should be avoided by means of awareness programmes. The labour force should be made aware of the conservation issues pertaining to the taxa occurring on the study site. 	Partly reversible	Pre-Construction and Construction Phases	Ecologist and / or SHEQ Officer	NEMBA, NEMA
2	Stripping of topsoil for construction of facilities and disturbance of site	Proliferation of alien invaders	<ul style="list-style-type: none"> Existing invasive plants will be removed and the mine property will be surveyed at least once a year to check for the return of any new alien invaders. An invasive and alien plant species control programme must be drafted and implemented by the SHEQ department. All illegal exotic or invader plants and weeds shall be eradicated as required. Awareness program to all staff must include alien and exotic species identification (species expected on this site only) and eradication measures. 	Partly reversible	Construction Phase	Contractor, ECO and / or SHEQ Officer	NEMBA, NEMA

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
			<ul style="list-style-type: none"> Invasive and alien plants should be identified and eradicated by implementation of the eradication programme. A monitoring program should be implemented afterwards to evaluate the success of the programme. On-going removal of alien vegetation stands and encroaching terrestrial species, which show signs of dominance or active recruitment, should take place throughout the construction and operational phase of the development. Soil should only be used for rehabilitation purposes and not for other uses such as for road construction. 				
3	Stripping of vegetation and topsoil for construction of facilities	Increased siltation of surface water and impact on aquatic biota	<ul style="list-style-type: none"> Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any stormwater drainage channels or areas where it is likely to erode or cause siltation. The topsoil stockpiles must be reshaped, protected against erosion and vegetated with indigenous grass species. Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the paths causing the erosion, are to be undertaken. Vegetation should only be removed in areas designated for infrastructure. Construction during the rainy season should be closely monitored and controlled. 	Partly reversible	Construction Phase	Contractor, ECO and / or SHEQ Officer	Conservation of Agricultural Resources Act (Act No. 43 of 1983) ("CARA")
Operational Phase							
4	Operation of the PGM Plant and FCR plant	Fauna and flora habitat loss and	<ul style="list-style-type: none"> Raise awareness amongst employees by the compilation and distribution of pamphlets 	Partly reversible	Operational phase		NEMBA, NEMA

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/



Reg. No. 2016/224365/07
Reg. No. 2016/268801/07


www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
		disturbance and proliferation of alien invaders	<p>indicating the names and photos of red data species found at the mine and/or surrounds.</p> <ul style="list-style-type: none"> The re-vegetation of the disturbed areas will become an integral part of activities during the operational phase. The areas where the buildings and plant area are situated will only be re vegetated once the structures have been removed during the decommissioning phase. The invasive and alien plant species control programme and awareness program must be implemented. Invasive plants will be removed and the mine property will be surveyed at least once a year to check for the return of any new alien invaders. On-going removal of alien vegetation stands and encroaching terrestrial species, which show signs of dominance or active recruitment, should take place throughout the construction and operational phase of the development. Intentional killing of invertebrates should be avoided by means of awareness programmes. The labour force should be made aware of the conservation issues pertaining to the taxa occurring on the study site. 			Mine manager and SHEQ Officer	
Closure and Decommissioning Phase							
5	Closure and decommissioning of the PGM Plant and FCR plant	Re-establishment of flora and fauna on site after rehabilitation	<ul style="list-style-type: none"> The invasive and alien plant species control programme and awareness program must be implemented. On-going removal of alien vegetation stands and encroaching terrestrial species, which show signs of dominance or active recruitment, should take place. Adhere to closure objectives and targets of the biodiversity management plan. Monitoring and maintenance of vegetation cover until a self-sustaining plant community is established. After mining operations have ceased, quarterly reports on the progress of the final rehabilitation 	N/A	Decommissioning	Ecologist and / or SHEQ Officer	NEMBA, NEMA

 info@ukwazi.com
 +27 (0)12 665 2154
 +27 (0)12 665 1176

 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

 www.linkedin.com/company/ukwazi/

 Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

www.ukwazi.com
DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
 advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
			will be submitted until final closure is approved by the authorities.				
AGRICULTURAL AND SOIL IMPACTS							
Construction Phase							
6	Stripping/storing of soil for construction of facilities	Increased erosion of site area	<ul style="list-style-type: none"> ▪ Checks must be carried out at regular intervals to identify areas where erosion is occurring. ▪ Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the paths causing the erosion, are to be undertaken. ▪ The topsoil stockpiles must be reshaped, protected against erosion and vegetated with indigenous grass species. ▪ Vegetation should only be removed in areas designated for infrastructure. ▪ The soil that is stripped during construction should be stockpiled in layers and protected by berms to prevent erosion. ▪ Construction during the rainy season should be closely monitored and controlled. 	Partly reversible	Construction, Operation	Contractor, ECO and / or SHEQ Officer	NEMA, CARA
7	Vehicle movement and maintenance	Potential contamination from fuel spills and leakages to soil	<ul style="list-style-type: none"> ▪ Construction vehicles and machines must be maintained properly to ensure that oil spillages are kept at a minimum. Oil residue shall be treated with oil absorbent and removed to an approved waste site. ▪ Old oil to be stored in dedicated area to prevent pollution and recycled via oil recycling companies. ▪ Vehicle maintenance should be conducted in designated areas ▪ Bunded facilities shall be provided for the storage of oil and lubricants. ▪ Spill trays must be provided if refuelling of construction vehicles is done on site. ▪ Chemical storage areas should be sufficiently contained. The use of all materials, fuels and chemicals which could potentially leach into underground water must be controlled. ▪ Oil, petrol and other chemicals will be disposed of hazardous waste and not with domestic waste. 	Partly reversible	Construction, Operation	Contractor, ECO and / or SHEQ Officer	NEMA, CARA

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
			<p>Particular attention will be given to training of staff and contractors in the handling of oils, diesel and other hazardous substances on site i.e., spills are to be avoided.</p> <ul style="list-style-type: none"> Spill kits must be easy accessible and workers must undergo training in the use thereof. Chemical sanitary facilities must be provided for construction workers. Construction workers should only be allowed to use temporary chemical / permanent toilets on the site. Frequent maintenance should include removal without spillages. 				
Operational Phase							
7	Operation of plants, vehicle movement and maintenance	Potential contamination from reagent & fuel spills and leakages to soil	<ul style="list-style-type: none"> Vehicles and machines must be maintained properly to ensure that oil spillages and leakages are kept at a minimum. Oil residue shall be treated with oil absorbent and removed to an approved waste site. Old oil to be stored in dedicated area to prevent pollution and recycled via oil recycling companies. Vehicle maintenance should be conducted in designated areas Bunded facilities shall be provided for the storage of oil and lubricants. Chemical storage areas should be sufficiently contained. The use of all materials, fuels and chemicals which could potentially leach into underground water must be controlled. Oil, petrol and other chemicals will be disposed of hazardous waste and not with domestic waste. Particular attention will be given to training of staff and contractors in the handling of oils, diesel and other hazardous substances on site i.e., spills are to be avoided. Spill kits must be easily accessible and workers must undergo training in the use thereof. 	Partly reversible	Construction, Operation	Contractor, ECO and / or SHEQ Officer	NEMA, CARA
Closure and Decommissioning Phase							
10	Rehabilitation of PGM and FCR plant areas			N/A	Decommissioning		NEMA, CARA

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
		Land use capability restoration	<ul style="list-style-type: none"> ▪ Disturbed land will be rehabilitated as soon as the activities have ceased and infrastructure dismantled ▪ The rehabilitation plan should be updated by the mine when necessary to reflect changes and closure objectives. ▪ All land exposed by the demolition of infrastructure and other disturbed land associated with the project will be rehabilitated. ▪ Monitoring and maintenance of vegetation cover until a self-sustaining plant community is established ▪ The mine will continue to submit information for the period after decommissioning activities have ceased, until the time that closure is approved by authorities. ▪ After mining operations have ceased, quarterly reports on the progress of the final rehabilitation will be submitted until final closure is approved by the authorities. ▪ Stockpiles and newly spread soil will be kept clear of invasive vegetation. 			Appointed engineer & SHEQ Officer	
SURFACE WATER IMPACTS							
Construction and Operational Phases							
11	Operation of the PGM Plant and FCR plant	Impact on surface water quality due to stormwater runoff	<ul style="list-style-type: none"> ▪ Routine checks should be done on all mechanical instruments for problems such as leaks, overheating, vibration, noise or any other abnormalities. All equipment should be free of obstruction, be properly aligned and be moving at normal speed. Mechanical maintenance must be according to the manufacturer's instructions ▪ Pumps should be checked for excessive noise, vibration, overheating and leaks. Lubrication of the pump should be in accordance with the manufacturer's instructions. ▪ Mine vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. ▪ All oil spills must be cleaned up immediately. ▪ Manage runoff from the plant area in its own circuit and provide sediment traps before discharge to 	Reversible	Construction and Operation	Appointed engineer & SHEQ Officer	NEMA, NWA, NEMWA

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
			<p>the existing stormwater management system in case of accidental spillage.</p> <ul style="list-style-type: none"> ▪ Contain and recirculate the process water in the new plants in its own closed water circuit as far as possible and minimise spillages to the SWD. ▪ Contain all reagents and possible contaminants in approved banded areas. ▪ The following bund areas will be constructed: <ol style="list-style-type: none"> a) Surge tank bund area b) Mill bund area c) Flotation bund area e) Hazardous waste bund area f) Oils and grease storage bund area g) Reagent storage & Mixing bund area ▪ Each of the bund areas listed except (e) and (f) will be fitted with adequately sized spillage pumps. The spillage pumps will direct the contaminated water to appropriate area within the plant. ▪ The hazardous waste (e) and the oils and grease storage area (f) will not be fitted with spillage pumps as it is undesirable to treat this contaminated water in the same vain as previously stated in the above bullet. These areas will be covered to prevent the ingress of rain fall. All hazardous waste and/or spillage be collected and transported in a sealed container to an accredited hazardous waste disposal contractor. ▪ All bund areas will be designed so as to have a minimum capacity of not less than 110 % of the stored volume of the oils and greases and chemical reagents and/or to have a capacity of a 1 in 50 year flood event for the surface area that will be exposed, whichever is largest. ▪ The bund areas will be designed to incorporate a sloped flooring to aid the flow of effluent to the spillage pump area. 				
Closure and Decommissioning Phase							
12	Rehabilitation of PGM and FCR plant areas	Impact on surface water	Refer to surface water mitigation during operational phase.	Reversible	Decommissioning	Appointed engineer & SHEQ Officer	NEMA, NWA, NEMWA

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
 📠 +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
 advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
HYDROGEOLOGICAL IMPACTS							
Construction and Operational Phases							
13	Operation of the PGM Plant and FCR plant	Impact on mine water balance – make up water requirements	<ul style="list-style-type: none"> Implement water conservation methods and recirculate process and storm water. 	Reversible	Construction and Operation	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
14	Operation of the PGM Plant and FCR plant	Impact on groundwater quality	<ul style="list-style-type: none"> The FCR plant and PGM plant extension areas to be concrete lined during construction. The mine's monitoring program should be implemented and maintained. Quarterly and annual monitoring reports should be submitted to the submitted to the DWS. One (1) shallow monitoring borehole (165 mm diameter, 25 m deep) should be added to the monitoring network downstream of the proposed plants. The groundwater level and water quality should be monitored on a quarterly basis. External material to be processed at the PGM and FCR plants need to be classified in terms of the NEMWA waste classification regulations, and the facility where the waste is deposited should be designed and approved to accommodate the waste type that is received. Also refer to surface water mitigation during operational phase. 	Reversible	Construction and Operation	Mine manager and SHEQ Officer	
Closure and Decommissioning Phase							
15	Rehabilitation of PGM and FCR plant areas	Impact on groundwater	<ul style="list-style-type: none"> Mine vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. All oil spills must be cleaned up immediately. 	Reversible	Decommissioning	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
HERITAGE IMPACTS							
Construction Phase							
16	Stripping/storing of soil for construction of facilities	Potential loss of heritage sites	<ul style="list-style-type: none"> In the event of accidental findings, all excavation shall be stopped, and the SAHRA and an archaeologist should be notified. 	Can be avoided, managed or mitigated	Implemented throughout all phases	Appointed engineer & SHEQ Officer	NHRA
AIR QUALITY IMPACTS							

