PROPOSED WEST WITS MINING PROJECT

Environmental Impact Assessment and Environmental Management Programme

Various portions of farms Roodepoort 236 IQ, Roodepoort 237 IQ, Tshekisho 710 IQ, Uitval 677 IQ, Vlakfontein 238 IQ, Vogelstruisfontein 231 IQ, Vogelstruisfontein 233 IQ, Witpoortjie 245 IQ, Glenlea 228 IQ, Gauteng

Prepared for:

WEST WITS MINING

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BASIS OF REPORT

This document has been prepared by an SLR Group company with reasonable skill, care and diligence, and taking account of the manpower, timescales and resources devoted to it in accordance with the appointment from the applicant.

This document has been prepared in accordance with the Department of Mineral Resources (DMR) EIA Report template format, and was informed by the guidelines posted on the official DMR website. This is in accordance with the requirements of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA). Given this, SLR has included additional information in the Introduction section of the report that it deems necessary and relevant to setting the scene for the environmental impact assessment (EIA) process. In addition, this report has been compiled in line with the requirements of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) and EIA regulations (2014), as amended.

The information contained in this report is relevant only to the specific project area and plan. It cannot be relied on for any other purpose or by any other person.

This report does not deal with the existing Solplaatjie mining operation or the two separate mining permit application processes for Creswell Park and Kimberley West as these do not form part of the EIA.

Information reported herein may be based on the interpretation of public domain data collected by SLR Consulting (South Africa) Pty Ltd (SLR), and/or information supplied by the applicant and/or its other advisors and associates. The data has been accepted in good faith as being accurate and valid.

This document may contain information of a specialised and/or highly technical nature and the reader is advised to seek clarification on any elements which may be unclear to it.

PROPOSED WEST WITS MINING PROJECT

EXECUTIVE SUMMARY

Introduction

West Wits MLI (Proprietary) Limited (West Wits), the applicant, is proposing to establish a mining operation in an area located south of Roodepoort and to the north of Soweto in the City of Johannesburg Metropolitan Municipality, Gauteng.

West Wits has applied for a mining right in terms of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA) as amended, for gold, uranium and silver over various portions of farms.

The proposed project includes activities listed under the Environmental Impact Assessment (EIA) Regulations 2014 (as amended), promulgated in terms of Chapter 5 of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) and the National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA), all as amended. Such listed activities are prohibited from commencing until authorisation is obtained from the competent authority, which in this case is the Department of Mineral Resources. The activities that are triggered require a full Scoping and Environmental Impact Assessment (EIA) process to inform the DMR's decision on the application for environmental authorisation.

West Wits is the South African subsidiary of West Wits Mining Limited, which is an Australian listed exploration and development company. The directors of West Wits Mining Limited include the Executive Chairman (Michael Quinert) and Non-executive Directors (Hulme Scholes, Daniel Pretorius, Vincent Savage and Dr Andrew Tunks). Through its listing, it is owned by a number of shareholders across the globe. West Wits is 33,3% empowered. The empowerment company is Lilitha Resources Proprietary Limited, previously referred to as Witpoortjie Resources Investments Proprietary Limited.

SLR Consulting (Africa) (Pty) Ltd (SLR) has been appointed as the independent environmental consultant to undertake the EIA process for the proposed project.

This executive summary provides a synopsis of the Environmental Impact Assessment and Environmental Management Programme (EIA and EMPr).

Opportunity to comment on the EIA and EMPr

This EIA and EMP **was** distributed for a 30-day comment period from **20 May 2019 to 25 June 2019** in order to provide Interested and Affected Parties (I&APs) with an opportunity to comment on any aspect of the proposed project and the findings of the EIA process. Copies of the full report **were** made available on the SLR website (at https://slrconsulting.com/za/slr-documents/) and at public review venues.

Electronic copies (compact disk) of the report **were made available on request**.

The EIA Report including comments received during the I&AP review period has been submitted to the DMR on 10 July 2019. Registered I&APs will receive notification of the final submission to DMR.

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Overview of the project

West Wits is proposing to establish a mining operation in an area located south of Roodepoort and to the north of Soweto in the City of Johannesburg Metropolitan Municipality, Gauteng. West Wits has applied for a mining right in terms of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA) as amended, for gold, uranium and silver over various portions of the farms Roodepoort 236 IQ, Roodepoort 237 IQ, Tshekisho 710 IQ, Uitval 677 IQ, Vlakfontein 238 IQ, Vogelstruisfontein 231 IQ, Vogelstruisfontein 233 IQ, Witpoortjie 245 IQ, Glenlea 228 IQ ('the project').

West Wits currently holds a prospecting right (GP 30/5/1/1/2/10035 PR) over a number of farms including the above listed farms. The prospecting right (MPT No. 29/2016) was ceded from Mintails SA Soweto Cluster (Proprietary) Limited to West Wits. Consent for the transfer of the prospecting right in terms of Section 11(2) of the MPRDA was granted by the DMR in 2018.

In broad terms the proposed project would involve the development of five open pit mining areas (referred to as the Mona Lisa Bird Reef Pit, Roodepoort Main Reef Pit, Rugby Club Main Reef Pit, 11 Shaft Main Reef Pit and Kimberley Reef East Pit) and refurbishment of two existing infrastructure complexes (referred to as the Bird Reef Central Infrastructure Complex and Kimberley Reef East Infrastructure Complex) to access the existing underground mine workings.

The project would also include the establishment of run of mine (ROM) ore stockpiles, topsoil stockpiles and waste rock dumps as well as supporting infrastructure including material storage and handling facilities (for fuel, lubricants, general and hazardous substances), general and hazardous waste management facilities, sewage management facilities, water management infrastructure, communication and lighting facilities, centralised and satellite offices, workshops, washbays, stores, change houses, lamprooms, vent fans and security facilities.

Primary mineral processing will take place on site, where ore will be crushed prior to transportation off-site. All run-of mine material will be transported to an existing processing plant off-site for concentrating of minerals.

Project timelines

The expected life of mine for the open pit operations (inclusive of rehabilitation) is five (5) years and 20 years for the underground operations (see diagram below) thus a total life of mine of 25 years. The pits would be mined in a phased approach with each pit taking between five and nine months to be mined and rehabilitated.

Opencast mining and concurrent rehabilitation operations	Continued opencast mining, concurrent and final rehabilitation and construction of infrastructure complexes	Underground mining operations
Year 1 to Year 3	Year 3 to 5	Year 6 to Year 25

The final post closure land uses have been identified in consultation with land owners and will include residential, commercial, industrial, infrastructure, as well as green belts and parks.

Public participation

The public participation process commenced with the Scoping Phase in July 2018. As part of this process, commenting authorities and interested and affected parties (I&APs) were given the opportunity to attend public open day sessions, focussed meetings, submit questions and comments to the project team, review the background information document, the Scoping Report **and EIA Report**. This EIA and EMPr **has** also **been** subjected to public and regulatory review. All comments submitted to date by the commenting authorities and I&APs have been included and addressed in the EIA.

Impacts and management measures

This section provides a summary of the findings of identified and assessed potential impacts on the receiving environment in both the unmitigated and mitigated scenarios. A summary of the potential impacts, associated with the preferred alternatives, in the unmitigated and mitigated scenarios for all project phases is included in Table below.

TABLE: SUMMARY OF POTENTIAL PROJECT-RELATED IMPACTS

Potential impact	Incremental significance	
	Unmitigated	Mitigated
Biophysical		
Loss of soil resources and land capability through physical disturbance	**High**	**Low**
Loss of soil resources and land capability through contamination	**Medium**	**Low**
Physical destruction of biodiversity	**Medium**	**Low**
General disturbance of biodiversity	**Medium**	**Low**
Alteration of surface drainage patterns	**High**	**Medium**
Contamination of surface water	**High**	**Medium-Low**
Reduction of water availability to third parties	**Low**	**Low**
Groundwater contamination	**Low**	**Low**
Change in ambient air concentrations	**High**	**Medium**
Increase in Greenhouse Gas emissions	**High**	**Medium**
Radiation Impact	**Low**	N/A
Increase in ambient noise levels	**Medium** (Open Pit) **Low** (Underground)	**Low**
Change in landscape and related visual impacts	**High**	**Medium** (Construction, Operational, Decommissioning) **Low** (Closure)
Socio-economic		

Potential impact	Incremental significance	
	Unmitigated	Mitigated
Economic impact (positive and negative)	**Medium +**	**High +**
Loss and sterilisation of mineral resources	-	-
Inward migration and social ills	**High**	**Low**
Loss of livelihood for illegal miners	**High**	**Medium**
Social benefits associated with employment and economic development	**Medium +**	**High +**
Road disturbance and traffic safety	**High**	**Medium**
Safety risks to third parties	**High**	**Low** (Construction, Operational, Decommissioning) **Medium +** (Closure)
Increase in health risks to receptors	**Medium** (inhalation health & cancer risk) **Low** (systemic non-cancer risk)	**Low** (Inhalation Health, Systemic Health, And Cancer Risk)
Blasting and Vibration Impacts	-	-
Land use impact	**High** (Construction, Operational and Decommissioning)	**Medium** (Construction, Operational And Decommissioning) **Medium +** (Closure)
Heritage and cultural		
Damage to or disturbance of heritage (including cultural) and palaeontological resources resulting in a loss of the resource	**High**	**Low**

- denotes 'No impact' or 'No contribution'

The assessment of the proposed project has shown that it has the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments. These impacts could occur both within and surrounding the mining right application area. At the same time the project would have a number of positive economic impacts.

The potential mitigated impacts on the biophysical environment are assessed to range between low to medium significance. In the case of the open pit mining activities, the impacts, especially visual and noise, would be of short duration of between five and nine months at each of the proposed open pit mining areas. Following rehabilitation of the open pits, these impacts would be negligible.

The underground mining operations of 20 years would be of a long term duration. In the case of the proposed Kimberley Reef East IC its location in-between existing slimes dams, would substantially reduce the severity and spatial scale of the operations. The Bird Reef Central IC would be closer to receptors and would thus require more careful implementation of mitigation measures. Noise impacts from ventilation shafts at both infrastructure complexes would be reduced through efficient engineering designs. With mitigation the potential impacts on the biophysical environments can be mitigated to acceptable levels. However, the specialist findings should be verified as part of the WULA and prior to mining commencing underground, this specifically relates to the Groundwater.

The proposed project would contribute positively towards to the local, regional and national economy through capital investment, creation of employment and revenue generation potential. The community based projects and implementation of the mine's social and labour plan would have direct social development and employment benefits for the relevant communities. With the implementation of the necessary mitigation, the economic and social impacts have been assessed as being of high positive significance.

Where the project aligns its timeline to support post-closure housing and other property development the economic benefits of both the mining and alternative land use can be realised. The short duration of the open cast activities are considered to have a minimal impact on their future planned programmes.

The impact of blasting and vibration is considered to be of negligible significance, given the increasing depth of the mining activity and the small charge masses being fired at any one time. It is therefore highly unlikely that any disturbances would be felt by surface receptors around the mining right application area.

With the implementation of the appropriate mitigation, the heritage and cultural impacts are assessed to be low significance. .

Should the proposed mining development not proceed, the potential opportunity to develop and grow existing industries, manufacturing and distribution facilities surrounding the proposed mining rights area would be substantially reduced and in certain cases areas could not occur due to mineral reserves, still being in place.

As depicted in the impact summary table and discussed above, the assessment of impact significance with mitigation, indicates negative impacts of only low to medium impact significance. At the same time the positive social and economic impacts are seen considered to be of high significance.

Thus, assuming the effectively implemented of the project mitigation in the EMP, the assessed impact significance levels are not such that they should stop the project proceeding.

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
%	Percentage
ABA	Acid Base Accounting
AEL	Atmospheric Emissions License
AQMP	Air Quality Management Plan
BEE	Black Economic Empowerment
BIC	Bushveld Igneous Complex
BID	Background Information Document
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
Cl_2	Chlorine gas
COJ	City of Johannesburg Metropolitan Municipality
CZ	Critical Zone
DAFF	Department of Agriculture, Fisheries and Forestry
DMR	Department of Mineral Resources
DMS	Dense media separation
DPM	Diesel Particulate Matter
DPRT	Department of Police, Roads and Transport
DPWRT	Department of Public Works, Roads and Transport
DRDLR	Department of Rural Development and Land Reform
DRT	Department of Roads and Transport
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	European Commission
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPr	Environmental Management Programme
FSE	Federation for a Sustainable Environment
GDP	Gross Domestic Profit
GDARD	Gauteng Department of Agriculture and Rural Development
GN	General Notice
GNR	General Notice Regulation
H_2SO_4	Sulphuric acid
ha	Hectares
HCl	Hydrochloric acid
HF	Hydrogen fluoride
I&APs	Interested and/or Affected Parties
IAIAsa	International Association of Impact Assessment South Africa
IDP	Integrated Development Plan
IWWMP	Integrated water and wastewater management plan
LZ	Lower Zone
km	Kilometre
kV	Kilovolt

Acronym / Abbreviation	Definition
mamsl	Metres above mean sea level
MAP	Mean annual precipitation
MAR	Mean annual runoff
MES	Minimum Emission Standards
M	Marginal
m	Meter
mamsl	Metres above mean sea level
mm	Millimetres
MPRDA	Mineral and Petroleum Resources Development Act, 2002
MZ	Main zone
NFEPA	National Freshwater Ecosystem Priority Areas
NEM:AQA	National Environmental Management: Air Quality Act, 2004
NEM:BA	National Environmental Management: Biodiversity Act, 2004
NEM:WA	National Environmental Management: Waste Act, 2008
NEMA	National Environmental Management Act, 1998
NGO	Non-government organisation
NH_3	Ammonia
NWA	National Water Act, 1998
Non-PAG	Non-Potentially Acid Generating
O_2	Oxygen
ROM	Run of mine
SACNASP	South African Council for Natural Scientific Professionals
SAHRA	South Africa Heritage Resource Agency
SANS	South African National Standard
SAWS	South African Weather Services
SLR	SLR Consulting (South Africa) (Pty) Ltd
SMS	Short Message Service
SO_4	Sulphate
TDS	Total dissolved solids
TSF	Tailings storage facility
TWQR	Target water quality range
UZ	Upper zone
WMA	Water management area
WML	Waste Management Licence
WRDs	Waste rock dumps
WUL	Water use licence
WULA	Water use license application

INTRODUCTION

This chapter describes the purpose of this report, provides a brief description of the project background, the legislative authorisation requirements, introduces the environmental assessment process, presents the structure of the report and outlines the opportunity for comment.

PURPOSE OF THIS REPORT

This Environmental Impact Assessment (EIA) and Environmental Management Programme (EMPr) has been compiled and distributed for review and comment as part of a Scoping and Environmental Impact Assessment process that is being undertaken for the application of a mining right by West Wits MLI (Proprietary) Limited (West Wits) in the Gauteng Province (refer to Figure 0-1 and Figure 0-2).

This EIA and EMPr provides a description of the proposed project and the affected environment; summarises the EIA process followed to date; identifies and assesses the key project impacts and presents management and mitigation measures that are recommended to enhance positive and limit negative impacts.

Interested and Affected Parties (I&APs) are asked to comment on the EIA and EMPr. The document will then be updated into a final report, giving due consideration to the comments received. The EIA and EMPr will be submitted to the Department of Mineral Resources (DMR) for consideration as part of the application for Environmental Authorisation in terms of Chapter 5 of the National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as amended.

INTRODUCTION TO THE PROPOSED PROJECT

West Wits is proposing to establish a mining operation in an area located south of Roodepoort and to the north of Soweto in the City of Johannesburg Metropolitan Municipality, Gauteng. West Wits has applied for a mining right in terms of the Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA) as amended, for gold, uranium and silver over various portions of the farms Roodepoort 236 IQ, Roodepoort 237 IQ, Tshekisho 710 IQ, Uitval 677 IQ, Vlakfontein 238 IQ, Vogelstruisfontein 231 IQ, Vogelstruisfontein 233 IQ, Witpoortjie 245 IQ, Glenlea 228 IQ (‘the project’).

West Wits currently holds a prospecting right (GP 30/5/1/1/2/10035 PR) over a number of farms including the above listed farms. The prospecting right (MPT No. 29/2016) was ceded from Mintails SA Soweto Cluster (Proprietary) Limited to West Wits. Consent for the transfer of the prospecting right in terms of Section 11(2) of the MPRDA was granted by the DMR in 2018.

In broad terms the proposed project would involve the development of five open pit mining areas and the refurbishment of two existing infrastructure complexes to access the existing underground mine workings (see Figure 0-2). The open pit areas are referred to as:

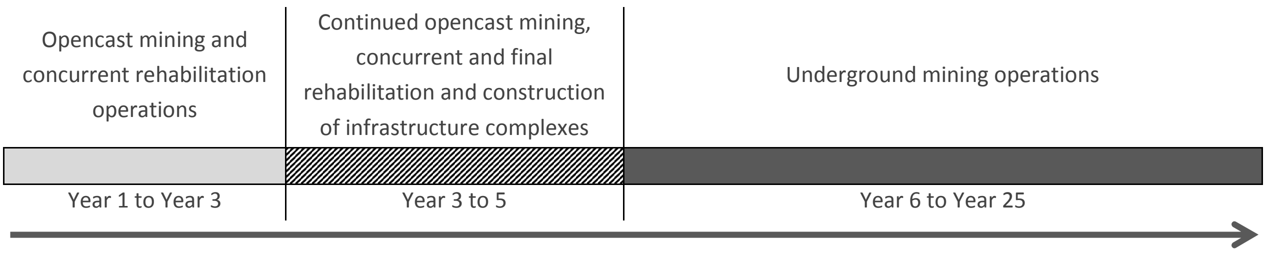
- Mona Lisa Bird Reef Pit,
- Roodepoort Main Reef Pit,
- Rugby Club Main Reef Pit,
- 11 Shaft Main Reef Pit, and
- Kimberley Reef East Pit.

The infrastructure complexes are referred to as:

- Bird Reef Central Infrastructure Complex and
- Kimberley Reef East Infrastructure Complex.).

The project would also include the establishment of run of mine (ROM) ore stockpiles, topsoil stockpiles and waste rock dumps as well as supporting infrastructure including material storage and handling facilities (for fuel, lubricants, general and hazardous substances), general and hazardous waste management facilities, sewage management facilities, water management infrastructure, communication and lighting facilities, centralised and satellite offices, workshops, washbays, stores, change houses, lamprooms, vent fans and security facilities.

The expected life of mine for the open pit operations (inclusive of rehabilitation) is five (5) years and 20 years for the underground operations (see diagram below) thus a total life of mine of 25 years. The pits would be mined in a phased approach with each pit taking between five and nine months to be mined and rehabilitated.