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
Construction Phases							
17	Stripping/storing of soil for construction of facilities	Impact on ambient air quality	<ul style="list-style-type: none"> A current fall monitoring network shall continue to be implemented. Specific reference should be made to the operations at the Thorncliffe guest farm. Baseline data should be taken prior to development. The current dust fallout network consisting of 11 dust buckets must be continued during operations. Dust fallout rates should be below 1200 mg/m²/day in non-residential areas and 600 mg/m²/day in residential areas, averaged over 30 days. Fugitive dust from roads should be suppressed with water. All employees working in dusty environments shall wear protective equipment. Employees working with dust or fumes shall receive annual health checks. 	Reversible	Construction	SHEQ Officer	NEMA, CARA
Operational Phase							
18	Operation of the PGM Plant and FCR plant	Impact on air quality	<ul style="list-style-type: none"> Exposed areas shall be rehabilitated with a mixture of local grasses. Vehicles and machines must be maintained properly. Also refer to air quality mitigation during construction phase. 	Reversible	Operational	SHEQ Officer	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
Closure and Decommissioning Phase							
20	Closure and decommissioning of the PGM plant and FCR plant	Dust and fumes from decommissioning, levelling, rehabilitation and mine vehicles	<ul style="list-style-type: none"> Refer to air quality mitigation during operational phase. 	Reversible	Decommissioning	SHEQ Officer	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
NOISE IMPACTS							
Construction Phase							

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
21	Vehicle movement and maintenance	Raise in ambient noise levels	<ul style="list-style-type: none"> A complaints register should stay in place. All complaints, solutions and agreements between the mine and complaining parties will be kept in a specific file in the Community Officer's office. Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events. Environmental noise monitoring should be carried out regularly at specific positions to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted. 	Reversible	Construction	SHEQ Officer	"NEMA, National noise-control regulations (GNR154), SANS 10103:2008,
Operational Phase							
22	Operation of the PGM Plant and FCR plant	Impact on ambient noise levels due to milling	Refer to noise mitigation during construction phase.	Reversible	Operational	SHEQ Officer	"NEMA, GNR154, SANS 10103:2008,
Closure and Decommissioning Phase							
23	Closure and decommissioning of the PGM plant and FCR plant	Impact on ambient noise levels from decommissioning, rehabilitation and mine vehicles	Refer to noise mitigation during construction phase.	Reversible	Once off and implemented throughout all phases	SHEQ Officer	"NEMA, GNR154, SANS 10103:2008,
VISUAL / AESTHETIC IMPACTS							
Construction Phases							
24	Stripping/storing of soil for construction of facilities	Decreased aesthetic appeal of site	<ul style="list-style-type: none"> No specific visual mitigation required. Impact of negligible significance. 	Reversible	Construction	Mine manager and SHEQ Officer	NEMA
Operational Phase							
25	Operation of the PGM Plant and FCR plant	Decreased aesthetic appeal of site	<ul style="list-style-type: none"> No specific visual mitigation required. Impact of negligible significance. 	Reversible	Operational	Mine manager and SHEQ Officer	NEMA
Closure and Decommissioning Phase							

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

www.ukwazi.com

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

UKWAZI
advisory

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
26	Closure and decommissioning of the PGM Plant and FCR plant	Increased aesthetic appeal of site upon closure	<ul style="list-style-type: none"> No specific visual mitigation required. Impact of negligible significance. 	N/A	Decommissioning	SHEQ Officer	NEMA
SOCIO-ECONOMIC IMPACTS							
Construction Phase							
27	Increase in employment opportunities and economic benefits	Unrealistic pre-construction expectations regarding economic benefits and job creation	<ul style="list-style-type: none"> The mine must communicate in an open and honest way what kind of jobs will be created, who will qualify and how the recruitment process will work. Contractors should be required to make use of a certain proportion of local labour although it is acknowledged that all skills will not be available locally. Jobs should be advertised in a way that is accessible to all members of society and labour desks should be established in accessible areas. 	Can be avoided, managed or mitigated	Construction	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
28	Construction initiation	Increase in income and employment	<ul style="list-style-type: none"> Local contractors are used where possible for any maintenance or services required. The mine will attempt to continue to enhance its beneficial socio-economic input into the region, especially to the local community from where the bulk of the labour force is drawn. The mine will continue to support the surrounding towns of the region where supplies and services are obtained. 	N/A	Construction	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
Operational Phase							
29	Operation of the PGM Plant and FCR plant	Increase in income and employ as pent	<ul style="list-style-type: none"> Local contractors are used where possible for any maintenance or services required. The mine will attempt to continue to enhance its beneficial socio-economic input into the region through the implementation of the approved SLP especially to the local community from where the bulk of the labour force is drawn. The mine will continue to support the surrounding towns of the region where supplies and services are obtained through its approved SLP. 	N/A	Operational	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
Decommissioning Phase							

No	Activity	Impact	Mitigation Measures	Mitigation Effect	Time period for implementation	Roles & Responsibility	Compliance with Standards
30	Rehabilitation of PGM and FCR plant areas	Loss of employment and livelihoods	<ul style="list-style-type: none"> ▪ Employees should prepare for the closure of the mine well in advance as per the requirements of the SLP. The employee wellness programme can assist with the mental and physical preparation of employees. ▪ Were possible skilled people should be redeployed in the Glencore group. ▪ The Social and Labour Plan should assist in creating an economy that not only depends on mining. Skills development programmes should focus on transferable skills. 	Can be avoided, managed or mitigated	Decommissioning	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline

11.5. Motivation where no alternative sites were considered

Not applicable. Two alternative sites for the PGM plant were investigated in this report.

11.6. Statement motivating the alternative development location within the overall site

Two different sites have been evaluated to determine the best possible area for the PGM plant extension. The preferred site for the FCR plant is on the footprint of the existing spiral plant site. No alternatives were evaluated for the FCR plant footprint area. The PGM plant extension (preferred site) is proposed to be constructed directly to the west of the existing PGM plant in a disturbed area where stockpiling is currently taking place. The alternative site evaluated for the proposed PGM plant extension (Alternative site 2) is located to the north of the existing PGM plant site in an area that has also largely been disturbed but still harbours some indigenous plants, including protected tree species in a narrow strip along the eastern boundary.

Alternative Site 1 was found to have a lower ecological impact compared to Alternative Site 2. Alternative Site 2 is expected to have similar noise and air quality impacts compared to Alternative Site 1. Even though still low, Alternative Site 2 is expected to have a slightly higher visual impact since it will be closer to the tar road running past the mine.

Both sites are situated within an existing disturbed area and inside of the mine's dirty water management area and will not require the mine's stormwater management plan to be updated.

Alternative site 1 is therefore the preferred site from an environmental perspective.

For more information refer to Section 8 above.

11.7. Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity

Methodology is described under section 11.2 above.

11.8. Assessment of each identified potentially significant impact and risk

The supporting impact assessment conducted by the EAP is included in Table 11-1.

Table 11-4: Assessment of identified impacts

No	Activity	Impact	Without or With Mitigation	Nature (Negative or Positive Impact)	Significance		Mitigation Type
					Score	Magnitude	
BIODIVERSITY IMPACTS							
Pre-Construction and Construction Phases							
1	Stripping of vegetation for construction of facilities	Fauna and flora habitat loss and disturbance	WOM	Negative	6	Negligible	Avoidance/ Prevention measure
			WM	Negative	6	Negligible	
2	Stripping of topsoil for construction of facilities and disturbance of site	Proliferation of alien invaders	WOM	Negative	14	Negligible	Control/ reduction measure
			WM	Negative	14	Negligible	
3	Stripping of vegetation and topsoil for construction of facilities	Increased siltation of surface water and impact on aquatic biota	WOM	Negative	28	Low	Control/ reduction measure
			WM	Negative	14	Negligible	
Operational Phase							
4	Operation of the PGM Plant and FCR plant	Fauna and flora habitat loss and disturbance and proliferation of alien invaders	WOM	Negative	16	Negligible	Avoidance/ Prevention measure
			WM	Negative	14	Negligible	
Closure and Decommissioning Phase							
5	Closure and decommissioning of the PGM Plant and FCR plant	Re-establishment of flora and fauna on site after rehabilitation	WOM	Positive	16	Negligible	Enhancement
			WM	Positive	32	Low	
AGRICULTURAL AND SOIL IMPACTS							
Construction Phase							
6	Stripping/storing of soil for construction of facilities	Increased erosion of site area	WOM	Negative	22	Low	Control/ reduction measure
			WM	Negative	14	Negligible	
7	Vehicle movement and maintenance	Potential contamination from fuel spills and leakages to soil	WOM	Negative	44	Moderate	Control/ reduction measure
			WM	Negative	22	Low	
Operational Phase							
7	Operation of plants, vehicle movement and maintenance	Potential contamination from reagent & fuel spills and leakages to soil	WOM	Negative	44	Moderate	Control/ reduction measure
			WM	Negative	22	Low	

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

UKWAZI
advisory

Closure and Decommissioning Phase							
10	Rehabilitation of PGM and FCR plant areas	Land use capability restoration	WOM	Positive	44	Moderate	Enhancement
			WM	Positive	48	Moderate	
SURFACE WATER IMPACTS							
Construction and Operational Phase							
11	Operation of the PGM Plant and FCR plant	Impact on surface water quality due to stormwater runoff	WOM	Negative	26	Low	Can be avoided, managed or mitigated
			WM	Negative	18	Negligible	
Closure and Decommissioning Phase							
12	Rehabilitation of PGM and FCR plant areas	Impact on surface water	WOM	Negative	24	Low	Avoidance/ Prevention measure
			WM	Negative	16	Negligible	
HYDROGEOLOGICAL IMPACTS							
Construction and Operational Phases							
13	Operation of the PGM Plant and FCR plant	Impact on mine water balance – make up water requirements	WOM	Negative	32	Low	Control/ reduction measure
			WM	Negative	16	Negligible	
14	Operation of the PGM Plant and FCR plant	Impact on groundwater quality	WOM	Negative	48	Moderate	Control/ reduction measure
			WM	Negative	24	Low	
Closure and Decommissioning Phase							
15	Rehabilitation of PGM and FCR plant areas	Impact on groundwater	WOM	Negative	24	Low	Can be avoided, managed or mitigated
			WM	Negative	16	Negligible	
HERITAGE IMPACTS							
Construction Phase							
16	Stripping/storing of soil for construction of facilities	Potential loss of heritage sites	WOM	Negative	14	Negligible	Control/ reduction measure
			WM	Negative	14	Negligible	
AIR QUALITY IMPACTS							
Construction Phase							
17	Stripping/storing of soil for construction of facilities	Impact on ambient air quality	WOM	Negative	22	Low	Control/ reduction measure
			WM	Negative	14	Negligible	
Operational Phase							
18	Operation of the PGM Plant and FCR plant	Impact on air quality	WOM	Negative	26	Low	Control/ reduction measure
			WM	Negative	26	Low	

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

UKWAZI
advisory

19	Operation of the PGM Plant and FCR plant	Dust and fumes from mine vehicles	WOM	Negative	18	Negligible	Control/ reduction measure
			WM	Negative	18	Negligible	
Closure and Decommissioning Phase							
20	Closure and decommissioning of the PGM plant and FCR plant	Dust and fumes from decommissioning, levelling, rehabilitation and mine vehicles	WOM	Negative	32	Low	Control/ reduction measure
			WM	Negative	14	Negligible	
NOISE IMPACTS							
Construction Phase							
21	Vehicle movement and maintenance	Raise in ambient noise levels	WOM	Negative	32	Low	Control/ reduction measure
			WM	Negative	16	Negligible	
Operational Phase							
22	Operation of the PGM Plant and FCR plant	Impact on ambient noise levels due to milling	WOM	Negative	26	Low	Control/ reduction measure
			WM	Negative	26	Low	
Closure and Decommissioning Phase							
23	Closure and decommissioning of the PGM plant and FCR plant	Impact on ambient noise levels from decommissioning, rehabilitation and mine vehicles	WOM	Negative	36	Low	Control/ reduction measure
			WM	Negative	18	Negligible	
VISUAL / AESTHETIC IMPACTS							
Construction Phases							
24	Stripping/storing of soil for construction of facilities	Decreased aesthetic appeal of site	WOM	Negative	18	Negligible	Control/ reduction measure
			WM	Negative	18	Negligible	
Operational Phase							
25	Operation of the PGM Plant and FCR plant	Decreased aesthetic appeal of site	WOM	Negative	18	Negligible	Control/ reduction measure
			WM	Negative	18	Negligible	
Closure and Decommissioning Phase							
26	Closure and decommissioning of the PGM Plant and FCR plant	Increased aesthetic appeal of site upon closure	WOM	Positive	40	Low	Enhancement
			WM	Positive	40	Low	
SOCIO-ECONOMIC IMPACTS							

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
 ☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

UKWAZI
 advisory

Pre-Construction and Construction Phases							
27	Increase in employment opportunities and economic benefits	Unrealistic pre-construction expectations regarding economic benefits and job creation	WOM	Negative	36	Low	Control/ reduction measure
			WM	Negative	18	Negligible	
28	Construction initiation	Increase in income and employment	WOM	Positive	45	Moderate	Enhancement
			WM	Positive	45	Moderate	
Operational Phase							
29	Operation of the PGM Plant and FCR plant	Increase in income and employment	WOM	Positive	50	Moderate	Enhancement
			WM	Positive	50	Moderate	
Decommissioning Phase							
30	Rehabilitation of PGM and FCR plant areas	Loss of employment and livelihoods	WOM	Negative	52	Moderate	Control/ reduction measure
			WM	Negative	36	Low	

11.9. Summary of specialist reports

Table 11-5: Summary of specialist recommendations

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
Air quality professional opinion	<p>The report by Airshed Planning Professionals (2022) stated that the increased air quality impacts during all phases of the project will be localised and is unlikely to increase ambient concentrations at the closest sensitive receptors to the project. The significance of the air quality impacts is therefore considered to be low.</p> <p>The dust mitigation and monitoring (Table 3) for the site (as provided in the 2018 Environmental Management Programme (EMPr)) is still valid and no additional recommendations are provided.</p>	X	Refer to Table 11-3 and Appendix 6.1: Air quality professional opinion
Heritage impact memorandum	<p>According to the heritage memorandum by Kruger (2022) the project is situated in a landscape that have been altered extensively as a result of mining, prospecting and the establishment of mine roads and other infrastructure.</p> <p>During the survey it was found the project areas have been transformed by past and ongoing mining activities and no sites of archaeological and historical value were documented within the proposed project footprints. It is also probable that no heritage resources were impacted upon during site clearing and initial construction, based on observations made on historic aerial images and maps.</p>	X	Refer to Section 10.1.10 and Appendix 6.2: Heritage impact memorandum

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
☎ +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
22 Karee Street, Southdowns, Centurion, 0157
Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
Reg. No. 2016/268801/07

UKWAZI
advisory

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
	<p>Kruger (2022) found that it is highly unlikely that sensitive heritage receptors or remnants remain at the site and the proposed project and related construction activities will have no significant impact on heritage resources or the larger heritage landscape. Mr Kruger recommended that the developer be exempted from further phases of heritage and / or archaeological impact assessments for the environmental authorisation process, subject to final review and comment by the competent heritage authorities as well as provisions contained the National Heritage Resources Act (NHRA - Act 25 of 1999).</p>		
Palaeontological desktop assessment	<p>Dr JF Durand (2018) found that the area was generally of no palaeontological importance as it was underlain by norite and pyroxenite of the Dwars River Subsuite. Parts of the Thornccliffe study site are overlain by Quaternary sediments where there is a very low probability that these sediments may be fossiliferous.</p> <p>Dr Durand (2018) recommended that the mine should be exempted from further palaeontological studies due to the very low probability of fossils occurring in the study area.</p>	X	Refer to Section 10.1.9 and Appendix 6.3: Palaeontological desktop assessment.
Terrestrial biodiversity memorandum	<p>Henning (2022) found the proposed expansion sites to be largely in a degraded state. The proposed development can therefore be supported without any further biodiversity surveys or studies, provided that the mitigation measures are implemented to limit and / or prevent the potential negative impacts on the area.</p>	X	Refer to Table 11-3 and Appendix 6.4: Appendix 6.4: Terrestrial biodiversity memorandum
Hydrogeological assessment	<p>Vivier & Delicado (2022) stated that the areas where the new plant extensions will be located are already disturbed. The proposed FCR and PGM flotation plant extensions do not pose a risk to the groundwater quantity or quality, as the sites are planned to be concrete lined during construction and there is no disposal of mine waste on the extended footprints.</p> <p>One (1) shallow monitoring borehole (165 mm diameter, 25 m deep) was recommended to be added to the monitoring network downstream of the proposed plants. The groundwater level and water quality should be monitored on a monthly basis.</p> <p>Vivier & Delicado (2022) stated that the new planned activities as described will not increase the existing impacts to groundwater receptors and recommended that the activity be approved.</p>	X	Refer to Table 11-3 and Appendix 6.5: Hydrogeological technical memorandum
Surface water assessment	<p>The report by Redco (2022) stated that the new planned activities as described do not increase the existing impacts to surface water significantly. Possible additional impacts will be mitigated by the</p>	X	Refer to Table 11-3 and Appendix 6.6: Surface water assessment

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
 📠 +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

UKWAZI
 advisory

List of studies undertaken	Recommendations of specialist reports	Specialist recommendations that have been included in the EIA report (mark with an X where applicable)	Reference to applicable section of report where specialist recommendations have been included
	<p>mitigation measures in the approved EMPR as well as the following additional mitigation measures:</p> <ul style="list-style-type: none"> ▪ Manage runoff from the plant area in its own circuit and provide sediment traps before discharge to the existing system in case of accidental spillage. ▪ Provide sealed and bunded areas where spillages may be expected and around the plant area. ▪ Implement water conservation methods and recirculate process and storm water. ▪ Contain and recirculate the process water in the new plants in its own closed water circuit as far as possible and minimise spillages to the SWD. ▪ Contain all reagents and possible contaminants in approved bunded areas. <p>Redco (2022) recommended that the activity could be approved.</p>		

✉ info@ukwazi.com

☎ +27 (0)12 665 2154
 🖨 +27 (0)12 665 1176

www.ukwazi.com

📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park,
 22 Karee Street, Southdowns, Centurion, 0157
 Private Bag X159, Centurion, 0046

DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba

🌐 www.linkedin.com/company/ukwazi/

Reg. No. 2016/224365/07
 Reg. No. 2016/268801/07

UKWAZI
 advisory

12. Environmental impact statement

12.1. Summary of key findings of the environmental impact assessment

For a summary of all impacts identified refer to Section 11 of this report.

12.2. Final Site Map

Final Site Map has been attached as Appendix A4.

12.3. Summary of the positive and negative implications and risks of the proposed activity and identified alternatives

The impacts associated with the proposed development have been discussed in the previous section. The table below provides a summary. For more information regarding significant ratings refer to Section 11.3 above.

Table 12-1: Summary of activities and anticipated potential impacts

No	Activity	Impact
BIODIVERSITY IMPACTS		
Pre-Construction and Construction Phases		
1	Stripping of vegetation for construction of facilities	Fauna and flora habitat loss and disturbance
2	Stripping of topsoil for construction of facilities and disturbance of site	Proliferation of alien invaders
3	Stripping of vegetation and topsoil for construction of facilities	Increased siltation of surface water and impact on aquatic biota
Operational Phase		
4	Operation of the PGM Plant and FCR plant	Fauna and flora habitat loss and disturbance and proliferation of alien invaders
Closure and Decommissioning Phase		
5	Closure and decommissioning of the PGM Plant and FCR plant	Re-establishment of flora and fauna on site after rehabilitation
AGRICULTURAL AND SOIL IMPACTS		
Construction Phase		
6	Stripping/storing of soil for construction of facilities	Increased erosion of site area
7	Vehicle movement and maintenance	Potential contamination from fuel spills and leakages to soil
Operational Phase		
7	Operation of plants, vehicle movement and maintenance	Potential contamination from reagent & fuel spills and leakages to soil
Closure and Decommissioning Phase		
10	Rehabilitation of PGM and FCR plant areas	Land use capability restoration
SURFACE WATER IMPACTS		
Construction and Operational Phase		
11	Operation of the PGM Plant and FCR plant	Impact on surface water quality due to stormwater runoff
Closure and Decommissioning Phase		
12	Rehabilitation of PGM and FCR plant areas	Impact on surface water
HYDROGEOLOGICAL IMPACTS		
Operational Phase		
13	Operation of the PGM Plant and FCR plant	Impact on mine water balance – make up water requirements
14	Operation of the PGM Plant and FCR plant	Impact on groundwater quality
Closure and Decommissioning Phase		
15	Rehabilitation of PGM and FCR plant areas	Impact on groundwater
HERITAGE IMPACTS		
Construction Phase		
16	Stripping/storing of soil for construction of facilities	Potential loss of heritage sites

No	Activity	Impact
AIR QUALITY IMPACTS		
Construction Phase		
17	Stripping/storing of soil for construction of facilities	Impact on ambient air quality
Operational Phase		
18	Operation of the PGM Plant and FCR plant	Impact on air quality
19	Operation of the PGM Plant and FCR plant	Dust and fumes from mine vehicles
Closure and Decommissioning Phase		
20	Closure and decommissioning of the PGM plant and FCR plant	Dust and fumes from decommissioning, levelling, rehabilitation and mine vehicles
NOISE IMPACTS		
Construction Phase		
21	Vehicle movement and maintenance	Raise in ambient noise levels
Operational Phase		
22	Operation of the PGM Plant and FCR plant	Impact on ambient noise levels due to milling
Closure and Decommissioning Phase		
23	Closure and decommissioning of the PGM plant and FCR plant	Impact on ambient noise levels from decommissioning, rehabilitation and mine vehicles
VISUAL / AESTHETIC IMPACTS		
Construction Phases		
24	Stripping/storing of soil for construction of facilities	Decreased aesthetic appeal of site
Operational Phase		
25	Operation of the PGM Plant and FCR plant	Decreased aesthetic appeal of site
Closure and Decommissioning Phase		
26	Closure and decommissioning of the PGM Plant and FCR plant	Increased aesthetic appeal of site upon closure
SOCIO-ECONOMIC IMPACTS		
Pre-Construction and Construction Phases		
27	Increase in employment opportunities and economic benefits	Unrealistic pre-construction expectations regarding economic benefits and job creation
28	Construction initiation	Increase in income and employment
Operational Phase		
29	Operation of the PGM Plant and FCR plant	Increase in income and employment
Decommissioning Phase		
30	Rehabilitation of PGM and FCR plant areas	Loss of employment and livelihoods

12.4. Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr

The necessary content required for this table has been included to Table 18-2 above.