The final post closure land uses have been identified in consultation with land owners and will include residential, commercial, industrial, infrastructure, as well as green belts and parks.

Prior to the commencement of the project, an EIA regulatory process must be conducted in terms of the MPRDA, National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA) and the National Environmental Management: Waste Act, 2008 (No. 59 of 2008) (NEM:WA), all as amended.

SLR Consulting (South Africa) (Pty) Ltd (SLR) has been appointed as the independent environmental assessment practitioner (EAP) responsible for undertaking the EIA for the project.

SUMMARY OF AUTHORISATION REQUIREMENTS

Prior to the commencement of the proposed project decisions are required from the following competent authorities:

- Environmental authorisation from the DMR in terms of the NEMA. The proposed project incorporates several activities listed in the Environmental Impact Assessment Regulations (EIA Regulations): Listing Notice 1, 2 and 3, 2014 published in Government Notice (GN) No. 983, 984 and 985 of 4 December 2014 and amended by GN No. 327, 325 and 324 of 7 April 2017. The EIA regulations being followed in this study are the EIA Regulations, 2014 published in GN No. 982 of 4 December 2014 and amended by GN No. 326 of 7 April 2017.
- A waste management licence (WML) from the DMR in terms of the NEM:WA. The proposed project incorporates waste management activities listed in GNR 921 of 29 November 2013, as amended.

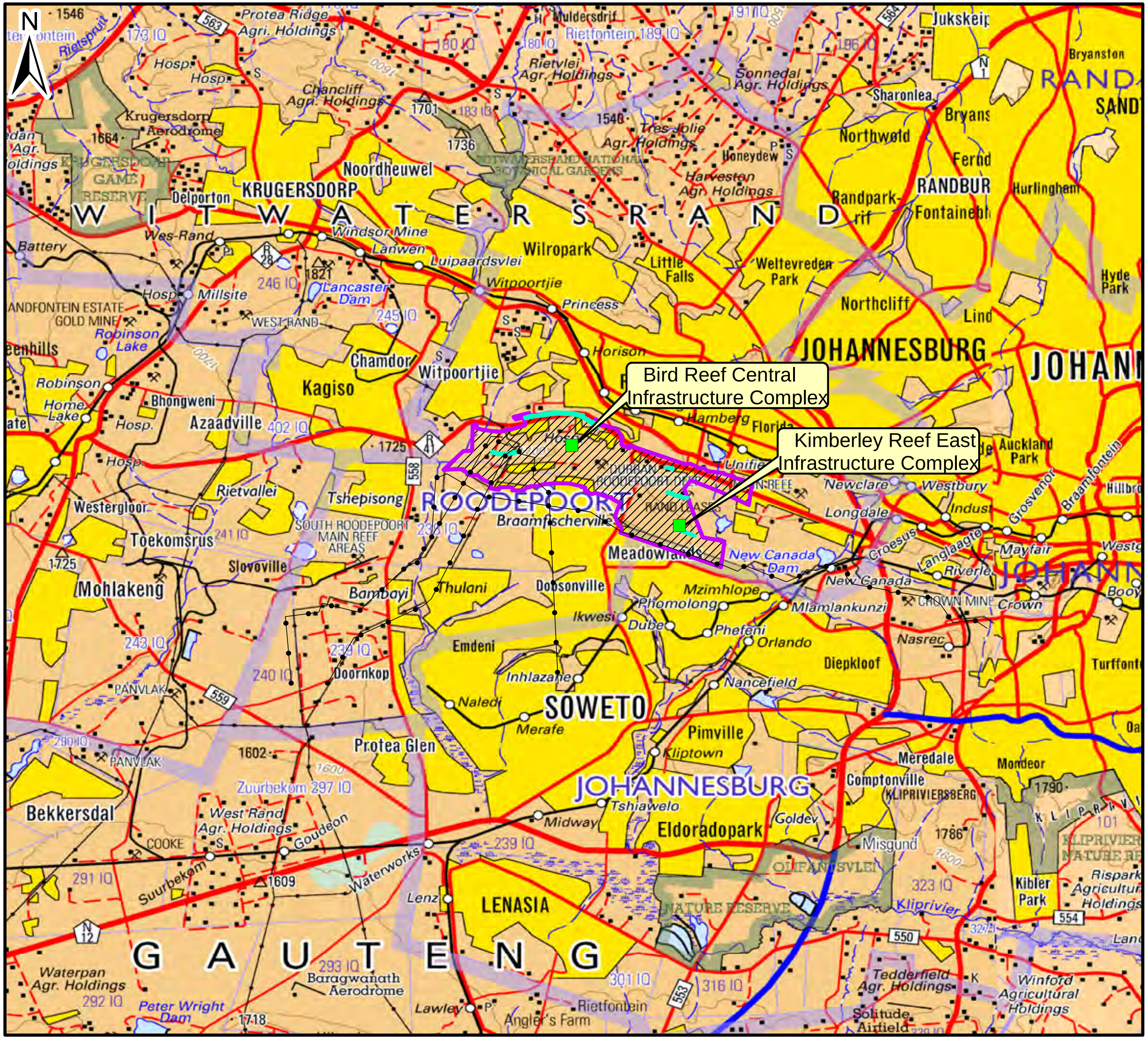
- A water use licence (WUL) from the Department of Water and Sanitation (DWS) in terms of the National Water Act, 1998 (No. 36 of 1998) (NWA). The proposed project incorporates water uses in terms of Section 21 of the NWA.

The applicable listed activities and water uses are listed in Section 3.1 of this report. A mining right application and integrated NEMA and NEM:WA application were lodged by West Wits with the DMR on 27 July 2018. The WUL application will be submitted to the DWS once the EIA Report has been submitted to the DMR.

Additional permits or licenses that may be required for the project include:

- Registration of dams with a wall greater than 5 m and a capacity of 50 000 m^3 as safety risk dams in terms of the NWA.
- Approval from the relevant Department of Roads and Transport for upgrading any roads or intersections.
- Permit in terms of the National Heritage Act, 1999 (No. 25 of 1999) (NHRA), the Ordinance on Exhumations, 12 of 1980, and/or the Human Tissues Act, 1983 (No. 65 of 1983 if any heritage sites (including graves) are damaged or removed.
- Permit in terms of the National Forests Act, 1998 (No. 84 of 1998) (NFA) if any protected plant species are removed or damaged.
- Certificate of registration or exemption in terms of the National Nuclear Regulator Act, 1999 (No. 47 of 1999) (NNR) for the handling and management of gold and uranium containing material.

Although permits or approvals in terms of health and safety regulations by West Wits fall outside the scope of the EIA process, the layout of the various operations will have to comply with the requirements of all relevant legislation e.g. the Mine Health and Safety Act, 1996 (No. 29 of 1996) (MHSA).



Legend

- Main Roads
- National Freeway
- Powerlines
- Railways
- Proposed Infrastructure Complexes
- Built-up Areas
- Proposed Opencast Mining Areas
- Proposed Mining Right Application Area

Kilometers

0 2.5 5 10

Scale: 1:200 000

Projection:Transverse Mercator

Datum: WGS84

WEST WITS MINING RIGHT

Figure 0-1

Regional Setting of West Wits

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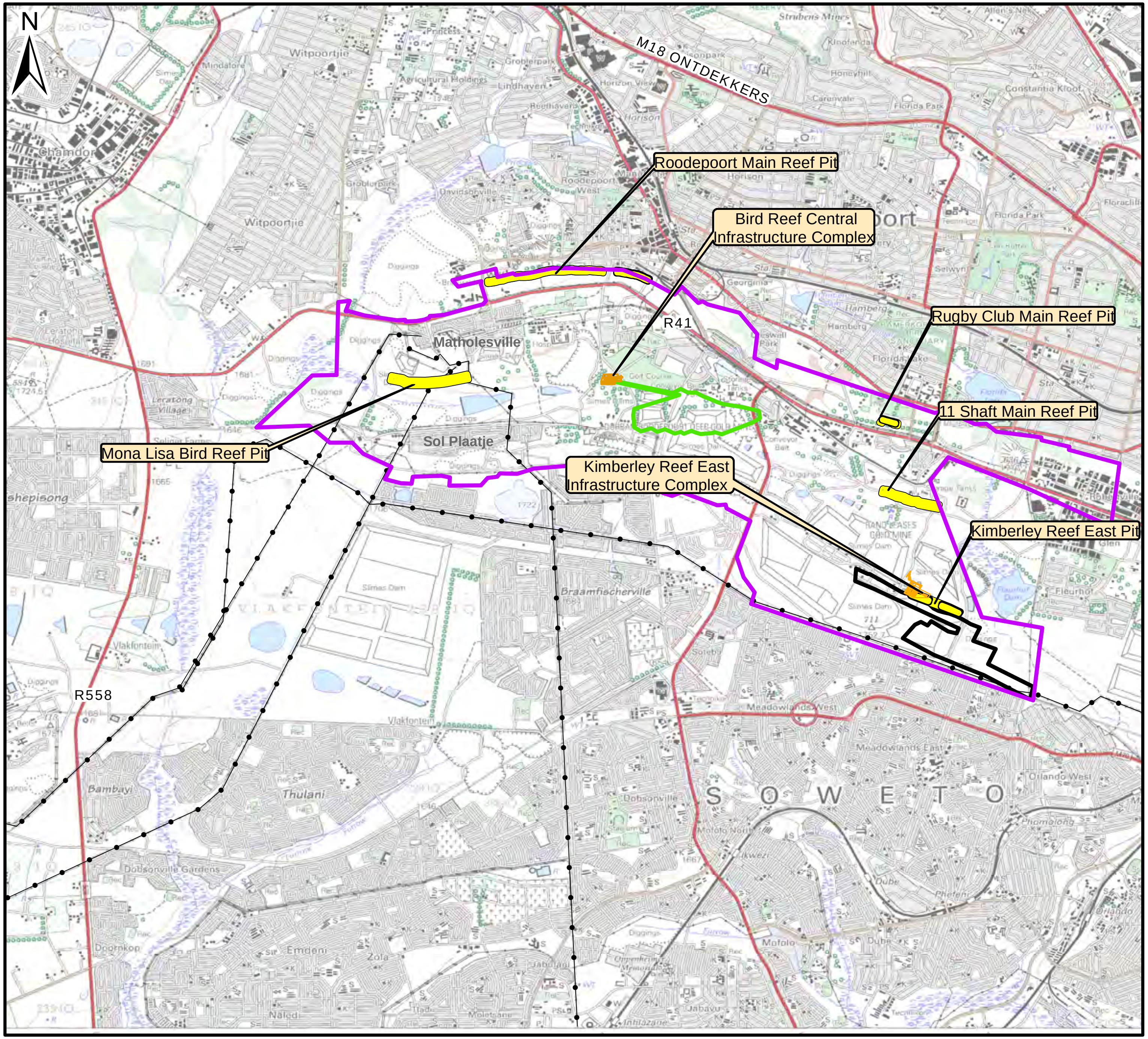
March 2019



Legend

- Main Roads
- Secondary Road
- Powerlines
- Railways

Proposed Infrastructure

- Infrastructure Complexes
- Proposed Opencast Mining Areas
- Bird Reef Central Underground Workings
- Kimberley Reef East Underground Workings
- Proposed Mining Right Application Area

Kilometers

0 0.75 1.5 3

Scale: 1:71 584

Projection:Transverse Mercator

Datum: WGS84

WEST WITS MINING RIGHT

Figure 0-2

Local Setting of West Wits

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EIA ASSESSMENT PROCESS

In accordance with Appendix 3 of GNR 982 the key objectives of this EIA are to:

- Determine the policies and legislation relevant to the activity and document how the proposed activity complies with and responds to the policy and legislative context;
- Describe the need and desirability of the proposed activity in the context of the development footprint on the preferred site as contemplated in the accepted Scoping Report;
- Identify feasible alternatives related to the project proposal;
- Ensure that all potential key environmental issues and impacts that will result from the proposed project are identified;
- Assess potential impacts of the proposed project alternatives during the different phases of project development;
- Identify the most ideal location of the activity within the development footprint of the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- Present appropriate mitigation or optimisation measures to avoid, manage or mitigate potential impacts or enhance potential benefits, respectively; and
- Identify residual risks that need to be managed and monitored.

This EIA process consists of a series of steps to ensure compliance with these objectives, the EIA Regulations 2014 (as amended) and MPRDA. The process involves an open, participatory approach to ensure that all impacts are identified and that decision-making takes place in an informed, transparent and accountable manner.

Specialist information and other relevant information has been be integrated into the EIA and EMPr.

STRUCTURE OF REPORT

This document has been prepared in accordance with the DMR EMPr Report template format, and was informed by the guidelines posted on the official DMR website. This is in accordance with the requirements of the MPRDA. This report also complies with the requirements of the NEMA and Appendix 3 and Appendix 4 of EIA Regulations 2014 (as amended).

Table 0-1 provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

TABLE 0-1: STRUCTURING OF THE EIA AND EMPR

EMPr report requirement as per the DMR template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Part A of DMR report template	**Appendix 3 of the NEMA regulations**	**Section/Appendix**
The EAP who prepared the report	Details of the EAP who prepared the report	Section 1.2
Expertise of the EAP	Details of the expertise of the EAP, including curriculum vitae	Section 1.3 and Appendix A
Description of the property	The location of the activity, including - the 21 digit Surveyor General code of each cadastral land parcel. Where available the physical address and farm name. Where the required information is not available, the	Section 2.1

EMPr report requirement as per the DMR template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
	coordinates of the boundary of the property or properties	
Locality plan	A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken or on land where the property has not been defined, the coordinates within which the activity is to be undertaken	Section 2.2
Description of the scope of the proposed overall activity	A description of the scope of the proposed activity, including all listed and specified activities triggered	Section 3
Description of the activities to be undertaken	A description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for and a description of the associated structure and infrastructure related to the development	Section 3.1 and 3.2
Policy and legislative context	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context	Section 4
Need and desirability of the proposed activity	A motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location	Section 5
Motivation for the preferred development footprint within the approved site including	A motivation of the preferred development footprint within the approved site including	Section 6
A full description of the process followed to reach the proposed development footprint within the approved site	A full description of the process followed to reach the proposed development footprint within the approved site	Section 6
Details of the development footprint alternatives considered	Details of all the alternatives considered	Section 6.1
Details of the public participation process followed	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs	Section 6.2
Summary of issues raised by I&APs	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them	Section 6.3
Environmental attributes associated with the development footprint alternatives	The environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 6.4
Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree of the	The impacts and risks identified, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts can be reversed, may cause irreplaceable	Section 6.5

EMPr report requirement as per the DMR template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
impacts	loss of resources and can be avoided, managed and mitigated	
Methodology used in determining the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks	Section 6.6
The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternative will have on the environment and the community that may be affected	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 6.7
The possible management actions that could be applied and the level of risk	The possible management actions that could be applied and level of residual risk	Section 6.8
Motivation where no alternative sites were considered	If no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such	Section 6.9
Statement motivating the alternative development location within the overall site	A concluding statement indicating the preferred alternatives, including preferred location within the approved site	Section 6.10
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) through the life of the activity	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structure and infrastructure will impose on the preferred location through the life of the activity including a description of all environmental issues and risks that were identified during the environmental impact assessment process and an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of management actions	Section 7
Assessment of each identified potentially significant impact and risk	An assessment of each identified potentially significant impact and risk including cumulative impacts, the nature, significant and consequence of the impact and risk, the extent and duration of the impact and risk, the probability of the impact and risk occurring, the degree to which the impact can be reversed, the degree to which the impact and risk may cause irreplaceable loss of a resources and the degree to which the impact and risk can be mitigated.	Section 8
Summary of specialist reports	Where applicable the summary of the findings and recommendations of any specialist report complying with Appendix 6 of these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report	Section 9
Environmental impact statement	An environmental impact statement which contains a summary of the key findings of the environmental impact assessment, a map at an appropriate scale which	Section 10

EMPr report requirement as per the DMR template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
	superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives	
Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation	Section 11
Final proposed alternatives	The final proposed alternatives which respond to the impact management actions, avoidance, and management actions identified through the assessment	Section 12
Aspects for inclusion as conditions of authorisation	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation	Section 13
Description of any assumptions, uncertainties and gaps in knowledge	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and management actions proposed	Section 14
Reasoned opinion as to whether the proposed activity should or should not be authorised	Reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation	Section 15
Period for which environmental authorisation is required	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised	Section 16
Undertaking	An undertaking under oath or affirmation by the EAP in relation to the correctness of the information provided in the reports, the inclusion of comments and inputs from stakeholders and I&APs, the inclusion of inputs and recommendations from the specialist reports where relevant and any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	Section 17
Financial provision	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Section 18
Deviation from the approved scoping report and plan of study	An indication of any deviation from the approved scoping report, including the plan of study, including any deviation from the methodology used in determining the significance of potential environmental impacts and risks;	Section 19

EMPr report requirement as per the DMR template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
	and a motivation for the deviation	
Other information required by the competent authority	Any specific information required by the competent authority.	Section 20
Other matter required in terms of section 24(4)(a) and (b) of the Act	Any other matter required in terms of section 24(4)(a) and (b) of the Act	Section 21
Part B of DMR report template	**Appendix 4 of the NEMA regulations**	**Section/Appendix**
Details of EAP	Details of the EAP who prepared the EMPr and the expertise of that EAP to prepare the EMPr, including a curriculum vitae	Section 22
Description of the aspects of the activity	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 23
Composite map	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers	Section 24
Description of impact management objectives including management statements	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including planning and design, pre-construction activities, construction activities, rehabilitation of the environment after construction and where applicable post closure; and where relevant, operation activities	Section 25
The determination of closure objectives		Section 25.1
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	-	Section 25.2
Potential acid mine drainage	-	Section 25.3
Steps taken to investigate, assess and evaluate the impact of acid mine drainage	-	Section 25.4
Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage	-	Section 25.5
Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage	-	Section 25.6
Volumes and rate of water use required for the mining	-	Section 25.7
Has a water use licence been applied for?	-	Section 25.8

EMPr report requirement as per the DMR template	EMPr report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Impacts to be mitigated in their respective phases	-	Section 25.9
Impact management outcomes	A description and identification of impact management outcomes required for the aspects contemplated in paragraph	Section 26
Impact management actions	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes be achieved, and must, where applicable, include actions to avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation; comply with any prescribed environmental management standards or practices; comply with any applicable provisions of the Act regarding closure, where applicable comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	Section 27
Financial provision		Section 28
Mechanism for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon	The method of monitoring the implementation of the impact management actions	Section 29
	The frequency of monitoring the implementation of the impact management actions	
	An indication of the persons who will be responsible for the implementation of the impact management actions	
	The time periods within which the impact management actions must be implemented	
	The mechanism for monitoring compliance with the impact management actions	
	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	
Environmental Awareness Plan	An environmental awareness plan describing the manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work; and risks must be dealt with in order to avoid pollution or the degradation of the environment	Section 30
Specific information required by the competent authority	Any specific information that may be required by the competent authority	Section 31
Undertaking	-	Section 32

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1 APPLICANT, EAP AND SPECIALISTS

1.1 APPLICANT DETAILS

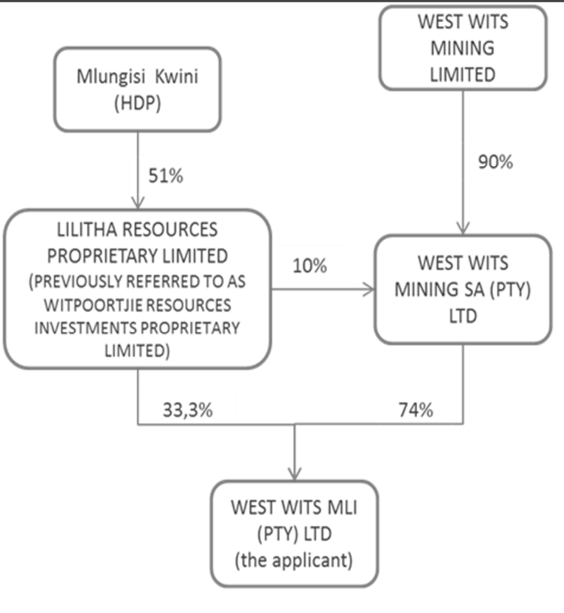
The applicant for the project is West Wits MLI (Proprietary) Limited (West Wits) (see details in Table Table 1-1).