12.5. Final proposed alternatives

Refer to Section 8. The final proposed and preferred alternative for the PGM plant is Alternative site 1.

12.6. Aspects for inclusion as conditions of authorisation

Refer to Table 11-3 for conditions which could possibly be included in the Environmental Authorisation.

The authorisation could potentially include the following specific recommendations:

- All mitigation measures and management of identified impacts recommended by the specialists as part of this report and EMPr must be adhered to and implemented during the operational phases of the project.
- The extent of the construction site should be demarcated on site layout plans and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the

construction site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors; and

- A continuous dust monitoring system must be in place and managed by the Applicant to determine the dust fallout generated on site by activities.
- One (1) shallow monitoring borehole (165 mm diameter, 25 m deep) should be added to the monitoring network downstream of the proposed plants. The groundwater level and water quality should be monitored in this borehole on a monthly basis.
- In terms of NEMBA, alien eradication and monitoring plans need to be compiled to address existing alien vegetation on the property and to control invasive species on the whole mining right area.
- Manage runoff from the plant area in its own circuit and provide sediment traps before discharge to the existing stormwater management system in case of accidental spillage.
- Contain and recirculate the process water in the new plants in its own closed water circuit as far as possible and minimise spillages to the SWD.
- Contain all reagents and possible contaminants in approved bunded areas.
- Revise closure cost assessment on annual basis as required by NEMA.
- All mitigation measures provided in this report must be implemented. Should the mitigation measures be deemed impractical, ineffective or cost prohibitive, the Applicant may apply to the DMRE to alter such mitigation measures accordingly. Any change in mitigation measures must be approved by the competent authority.

12.7. Description of any assumptions, uncertainties and gaps in knowledge

All conclusions, findings, and recommendation were made on the assumption that information provided by the applicant to the appointed EAP and specialists were accurate.

The specialists that provided memoranda or opinion reports based their findings on experience gained from various previous studies conducted at Glencore Eastern Mines. The study area was for instance also investigated during 2008 and 2014. The specialists all agree that the memoranda compiled, together with the existing approved EMPRs sufficiently address the impacts and required mitigation measures for the proposed project. The only exception in this regard was for additional measures required as part of the hydrogeological and surface water assessments. These mitigation measures were incorporated into the EMPr.

The surface water assessment assumed that the new PGM plant will be designed to contain all process and contact water within the plant footprint and recycle within the system. All reagent storage areas must be bunded and roofed to prevent impact on surface water.

The air quality assessment assumed that the process description and activities for the project, as provided by the proponent, was assumed to be accurate and typical of normal proposed operating conditions.

The heritage specialist noted that, even though it might be assumed that survey findings are representative of the heritage landscape of the project area for the project, the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

12.8. Reasoned opinion as to whether the proposed activity should or should not be authorised

12.8.1. Reasons why the activity should be authorized or not

Please refer to section 12.1 for a summary of the key findings of the EIA.

The findings of the specialist studies undertaken within this EIA&EMPR provide an assessment of both the benefits and potential negative impacts anticipated as a result of the proposed project. The findings conclude that, provided that the recommended mitigation and management measures are implemented, there are no environmental fatal flaws that should prevent the proposed project from proceeding. All negative impacts identified could be mitigated to

be of low or negligible significance. Positive impacts expected from the development include an increase in income and employment.

Based on the abovementioned factors, it is recommended that the environmental authorisation for the project could be granted.

12.8.2. Conditions that must be included in the authorization

Refer to Section 12.6.

12.8.3. Rehabilitation requirement

For the mining operation, the following closure objectives and goals are proposed:

- To rehabilitate all disturbed land to a state that is suitable for its post closure use (wilderness and grazing land use)
- To ensure that affected areas are safe and secure for both human and animal activities
- To utilize all aggregate / unsuitable material dumps as backfill into excavated areas to increase the safety of the area and to ensure an area suitable for its post closure use
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality)
- To limit the impact on personnel whose positions may become redundant on decommissioning of the operation.

12.9. Period for which the Environmental Authorisation is required

The current life of mine ("LoM") with the recent extension of underground mining operation into the farms Richmond and St George is estimated to be in excess of 30 years. The environmental authorisation should cater for the period up until at least 2050.

13. Undertaking

The EAP undertakes that the information provided in Part A is correct, and that the comments and inputs from stakeholders and I&APs have been correctly recorded in the report. This is only applicable to the Environmental Impact Assessment Report and EMPr and Basic Assessment Process.

Refer to Part B Section 19 for the EAP's signed undertaking.

14. Financial Provision

The calculated additional impact on the environmental liability as a result of the proposed project (both plants) is estimated at R 4,972,542.99 (Excl. VAT) and R 5 718 424.44 (Incl. VAT). For the quantum calculation refer to Table 18-3 and Table 18-4 below.

14.1. Explain how the aforementioned amount was derived

The financial provision was calculated in accordance with the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) as amended and Regulation 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998). In accordance with the aforementioned legislation, the holder of a mining right must make the prescribed financial provision for the costs associated with the undertaking of the management, rehabilitation and remediation of the negative environmental impacts due to prospecting, exploration and mining activities and the latent or residual environmental impacts that may become known in future.

For the quantum calculation refer to Table 18-3 and Table 18-4 below.

14.2. Confirm that this amount can be provided from operating expenditure

Agreed.

✉ info@ukwazi.com	📍 Unit DSF01, 2nd Floor, Block D, Southdowns Office Park, 22 Karee Street, Southdowns, Centurion, 0157 Private Bag X159, Centurion, 0046	🌐 www.linkedin.com/company/ukwazi/	UKWAZI advisory
☎ +27 (0)12 665 2154 📠 +27 (0)12 665 1176	DIRECTORS: JJ Lotheringen, SA Eckstein, NE Xaba	Reg. No. 2016/224365/07 Reg. No. 2016/268801/07	
www.ukwazi.com			

15. Deviations from the approved scoping report and plan of study

15.1. Deviations from the methodology used in determining the significance of potential environmental impacts and risks

Not applicable.

15.2. Motivation for the deviation

Not applicable.

16. Other Information required by the competent Authority

16.1. Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998)

16.1.1. Impact on the socio-economic conditions of any directly affected person

The proposed project area is within an existing mine owned by the Applicant. Therefore, there are no directly affected parties. Please refer to Section 12.1 for a description of social impacts predicted for the project.

16.1.2. Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act

The field survey by Mr Kruger found the project areas have been transformed by past and ongoing mining activities and no sites of archaeological and historical value were documented within the proposed project footprints. The project archaeologist is of the opinion that the proposed project will not have an impact on heritage resources or the larger heritage landscape.

17. Other matters required in terms of sections 24(4)(a) and (b) of the Act

The project alternatives are discussed in section 8 of this report.

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

18. Environmental management programme

18.1. Details of the EAP

The details of the EAP are provided in Section 1.

18.2. Description of the aspects of the activity

Key aspects identified by the EAP and specialists that were assessed include amongst others:

- Heritage and palaeontology,
- Biodiversity (fauna and flora),
- Soils, land capability and agricultural potential,
- Surface and groundwater,
- Air quality,
- Socio-economic aspects,
- Rehabilitation and financial provision for closure.

Also refer to Section 11.1 and Table 11-1.

18.3. Composite Map

A sensitivity map is included in Appendix 3.

18.4. Description of impact management objectives including management statements

18.4.1. Determination of closure objectives

For the mining operation, the following closure objectives and goals are proposed:

- To rehabilitate all disturbed land to a state that is suitable for its post closure use (wilderness/grazing)
- To ensure that affected areas are safe and secure for both human and animal activities
- To utilize all aggregate / unsuitable material dumps as backfill into excavated areas to increase the safety of the area and to ensure an area suitable for its post closure use
- The physical and chemical stability of the remaining structures should be such that risk to the environment through naturally occurring forces is eliminated
- To rehabilitate all disturbed land to a state where limited or preferably no post closure management is required
- To rehabilitate all disturbed land to a state that facilitates compliance with current environmental quality objectives (air and water quality) and
- To limit the impact on personnel whose positions may become redundant on decommissioning of the operation.

18.4.2. The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

The proposed project does not trigger any listed activities in terms of the NEMA or NEMWA. The footprint of the proposed development will cover approximately 1.8 ha that was previously disturbed by mining activities. The sites are currently used for stockpiling of material. The project will not require the treatment of extraneous water.

Refer to Table 11-3 for the proposed mitigation measures.

18.4.3. Potential risk of Acid Mine Drainage

During 2017, Exigo Sustainability (Pty) Ltd conducted a geochemical specialist investigation to determine the leachate potential and waste classification of the Glencore Eastern Chrome Mining operations' mine residue. This included samples from Thorncliffe, Magareng and Helena mines. Thirteen samples of mine residue were taken at Thorncliffe mine. One composite sample from Helena, Magareng and Thorncliffe tailings were taken as these 3 mine sections tailings are deposited on the same facility at Thorncliffe.

The macro-chemical leachate (“LCT”) analysis at Thorncliffe mine indicated the following:

1. The leachate pH is close to neutral at 7.1 to 7.7 for all samples
2. The sulphate concentrations are low, ranging from 2 mg/ℓ to 14 mg/ℓ

Due to the neutral pH, no leaching of metals is expected. There is no risk for acid mine drainage as the sulphide content is far exceeded by the alkaline buffer capacity.

For more information refer to section 10.1.8.

18.4.4. Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

Refer to section 18.4.3 above. The proposed project does not pose a risk in terms of acid mine drainage.

18.4.5. Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Not applicable. Refer to section 18.4.3 above. The proposed project does not pose a risk in terms of acid mine drainage.

18.4.6. Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Not applicable. Refer to section 18.4.3 above.

18.4.7. Volumes and rate of water use required

The proposed PGM plant is similar to the existing PGM plant in design. Water is added to the tailings material before it enters the re-pulping facility to form a slurry. The existing PGM plant uses 0.047 m³/tonne potable water and 0.1 m³/t process make-up water.

The mine’s IWUL specifies that the mine is authorised to abstract the following types and volumes of water:

- The abstraction of a maximum quantity of 109 500 m³/a (300 m³/day) of water from underground (fissure water) on the farm Thorncliffe 374KT for mining purposes (also licenced under Section 21(j) below).
- The taking of a maximum quantity of 300 000 m³/a (821.9 m³/day) of water from boreholes on the farm Thorncliffe 374KT for domestic purposes.
- The taking of 85 775 m³/a of water from the De Grootboom Open Pit on the farm De Grootboom 373KT for mining purposes.

In addition, the Licence also allows the Licensee to abstract water as originally allocated in permit (No 1506N) as follows:

- Abstract 141 000 m³/a (386.3 m³/day) from the Groot Dwars River for Thorncliffe Mine for mining purposes.
- Abstract 113 950 m³/a (312.2 m³/day) from boreholes for domestic purposes.

The current IWUL superseded permit No 1506N, however the allocation specified in the permit was taken up in the existing IWUL.

The water allocation for the plants will be obtained from the existing WUL allocation.

18.4.8. Has a water use license been applied for?

Thorncliffe mine is in possession of a WUL in terms of Section 40 of the NWA. On 18 May 2012 an Integrated Water Use License (IWUL) was issued to Xstrata Alloys Eastern Mines (Pty) Ltd (now Glencore Eastern Mines) (Licence no.: 04/B41G/ACGIJ/1676; file no.: 16/2/7/B400/C5). The WUL was a combined licence for Thorncliffe and Mototolo Mines. In 2019 the DWS approved the licence separation between Thorncliffe and Mototolo mines and Thorncliffe received a standalone WUL. The newest WUL is dated 26 April 2019 with Licence no. 06/B42H/IAGJ/8931.

The WUL authorises water uses in accordance with Section 21 a, Section 21 b, Section 21 c, Section 21 g, Section 21 i and Section 21 j of the NWA.

No water uses requiring authorisation in terms of Section 40 of the NWA are triggered by the proposed project.

18.4.9. Impacts to be mitigated in their respective phases

Refer to Table 18-1 below.

Table 18-1: Mitigation Measures to rehabilitate the environment

No	Activity	Impact	Mitigation Measures	Mitigation Type	Time period for implementation	Roles & Responsibility	Compliance with Standards/ Standard to be achieved
BIODIVERSITY IMPACTS							
Pre-Construction and Construction Phases							
1	Stripping of vegetation for construction of facilities	Fauna and flora habitat loss and disturbance	<ul style="list-style-type: none"> ▪ The extent of the construction site should be demarcated on site layout plans and no construction personnel or vehicles may leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors; and ▪ The sites proposed for development have been disturbed and protected tree species are not known to occur on the preferred development sites. However protected tree species do occur to the north of the existing PGM plant site. Should protected tree species need to be removed at the mine site this can only happen after a permit is obtained from the Department of Forestry. ▪ Intentional killing of invertebrates should be avoided by means of awareness programmes. ▪ The labour force should be made aware of the conservation issues pertaining to the taxa occurring on the study site. 	Avoidance/ Prevention measure	Pre-Construction and Construction Phases	Ecologist and / or SHEQ Officer	NEMBA, NEMA
2	Stripping of topsoil for construction of facilities and disturbance of site	Proliferation of alien invaders	<ul style="list-style-type: none"> ▪ Existing invasive plants will be removed and the mine property will be surveyed at least once a year to check for the return of any new alien invaders. ▪ An invasive and alien plant species control programme must be drafted and implemented by the SHEQ department. ▪ All illegal exotic or invader plants and weeds shall be eradicated as required. ▪ Awareness program to all staff must include alien and exotic species identification (species expected on this site only) and eradication measures. ▪ Invasive and alien plants should be identified and eradicated by implementation of the eradication programme. A monitoring program should be 	Control/ reduction measure	Pre-Construction and Construction Phases	Contractor, ECO and / or SHEQ Officer	NEMBA, NEMA

			<p>implemented afterwards to evaluate the success of the programme.</p> <ul style="list-style-type: none"> On-going removal of alien vegetation stands and encroaching terrestrial species, which show signs of dominance or active recruitment, should take place throughout the construction and operational phase of the development. Soil should only be used for rehabilitation purposes and not for other uses such as for road construction. 				
3	Stripping of topsoil for construction of facilities	Increased siltation of surface water and impact on aquatic biota	<ul style="list-style-type: none"> Excavated and stockpiled soil material are to be stored and bermed on the higher lying areas of the footprint area and not in any stormwater drainage channels or areas where it is likely to erode or cause siltation. The topsoil stockpiles must be reshaped, protected against erosion and vegetated with indigenous grass species. Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the paths causing the erosion, are to be undertaken. Vegetation should only be removed in areas designated for infrastructure. Construction during the rainy season should be closely monitored and controlled. 	Control/reduction measure	Pre-Construction and Construction Phases	Contractor, ECO and / or SHEQ Officer	Conservation of Agricultural Resources Act (Act No. 43 of 1983) ("CARA")
Operational Phase							
4	Operation of the PGM Plant and FCR plant	Fauna and flora habitat loss and disturbance and proliferation of alien invaders	<ul style="list-style-type: none"> Raise awareness amongst employees by the compilation and distribution of pamphlets indicating the names and photos of red data species found at the mine and/or surrounds. The re-vegetation of the disturbed areas will become an integral part of activities during the operational phase. The areas where the buildings and plant area are situated will only be re vegetated once the buildings have been removed during the decommissioning phase. The invasive and alien plant species control programme and awareness program must be implemented. Existing invasive plants will be removed and the mine property will be surveyed at least once a year to check for the return of any new alien invaders. 	Avoidance/Prevention measure	Operational phase	Mine manager and SHEQ Officer	NEMBA, NEMA

			<ul style="list-style-type: none"> On-going removal of alien vegetation stands and encroaching terrestrial species, which show signs of dominance or active recruitment, should take place throughout the construction and operational phase of the development. Intentional killing of invertebrates should be avoided by means of awareness programmes. The labour force should be made aware of the conservation issues pertaining to the taxa occurring on the study site. 				
Closure and Decommissioning Phase							
5	Closure and decommissioning of the PGM Plant and FCR plant	Re-establishment of flora and fauna on site after rehabilitation	<ul style="list-style-type: none"> The invasive and alien plant species control programme and awareness program must be implemented. On-going removal of alien vegetation stands and encroaching terrestrial species, which show signs of dominance or active recruitment, should take place. Adhere to closure objectives and targets of the biodiversity management plan. Monitoring and maintenance of vegetation cover until a self-sustaining plant community is established. After mining operations have ceased, quarterly reports on the progress of the final rehabilitation will be submitted until final closure is approved by the authorities. 	Enhancement	Decommissioning	Ecologist and / or SHEQ Officer	NEMBA, NEMA
AGRICULTURAL AND SOIL IMPACTS							
Construction Phase							
6	Stripping/storing of soil for construction of facilities	Increased erosion of site area	<ul style="list-style-type: none"> Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, and where necessary, the relocation of the paths causing the erosion, are to be undertaken. The topsoil stockpiles must be reshaped, protected against erosion and vegetated with indigenous grass species. Vegetation should only be removed in areas designated for infrastructure. The soil that is stripped during construction should be stockpiled in layers and protected by berms to prevent erosion. Construction during the rainy season should be closely monitored and controlled. 	Control/reduction measure	Construction, Operation	Contractor, ECO and / or SHEQ Officer	NEMA, CARA

7	Vehicle movement and maintenance	Potential contamination from fuel spills and leakages to soil	<ul style="list-style-type: none"> ▪ Construction vehicles and machines must be maintained properly to ensure that oil spillages are kept at a minimum. Oil residue shall be treated with oil absorbent and removed to an approved waste site. ▪ Old oil to be stored in dedicated area to prevent pollution and recycled via oil recycling companies. ▪ Vehicle maintenance should be conducted in designated areas ▪ Bunded facilities shall be provided for the storage of oil and lubricants. ▪ Spill trays must be provided if refuelling of construction vehicles is done on site. ▪ Chemical storage areas should be sufficiently contained. The use of all materials, fuels and chemicals which could potentially leach into underground water must be controlled. ▪ Oil, petrol and other chemicals will be disposed of hazardous waste and not with domestic waste. Particular attention will be given to training of staff and contractors in the handling of oils, diesel and other hazardous substances on site i.e., spills are to be avoided. ▪ Spill kits must be easy accessible and workers must undergo training in the use thereof. ▪ Chemical sanitary facilities must be provided for construction workers. Construction workers should only be allowed to use temporary chemical / permanent toilets on the site. Frequent maintenance should include removal without spillages. 	Control/ reduction measure	Construction, Operation	Contractor, ECO and / or SHEQ Officer	NEMA, CARA
Operational Phase							
7	Operation of plants, vehicle movement and maintenance	Potential contamination from reagent & fuel spills and leakages to soil	<ul style="list-style-type: none"> ▪ Vehicles and machines must be maintained properly to ensure that oil spillages and leakages are kept at a minimum. Oil residue shall be treated with oil absorbent and removed to an approved waste site. ▪ Old oil to be stored in dedicated area to prevent pollution and recycled via oil recycling companies. ▪ Vehicle maintenance should be conducted in designated areas ▪ Bunded facilities shall be provided for the storage of oil and lubricants. ▪ Chemical storage areas should be sufficiently contained. The use of all materials, fuels and chemicals which could potentially leach into underground water must be controlled. 	Control/ reduction measure	Construction, Operation	Contractor, ECO and / or SHEQ Officer	NEMA, CARA

			<ul style="list-style-type: none"> Oil, petrol and other chemicals will be disposed of hazardous waste and not with domestic waste. Particular attention will be given to training of staff and contractors in the handling of oils, diesel and other hazardous substances on site i.e., spills are to be avoided. Spill kits must be easy accessible and workers must undergo training in the use thereof. 				
Closure and Decommissioning Phase							
10	Rehabilitation of PGM and FCR plant areas	Land use capability restoration	<ul style="list-style-type: none"> Disturbed land will be rehabilitated as soon as the activities have ceased. The rehabilitation plan should be updated by the mine when necessary to reflect changes and closure objectives. All land exposed by the demolition of infrastructure and other disturbed land associated with the project will be rehabilitated. Monitoring and maintenance of vegetation cover until a self-sustaining plant community is established The mine will continue to submit information for the period after decommissioning activities have ceased, until the time that closure is approved by authorities. After mining operations have ceased, quarterly reports on the progress of the final rehabilitation will be submitted until final closure is approved by the authorities. Stockpiles and newly spread soil will be kept clear of invasive vegetation. 	Enhancement	Decommissioning	Appointed engineer & SHEQ Officer	NEMA, CARA
SURFACE WATER IMPACTS							
Construction and Operational Phase							
11	Operation of the PGM Plant and FCR plant	Impact on surface water quality due to stormwater runoff	<ul style="list-style-type: none"> Routine checks should be done on all mechanical instruments for problems such as leaks, overheating, vibration, noise or any other abnormalities. All equipment should be free of obstruction, be properly aligned and be moving at normal speed. Mechanical maintenance must be according to the manufacturer's instructions Pumps should be checked for excessive noise, vibration, overheating and leaks. Lubrication of the pump should be in accordance with the manufacturer's instructions. Mine vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. All oil spills must be cleaned up immediately. 	Can be avoided, managed or mitigated	Construction and Operation	Appointed engineer & SHEQ Officer	NEMA, NWA, NEMWA