TABLE 1-1: APPLICANT DETAILS

Project applicant	West Wits MLI (Proprietary) Limited
Postal address	Postnet Suite 325 Private Bag X1, Melrose Arch, Johannesburg, 2001
Telephone number	010 020 5034
Contact person	Jac van Heerden

West Wits Mining Limited is an Australian listed exploration and development company. The directors include the Executive Chairman (Michael Quinert) and Non-executive Directors (Hulme Scholes, Daniel Pretorius, Vincent Savage and Dr Andrew Tunks). Through its listing, it is owned by a number of shareholders across the globe.

West Wits a South African subsidiary of the company is 33,3% empowered. The empowerment company is Lilitha Resources Proprietary Limited, previously referred to as Witpoortjie Resources Investments Proprietary Limited.



ORGANOGRAM OF WEST WITS STRUCTURE

1.2 DETAILS OF THE EAP WHO PREPARED THE REPORT

As noted in the Introduction, SLR has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process for the proposed project. The details of the EAP project team are provided in Table 1-2.

SLR has no vested interest in the proposed project other than fair payment for consulting services rendered as part of the EIA process and has declared its independence as required by the EIA Regulations 2014 (as amended). An undertaking by the EAP is provided in Section 17.

TABLE 1-2: DETAILS OF THE SLR PROJECT TEAM

General	
Organisation	SLR Consulting South (Africa) (Pty) Ltd
Postal address	PO Box 1596, Cramerview, 2060
Tel No.	(011) 467 0945
Fax No.	(011) 467 0978

Name	Tasks and roles	Email
Jonathan Crowther (SLR)	Review	jcrowther@slrconsulting.com
Marline Medallie (SLR)	Management of the EIA phase process, including public consultation, process review, specialist study review and report compilation	mmedallie@slrconsulting.com
JC Pretorius and Clive Phashe (SLR)	Project assistant and public consultation	jcpretorius@slrconsulting.com cphashe@slrconsulting.com

1.3 EXPERTISE OF THE EAPS

Jonathan Crowther hold a Master's Degree in Environmental Science (from the University of Cape Town) and has 30 years of experience in a range of environmental disciplines, including EIAs, EMPs, Licensing, Environmental Auditing and Monitoring, Review and Public Consultation. He has expertise in a wide range of projects. He is Registered Pr.Sci.Nat (Environmental Science).

Marline Medallie holds a Master's Degree in Botany (from the University of Johannesburg) and has over 10 years of experience in a range of environmental disciplines, including EIAs, EMPs, Licensing, Environmental Auditing and Monitoring, Review and Public Consultation. She has expertise in a wide range of projects. She is a member of the International Association of Impact Assessment South Africa (IAIAsa).

JC Pretorius holds an Honours Degree in Environmental Management (from the North-West University) and has over 12 years of relevant experience. Clive Phashe holds a Bachelor of Science in Life and Environmental Sciences from the University of Johannesburg and has over two years of relevant experience. JC and Clive are Environmental Project Assistants with SLR and have assisted in a variety of mining projects since joining the company.

Relevant curricula vitae (including proof of registrations) are attached in Appendix A.

1.4 SPECIALIST STUDIES

Specialist studies have been undertaken to inform the EIA process. The specialist studies involved the gathering of data (desktop and site visit, where applicable) relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts have been assessed according to pre-defined rating scales (see Section 6.6). Specialist studies included recommended mitigation measures to minimise potential impacts or optimisation measures to enhance potential benefits as well as monitoring requirements, where required. These have been incorporated into the EMPr. The methodologies applied to each specialist study are included in the specialist reports attached as appendices to this EIA and EMPr.

Specialists who provided input to the EIA process are listed in the table below (Table 1-3).

TABLE 1-3: SPECIALIST STUDIES

Specialist field	Name and Surname	Company	Expertise
Soil and land capability	Stephen van Staden and Braveman Mzila	Scientific Aquatic Services	Freshwater and wetland ecologist and soil scientist
Terrestrial biodiversity	Stephen van Staden, Nelanie Cloete and Hennie de Beer	Scientific Terrestrial Services	Ecologists
Freshwater and aquatic biodiversity	Stephen van Staden, Christel du Preez and Kelly Dyamond	Scientific Aquatic Services	Freshwater and wetland ecologist
Surface water	Kevin Bursey and Chenai Makamure	SLR	Hydrologist
Groundwater	Stephan Meyer	Noa Agencies (Pty) Ltd	Hydrogeologist
Climate change	Karien Erasmus and Robbie Louw	Promethium Carbon	Climate change advisor
Air quality	Nick Grobler	Airshed Planning Professionals	Air quality specialist
Radiation	Dr Dawid de Villiers	SciRAD Consulting	Radiological specialist
Noise	Reneé von Gruenewaldt	Airshed Planning Professionals	Noise specialist
Vibration and blasting	Erik Kohler	Cambrian CC	Vibration and blasting specialist
Visual	Stephen van Staden and Sanja Erwee	Scientific Terrestrial Services	Visual specialist
Traffic	Paul van der Westhuizen	Siyazi Gauteng Consulting Services (Pty) Ltd	Traffic engineer
Heritage	Wouter Fourie, Jennifer Kitto and	PGS Heritage	Heritage specialist and archaeologist
Socio-economic	Werner Neethling Lizinda Dickson	Mercury Financial Consultants	Economist and social scientist
Human health	Nardus Potgieter	EnviroSim Consulting	Human health specialist
Closure costing/ financial provision	Gus Calder Anthony Lamb Robyn Mellett	EPCM Golder Associates Africa (Pty) Ltd	Registered Chartered Surveyor Environmental Strategies

2 PROPERTY DESCRIPTION

2.1 PROPERTY DESCRIPTION

A description of the property on which the project would be located is provided in Table 2-1 below.

TABLE 2-1: PROPERTY INFORMATION

<table>
<tr><th>Aspect</th><th colspan="2">Detail</th></tr>
<tr><td>Farms on which the proposed project is located</td><td colspan="2">Vogelstruisfontein 231 IQ
• Portions 228, 229, 131, 151, 152, 154, 157, 163, 168, 170, 173, 178, 179, 183, 184, 186, 187, 193, 210, 213, 216, 222, 223;
• Portions of Portions 15, 42, 43, 149, 175, 185, 206, 211, 212, 214, 224;
• Remainder of portions 4 and 161; and
• A portion of the remainder of Portions 17 and 18.
Vogelstruisfontein 233 IQ
• Remainder of Portion 36 and 48.
Vlakfontein 238 IQ
• Remainder of Portions 1, 94; and
• Portion of Portion 92.
Farm Roodepoort 236 IQ
• Portion 1; and
• Remainder.
Roodepoort 237 IQ
• Portions 26, 27, 43, 44, 135, 136, 137, 138, 193, 389, 393, 400, 403, 404, 409, 410, 429;
• Remainder of Portions 1, 5, 401, 407;
• Portion of Portions 182, 196, 408; and
• Portion of the Remainder of Portion 14.
Witpoortjie 245 IQ
• A portion of Portion 1.
Uitval 677 IQ
Previously known as:
• Vogelstruisfontein 233 IQ Portion 91; and
• Vlakfontein 238 IQ Portion 47.
Tshekisho 710 IQ
Previously known as:
• Roodepoort 237 IQ Portions 402 and 445; and
• Vlakfontein 238 IQ Portion 95.
Glenlea 228 IQ
• Portion of the farm.</td></tr>
<tr><td>Application area (ha)</td><td colspan="2">A surface disturbance area of approximately (~) 80 ha comprising opencast pit areas of ~ 73 ha and infrastructure complex areas of ~ 6 ha.
Proposed mining right application area: 2 072.2 ha</td></tr>
<tr><td rowspan="3">21 digit surveyor general Code</td><td>Vogelstruisfontein 231 IQ Portion 004</td><td>T0IQ00000000023100004</td></tr>
<tr><td>Vogelstruisfontein 231 IQ Portion 015</td><td>T0IQ00000000023100015</td></tr>
<tr><td>Vogelstruisfontein 231 IQ Portion 017</td><td>T0IQ00000000023100017</td></tr>
</table>

Aspect	Detail	
	Vogelstruisfontein 231 IQ Portion 018	T0IQ00000000023100018
	Vogelstruisfontein 231 IQ Portion 042	T0IQ00000000023100042
	Vogelstruisfontein 231 IQ Portion 043	T0IQ00000000023100043
	Vogelstruisfontein 231 IQ Portion 131	T0IQ00000000023100131
	Vogelstruisfontein 231 IQ Portion 149	T0IQ00000000023100149
	Vogelstruisfontein 231 IQ Portion 151	T0IQ00000000023100151
	Vogelstruisfontein 231 IQ Portion 152	T0IQ00000000023100152
	Vogelstruisfontein 231 IQ Portion 154	T0IQ00000000023100154
	Vogelstruisfontein 231 IQ Portion 157	T0IQ00000000023100157
	Vogelstruisfontein 231 IQ Portion 161	T0IQ00000000023100161
	Vogelstruisfontein 231 IQ Portion 163	T0IQ00000000023100163
	Vogelstruisfontein 231 IQ Portion 168	T0IQ00000000023100168
	Vogelstruisfontein 231 IQ Portion 170	T0IQ00000000023100170
	Vogelstruisfontein 231 IQ Portion 173	T0IQ00000000023100173
	Vogelstruisfontein 231 IQ Portion 175	T0IQ00000000023100175
	Vogelstruisfontein 231 IQ Portion 178	T0IQ00000000023100178
	Vogelstruisfontein 231 IQ Portion 179	T0IQ00000000023100179
	Vogelstruisfontein 231 IQ Portion 183	T0IQ00000000023100183
	Vogelstruisfontein 231 IQ Portion 184	T0IQ00000000023100184
	Vogelstruisfontein 231 IQ Portion 185	T0IQ00000000023100185
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	Vogelstruisfontein 231 IQ Portion 210	T0IQ00000000023100210
	Vogelstruisfontein 231 IQ Portion 211	T0IQ00000000023100211
	Vogelstruisfontein 231 IQ Portion 212	T0IQ00000000023100212
	Vogelstruisfontein 231 IQ Portion 213	T0IQ00000000023100213
	Vogelstruisfontein 231 IQ Portion 214	T0IQ00000000023100214
	Vogelstruisfontein 231 IQ Portion 216	T0IQ00000000023100216
	Vogelstruisfontein 231 IQ Portion 222	T0IQ00000000023100222
	Vogelstruisfontein 231 IQ Portion 223	T0IQ00000000023100223
	Vogelstruisfontein 231 IQ Portion 224	T0IQ00000000023100224
	Vogelstruisfontein 231 IQ Portion 228	T0IQ000000000231002280
	Vogelstruisfontein 231 IQ Portion 229	T0IQ000000000231002290
	Vogelstruisfontein 233 IQ Portion 036	T0IQ00000000023300036
	Vogelstruisfontein 233 IQ Portion 048	T0IQ000000000233000480
	Vogelstruisfontein 233 IQ Portion 091	T0IQ00000000023300091
	Roodepoort 236 IQ Portion 000	T0IQ00000000023600000
	Roodepoort 236 IQ Portion 001	T0IQ00000000023600001
	Roodepoort 237 IQ Portion 001	T0IQ00000000023700001
	Roodepoort 237 IQ Portion 005	T0IQ00000000023700005
	Roodepoort 237 IQ Portion 014	T0IQ00000000023700014
	Roodepoort 237 IQ Portion 026	T0IQ00000000023700026
	Roodepoort 237 IQ Portion 027	T0IQ00000000023700027
	Roodepoort 237 IQ Portion 043	T0IQ00000000023700043
	Roodepoort 237 IQ Portion 044	T0IQ00000000023700044
	Roodepoort 237 IQ Portion 135	T0IQ00000000023700135
	Roodepoort 237 IQ Portion 136	T0IQ00000000023700136
	Roodepoort 237 IQ Portion 137	T0IQ00000000023700137
	Roodepoort 237 IQ Portion 138	T0IQ00000000023700138
	Roodepoort 237 IQ Portion 182	T0IQ00000000023700182
	Roodepoort 237 IQ Portion 193	T0IQ00000000023700193
	Roodepoort 237 IQ Portion 196	T0IQ00000000023700196
	Roodepoort 237 IQ Portion 389	T0IQ00000000023700389

Aspect	Detail	
	Roodepoort 237 IQ Portion 393	T0IQ00000000023700393
	Roodepoort 237 IQ Portion 400	T0IQ00000000023700400
	Roodepoort 237 IQ Portion 401	T0IQ00000000023700401
	Roodepoort 237 IQ Portion 402	T0IQ00000000023700402
	Roodepoort 237 IQ Portion 403	T0IQ00000000023700403
	Roodepoort 237 IQ Portion 404	T0IQ00000000023700404
	Roodepoort 237 IQ Portion 407	T0IQ00000000023700407
	Roodepoort 237 IQ Portion 408	T0IQ00000000023700408
	Roodepoort 237 IQ Portion 409	T0IQ00000000023700409
	Roodepoort 237 IQ Portion 410	T0IQ00000000023700410
	Roodepoort 237 IQ Portion 429	T0IQ00000000023700429
	Roodepoort 237 IQ Portion 445	T0IQ00000000023700445
	Vlakfontein 238 IQ Portion 001	T0IQ00000000023800001
	Vlakfontein 238 IQ Portion 047	T0IQ00000000023800047
	Vlakfontein 238 IQ Portion 092	T0IQ00000000023800092
	Vlakfontein 238 IQ Portion 094	T0I000000000238000941
	Vlakfontein 238 IQ Portion 095	T0IQ00000000023800095
	Witpoortje 245 IQ Portion 001	T0IQ00000000024500001
	Glenlea 228 IQ Portion	T0IQ000000000228000000

2.2 PROJECT LOCALITY

A description of the project locality is provided in Table 2-2 below. The regional and local settings are illustrated on Figure 0-1 and Figure 0-2, respectively.

TABLE 2-2: PROJECT LOCALITY INFORMATION

Aspect	Detail
Centre co-ordinates for the proposed mining right application area	26°10’49.82”S 27°52’20.98”E
Nearest towns	Roodepoort (immediately north) Braamfischerville (immediately south)
Province	Gauteng
Local authority	City of Johannesburg Metropolitan Municipality (COJ) Roodepoort Magisterial District
Water catchment and management area	The project area falls within the Upper Vaal Water Management Area (WMA) within the C22A quaternary catchment. This WMA includes dams important for South Africa’s water supply. These include the Vaal Dam, Grootdraai Dam and Sterkfontein Dam, all located upstream of the proposed project area. The Klip River is the major river within the quaternary catchment.

3 DESCRIPTION OF THE SCOPE OF THE ACTIVITY

As indicated in the introduction, the proposed project would involve the development of five open pit mining areas and refurbishment of two existing infrastructure complexes, including additional infrastructure, to access the existing underground mine workings. Conceptual design layout plans showing the location of the proposed open pit mining areas, infrastructure complexes and underground workings are illustrated in Figure 3-1, Figure 3-2, Figure 3-3, and Figure 3-4. Further detail is provided in Section 3.2 below.

3.1 LISTED AND SPECIFIED ACTIVITIES

The proposed project triggers activities for which various decisions are required. The associated listed or specified activities are summarised below.

3.1.1 NEMA AND THE EIA REGULATIONS 2014

The EIA Regulations, 2014 (as amended by GN No. 326 of 7 April 2017) promulgated in terms of Chapter 5 of NEMA provide for control over certain listed activities. These listed activities are detailed in Listing Notice 1 (as amended by GN No. 327 of 7 April 2017), Listing Notice 2 (as amended by GN No. 325 of 7 April 2017) and Listing Notice 3 (as amended by GN No. 324 of 7 April 2017). The undertaking of activities specified in the Listing Notices is prohibited until Environmental Authorisation has been obtained from the competent authority. Such Environmental Authorisation, which may be granted subject to conditions, will only be considered once there has been compliance with the EIA Regulations. The EIA Regulations 2014 (as amended) are being applied to this project.

The EIA Regulations set out the procedures and documentation that need to be complied with when applying for Environmental Authorisation. Where a development triggers activities listed in Listing Notices 2, a Scoping and EIA process must be applied to the application. As the proposed project would trigger activities specified in Listing Notices 1, 2 and 3 (see Table 3-1 and Table 3-2) a Scoping and EIA process has to be conducted.