			<ul style="list-style-type: none"> ▪ Manage runoff from the plant area in its own circuit and provide sediment traps before discharge to the existing stormwater management system in case of accidental spillage. ▪ Contain and recirculate the process water in the new plants in its own closed water circuit as far as possible and minimise spillages to the SWD. ▪ Contain all reagents and possible contaminants in approved bunded areas. ▪ The following bund areas will be constructed: <ul style="list-style-type: none"> a) Surge tank bund area b) Mill bund area c) Flotation bund area e) Hazardous waste bund area f) Oils and grease storage bund area g) Reagent storage & Mixing bund area ▪ Each of the bund areas listed except (e) and (f) will be fitted with adequately sized spillage pumps. The spillage pumps will direct the contaminated water to appropriate area within the plant. ▪ The hazardous waste (e) and the oils and grease storage area (f) will not be fitted with spillage pumps as it is undesirable to treat this contaminated water in the same vain as previously stated in the above bullet. These areas will be covered to prevent the ingress of rain fall. All hazardous waste and/or spillage be collected and transported in a sealed container to an accredited hazardous waste disposal contractor. ▪ All bund areas will be designed so as to have a minimum capacity of not less than 110 % of the stored volume of the oils and greases and chemical reagents and/or to have a capacity of a 1 in 50 year flood event for the surface area that will be exposed, whichever is largest. ▪ The bund areas will be designed to incorporate a sloped flooring to aid the flow of effluent to the spillage pump area. 				
Closure and Decommissioning Phase							
12	Rehabilitation of PGM and FCR plant areas	Impact on surface water	<ul style="list-style-type: none"> ▪ Refer to surface water mitigation during operational phase. 	Avoidance/Prevention measure	Decommissioning	Appointed engineer & SHEQ Officer	NEMA, NWA, NEMWA
HYDROGEOLOGICAL IMPACTS							
Operational Phase							

13	Operation of the PGM Plant and FCR plant	Impact on mine water balance – make up water requirements	<ul style="list-style-type: none"> Implement water conservation methods and recirculate process and storm water. 	Control/reduction measure	Construction and Operation	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
14	Operation of the PGM Plant and FCR plant	Impact on groundwater quality	<ul style="list-style-type: none"> The FCR plant and PGM plant extension areas should be concrete lined during construction. The mine's monitoring program should be implemented and honoured. Quarterly and annual monitoring reports should be submitted to the submitted to the DWS. One (1) shallow monitoring borehole (165 mm diameter, 25 m deep) should be added to the monitoring network downstream of the proposed plants. The groundwater level and water quality should be monitored on a quarterly basis. External material to be processed at the PGM and FCR plants need to be classified in terms of the NEMWA waste classification regulations, and the facility where the waste is deposited should be designed and approved to accommodate the waste type that is received. Also refer to surface water mitigation during operational phase. 	Control/reduction measure	Construction and Operation	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
Closure and Decommissioning Phase							
15	Rehabilitation of PGM and FCR plant areas	Impact on groundwater	<ul style="list-style-type: none"> Mine vehicles to be inspected to ensure no oil and hydraulic fluid leaks occur. All oil spills must be cleaned up immediately. 	Can be avoided, managed or mitigated	Decommissioning	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
HERITAGE IMPACTS							
Construction Phase							
16	Stripping/storing of soil for construction of facilities	Potential loss of heritage sites	<ul style="list-style-type: none"> In the event of accidental findings, all excavation shall be stopped, and the SAHRA and an archaeologist should be notified. 	Control/reduction measure	Implemented throughout all phases	Appointed engineer & SHEQ Officer	NHRA
AIR QUALITY IMPACTS							
Construction Phase							

17	Stripping/storing of soil for construction of facilities	Impact on ambient air quality	<ul style="list-style-type: none"> ▪ A dust fall monitoring network shall be implemented. Specific reference should be made to the operations at the Thorncliffe guest farm. ▪ Baseline data should be taken prior to development. ▪ The current dust fallout network consisting of 11 dust buckets must be continued during operations. Dust fallout rates should be below 1200 mg/m²/day in non-residential areas and 600 mg/m²/day in residential areas, averaged over 30 days. ▪ Fugitive dust from roads should be suppressed with water. ▪ All employees working in dusty environments shall wear protective equipment. ▪ Employees working with dust or fumes shall receive annual health checks. 	Control/reduction measure	Construction	SHEQ Officer	NEMA, CARA
Operational Phase							
18	Operation of the PGM Plant and FCR plant	Impact on air quality	<ul style="list-style-type: none"> ▪ Rehabilitation shall occur concurrent with mining activities. ▪ Exposed areas shall be rehabilitated with a mixture of local grasses. . ▪ The soil must be used for rehabilitation as soon as practicable. ▪ Vehicles and machines must be maintained properly. ▪ Also refer to air quality mitigation during construction phase. 	Control/reduction measure	Operational	SHEQ Officer	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
19	Operation of the PGM Plant and FCR plant	Dust and fumes from mine vehicles	<ul style="list-style-type: none"> ▪ Refer to air quality mitigation during construction phase. 	Control/reduction measure	Operational	SHEQ Officer	
Closure and Decommissioning Phase							
20	Closure and decommissioning of the PGM plant and FCR plant	Dust and fumes from decommissioning, levelling, rehabilitation and mine vehicles	<ul style="list-style-type: none"> ▪ Refer to air quality mitigation during operational phase. 	Control/reduction measure	Decommissioning	SHEQ Officer	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
NOISE IMPACTS							
Construction Phase							
21	Vehicle movement and maintenance	Raise in ambient noise levels	<ul style="list-style-type: none"> ▪ A complaints register should stay in place. ▪ All complaints, solutions and agreements between the mine and complaining parties will be kept in a specific file in the Community Officer's office. ▪ Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance 	Control/reduction measure	Construction	SHEQ Officer	NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004,

			<p>of all forms of equipment, training of personnel to adhere to operational procedures that reduce the occurrence and magnitude of individual noisy events.</p> <ul style="list-style-type: none"> Environmental noise monitoring should be carried out regularly at specific positions to detect deviations from predicted noise levels and enable corrective measures to be taken where warranted. 				SANS 10328:2008, SANS 10357:2004
Operational Phase							
22	Operation of the PGM Plant and FCR plant	Impact on ambient noise levels due to milling	<ul style="list-style-type: none"> Refer to noise mitigation during construction phase. 	Control/reduction measure	Operational	SHEQ Officer	NEMA, GNR154, SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
Closure and Decommissioning Phase							
23	Closure and decommissioning of the PGM plant and FCR plant	Impact on ambient noise levels from decommissioning, rehabilitation and mine vehicles	<ul style="list-style-type: none"> Refer to noise mitigation during construction phase. 	Control/reduction measure	Once off and implemented throughout all phases	SHEQ Officer	NEMA, GNR154, SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
VISUAL / AESTHETIC IMPACTS							
Construction Phases							
24	Stripping/storing of soil for construction of facilities	Decreased aesthetic appeal of site	<ul style="list-style-type: none"> Mine management to ensure that rehabilitation occurs concurrent with mining operations. 	Control/reduction measure	Construction	Mine manager and SHEQ Officer	NEMA
Operational Phase							
25	Operation of the PGM Plant and FCR plant	Decreased aesthetic appeal of site	<ul style="list-style-type: none"> Mine management to ensure that rehabilitation occurs concurrent with mining operations. 	Control/reduction measure	Operational	Mine manager and SHEQ Officer	NEMA
Closure and Decommissioning Phase							
26	Closure and decommissioning of the PGM Plant and FCR plant	Increased aesthetic appeal of site upon closure	<ul style="list-style-type: none"> Mine management to ensure that rehabilitation occurs concurrent with mining operations. 	Enhancement	Decommissioning	SHEQ Officer	NEMA
SOCIO-ECONOMIC IMPACTS							
Pre-Construction and Construction Phases							

27	Increase in employment opportunities and economic benefits	Unrealistic pre-construction expectations regarding economic benefits and job creation	<ul style="list-style-type: none"> The mine must communicate in an open and honest way what kind of jobs will be created, who will qualify and how the recruitment process will work. Contractors should be required to make use of a certain proportion of local labour although it is acknowledged that all skills will not be available locally. Jobs should be advertised in a way that is accessible to all members of society and labour desks should be established in accessible areas. 	Control/reduction measure	Pre-construction and Construction phases	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
28	Construction initiation	Increase in income and employment	<ul style="list-style-type: none"> Local contractors are used where possible for any maintenance or services required. The mine will attempt to continue to enhance its beneficial socio-economic input into the region, especially to the local community from where the bulk of the labour force is drawn. The mine will continue to support the surrounding towns of the region where supplies and services are obtained. 	Enhancement	Construction	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
Operational Phase							
29	Operation of the PGM Plant and FCR plant	Increase in income and employment	<ul style="list-style-type: none"> Local contractors are used where possible for any maintenance or services required. The mine will attempt to continue to enhance its beneficial socio-economic input into the region, especially to the local community from where the bulk of the labour force is drawn. The mine will continue to support the surrounding towns of the region where supplies and services are obtained. 	Enhancement	Operational	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
Decommissioning Phase							
30	Rehabilitation of PGM and FCR plant areas	Loss of employment and livelihoods	<ul style="list-style-type: none"> Employees should prepare for the closure of the mine well in advance. The employee wellness programme can assist with the mental and physical preparation of employees. Were possible skilled people should be redeployed in the Glencore group. The Social and Labour Plan should assist in creating an economy that not only depends on mining. Skills development programmes should focus on transferable skills. 	Control/reduction measure	Decommissioning	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline

18.5. Impact Management Outcomes

Table 18-2: Impact Management Outcomes

No	Activity	Impact	Mitigation Type	Roles & Responsibility	Compliance with Standards/Standard to be achieved
BIODIVERSITY IMPACTS					
Pre-Construction and Construction Phases					
1	Stripping of vegetation for construction of facilities	Fauna and flora habitat loss and disturbance	Avoidance/Prevention measure	Ecologist and / or SHEQ Officer	NEMBA, NEMA
2	Stripping of topsoil for construction of facilities and disturbance of site	Proliferation of alien invaders	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMBA, NEMA
3	Stripping of vegetation and topsoil for construction of facilities	Increased siltation of surface water and impact on aquatic biota	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	Conservation of Agricultural Resources Act (Act No. 43 of 1983) ("CARA")
Operational Phase					
4	Operation of the PGM Plant and FCR plant	Fauna and flora habitat loss and disturbance and proliferation of alien invaders	Avoidance/Prevention measure	Mine manager and SHEQ Officer	NEMBA, NEMA
Closure and Decommissioning Phase					
5	Closure and decommissioning of the PGM Plant and FCR plant	Re-establishment of flora and fauna on site after rehabilitation	Enhancement	Ecologist and / or SHEQ Officer	NEMBA, NEMA
AGRICULTURAL AND SOIL IMPACTS					
Construction Phase					
6	Stripping/storing of soil for construction of facilities	Increased erosion of site area	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMA, CARA
7	Vehicle movement and maintenance	Potential contamination from fuel spills and leakages to soil	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMA, CARA
Operational Phase					
7	Operation of plants, vehicle movement and maintenance	Potential contamination from reagent & fuel spills and leakages to soil	Control/reduction measure	Contractor, ECO and / or SHEQ Officer	NEMA, CARA
Closure and Decommissioning Phase					