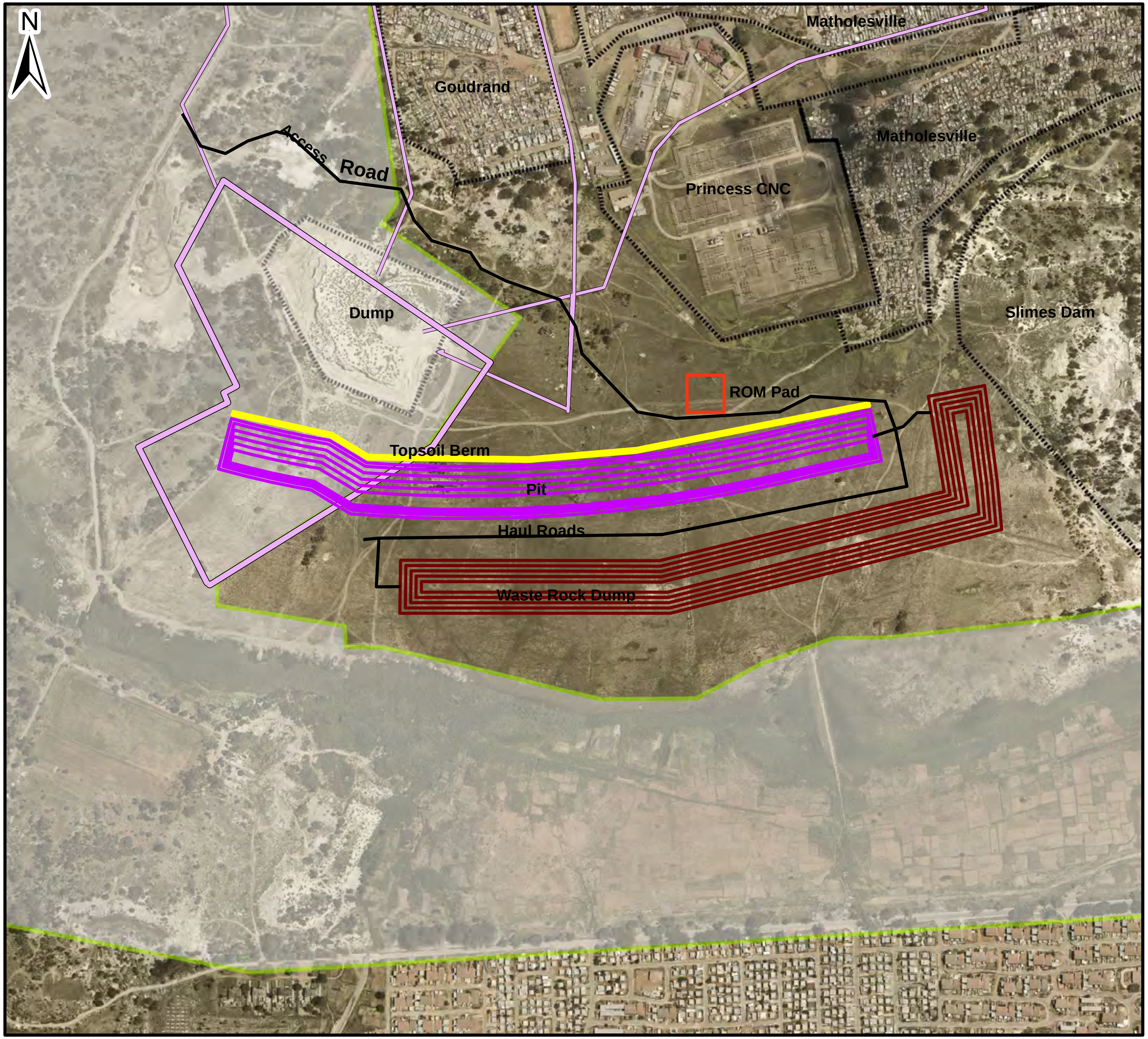
3.1.2 NEM:WA

The NEM:WA regulates all aspects of waste management and has an emphasis on waste avoidance and minimisation. NEM:WA creates a system for listing and licensing waste management activities which may have a detrimental effect on the environment.

Listed waste management activities are included in GN R 921 of November 2013. Category A and B listed waste management activities are subject to a Scoping and EIA process and licensing. The proposed project would trigger Category A and B listed activities (see Table 3-1 and Table 3-2) which require an application for NEM:WA authorisation and therefore a Scoping and EIA process is being conducted.

3.1.3 NWA

The proposed project would require a WUL for water uses in terms of Section 21 of the NWA. Water uses identified have been included in Table 3-1 and Table 3-2.



Legend

- Mona Lisa Bird Reef Pit
- Waste Rock Dump
- Top Soil Berm
- ROM Ore Stock Pile Crusher Area
- Access and Haul Roads
- Earmarked for Solar Plant and Infrastructure Development
- Earmarked for Housing Development

Kilometers

0 0.125 0.25 0.5

Scale: 1:14 584

Projection:Transverse Mercator
Datum: WGS84

WEST WITS MINING RIGHT

Figure 3-1

Conceptual Design Layout of the Proposed Mona Lisa Bird Reef Pit

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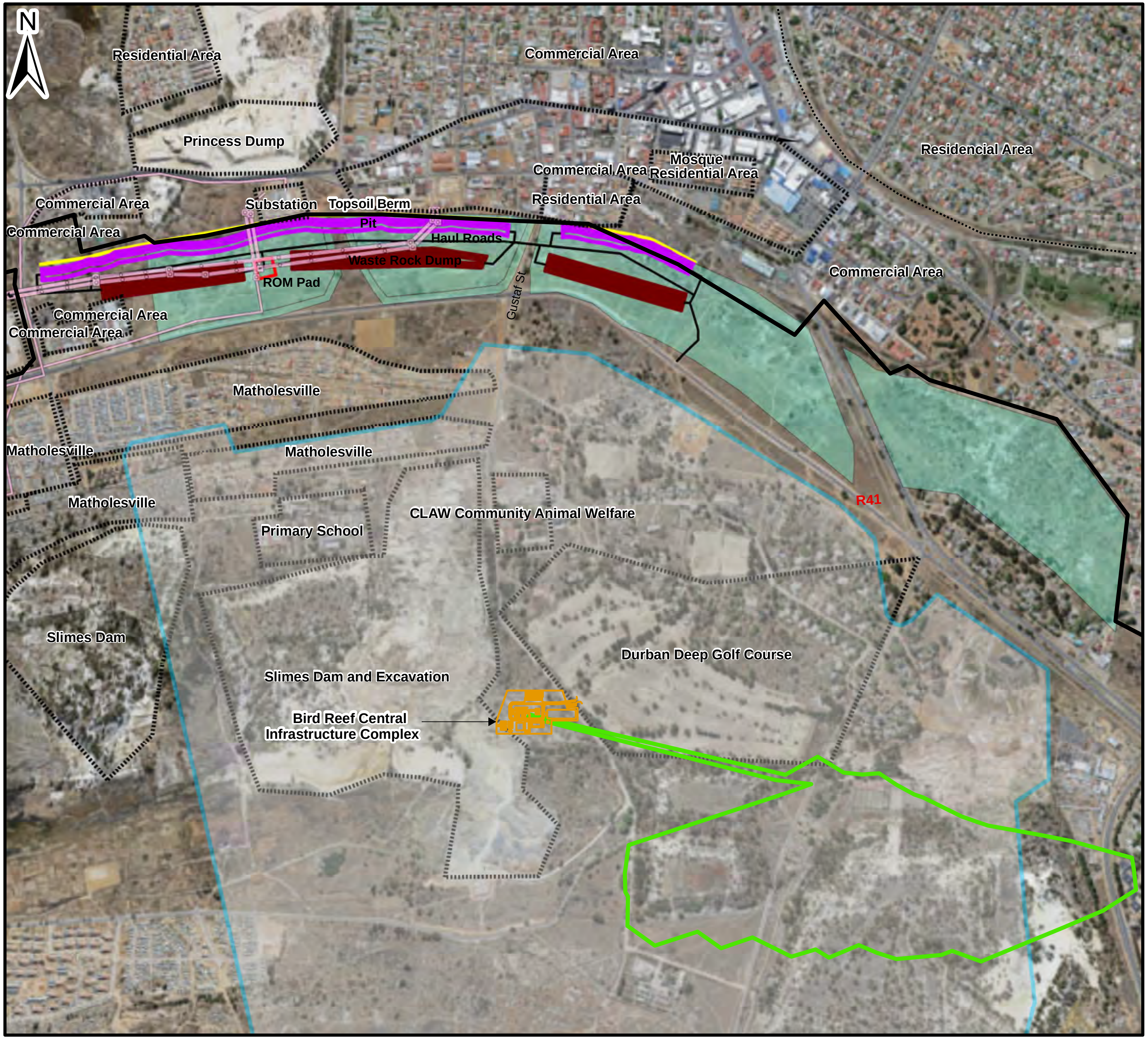
March 2019



Legend

- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Area
- Access and Haul Roads
- Earmarked for Solar Plant Infrastructure Development
- Earmarked for Housing Development
- Earmarked for Housing Development
- Bird Reef Central Underground Workings
- Proposed Mining Right Application Area

Kilometers

0 0.25 0.5 1

Scale: 1:15 584

Projection:Transverse Mercator
Datum: WGS84

WEST WITS MINING RIGHT

Figure 3-2

Conceptual Design Layout of the Proposed Roodepoort Main Reef Pit and Bird Reef Central Infrastructure Complex and Associated Underground Workings

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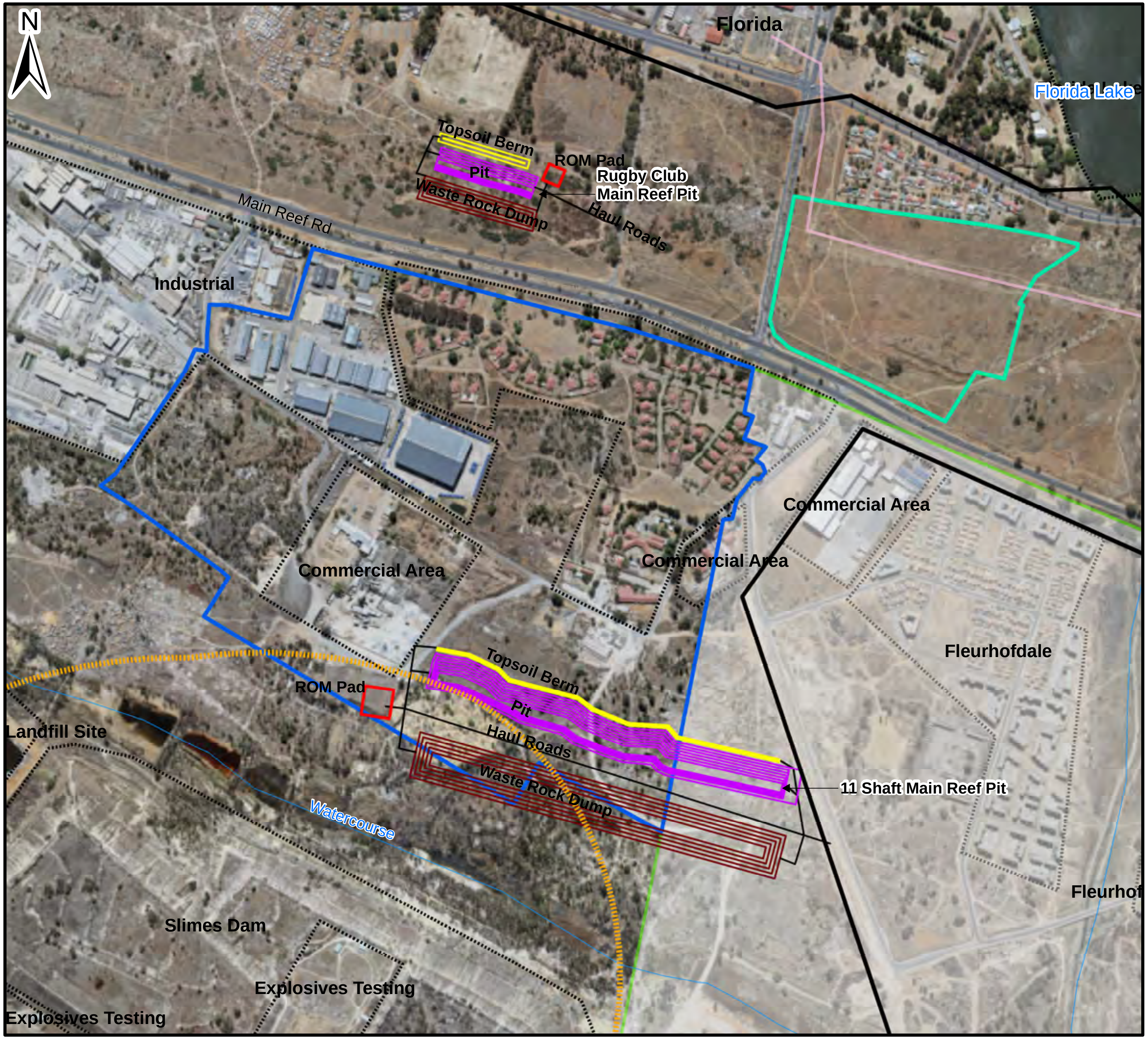

Legend

- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Areas
- Access and Haul Roads
- Earmarked for Solar Plant and Infrastructure Development
- Earmarked for Housing Development
- Earmarked for Housing Development
- Earmarked for Housing and Industrial Development
- MAXAM Dantex Safety Distance
- Proposed Mining Right Application Area
- Watercourse

Kilometers

0 0.25 0.5

Scale: 1:14 584

Projection:Transverse Mercator

Datum: WGS84

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Figure 3-3

Conceptual Design Layout of the Proposed Rugby Club Main Reef Pit and 11 Shaft Main Reef Pit

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Legend

- Ventilation Shafts
- Kimberley Reef East Infrastructure Complex
- Waste Rock Dump
- Pit
- Access Road and Haul Roads
- ROM Ore Stockpile Crusher Area
- Topsoil Berm
- Kimberley Reef East Underground Workings
- Earmarked for Housing Development
- MAXAM Dantex Safety Distance
- Proposed Mining Right Application Area
- Watercourse

Kilometers

0 0.25 0.5

Scale: 1:14 584

Projection:Transverse Mercator
Datum: WGS84

WEST WITS MINING RIGHT

Figure 3-4

Conceptual Design Layout of the Proposed Kimberley Reef East Pit and Kimberley Reef East Infrastructure Complex and Associated Underground Workings

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TABLE 3-1: PROJECT ACTIVITIES AND ASSOCIATED LISTED ACTIVITIES IN TERMS OF THE EIA REGULATIONS 2014

<table>
<tr><th>Description of the project activity</th><th>Approximate aerial extent of the activity (ha)</th><th>Listed activity number, applicable listing notice and activity description</th></tr>
<tr><td colspan="3">Site preparation and construction activities (for underground mining operations only)</td></tr>
<tr><td>Selective clearing of vegetation (in line with a biodiversity management plan to be developed for the project).</td><td rowspan="8">Within infrastructure complexes of ~ 6 ha comprising:
• Bird Reef Central complex of ~ 2.19 ha;
• Kimberley Reef East Shaft of ~ 3.5 ha.</td><td>NEMA GNR 983 (27) or GNR 984 (15) or GNR 985 (12).
NEMA GNR 983 (30).
NEMA GNR 985 (15).</td></tr>
<tr><td>Establishing a construction contractors’ area.</td><td rowspan="3">Not applicable.</td></tr>
<tr><td>Stripping, handling and stockpiling of topsoil (in line with the soil management plan developed for the project).</td></tr>
<tr><td>Cleaning, grubbing and bulldozing activities.</td></tr>
<tr><td>Decommissioning of old mining infrastructure to allow for refurbishing of existing infrastructure complexes</td><td>NEMA GNR 983 (22) and (31).</td></tr>
<tr><td>Establishing storm water controls (in line with a Regulation 704 compliant storm water management plan to be developed for the project).</td><td rowspan="2">NEMA GNR 983 (13) and (48).
NEMA GNR 984 (6), (11) and (16).
NEMA GNR 985 (14) and (16).
NWA 21(b) and 21(g).</td></tr>
<tr><td>Excavations and establishing dam(s).</td></tr>
<tr><td>Bulk earthworks including foundations, trenches, berms.</td><td>Not applicable.</td></tr>
<tr><td>Establishing and using mine access roads mainly from the R41 and existing road networks.</td><td rowspan="2">Within overall application area of ~ 2 072.2 ha.</td><td>NEMA GNR 983 (24) and (56).
NEMA GNR 984 (27).
NEMA GNR 985 (4) and (18).
NEM:WA GNR 921 A (9) or B (9).
NEM:WA A (12) or B (10) and A (14).</td></tr>
<tr><td>Relocation of existing Municipal water supply infrastructure and services</td><td>NEMA GNR 983 (9) and (45)</td></tr>
<tr><td>General building activities, erection of structures and concrete and steel work associated with infrastructure complexes and the related support facilities (including road development and power supply).</td><td>Within infrastructure complexes of ~ 6 ha.</td><td>NEMA GNR 983 (9), (10), (14), (28), (45) and (46).
NEMA GNR 984 (4) and (25).
NEMA GNR 985 (1), (2), (3), (10) and (22).</td></tr>
<tr><td colspan="3">Open pit mining</td></tr>
</table>

Description of the project activity	Approximate aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
Mining comprising: - Establishing storm water controls (in line with a GN704 compliant storm water management plan developed for the project) ahead of mining - Clearing of vegetation (in line with a biodiversity management plan to be developed for the project) ahead of mining - Stripping, handling and stockpiling of topsoil (in line with the soil management plan developed for the project) ahead of mining - Bulldozing of illegally dumped general and hazardous waste material - Relocation of existing Municipal water supply infrastructure and services - Establishing access and internal haul roads ahead of mining - Excavating waste rock - Excavating mineral resource - Stockpiling of run-of-mine (RoM) - Crushing - Loading RoM onto tipper trucks	Within opencast pit areas of ~ 80 ha comprising: • Rugby Club Main Reef of ~ 2.6 ha; • Roodepoort Main Reef of ~ 26.5 ha; • 11 Shaft Main Reef of ~ 15 ha; • Mona Lisa Bird Reef of ~ 20 ha; • Kimberley Reef East of ~ 9.2 ha.	NEMA GNR 983 (27) or GNR 984 (15) or GNR 985 (12). NEMA GNR 983 (9), (19), (24), (28), (30), (45) and (56). NEMA GNR 984 (6), (11), (16), (17), (24) and (27). NEMA GNR 985 (1), (4), (15) and (18). NEM:WA GNR 921 A (9) or B (9); A (12) or B (10); A (14), B (4) and B (10). NWA 21(c) and (i), 21(g) and 21(j).
Underground mining		
Mining comprising: - Dewatering - Excavating waste rock - Excavating mineral resource - Stockpiling/storing of run-of-mine (RoM) - Crushing - Loading RoM onto tipper trucks - Backfilling waste rock material into the underground workings.	Within overall application area of ~ 2 072.2 ha.	NEMA GNR 983 (9), (45) and (46). NEMA GNR 984 6 and 17. NEM:WA GNR 921 A(9) or B(9); A(12) and/or B(10); A(14) and B(7), (10) and (11) NWA 21(j).
Transportation		
Vehicle, machinery and/or material movement within the site boundary.	~ 0.69 ha	Not applicable.
Use of access road and public roads for transporting staff, consumables, general/industrial waste and RoM.	Within overall application area of	

Description of the project activity	Approximate aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
	~ 2 072.2 ha.	
Water supply and management		
Potable water supply from local municipality.	Within overall application area of ~ 2 072.2 ha.	Not applicable.
Process/make-up water supply from local municipality.		
Service water supply using recycled underground dewatering water.		NWA 21(a).
Treatment and storage of dewatering water, brine and related solids.		NEM:WA GNR 921 B (1) and (10).
Clean water storage.		NEMA GNR 983 (12) and (13). NWA 21(b).
Dirty water storage and management.		NEMA GNR 983 12, 13 NWA 21(g).
Storm water management.		NWA 21 (b) and 21 (g).
Dust suppression using recycled dewatering water.		NWA 21(e).
Power supply		
Use of Eskom power via overhead powerline (for underground mining operations only).	-	Not applicable.
Use of emergency diesel generators.	Within overall infrastructure and opencast pit areas of ~ 80 ha.	Not applicable – below threshold of listed activity.
Waste rock management		
Temporary storage/stockpiling of waste rock material (to be used to backfill pits and underground workings).	Within overall infrastructure and opencast pit areas of ~ 80 ha.	NEM:WA GNR 921 B(11) and (10) NWA 21(g).

Description of the project activity	Approximate aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
General and hazardous waste management		
Bulldozing, sorting, handling and disposal of illegally dumped general and hazardous waste found within open pit mining areas	Within overall infrastructure and opencast pit areas of ~ 80 ha.	NEM:WA GNR 921 A (10), (12) and (14) and B (4), (7) and (10).
In-situ treatment or bioremediation of hydrocarbon contaminated soils (where required).	Within overall infrastructure and opencast pit areas of ~ 80 ha.	NEM:WA GNR 921 B (4) and (10).
Use of portable toilets.		Not applicable.
Temporary storage and sorting of general and hazardous waste at a waste/salvage yard for re-use or recycling.	Within infrastructure complexes of ~ 6 ha.	Not applicable.
Management of brine and solids produced by the waste water treatment plant.		NEM:WA GNR 921 Category B (1) and (10).
Removal of waste by contractor for recycling, re-use or final disposal at permitted waste disposal facilities.		Not applicable.
Support facilities		
Bird Reef Central Infrastructure Complex: - Security Office at main gate and drop off zone - Parking area - Laydown area and yard store - Stores, workshops, store yards and offices - Main centralised office complex and communication facilities - Refurbished circular shaft - Ore storage - Change house and walkway - Lamp room - Headgear, winder house, banksman cabin and proto room - Laundry - Medical centre	Within Bird Reef Central infrastructure complex of ~ 2.19 ha	NEMA GNR 983 (9), (10), (14), (22) and (24). NEMA GNR 985 (10).

Description of the project activity	Approximate aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
- Potable water tanks - Sewage collection and pump station - Perimeter fencing and lighting - Access and haul roads		
Kimberley Reef East Infrastructure Complex: - Parking area - Security office at main gate and drop off zone - Change house - Lamp room - Medical centre - Headgear, Winder house, Banksman cabin and proto room - Donkey adit and Pump station - Ore storage - Laydown area and yard store - Stores, Workshop, Store yards - Main office complex - Potable water tanks - Sewage collection and pump station - Access, Internal and Haul roads - Perimeter fencing and lighting	Within Kimberley Reef East infrastructure complex of ~ 3.5 ha.	NEMA GNR 983 (9), (10), (14), (22) and (24). NEMA GNR 985 (10).
Ventilation shafts and fans.	Within overall application area of ~ 2 072.2 ha.	Not applicable.
General site management		
Appointment of contractors.	Not applicable.	Not applicable.
Site management (monitoring, inspections, maintenance, security, access control).		
Environmental awareness training and emergency response.		
Implementing and maintaining management plans.		

Description of the project activity	Approximate aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
Demolition		
Dismantling and demolition of infrastructure and equipment.	Within infrastructure complexes of ~ 6 ha.	NEMA GNR 983 (22) and (31).
Rehabilitation		
Backfilling waste rock material into open pits (as part of rehabilitation)	Within overall infrastructure and opencast pit areas of ~ 80 ha.	NEM:WA GNR 921 Category A(9) or B(9); A(12) and/or B(10); A(14) and B(7), (10) and (11).
Ripping compacted areas and replacing soil resources.		Not applicable.
Slope stabilisation and erosion control.		
Landscaping.		
Alien invasive management.		
Restoration of natural drainage patterns as far as practically possible.		
Re-vegetation of disturbed areas.		NWA 21(e).
Maintenance and aftercare		
Maintenance and aftercare of rehabilitated areas.	Within overall infrastructure and opencast pit areas of ~ 80 ha.	Not applicable.

TABLE 3-2: DESCRIPTION OF THE EIA REGULATIONS NEM:WA LISTED ACTIVITIES AND WATER USES BEING APPLIED FOR AS PART OF THE PROPOSED PROJECT

Activity No.	Listed activity	Applicability of the activity
NEMA Listing Notice 1, 2014 (as amended by GN 327 of 7 April 2017)		
9	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more.	Pipelines would be required for transporting water and storm water within the infrastructure complexes. The internal diameter and/or peak throughput could trigger this activity. Relocation of existing Municipal water supply pipelines within the mining right application area could trigger this activity.
10	The development and related operation of infrastructure exceeding 1 000 metres	Pipelines would be required for transporting sewage or process water. The

Activity No.	Listed activity	Applicability of the activity
	in length for the bulk transportation of sewage, waste water— (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more.	length of the pipeline, internal diameter and/or peak throughput could trigger this activity.
12	The development of – (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs - (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.	Water storage dams will be required for the project. Due to some mining and infrastructure areas being in close proximity to watercourses the final positioning of these could trigger this activity.
13	The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50 000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	The project would require the storage of water in dam(s). The combined capacity of the dam(s) is expected to exceed 50 000 cubic metres.
14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres.	The project would require the storage and handling of diesel and fuel oil with a combined capacity exceeding 80 m^3.
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, pebbles or rock of more than 10 cubic metres from a watercourse	Non-perennial watercourses occur within the area. Watercourse crossings could be required.
22	The decommissioning of any activity requiring- (i) a closure certificate in terms of section 43 of the Mineral and Petroleum Resource Development Act, 2002 (Act No. 28 of 2002); or (ii) a prospecting right, mining right, mining permit, production right or exploration right, where the throughput of the activity has reduced by 90% or more over a period of 5 years excluding where the competent authority has in writing agreed that such reduction in throughput does not constitute closure	Historical mining infrastructure occurs within the project footprints. This infrastructure has not been in use for over 50 years. Some of this infrastructure will need to be demolished to make way for new project-related infrastructure. Decommissioning of infrastructure would be required during the decommissioning phase of the project.
24	The development of a road -	Existing roads will be used as far as possible, however new access and internal

Activity No.	Listed activity	Applicability of the activity
	(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.	haul roads would also be required. The final road network plan and related dimensions could trigger this activity.
25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.	Wastewater treatment facilities would be required for the project.
27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation.	Mining activities may require clearance of indigenous vegetation. The project footprint could trigger this activity.
28	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development: (i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;	Some areas are used for small scale agriculture would form part of the project footprint.
30	Any process or activity identified in terms of section 53(1) of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004).	The removal of protected plants and trees may be required.

Activity No.	Listed activity	Applicability of the activity
31	The decommissioning of existing facilities, structures or infrastructure for— (i) any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iv) any phased activity or activities for development and related operation activity or expansion or related operation activities listed in this Notice or Listing Notice 3 of 2014; or (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i) or (ii) above; and (b) is still in operation or development is still in progress; excluding where— (aa) activity 22 of this notice applies; or (bb) the decommissioning is covered by part 8 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies.	Historical surface infrastructure occurs within the various project footprints. This infrastructure has not been in use for over 50 years. Some of this infrastructure will need to be demolished to make way for new project-related infrastructure.
45	The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure— (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion— (aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or (bb) will occur within an urban area.	Dewatering of the underground workings could trigger this activity. Relocation of existing Municipal water supply pipelines within the mining right application area could trigger this activity.

Activity No.	Listed activity	Applicability of the activity
46	The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure— (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion— (aa) relates to the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve or railway line reserve; or (bb) will occur within an urban area.	Dewatering of the underground workings could trigger this activity.
48	The expansion of— (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion occurs— (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding— (dd) where such expansion occurs within an urban area; or (ee) where such expansion occurs within existing roads, road reserves or railway line reserves.	Water storage dams and infrastructure will be required for the project. The final extent and positioning of these could trigger this activity.

Activity No.	Listed activity	Applicability of the activity
56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre— (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	Existing roads would be used for the project where possible. These may need to be lengthened or widened. The final road network plan and related dimensions could trigger this activity.
NEMA Listing Notice 2, 2014 (as amended by GN 325 of 7 April 2017)		
4	The development and related operation of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.	The project would require the storage and handling of diesel and fuel oil with a combined capacity exceeding 500 m^3.
6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent: excluding - (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act , 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act , 2008 applies; (iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less.	The project would require a water use license.
11	The development of facilities or infrastructure for the transfer of 50 000 cubic metres or more water per day, from and to or between any combination of the following - (i) water catchments; (ii) water treatment works; or (iii) impoundments; excluding treatment works where water is to be treated for drinking purposes.	Water management on site may require the transfer of water between facilities.
15	The clearance of an area of 20 hectares or more of indigenous vegetation.	Mining activities may require clearance of indigenous vegetation. The project footprint could trigger this activity.
16	The development of a dam where the highest part of the dam wall, as measured	Water storage dams will be required for the project. The final dimensions of

Activity No.	Listed activity	Applicability of the activity
	from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high water mark of the dam covers an area of 10 hectares or more.	the dam(s) could trigger this activity.
17	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including— (a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or (b) the primary processing of a mineral resource including crushing.	A mining right is required for the project.
24	The extraction or removal of peat or peat soils, including the disturbance of vegetation or soils in anticipation of the extraction or removal of peat or peat soils, but excluding where such extraction or removal is for the rehabilitation of wetlands in accordance with a maintenance management plan .	Peat soils may occur within the project footprints.
25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of 15 000 cubic metres or more.	Wastewater treatment facilities would be required for the project.
27	The development of a road - (iii) with a reserve wider than 30 metres; or (iv) catering for more than one lane of traffic in both directions; but excluding a road - (b) which is 1 kilometre or shorter; or (c) where the entire road falls within an urban area.	Existing roads will be used as far as possible, however new access and internal haul roads would also be required. The final road network plan and related dimensions could trigger this activity.

Activity No.	Listed activity	Applicability of the activity
NEMA Listing Notice 3, 2014 (as amended by GN 324 of 7 April 2017)		
1	The development of billboards exceeding 18 square metres in size outside urban areas, mining areas or industrial complexes. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vii. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority	Notice boards would be required for the project. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.
2	The development of reservoirs, excluding dams, with a capacity of more than 250 cubic metres. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority	Water reservoirs and dams would be required for the project. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.

Activity No.	Listed activity	Applicability of the activity
3	The development of masts or towers of any material or type used for telecommunication broadcasting or radio transmission purposes where the mast or tower - (a) is to be placed on a site not previously used for this purpose; and (b) will exceed 15 metres in height but excluding attachments to existing buildings and masts on rooftops. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority	Communication structures would be required for the project. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.
4	The development of a road wider than 4 metres with a reserve less than 13,5 metres. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas	Existing roads will be used as far as possible, however new access and internal haul roads would also be required. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.

Activity No.	Listed activity	Applicability of the activity
10	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic metres. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas	The storage and handling of dangerous goods would be required for the project. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.
12	The clearance of an area of 300 square metres or more of indigenous vegetation. In the: c. Gauteng i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004; ii. Within Critical Biodiversity Areas or Ecological Support Areas identified in the Gauteng Conservation Plan or bioregional plans; or	Mining activities may require clearance of indigenous vegetation. These could fall within or be located in close proximity to CBAs, ESAs and critically endangered ecosystems.

Activity No.	Listed activity	Applicability of the activity
14	The development of - (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs - (a) within a watercourse ; (c) if no development setback has been adopted, within 32 metres of a watercourse , measured from the edge of a watercourse ; c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority	Water storage dams and infrastructure will be required for the project. Due to some mining and infrastructure areas being in close proximity to watercourses and areas zoned as sensitive to development activities in the Gauteng EMF the final positioning of these could trigger this activity.
15	The transformation of land bigger than 1 000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010. b. Gauteng i. All areas.	The project footprint will exceed 1 000 m^2. This activity may be triggered by the project development.

Activity No.	Listed activity	Applicability of the activity
16	The expansion of reservoirs, excluding dams, where the capacity will be increased by more than 250 cubic metres. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority.	Existing reservoirs may be used and would require expansion.
18	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas.	Existing roads will be used as far as possible, however widening or lengthen of roads may be required. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.

Activity No.	Listed activity	Applicability of the activity
22	The expansion and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage facilities or infrastructure will be expanded by 30 cubic metres or more but no more than 80 cubic metres. c. Gauteng iv. Sites identified as Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act : Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by the relevant environmental authority; vii. Sites identified as high potential agricultural land in terms of Gauteng Agricultural Potential Atlas.	The storage and handling of dangerous goods would be required for the project. These could fall within or be located in close proximity to CBAs, ESAs, threatened ecosystems or areas zoned as sensitive to development activities in the Gauteng EMF. This will be confirmed in the final positioning and extent of activities.
NEM:WA Listed Activities (GNR 921)		
Category A (9)	The disposal of inert waste to land in excess of 25 tons but not exceeding 25 000 tons, excluding the disposal of such waste for the purpose of levelling and building which has been authorised by or under other legislation.	Inert rock material and construction rubble will be used on site for fill and levelling of roads in and around the mine (suitable roadbed material). The material would remain if it supported the post-closure land use, would be stored until final disposal in the open pits or underground mine voids or stored until it is reused.
Category A (10)	The disposal of general waste to land covering an area of more than 50 m^2 but less than 200 m^2 and with a total capacity not exceeding 25 000 tons.	Illegally dumped general waste exists within the project footprint. The final management of this waste is yet to be determined. This activity may be triggered.
Category A (12)	The construction of a facility for a waste management activity listed in Category A of this Schedule (not in isolation to associated waste management activity).	Included due to activities above and below.
Category A (13)	The expansion of a waste management activity listed in Category A or 8 of this schedule which does not trigger an additional waste management activity in terms of this Schedule.	To cater for removal of existing waste on site.
Category A (14)	The decommissioning of a facility for a waste management activity listed in Category A or 8 of this schedule.	To cater for removal of existing waste on site.
Category B	The storage of hazardous waste in lagoons excluding storage of effluent,	A wastewater treatment plant would be required for the project to treat

Activity No.	Listed activity	Applicability of the activity
(1)	wastewater or sewage.	dewatering water from the underground mine. Brine and gypsum would need to be stored (depending on treatment technology) until it can be removed by a waste contractor for disposal at a licensed facility.
Category B (4)	The treatment of hazardous waste in excess of 1 ton per day calculated as a monthly average; using any form of treatment excluding the treatment of effluent, wastewater or sewage.	Treatment of hazardous waste may be required and may trigger this threshold. The establishment of a bioremediation facility would trigger this activity.
Category B (7)	The disposal of any quantity of hazardous waste to land.	Illegally dumped hazardous waste exists within the project footprint. The final management of this waste is yet to be determined. This activity may be triggered. Waste rock will be used to backfill the open pits and underground workings as part of rehabilitation.
Category B (9)	The disposal of inert waste to land in excess of 25 000 tons, excluding the disposal of such waste for the purposes of levelling and building which has been authorised by or under other legislation.	Inert rock material and construction rubble will be used on site for fill and levelling of roads in and around the mine (suitable roadbed material). The material would remain if it supported the post-closure land use, would be stored until final disposal in the open pits or underground mine voids or stored until it is reused.
Category B (10)	The construction of a facility for a waste management activity listed in Category B of this Schedule (not in isolation to associated waste management activity).	Included due to activities above and below.
Category B (11)	The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	The project will require the establishment of waste rock dumps and re-use of waste rock to backfill open pits and underground mining voids.

3.2 DESCRIPTION OF THE ACTIVITIES

3.2.1 PROJECT OVERVIEW

An overview of the project activities is included in Table 3-1 and Table 3-2 above. Further detail, where required, is provided in the sections below.

3.2.2 PROJECT TIMELINE

3.2.2.1 Development and life of mine timeline

The timing associated with the implementation of the proposed project is outlined below.

Activity		Timeline							
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 -25	year 26	Year 27 - 28
Opencast mining and concurrent rehabilitation									
Rugby Club Main Reef Pit	Mining								
	Rehabilitation								
Roodepoort Main Reef Pit	Mining								
	Rehabilitation								
11 Shaft Main Reef Pit	Mining								
	Rehabilitation								
Mona Lisa Bird Reef Pit	Mining								
	Rehabilitation								
Kimberley Reef East Pit	Mining								
	Rehabilitation								
Continued opencast rehabilitation and construction of infrastructure complexes									
Underground mining operations									
Steady state production achieved									
Decommissioning and closure									
Aftercare and maintenance									

Note: Shaded blocks indicate in which quarter the related activity would commence or end. The shading is not representative of the duration of the related activity.

3.2.2.2 Operating hours

The operational phase for the opencast mining activities would comprise a 5.5-day working week with a one shift system per day between 06:00 to 18:00 Monday to Friday and between 06:00 to 14:00 on Saturday.

The construction of surface infrastructure for the underground operations would be a 5.5-day working week with one shift per day from 07:00 to 17:00 Monday to Friday and from 07:00 to 14:00 on Saturdays.

The operational phase for the underground mining activities would comprise a 7-day week with three 8-hour shifts per day.

3.2.3 Construction (required only when the underground mining operations commence)

Construction contractor's site camp areas would be established at the start of the construction phase for the underground mining. The facilities could include one or more of the following:

- workshops, stores, washbay and lay-down areas
- handling and storage area for construction materials (paints, solvents, oils, grease) and wastes
- fuel handling and storage area
- mobile site offices
- portable change houses and ablution facilities
- generators for temporary power supply
- water storage and management infrastructure
- main access road and internal roads
- parking area
- security and access control.

These facilities would either be removed at the end of the construction phase or incorporated into the layout of the infrastructure complexes.

3.2.4 Mining methods

The proposed project would include:

- five open pit mining areas and associated topsoil stockpiles, run-of-mine ore stockpiles and crusher areas, waste rock dumps and haul roads; and
- an underground mine comprised of two surface infrastructure complexes, underground mine workings and access roads.

Initially, near surface resources will be targeted for mining through means of open pit methods. The resources at the open pit targets are generally outcropping and production would commence at the onset of mining activities. No construction activities, as such, are associated with the open pit sites.

When the resources at the open pit targets near depletion the underground mining operations would commence. The activities required to enable extraction of the resources include re-establishment of existing incline, circular and vertical shafts and related infrastructure as well as rehabilitation of the existing workings.