10	Rehabilitation of PGM and FCR plant areas	Land use capability restoration	Enhancement	Appointed engineer & SHEQ Officer	NEMA, CARA
SURFACE WATER IMPACTS					
Construction and Operational Phase					
11	Operation of the PGM Plant and FCR plant	Impact on surface water quality due to stormwater runoff	Can be avoided, managed or mitigated	Appointed engineer & SHEQ Officer	NEMA, NWA, NEMWA
Closure and Decommissioning Phase					
12	Rehabilitation of PGM and FCR plant areas	Impact on surface water	Avoidance/Prevention measure	Appointed engineer & SHEQ Officer	NEMA, NWA, NEMWA
HYDROGEOLOGICAL IMPACTS					
Operational Phase					
13	Operation of the PGM Plant and FCR plant	Impact on mine water balance – make up water requirements	Control/reduction measure	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
14	Operation of the PGM Plant and FCR plant	Impact on groundwater quality	Control/reduction measure	Mine manager and SHEQ Officer	
Closure and Decommissioning Phase					
15	Rehabilitation of PGM and FCR plant areas	Impact on groundwater	Can be avoided, managed or mitigated	Mine manager and SHEQ Officer	NEMA, NWA, NEMWA
HERITAGE IMPACTS					
Construction Phase					
16	Stripping/storing of soil for construction of facilities	Potential loss of heritage sites	Control/reduction measure	Appointed engineer & SHEQ Officer	NHRA
AIR QUALITY IMPACTS					
Construction Phase					
17	Stripping/storing of soil for construction of facilities	Impact on ambient air quality	Control/reduction measure	SHEQ Officer	NEMA, CARA
Operational Phase					
18	Operation of the PGM Plant and FCR plant	Impact on air quality	Control/reduction measure	SHEQ Officer	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
19	Operation of the PGM Plant and FCR plant	Dust and fumes from mine vehicles	Control/reduction measure	SHEQ Officer	
Closure and Decommissioning Phase					

20	Closure and decommissioning of the PGM plant and FCR plant	Dust and fumes from decommissioning, levelling, rehabilitation and mine vehicles	Control/reduction measure	SHEQ Officer	NEM:AQA, Ambient Air Quality Standards, National Dust Control Regulations
NOISE IMPACTS					
Construction Phase					
21	Vehicle movement and maintenance	Raise in ambient noise levels	Control/reduction measure	SHEQ Officer	NEMA, National noise-control regulations (GNR154), SANS 10103:2008, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004
Operational Phase					
22	Operation of the PGM Plant and FCR plant	Impact on ambient noise levels due to milling	Control/reduction measure	SHEQ Officer	NEMA, GNR154, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004, SANS 10103:2008,
Closure and Decommissioning Phase					
23	Closure and decommissioning of the PGM plant and FCR plant	Impact on ambient noise levels from decommissioning, rehabilitation and mine vehicles	Control/reduction measure	SHEQ Officer	NEMA, GNR154, SANS 10210:2004, SANS 10328:2008, SANS 10357:2004, SANS 10103:2008,
VISUAL / AESTHETIC IMPACTS					
Construction Phases					
24	Stripping/storing of soil for construction of facilities	Decreased aesthetic appeal of site	Control/reduction measure	Mine manager and SHEQ Officer	NEMA
Operational Phase					
25	Operation of the PGM Plant and FCR plant	Decreased aesthetic appeal of site	Control/reduction measure	Mine manager and SHEQ Officer	NEMA
Closure and Decommissioning Phase					
26	Closure and decommissioning of the PGM Plant and FCR plant	Increased aesthetic appeal of site upon closure	Enhancement	SHEQ Officer	NEMA
SOCIO-ECONOMIC IMPACTS					
Pre-Construction and Construction Phases					
27	Increase in employment opportunities and economic benefits	Unrealistic pre-construction expectations regarding economic benefits and job creation	Control/reduction measure	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline

28	Construction initiation	Increase in income and employment	Enhancement	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
Operational Phase					
29	Operation of the PGM Plant and FCR plant	Increase in income and employment	Enhancement	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline
Decommissioning Phase					
30	Rehabilitation of PGM and FCR plant areas	Loss of employment and livelihoods	Control/reduction measure	Mine manager and SHEQ Officer	MPRDA, Labour Relations Act (Act 66 of 1995), Basic Conditions of Employment Amendment Act (Act 11 of 2002D), MRE SLP guideline

18.6. Impact Management Actions

The necessary content for this section has been included to Table 18-1 and Table 18-2 above.

18.7. Financial provision

18.7.1. Determination of the amount of financial provision

The financial provision was calculated in accordance with the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) as amended and Regulation 1147 of the National Environmental Management Act, 1988 (Act No. 107 of 1998). In accordance with the aforementioned legislation, the holder of a mining right must make the prescribed financial provision for the costs associated with the undertaking of the management, rehabilitation and remediation of the negative environmental impacts due to prospecting, exploration and mining activities and the latent or residual environmental impacts that may become known in future.

For the quantum calculation refer Table 18-3 and Table 18-4 below.

The environmental liability (unscheduled closure) was calculated as R 1,673,953.47 (Excl. VAT) for the FCR plant, while the liability for the PGM plant extension was calculated as R 3,298,589.52 (Excl. VAT).

The **total calculated additional impact on the environmental liability** as a result of the proposed project (both plants) is estimated at **R 4,972,542.99 (Excl. VAT) and R 5 718 424.44 (Incl. VAT).**

Table 18-3: Calculation of quantum for the FCR plant

PROJECT:	THORNCLIFFE MINE NEW FCR PLANT	REVISION:	0	
YEAR:	2022	DATE:	25/1/2022	
SUMMARY - FINAL REHABILITATION, DECOMMISSIONING & CLOSURE				
		UNSCHEDULED CLOSURE		
CLOSURE COMPONENTS				2022
Zone	Area	Decommissioning	Restoration	Total
A	Plant & Related Infrastructure	R 553,667.63	R 0	R 789,213.13
B	Buildings & Structures	R 44,958.36	R 0	R 44,958.36
E	Water Management	R 168,610.90	R 0	R 168,610.90
F	General Disturbed Areas	R 0	R 0	R 0
H	Maintenance	R 0	R 0	R 0
J	Monitoring & Studies	R 0	R 441,000.00	R 441,000.00
	Sub Total 1	R 767,236.90	R 441,000.00	R 1,443,782.40
	Preliminary & General	R 153,447.38	R 0	R 153,447.38
	Contingencies	R 76,723.69	R 0	R 76,723.69
	Total 1 (excl VAT; incl P&G's and contingencies)	R 997,407.97	R 441,000.00	R 1,673,953.47
	VAT (15%)	R 149,611.19	R 66,150.00	R 251,093.02
	Total (incl 15% VAT)	R 1,147,019.16	R 507,150.00	R 1,925,046.49

Table 18-4: Calculation of quantum for the PGM plant extension

PROJECT:	THORNCLIFFE MINE NEW PGM PLANT EXTENSION	REVISION:	0	
YEAR:	2022	DATE:	25/1/2022	
SUMMARY - FINAL REHABILITATION, DECOMMISSIONING & CLOSURE				
		UNSCHEDULED CLOSURE		
CLOSURE COMPONENTS				2022
Zone	Area	Decommissioning	Restoration	Total
A	Plant & Related Infrastructure	R 2,322,744.77	R 451,381.85	R 2,774,126.62
B	Buildings & Structures	R 0	R 0	R 0
C	Shafts & Opencasts	R 0	R 0	R 0
D	Mine Residue Deposits	R 0	R 0	R 0
E	Water Management	R 0	R 0	R 0
F	General Disturbed Areas	R 0	R 8,343.91	R 8,343.91
	Offsite & Shared Infrastructure	R 0	R 0	R 0
H	Maintenance	R 0	R 0	R 0
J	Monitoring & Studies		R 100,000.00	R 100,000.00
K	Post Closure Activities	R 0	R 0	R 0
	Sub Total 1	R 0	R 108,343.91	R 2,882,470.53
	Preliminary & General	R 232,274.48	R 45,138.18	R 277,412.66
	Contingencies	R 116,137.24	R 22,569.09	R 138,706.33
	Total 1 (excl VAT; incl P&G's and contingencies)	R 348,411.72	R 176,051.18	R 3,298,589.52
	VAT (15%)	R 52,261.76	R 26,407.68	R 494,788.43
	Total (incl 15% VAT)	R 400,673.47	R 202,458.86	R 3,793,377.95

18.7.2. Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein

The closure objective is to return the site to the original land use prior to the construction of the mine as per the baseline environment described under Section 10.1. The post closure land use proposed for the project area is to return the area to wilderness/natural area or area suitable for game and or grazing land.

Previous land capability studies for the mine have shown that the soil is generally shallow and vary between soils of a colluvial nature i.e. Glenrosa, Family Dumisa to Mispah form, Family Myhill. Rockiness varies between 30% to 70% (Glenrosa) and 65% on the Mispah form. The soils are derived from norite and have a moderate (15-35%) to high (>35%) clay content, depending on their position in the landscape. The soil depth varies between shallow gravelly soils in the rocky terraces (<450mm) and non-perennial drainage channels, to deeper loamy - clay soils on the plains (450-750mm) (Henning, 2017).

The current land-use of the proposed development site is mining with the neighbouring areas being predominantly used for grazing by livestock as well as small scale subsistence crop cultivation. The major land use of the study area as classified by the Environmental Potential Atlas of South Africa (2000) as vacant / unspecified land.

From the above it is deduced that the Agricultural potential is moderate to low. The limited soil on site can be used for rehabilitation post-mining if adequately managed.

The erodibility of the soil is moderate. The low or non-existent vegetation cover increases the erosion potential. The erodibility should be considered in all mining activities. The closure objectives have been determined taking this into account.

All disturbed sites will be rehabilitated to a wilderness/natural area. Any topsoil removed during construction will be stockpiled and used for rehabilitation at the end of life of mine. Once operations cease, all infrastructure will be removed. Disturbed sites will be ripped and seeded.

Also refer to section 18.4.1 above for closure objectives.

18.7.3. Confirm specifically that objectives in relation to closure have been consulted with landowner and interested and affected parties

The Applicant owns the land on which the proposed project is proposed.

The identified interested and affected parties will be consulted with regards to the proposed development during the public participation phase. A period of 30 days will be made available for public comment on the Draft EMPr in which Interested and Affected Parties (I&APs) will have an opportunity to provide comments on the environmental objectives in relation to closure.

18.7.4. Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

The footprint area is proposed to be 1.8 ha in extent. All mining infrastructure is planned to be dismantled and/or demolished. The total footprint must be cleared of any mining-related surface infrastructure. The mine infrastructure footprint is to be levelled, rehabilitated with topsoil and revegetated with indigenous grass species similar to that of the surrounding natural environment.

18.7.5. Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The rehabilitation plan has been compiled in accordance with the objectives and goals listed in section 18.4.1 and is deemed to be satisfactory according to the MPRDA as amended.

18.7.6. Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The calculated additional impact on the environmental liability as a result of the proposed project is estimated at R 4,972,542.99 (Excl. VAT) and R 5 718 424.44 (Incl. VAT).

For the closure quantum calculation refer to Table 18-3 and Table 18-4 above.

18.7.7. Confirm that the financial provision will be provided as determined

The stated financial provision that is required to both manage and rehabilitate the environment will be provided by a financial bank guarantee.

18.7.8. Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon

18.7.8.1. Environmental monitoring and auditing

DEAT (2004) defines environmental auditing as “a process whereby an organisation’s environmental performance is tested against its environmental policies and objectives.” Monitoring and auditing is an essential environmental management tool which is used to assess, evaluate and manage environmental and sustainability issues.

In order to ensure that the objectives of sustainable development and integrated environmental management are met and in order to obtain data which can inform continuous improvement of environmental practices at the site (adaptive management), monitoring and reporting will be an essential component of the proposed operations.

Monitoring and management actions associated with the project are contained in Table 11-3 of this report. This section provides a summary of the critical monitoring aspects per specific environmental field.

18.7.8.2. General monitoring and management

Glencore must keep a qualified on-site Environmental Superintendent (“ES”) to ensure the successful implementation of this project. The ES will be responsible for the implementation of the EMPr, applicable environmental legislation and any stipulations/conditions set by the relevant competent authorities (including but not limited to the DMRE and DWS). The ES will conduct formal weekly site inspections and monthly internal EMPr compliance reports. An independent Environmental Control Officer (“ECO”) should also be appointed to conduct annual audits for the duration of the construction phase. The Independent ECO should monitor the success and effective implementation of the environmental management measures stipulated by applicable legislation, the EIA & EMPr, and any conditions

set by the competent authorities. Following each site visit, the ECO should submit a report to the DMRE documenting the success/failure of the implementation of the management measures at the operations.