Specific details regarding the proposed opencast and underground mining operations with specific reference to their location, schedule, duration of operation and rehabilitation is provided in Table 3-3 below and illustrated conceptually in Figure 3-1, Figure 3-2, Figure 3-3 and Figure 3-4. The conceptual process flow diagram provides an overview of each potential component of the operation and highlights inputs to and outputs from each component (Figure 3-7).

TABLE 3-3: DATA ON THE PROPOSED MINING OPERATIONS

Features	Details
Target commodities	Gold, uranium and silver
Mineable resource	~ 9 000 000 tonnes

Opencast mining

Open pits			**Rugby Club**	**Roodepoort**	**11 Shaft**	**Mona Lisa**	**Kimberley East**
Location			See Figure 3-3	See Figure 3-2	See Figure 3-3	See Figure 3-1	See Figure 3-4
Coordinates	A	Longitude	27° 53' 38.62"E	27° 50' 57.47"E	27° 53' 38.32"E	27° 50' 17.66"E	27° 53' 50.18"E
		Latitude	26° 10' 52.28"S	26° 9' 54.74"S	26° 11' 21.58"S	26° 10' 35.60"S	26° 12' 2.05"S
	B	Longitude	27° 53' 44.62"E	27° 50' 57.60"E	27° 54' 1.52"E	27° 50' 49.79"E	27° 53' 49.87"E
		Latitude	26° 10' 53.89"S	26° 9' 55.88"S	26° 11' 28.05"S	26° 10' 35.04"S	26° 12' 3.15"S
	C	Longitude	27° 53' 39.04"E	27° 52' 3.02"E	27° 54' 1.90"E	27° 50' 49.23"E	27° 54' 9.92"E
		Latitude	26° 10' 52.70"S	26° 9' 55.00"S	26° 11' 26.12"S	26° 10' 32.82"S	26° 12' 10.78"S
	D	Longitude	27° 53' 39.04"E	27° 52' 3.62"E	27° 53' 38.93"E	27° 50' 18.28"E	27° 54' 10.58"E
		Latitude	26° 10' 51.05"S	26° 9' 53.88"S	26° 11' 19.64"S	26° 10' 33.40"S	26° 12' 9.91"S
Mining sequence			1	2	3	4	5
Mining direction			East to West	West to East	East to West	West to East	West to East
Size of mining area			~ 2.6 ha	~ 26.5 ha	~ 15 ha	~ 20 ha	~ 9.2 ha
Mining rate (per month)			15 000 tonnes	15 000 tonnes	15 000 tonnes	15 000 tonnes	15 000 tonnes
Pit depth			7 to 10 m	7 to 10 m	20 to 30 m	20 to 30 m	20 to 30 m
Mineable resource (tonnes)			30 212	179 290	117 631	34 351	62 917
Mining duration (including concurrent rehabilitation, season dependent)			~ 6 months	~ 6 months	~ 6 months	~ 3 months	~ 5 months
Final rehabilitation duration			~ 3 months	~ 2 months	~ 2 months	~ 2 months	~ 2 months
Temporary waste rock dump volume			260 288 m^3	1 103 323 m^3	1 013 436 m^3	295 947 m^3	503 336 m^3
Temporary waste rock dump height			10 m	10 m	20 to 30 m	20 to 30 m	20 to 30 m

Underground mining

Infrastructure complexes			**Kimberley Reef East**	**Bird Reef Central**
Location			See Figure 3-2	See Figure 3-4
Coordinates	A	Longitude	27° 51' 44.97"E	27° 53' 47.58"E
		Latitude	26° 10' 32.99"S	26° 12' 2.20"S
	B	Longitude	27° 51' 43.91"E	27° 53' 57.31"E
		Latitude	26° 10' 36.95"S	26° 12' 4.07"S

Features			Details	
	C	Longitude	27° 51' 49.45"E	27° 53' 54.84"E
		Latitude	26° 10' 36.91"S	26° 11' 59.19"S
	D	Longitude	27° 51' 50.56"E	27° 53' 50.52"E
		Latitude	26° 10' 32.99"S	26° 11' 56.98"S
Mining sequence			1	2
Infrastructure complex size			~ 3.5 ha	~ 2.19 ha
Size of mining area			~ 100 ha	~ 52 ha
Mining rate (per month)			15 000 tonnes	15 000 tonnes
Workings depth			50 m to interception of reef (up 3 km below surface)	50 m to interception of reef (up 3 km below surface)
Mining duration			20 years	10 years
Waste rock			All waste rock will remain in the underground workings.	All waste rock will remain in the underground workings.

Opencast mining

Opencast mining activities would include a conventional excavate, load and haul mining cycle. The five proposed opencast mining areas would be developed in a phased approach, although there would be some overlap as mining of one open cast area nears completion and the start-up of the next area commences. . It is anticipated that up to 180 000 tonnes of ore would be mined per annum from the opencast resources.

TABLE 3-4: OPEN CAST MINING METHOD DESCRIPTION

Activity	Description
Topsoil stripping	Topsoil will be stripped and stockpiled separately in accordance with the soil management plan.
Excavation	Once the topsoil is cleared, waste rock material will be removed through the excavation of a box cut (roughly one third of the strike length). An Xcentric ripper would be used to break the ground. This equipment replaces the need to conduct blasting. This is both for safety reasons and to minimise impacts on the surrounding environment. During excavation of the waste rock material, a ramp will be constructed to access the waste rock material and ore further down.
Removal of waste rock	The removal of the waste rock above the ore body will be done by means of loading and hauling with large equipment, and stockpiled on waste rock dumps. Once the box cut has reached its final depth, another cut next to the box cut will be excavated, and the waste rock material tipped back in the previous box cut thus ensuring that the rehabilitation is done concurrently to the mining. In the event where multiple ore reefs can be mined, the middling between the reefs will be removed and transported for storage. Once the open pit has been mined, the remaining pit volume (plus the swell factor) will be backfilled into the pits.
Removal of ore	Ore would then be excavated and hauled to an ore stockpile for crushing before transportation off-site.
Rehabilitation and partial backfilling of	Rehabilitation will be concurrent with mining. Waste rock will be used to backfill the open pits. Topsoil will be replaced on the waste rock to enable vegetation to re-establish.

Activity	Description
pits	Following final rehabilitation and adequate stabilisation, each of the areas would be made available in line with post-closure land use objectives. No waste rock dumps would remain.

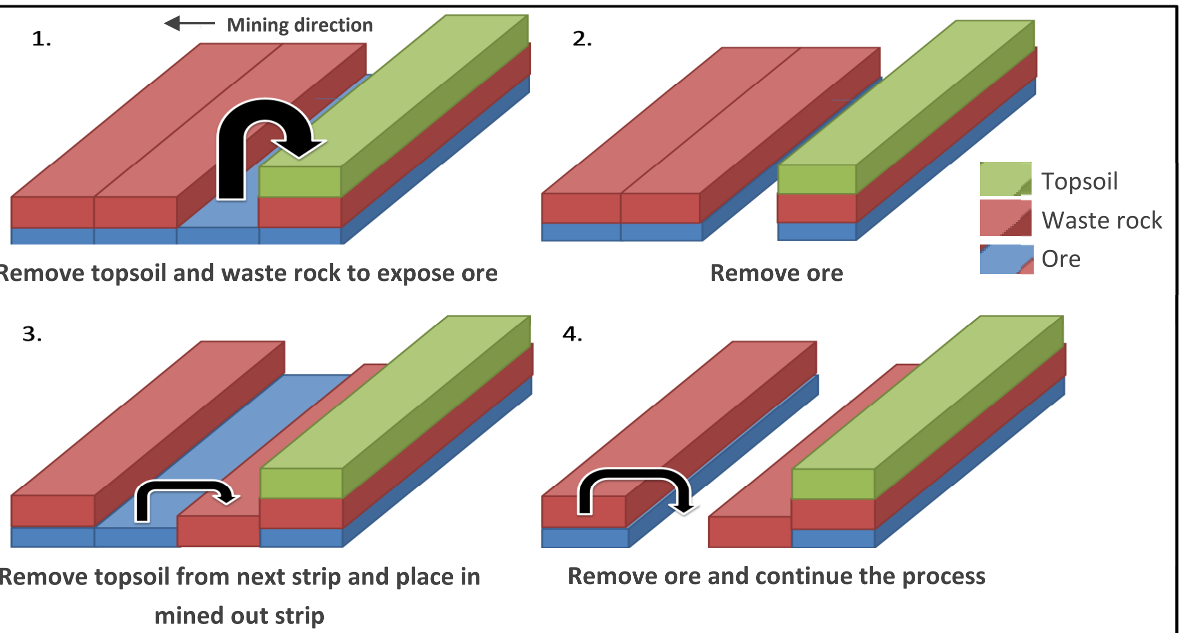

FIGURE 3-5: SCHEMATIC OF CONCURRENT REHABILITATION IN THE OPEN PITS

 Example of an open pit (20 to 30 m deep)	 General view of open pit area
 Xcentric rippers breaking rock	 Loading of material onto trucks

PHOTO PLATE 3-1: EXAMPLE OF THE OPENCAST MINING OPERATIONS

Underground mining

The underground mining method would be conventional drill and blast breast mining methods. Access to the underground mine workings would be through the refurbishment of two existing infrastructure complexes. It is anticipated that up to 360 000 tonnes of ore would be mined per annum from the underground resources.

A summary of the activities associated with the mining operations is provided in Table 3-5 below. Refer to Figure 3-8 and Figure 3-9 for the infrastructure complex layouts.

TABLE 3-5: SUMMARY OF UNDERGROUND MINING ACTIVITIES

Activity	Description
Topsoil stripping	During the establishment of surface related infrastructure, topsoil will be stripped and stockpiled separately in accordance with the soil management plan.
Access to underground workings	Access infrastructure would be via incline shafts, equipped with a winder house, providing means for movement of men, material and rock to and from the underground workings. Ore drives would be developed on reef with raises developed from the drives. Loading boxes would be constructed and winches would be installed on the down-dip side of the raise to remove the broken rock from the stopes. Ore would be transported to the incline shafts by means of conventional track bound equipment. Access infrastructure is divided into two categories, namely primary vertical access and secondary horizontal access. Primary vertical access will be via the main shaft complex. Secondary horizontal access mainly comprises spines. All the air required for the mining sections must be supplied through the spines. In addition to this all men, material and rock will be transported through the spines. In order to create these spines, several barrels will have to be developed that will be connected with laterals. It is envisaged that the workshops, refuelling bays, tyre change bays, pump stations and lateral conveyors will all be positioned in the laterals. Closer to the shaft a material transfer bay will be required for every spine. In this chamber, track-bound cars filled with material will be loaded onto trackless material underground vehicles for transport down the declines. Around the shaft, lateral development will be used for the parking of trackless equipment and temporary storage of equipment.
Drill and blast breast	Stoping is the process of extracting the desired ore from an underground mine, leaving behind an open space known as a stope. Stoping is conducted by using explosives, power tools or machines and the method is used when the rock is sufficiently strong not to cave into the stope, although in most cases artificial support is also provided. As mining progresses the stope is then backfilled with shale (stage 1) which will be throw-blasted into worked-out areas where it is then naturally compacted or consolidated due to the blasting event and left as uncemented backfill. Thereafter, the basal reef will be mined as stage 2.
Rock flow	Load Haul Dumpers (LHDs) on the reef horizon will remove ore and waste from the face and dump it in dedicated muck bays. A separate LHD will load the material from the muck bay onto trucks. These trucks, in turn, transfer ore and waste in separate loads onto a transfer/decline feeder conveyor belt which, in turn, will feed onto the main decline conveyor belt that will transport the ore and waste to the two separate shaft silos. The decline conveyor will transport only one product at a time which will be determined by the hoisting schedule and rock silo levels.

Activity	Description
Rock hoisting	At the shaft silos, skips will be loaded on the loading level via a loading flask, vibrating feeder and chute arrangement. The loading flask arrangements will measure the exact tonnage before depositing it into the skips. Once loaded, skips carrying either waste rock or ore will be hoisted to surface by means of the rock hoisting shaft.
ROM ore	Ore would be stored for initial crushing before transportation off-site.
Waste rock transport	All waste rock created during the development and mining process underground, will remain underground.
Ventilation	The primary ventilation requirement is 60 m^3/s measured at surface density for the 15 kilo tons per month (ktpm). The overall ventilation quantity is dictated by the need to remove heat (distribute cooling), dilute blasting fumes (during re-entry period) and for dilution of diesel emissions. In addition to the air required for production, it will also be necessary to provide air for the infrastructural services (workshops, refuelling bays and pump chambers etc).
Men flow	Mining and engineering personnel working underground will access the underground mine working through the man cage at the main shaft. Crews will be grouped per mining section and per cage capacity. Personnel carriers will be parked in the designated laterals of the shaft for the duration of the shift and will only be utilised again when the shift is over and the crew is transported back to the shaft.
Material flow	Material transfer will typically take place once all crews have been transported underground and the working shift has commenced. On surface, material will be packaged into cartridges and placed on rail-bound cars. Cars will be pushed into the cages and transported to the respective levels. When material cars reach the pre-determined levels they will again be rolled out and pushed to a designated material transfer facility. Empty cartridges will be transferred back onto the rail cars and the empty cars can be rolled back to the cage for transport to surface.
Dewatering	Dewatering activities might be required to allow for safe mining operations. Mining will occur above the water table as far as practically possible. Where dirty water is collected in the underground workings it will be pumped into historical underground workings/voids. A water pillar will remain between the project and the historical underground workings to prevent continuous dirty water from flowing.

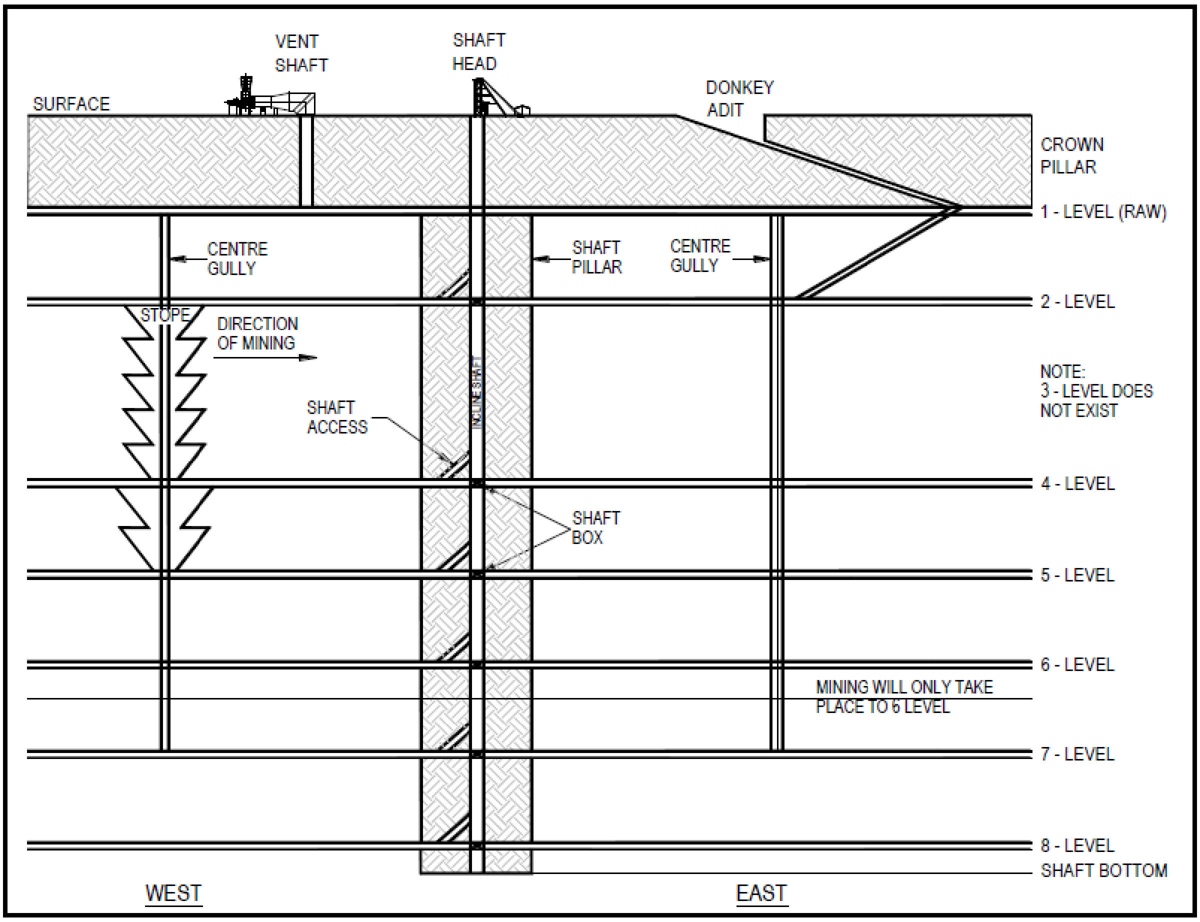

FIGURE 3-6: SCHEMATIC OF UNDERGROUND MINING METHOD

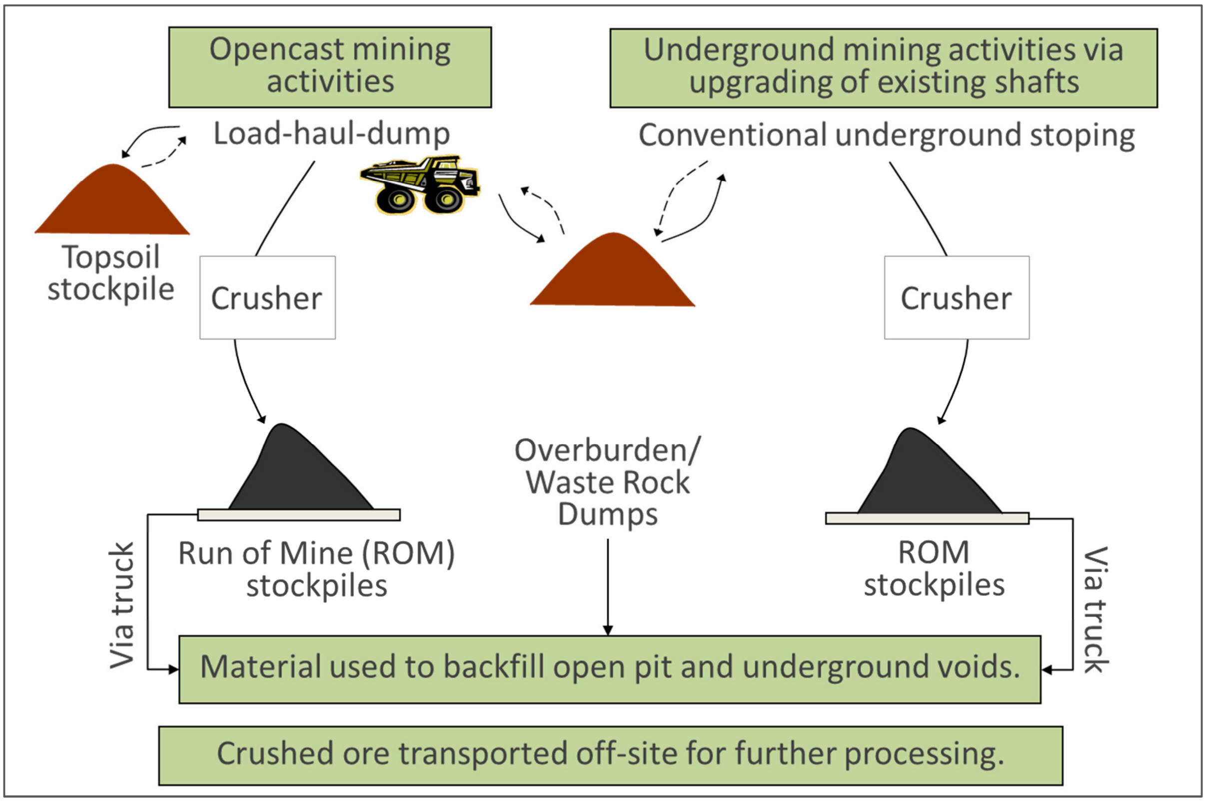

FIGURE 3-7: CONCEPTUAL PROCESS FLOW DIAGRAM OF THE MINING OPERATIONS

KEY:
1 Drop Off Zone
2 Security Office At Main Gate
3 Parking Area
4 Main Office Complex
5 Change House and Walkway
6 Main Store
7 Lamp Room
8 Head Gear
9 Winder House
10 Medical Centre
11 Stockpile
12 Laydown Area and Yard Store
13 Banksman Cabin and Proto Room
14 Potable Water Tank
15 Explosives Off-Loading
16 Sewage Collection and Pump Station
17 Laundry
18 Perimeter Fence
19 Store Yard
20 Internal Access Roads
21 Refurbished Circular Shaft
22 Ore Storage
23 Waste Yard
24 Bioremediation

Meters
0 25 50

Scale: 1:10 000 @ A4

Projection:Transverse Mercator
Datum: WGS84

West Wits

Figure 3-8

Layout Of The Proposed Bird Reef Central Infrastructure Complex

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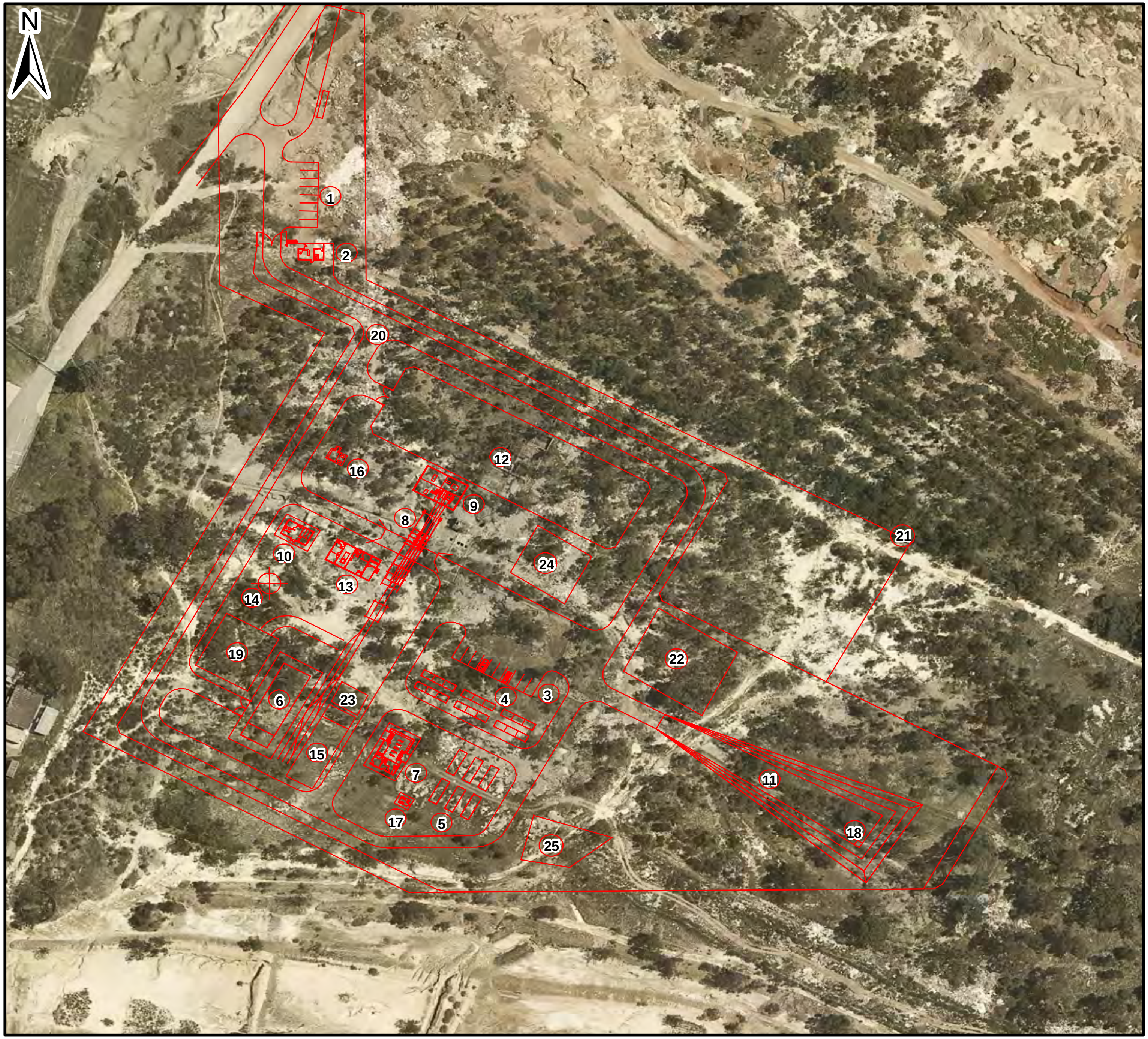

Legend

ID	Infrastructure
1	Dropoff Zone
2	Security Office at Main Gate
3	Parking Area
4	Main Office Complex
5	Change House
6	Main Store
7	Lamp Room
8	Head Gear
9	Winder House
10	Medical Centre
11	Donkey Audit
12	Laydown Area
13	Banksman Cabin and Proto Room
14	Potable Water Tank
15	Main Workshop
16	Sewage Collection and Pump Station
17	Laundry
18	Adit Pump Station
19	Store Yard
20	Access, Internal and Haul Roads
21	Perimeter Fencing and Lighting
22	Ore Storage
23	Bioremediation
24	Waste Yard
25	Explosives Off -Loading

Meters

0 20 40 80

Scale: 1:71 584

Projection:Transverse Mercator
Datum: WGS84

WEST WITS MINING RIGHT

Figure 3-9

Layout of the Proposed Kimberley Reef East Infrastructure Complex

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3.2.5 MINERAL PROCESSING METHOD

Primary mineral processing will take place on site, where ore will be crushed prior to transportation off-site. All run-of mine material will be transported to an existing off-site processing plant for concentrating of minerals. The mineral processing method is described in Table 3-6 below.

TABLE 3-6: MINERAL PRIMARY PROCESSING METHOD

Activity	Description
Mobile crushing and screening	Ore from the ROM stockpile will be transported via front end loaders/ articulated trucks to the primary crushing area (consisting of a primary feed bin, vibrating grizzly, jaw crusher and stockpile area) in order to reduce the ROM material to a size required by the downstream processes.
Transportation of ROM	Saleable ROM material will be transported by front end loaders/ articulated trucks for removal off-site via truck for sale to third parties.
Dust suppression	Dust suppression will be utilised at all material handling transfer points.

3.2.6 ACCESS AND TRANSPORT

Access to the mining areas

Existing surfaced and gravel roads will be used for the project as far as possible (Siyazi, 2019):

- The Rugby Main Reef Pit will be accessed using the R41 at two streets leading into Hamberg Road (Points I and J in Figure 3-10).
- The Roodepoort Main Reef Pit will be accessed using the R41 and Gustaf Street (Point G in Figure 3-10) and Irridium Street (Point F in Figure 3-10), however a new intersection will be required in Gustaf Road;
- The Kimberley Reef East (opencast and underground) and 11 Shaft Main Reef Pit will be accessed using the R41 and Mine Road (Point K in Figure 3-10);
- The Mona Lisa Bird Pit will be accessed via an internal haul road to the east from where access will be gained to and from the R41 via Gustav Street (at Point G in Figure 3-10).and
- Bird Reef Shaft (Underground) will be accessed using the R41 and Gustaf Street (Point G in Figure 3-10).

All roads and intersections to be used to gain access to and from these sites are existing roads and intersections, and it was therefore assumed that intersection spacing and sight distances are acceptable.

Further investigation and collaboration with the relevant roads authority is required to finalise the access routes during the detailed design phase for the project.

Transportation of workers and supplies to site

During the construction and operation of the proposed project workers would travel to and from site, vehicles would supply input materials and machinery, and vehicles would move waste material. Machinery that will be transported to the project site for the open pit mining would include: two excavators, four ADT's, one water truck, one D6 Dozer and one Grader.

Ore will be transported from site via the R41 and R558 to an existing processing plant in the Gauteng region.

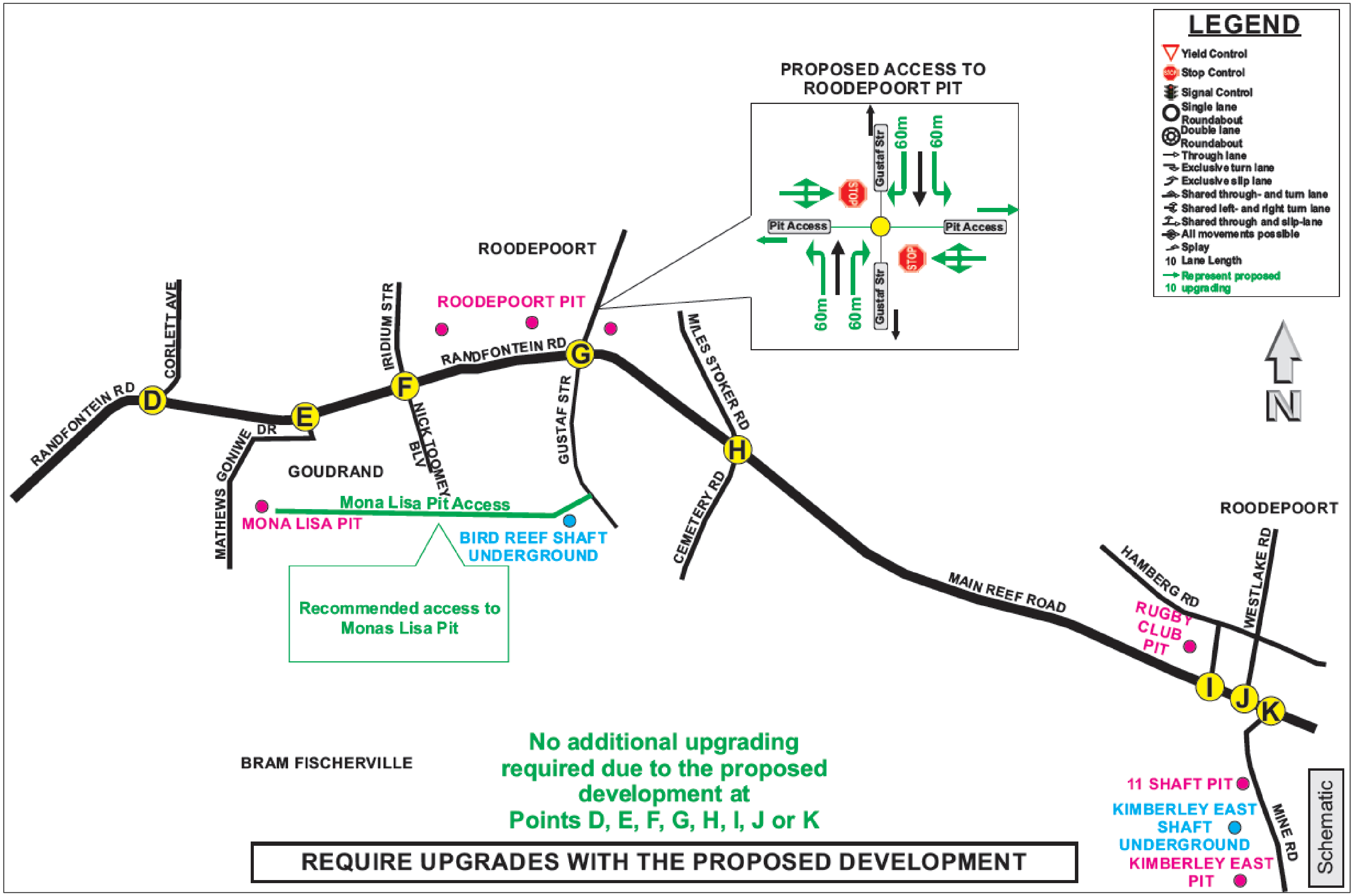

FIGURE 3-10: INTERSECTION AND ROAD NETWORK FOR THE PROPOSED MINING DEVELOPMENT (SIYAZI, 2019)

Table 3-7 below provides a summary of the calculated trip generation rates for the various mining areas. Detailed trip calculations are provided in the traffic assessment report (refer to Appendix O).

TABLE 3-7: CALCULATED DAILY TRIP GENERATION RATES AT PEAK TIMES (IN AND OUT) (SIYAZI, 2019)

	Rugby Club Pit	**Roodepoort Main Reef Pit**	**11 Shaft Main Reef Pit**	**Mona Lisa Pit**	**Kimberley East Pit**	**Bird Reef Underground**	**Kimberley East Underground**
Total number of vehicle trips for worker transport	16	16	16	8	16	138	138
Total number of heavy vehicle trips transporting ore to processing plant off-site	8	32	24	12	16	16	16
Total number of heavy vehicle trips delivering consumables	4	4	4	4	4	4	4

Pipelines

A network of pipelines would be required to transport potable water and the various service waters within the site. The applicant will apply and obtain a legal connection from the City of Johannesburg Water. Water will be piped via a route agreed with the City of Johannesburg Water.

3.2.7 WATER SUPPLY AND MANAGEMENT

Service water and potable water

Water would be required during the construction phase for domestic use, dust suppression, for washing vehicles and equipment and earthworks. During the operational phase additional requirements to those used during construction would include irrigation of rehabilitated areas. During decommissioning and closure, water would be required for dust suppression, washing vehicles and irrigating rehabilitated areas.

Potable would be sourced from the local municipality during all phases and stored in above-ground potable tank(s). Approximately 50 000 litre of potable water would be required for domestic use per day. Service water would be sourced from the local municipality and from the treated dewatering water from the underground workings. Service water would be stored in above-ground service water tank(s).

Operational dewatering and wastewater treatment plant

Dewatering of the underground workings would be required.

Fire water

Water for the fire water reticulation system will be sourced directly from the bulk service water storage tank. Back-up fire water will be sourced from the potable water tank at the infrastructure complexes.

Stormwater management

Information provided in this section was sourced from the surface water management plan developed for the proposed project by SLR (SLR, 2019) included in Appendix G.

Water management facilities for the control of stormwater and for pollution prevention would be designed to meet the requirements of Regulation 704 (4 June 1999) for water management on mines. The two main principle sections of Regulation 704 (4 June 1999) that are applicable to the stormwater management of the proposed project include:

- Regulation 6 which describes the capacity requirements of clean and dirty water systems. Clean and dirty water systems must be kept separate and must be designed, constructed, maintained and operated such that these systems do not spill more than once in 50 years.
- Regulation 7 which requires that measures must be taken to protect water resources from all dirty water or substances which cause or are likely to cause pollution of a water resource either through natural flow or by seepage.

Further detail pertaining the various stormwater management facilities associated with the proposed project are discussed in further detail below. The stormwater facilities associated with the waste rock dump is provided in Table 3-9.

<u>Diversion of clean and dirty water</u>

Any dirty run-off collected at the open pit mining areas, waste rock dumps (in cases where the waste rock dump is located outside the pit footprint) and infrastructure complexes will be collected in a series of open channels and circular culverts that will divert any dirty water to the respective pollution control dams. All dirty water channels will be concrete lined. Clean water channels will divert any clean water away from the site. The distribution of clean and dirty water channels are illustrated in Figure 3-11, Figure 3-12, Figure 3-13, Figure 3-14, Figure 3-15, Figure 3-16 and Figure 3-17. .

For waste rock dumps, in order to maintain the capacities of the PCD's, silt traps need to be built along the channel systems entering the PCDs. These silt traps must be double compartment silt traps so that they can be cleaned while the storm water flows through the other compartment.

<u>Stormwater management dams – containment of dirty water</u>

Dirty water collected at the open pit areas and infrastructure complexes will be contained in pollution control dams (PCD). The location of the proposed pollution control dams are illustrated in Figure 3-11, Figure 3-12, Figure 3-13, Figure 3-14, Figure 3-15, Figure 3-16 and Figure 3-17. The pollution control dams have been designed to accommodate the 1:50 year 24 hour runoff volumes and a 0.8 m freeboard. In this regard, the capacities of the respective pollution control dams are provided in Table 3-8 below. The pollution control dams will be lined with an HDPE liner. Any dirty water contained within the pollution control dams will be treated and re-used.