18.7.8.3. Specific monitoring requirements

Monitoring of the proposed development (both on site and where appropriate in the surrounding environments) should be considered a high priority and should be conducted in accordance with the relevant specialist recommendations as summarized below:

18.7.8.4. Monitoring protocol

It is essential that during the construction and operational phases of the proposed development that the monitoring of certain elements is carried out to ensure compliance with licenses and/or authorisations. A monitoring protocol for both the construction phase and the operational phase will be required.

18.7.8.5. Monitoring requirements and record keeping

To ensure that the procedures outlined throughout the EMPr are implemented effectively, it will be necessary to monitor the implementation of the EMPr and evaluate the success of achieving the objectives listed in the EMPr. To ensure that all personnel on site are aware of their obligation to protect the environment, induction training will also include environmental awareness.

The audit procedure will include a compliance audit, conducted by the environmental control officer. Where the objectives of the EMPr are not being met, the reasons will be determined and remedial action or variation to the tasks will be recommended. Major residual effects shall be documented in a Non-Conformance Report, during the construction and operational phases. Follow-up audits will be conducted as per the audit protocol in the EMPr.

18.7.8.6. Audit protocol

An audit protocol for the construction phase will be required. The following audits need to be completed (valid for this EMPr):

- EMPr compliance (on a monthly basis): to be checked by an on-site ECO (Mine SHE representative or Environmental Manager (EM))
- EMPr compliance (annual basis during the construction phase): to be checked by an independent auditor.

18.7.8.7. Environmental incidents

An environmental incident is defined as any unplanned event that results in actual or potential damage to the environment, whether of a serious or non-serious nature. An incident may involve non-conformance with environmental legal requirements, the requirements of the EMPr, or contravention of written or verbal orders given by the Environmental superintendent of Glencore or relevant authority.

In the event of any incident, an Environmental Incident Log should be completed and these reports should be kept on file by the Environmental superintendent. Such reports should provide the following details:

- Date of the incident (and time if relevant)
- Description of the nature of the incident (what happened)
- Explanation for current conditions (why it happened), responsible person, supporting photographs etc.
- Description of corrective actions taken

Corrective action to mitigate the impact (appropriate to the nature and scale of the incident) should be conducted immediately and affected parties notified. In the case of serious incidents or emergencies, the incident report should be sent to the relevant authority as soon as possible after the incident has been recorded.

18.7.8.8. Environmental Awareness Plan

The mine shall ensure that employees are adequately trained with regard to the implementation of the EMPr and environmental legal requirements and obligations. It is recommended that a training need analysis be conducted by a competent environmental training consultant to identify the appropriate environmental training programmes, and the appropriate target groups. Environmental training programmes shall be targeted at three distinct levels of employment i.e. the executive, middle management and labour. The training programmes shall contain the following information:

- The names, positions and responsibilities of the personnel to be trained
- The framework for appropriate training programmes
- The summarized content of each training course
- A schedule for the presentation of the training courses

All employees (including contractor employees) must undergo general induction training. A section on environmental management at the mining operations is included in the training content. This training will happen continuously and

all new employees and employees returning from leave must attend induction. Other means of training material (such as videos) are utilised for induction and general awareness training of employees, contractors and visitors. Environmental conditions will be included in any operational contracts, thereby making contractors aware of the potential environmental risks associated with the project and the necessity to prevent accidental spillages by implementing good housekeeping practices.

The following principles will apply to the environmental awareness plan (safety, health and environment):

- All personnel will as a minimum undergo general Safety, Health & Environmental (“SHE”) induction and awareness training
- The environmental officers will identify the SHE training requirements for all personnel and contractors
- The training requirements will be recorded in a training need matrix indicating particular training that must be undertaken by identified personnel and contractors
- The training matrix will be administrated by the Environmental Officer.

A training programme needs to be developed that includes general and specific awareness training.

The Health, Safety, Environment and Community (“HSEC”) manager will be responsible for the development of the required SHE induction and general awareness training. A general environmental awareness training module will be developed and integrated into the induction programme. The training manual shall include a review of the Environmental Policy, a review of significant environmental aspects, a description of the EMP and the importance of conformance to its requirements, general responsibilities of mine personnel with regard to the EMP and a review of the emergency and corrective action procedures. The Environmental officer will be responsible to conduct the general awareness training. A record will be kept of all persons attending general awareness training. Such attendance registers shall indicate the names of attendants and their organizations, the date and type of training received.

Specific environmental training will be in line with the requirements identified in the training matrix. People whose work tasks can impact on the environment will be made aware of the requirements of appropriate procedures/ work instructions. The Environmental Officer will communicate training requirements to responsible supervisors to ensure that personnel and contractors are trained accordingly. The effectiveness of the environmental training will be reflected by the degree of non-conformance to EMP requirements, the results of internal audits and the general performance achieved.

Incidents and non-conformances raised against the EMPr will be assessed by the HSEC manager and Environmental Officer to determine the cause. Should it be evident that re-training is required, the Environmental Officer will take the appropriate actions.

18.7.9. Indicate the frequency of the submission of the performance assessment report

Annual performance assessment reports need to be compiled and submitted to the DMRE.

18.7.10. Environmental Awareness Plan

18.7.10.1. Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

Refer to section 18.7.8.8.

18.7.10.2. Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

The EMPr details commitments in order to avoid pollution or the degradation of the environment. Compliance to the EMPr commitments will form part of the daily operations of the mine, and a copy of the EMPr commitments will be provided to the contractors. Employees will also be briefed regarding the EMPr commitments prior to the commencement of operations. In addition to this, monitoring will be undertaken by an internal ECO as well as by an external auditor.

All employees are required to undergo environmental awareness induction training on appointment. All records of such training must be kept. Refresher induction training must periodically take place.

Regular meetings (toolbox talks) communicating the following is recommended:

- Findings of environmental performance reports
- Awareness raising campaigns discussing environmental topics
- Information of any environmental risk which may result from employee’s work.

Refer to Table 11-3 for the recommended mitigation measures to limit environmental impacts.

18.7.10.3. Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Emergency systems and procedures need to be designed and implemented in the case of an emergency, to prevent or minimise environmental damage. The environmental emergency contingency plan must address any reasonably anticipated failure (most probable risk) for the entire mining area as well as the additional infrastructure that could cause environmental emergencies.

Emergencies and risks that should be included in the emergency plan include: accidents, fires and hydrocarbon spillages (as a minimum).

Communication is vital in an emergency and thus communication devices, such as mobile phones, radios, pagers or telephones, must be available around the site. A checklist of emergency response participants must be consulted and the relevant units notified.

Refer to Table 11-3 for the recommended mitigation measures to avoid pollution or the degradation of the environment.

18.7.11. Specific information required by the Competent Authority

The immediate closure provision will be updated yearly as part of the annual liability assessment required by the MPRDA and GNR 1147 in terms of the NEMA when it comes into effect. This financial provision assessment will be accompanied by an annual environmental audit of the EMPr and an audit of the WUL.

20. Undertaking

The EAP herewith confirms:

- a) the correctness of the information provided in the reports
- b) the inclusion of comments and inputs from stakeholders and I&APs;
- c) the inclusion of inputs and recommendations from the specialist reports where relevant; and
- d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

21. References

- Airshed. (2018). *Air Quality Impact Assessment for the Glencore Mines Near Lydenburg*. Report No: 15EXI12.
- Airshed. (2022). *Professional opinion on the potential air quality impacts due to the proposed fine chrome recovery plant and extension to the existing platinum floatation plant at the Glencore Thorncliffe mine in the Steelpoort Valley*.
- Delicado. V. & Vivier, K. (2021). *Glencore Eastern Chrome Mines: Helena WRD and Thorncliffe Co-Disposal Design Numerical Model and Impact Assessment - Hydrogeological Specialist Investigation*. KC Vivier (Pty) Ltd.
- Durand, J.F. (2018). *Glencore Eastern Chrome Mines Extension Project (Thorncliffe 374KT, Richmond 370 KT, St George 2 JT, Helena 6 JT and De Grootboom 373 KT), Sekhukhune District Municipality, Limpopo Province*.
- Exigo Sustainability. (2018). *Draft environmental impact assessment report and environmental management programme report proposed Glencore Eastern Mines EMPR Amendment Project*.
- Exigo Sustainability. (2020). *Integrated Water and Waste Management Plan (IWWMP) for the Operations at Glencore, Thorncliffe, Limpopo Province (2020)*.
- Ferreira, S., Barratt, J.C. & Vivier, J.J.P. 2018. *Glencore Chrome Eastern Mines: Helena, Magareng, Thorncliffe – HydroGeochemical Specialist Study and Waste Assessment*. Exigo Sustainability Pty Ltd.
- Fetakgomo-Greater Tubatse Local Municipality (FGTLM) 2016. *Integrated Development plan 2016/2017*.
- Henning, B.J. (2017). 2017a. *A specialist report on the soils, agricultural potential and land capability for the proposed Glencore Eastern Mines Expansion Project, Limpopo Province*.
- Henning, B.J. (2022). *Memorandum on the terrestrial biodiversity that forms part of the proposed Glencore Eastern Mines platinum flotation plant and chrome plant expansion sites*. AGES Limpopo Pty Ltd.
- KC Vivier (2021). *Glencore Eastern Chrome Mines: Helena WRD and Thorncliffe Co-Disposal Design Numerical Model and Impact Assessment, E47700225. Hydrogeological Specialist Investigation*.
- Kruger, N. (2022). *Memorandum on site status and heritage impact of the proposed expansion of the Glencore Thorncliffe platinum flotation plant and chrome plant, Greater Fetakgomo Tubatse Local Municipality, Limpopo Province*. Exigo Sustainability.
- StatsSA. (2011). Greater Tubatse Statistics. http://www.statssa.gov.za/?page_id=993&id=greater-tubatse-municipality
- Redco. (2022). *Thorncliffe Mine: Extension of FeCr and PGM plants – Surface Water Assessment Technical Memorandum*.
- Vivier, K. & Delicado. V. (2022). *Technical memorandum: Glencore Thorncliffe PGM & FCR plant expansion – Hydrogeological Assessment*. Artesium Consulting Services.

23. Appendices

23.1. Appendix 1: EAP's curriculum vitae & qualifications

23.3. Appendix 2: Company profile

23.5. Appendix 3: Locality map

23.7. Appendix 4: Site plan

23.9. Appendix 5 Public Participation Documentation

Proof to be included in Final EMPr to be submitted to the DMRE

23.9.1. Appendix 5.1: Proof of advertisement

23.9.2. Appendix 5.2: Proof of site notice

23.9.3. Appendix 5.3: Proof of Notification

23.9.4. Appendix 5.4: I&AP correspondence

23.9.5. Appendix 5.5: Comments and response register

23.10. Appendix 6: Specialist Reports

23.10.1. Appendix 6.1: Air quality professional opinion

23.10.2. Appendix 6.2: Heritage impact memorandum

23.10.3. Appendix 6.3: Palaeontological desktop assessment

23.10.4. Appendix 6.4: Terrestrial biodiversity memorandum

23.10.5. Appendix 6.5: Hydrogeological technical memorandum

23.10.6. Appendix 6.6: Surface water assessment