TABLE 3-8: CAPACITY OF THE POLLUTION CONTROL DAMS

PCD No	Location	Capacity (m^3)
PCD1	Rugby Club Main Reef Pit	4 076
PCD2	Roodepoort Main Reef Pit	23 021
PCD3	Roodepoort Main Reef Pit	7 804
PCD4	11 Shaft Main Reef Pit	26 634
PCD5	Mona Lisa Bird Reef Pit	43 280

PCD No	Location	Capacity (m^3)
PCD6	Kimberly Reef East Pit	9 235
PCD7	Kimberly Reef East Infrastructure Complex	15 750
PCD8	Bird Reef Central Infrastructure Complex	4 576

Legend

- Mining Right Area
- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Areas
- Access and Haul Roads
- Watercourse
- Subcatchments
- Weirs
- Outfalls
- Storages

Meters

0 95 190

Scale: 1:4 200

Projection:Transverse Mercator
Datum: WGS84

WEST WITS

Figure 3-11

Conceptual Stormwater Management Plan for the Rugby Club Main Reef Pit

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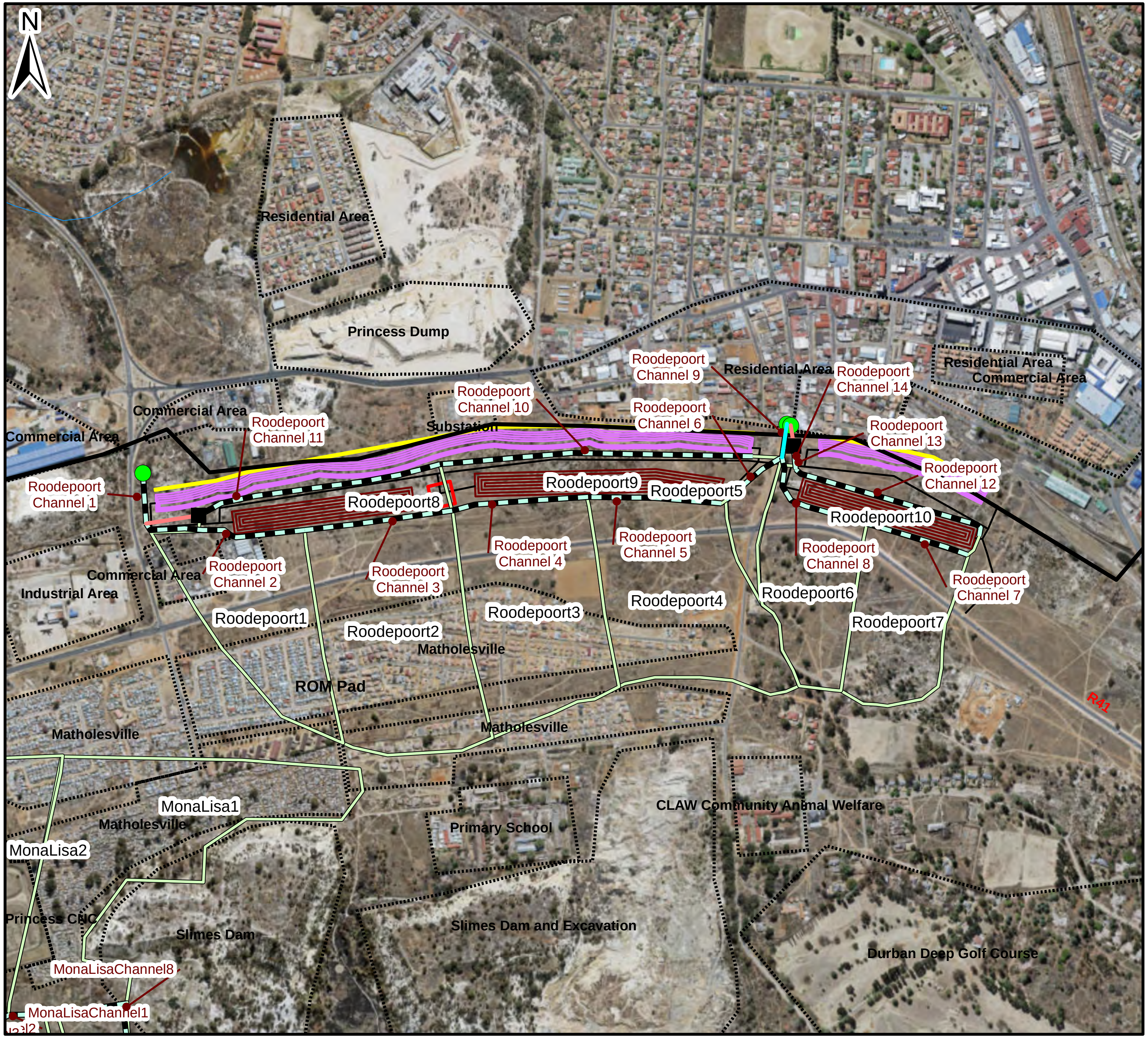

Legend

- Mining Right Area
- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Areas
- Access and Haul Roads
- Watercourse
- Subcatchments
- Conduits
- Weirs
- Outfalls
- Storages

Meters

0 285 570

Scale: 1:12 500 @ A4

Projection:Transverse Mercator
Datum: WGS84

WEST WITS

Figure 3-12

Conceptual Stormwater Management Plan for the Roodepoort Main Reef Pit

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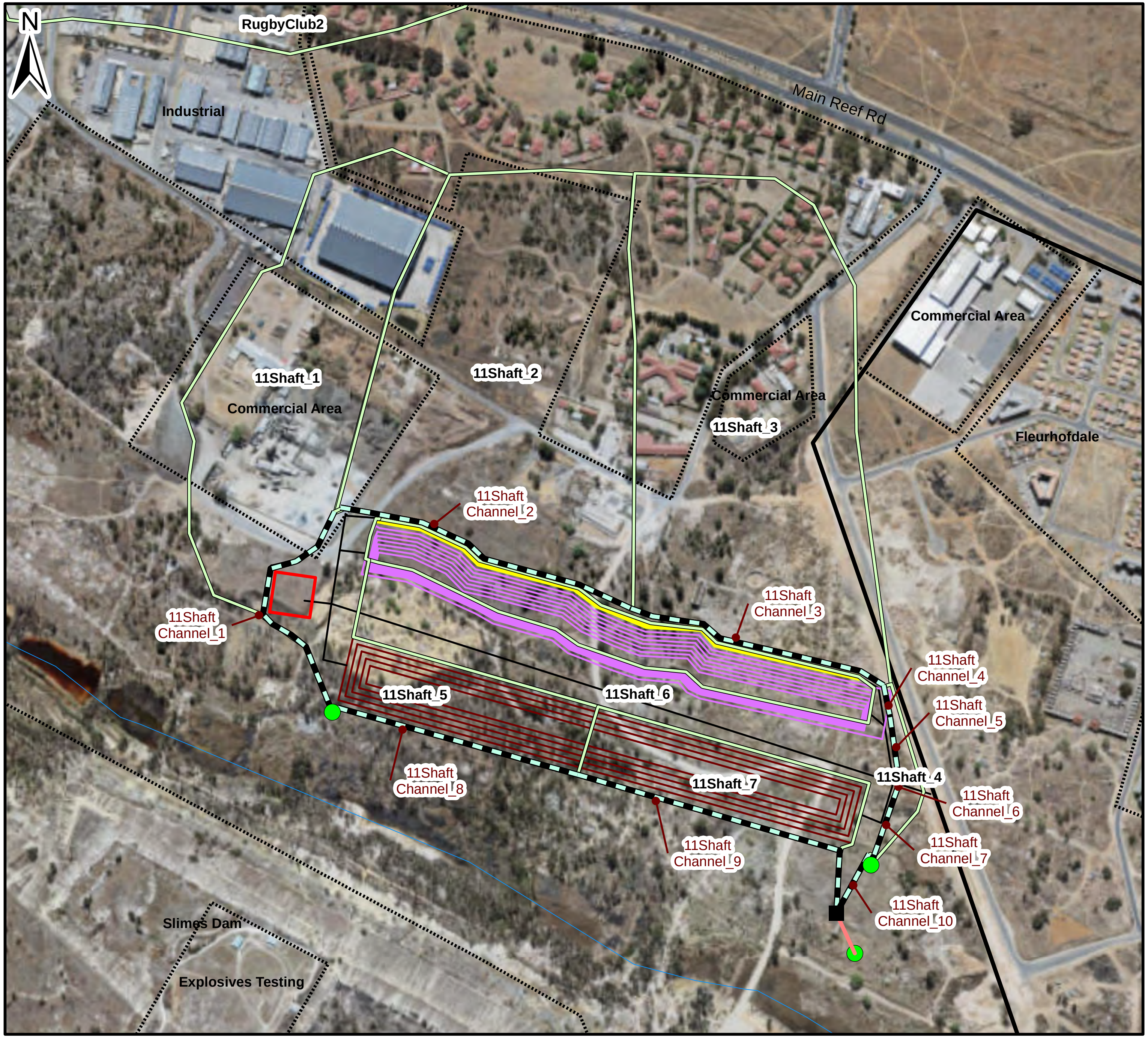

Legend

- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Areas
- Access and Haul Roads
- Watercourse
- Subcatchments
- Conduits
- Weirs
- Outfalls
- Storages

Meters

0 160 320

Scale: 1:7 000 @ A4

Projection:Transverse Mercator

Datum: WGS84

WEST WITS

Figure 3-13

Conceptual Stormwater Management Plan for the 11 Shaft Main Reef Pit

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Legend

- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Areas
- Access and Haul Roads
- Watercourse
- Subcatchments
- Conduits
- Weirs
- Pumps
- Outfalls
- Storages

Meters

0 230 460

Scale: 1:10 000 @ A4

Projection:Transverse Mercator
Datum: WGS84

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Figure 3-14

Conceptual Stormwater Management Plan for the Mona Lisa Bird Reef Pit

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Legend

- Mining Right Area
- Pits
- Waste Rock Dumps
- Topsoil Berms
- ROM Ore Stockpile Crusher Areas
- Access and Haul Roads
- Watercourse
- Subcatchments
- Conduits
- Weirs
- Outfalls
- Storages

Meters

0 137.5 275

Scale: 1:6 000 @ A4

Projection:Transverse Mercator
Datum: WGS84

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Figure 3-15

Conceptual Stormwater Management Plan for the Kimberly Reef East Pit

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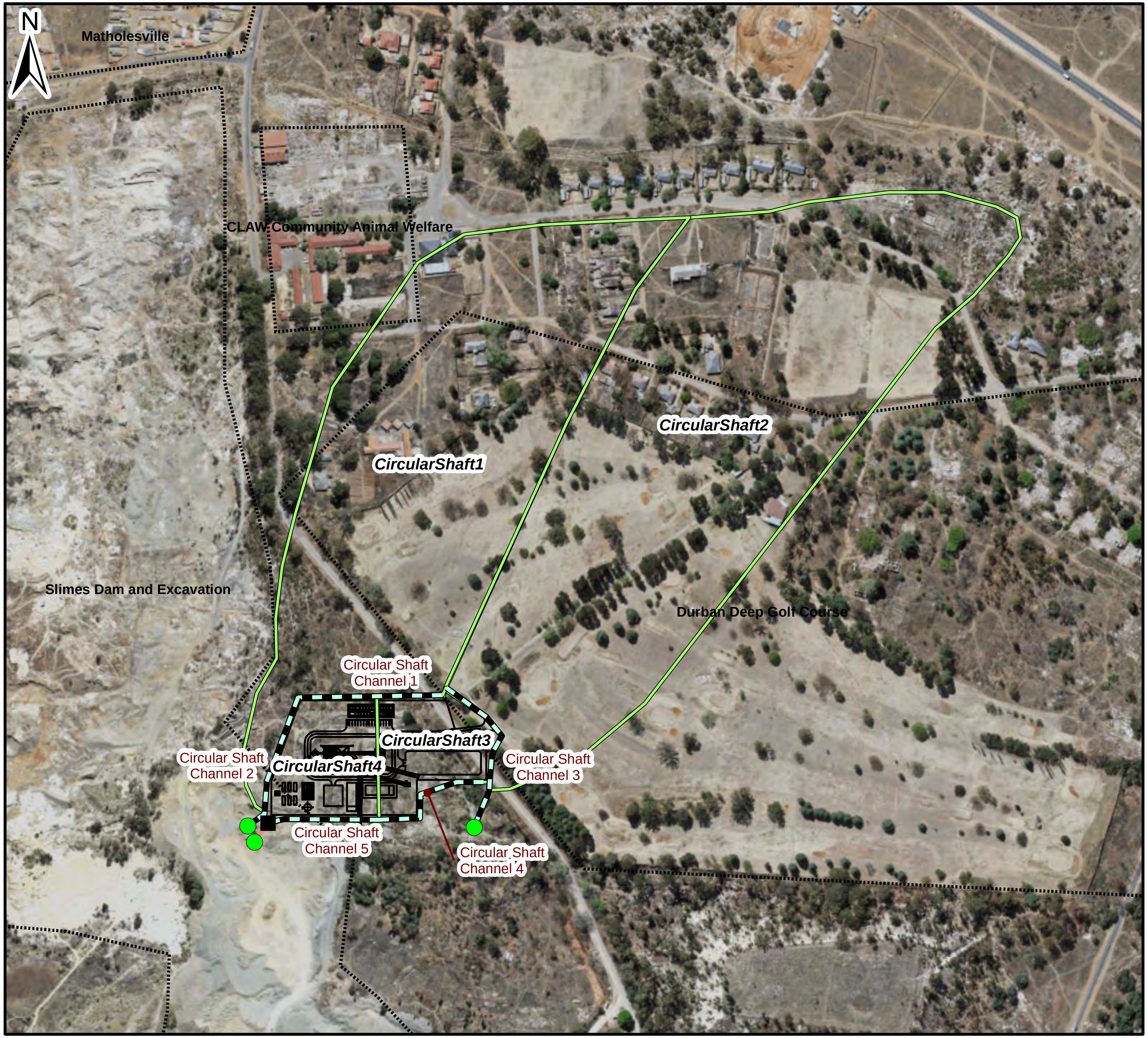

Legend

- Circular Shaft Infrastructure
- Subcatchments
- Conduits
- Weirs
- Outfalls
- Storages

Meters

0 137.5 275

Scale: 1:10 000 @ A4

Projection:Transverse Mercator
Datum: WGS84

WEST WITS

Figure 3-16

Conceptual Stormwater Management Plan for the Bird Reef Central Infrastructure Complex

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Legend

- Mining Right Area
- Watercourse
- Kimberley Reef East Infrastructure Complex
- Subcatchments
- Conduits
- Weirs
- Outfalls
- Storages

Meters

0 225 450

Scale: 1:10 000 @ A4

Projection:Transverse Mercator
Datum: WGS84

WEST WITS

Figure 3-17

Conceptual Stormwater Management Plan for the Kimberley Reef East Infrastructure Complex

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3.2.8 DISTURBANCE OF WATERCOURSES

Regulation 704 of the NWA requires that infrastructure including residue facilities should not be located within 100 m from any watercourse or within the 1:100 year floodline, whichever is the greatest.

The Klip River flows along the western boundary of the proposed mining right application area. There are six drainage lines flowing through the project area which feed into the Klip River.

None of the open pit mining areas or infrastructure complexes will be located within the 1:100 year floodline of the Klip River. A section of the Mona Lisa Bird Reef and 11 Shaft Main Reef open pit mining areas would be located within 100 m of two of the Klip River tributaries, respectively. The Roodepoort Main Reef, Mona Lisa Bird Reef, 11 Shaft Main Reef and a section of the Kimberley Reef East open pit mining areas would be within the 500 m regulated zone of three of the Klip River tributaries. Prior to the establishment of these facilities the necessary approvals/exemptions will need to be obtained from the DWS in terms of both the NWA and Regulation 704.

3.2.9 WATER BALANCE

Information provided in this section was sourced from the water balances developed for the proposed project by SLR (SLR, 2019) included in Appendix G.

A site wide water balance model has been prepared to understand flows within the proposed project operational water circuit during average dry season and average wet season conditions.

Based on the safety of mine personnel, protection of the environment and the anticipated future cost of water the following overall water balance priorities were set in order of precedence:

- **Water balance priority 1** - Surface water runoff management: Any unpolluted water (clean water) must be separated or diverted, away from any polluted water (dirty water) area. The accumulation of water into the open pit must be limited to minimise the impact on mining activities and mine personnel within the open pit.
- **Water balance priority 2** – Containment of dirty water to meet Regulation 704. Each Dirty water dam must be maintained and operated so that it is:
  - not likely to spill into any clean water system more than once in 50 years; and
  - at all times capable of handling the 1:50 year flood-event on top of its mean operating level without spilling.
- **Water management priority 3** - Process make up water: Make up water must be kept to a minimum by optimising the re-use of existing dirty water sources, and limiting the use of more costly clean water sources.

Incorporating the above priorities, water allocation for process water usage at the proposed West Wits Mine will be allocated in the following order of precedence:

- Return water from the proposed Plant PCD; and
- Make up water from the process make up water source.

Apart from potable water for domestic use, water for the operations would be used for dust suppression and mine service activities.

The water balances for each infrastructure complex indicates that there will be excess water. Controlled discharge of excess water to the environment can be achieved through treatment of excess process water (as fed from the Process Water Tank) to a recommended discharge water quality.

3.2.10 POWER SUPPLY AND USE

Power would be required for the underground mining operations during all project phases prior to closure. The operations are expected to require approximately 8.5 MW of power. It is planned to source this power from Eskom. Backup diesel generators would be available during the construction phase and opencast mining operations and for emergency supply. West Wits will investigate solar power as an alternative on power supply.

3.2.11 MINERALISED WASTE MANAGEMENT

Waste rock would be produced by the mining operations. This would comprise material excavated to expose the targeted reefs of the opencast and underground reserves. For the opencast mining operations these materials would need to be temporarily stored and/or stockpiled on site before being used as backfill material in the open pits during rehabilitation. For the underground mining operations, these materials would remain underground and used to backfill the underground mine workings.

In compliance with Section 4 of NEM:WA Regulations (GNR. 632 of 2015) and Section 73 of the MPRDA Regulations (GNR 527 of 2004), the design features characteristics associated with the waste rock dump are provided in Table 3-9 below.

TABLE 3-9: DESIGN FEATURES FOR THE WASTE ROCK DUMP

Feature	Detail
Physical Dimensions	Footprint area: • Rugby Club - up to a maximum of 0.82 ha; • Roodepoort - up to a maximum of 6.61 ha; • 11 Shaft - up to a maximum of 5.18 ha; • Mona Lisa - up to a maximum of 6.73 ha; • Kimberley Reef East - up to a maximum of 2.28 ha.
	Height: • Rugby Club - up to a maximum of 10 m; • Roodepoort - up to a maximum of 10 m; • 11 Shaft - up to a maximum of 30 m; • Mona Lisa - up to a maximum of 30 m; • Kimberley Reef East - up to a maximum of 30 m.
	Approximate tonnes per month: • Rugby Club - ~ 40 000 m^3; • Roodepoort - ~ 40 000 m^3; • 11 Shaft - ~ 40 000 m^3; • Mona Lisa - ~ 40 000 m^3; • Kimberley Reef East - ~ 40 000 m^3.
Physical Characteristics	Size distribution: maximum 400 mm top size
	Void ratio: approximately 1 to 1.3.

Feature	Detail
	Permeability of material: Very low permeability
Transport and placement	Waste rock material will be transported to the waste rock dump by haul road.
Barrier	Based on the outcome of the Geochemical assessment, a Class D engineered barrier is recommended for the waste rock dumps, which entails topsoil stripping and 150 mm base preparation.
Cover	Store and release cover ~ 0.5m thick, constructed from soil overburden excavated from shaft sinking. The surface top soil layer will be stockpiled separately so as not to risk mixing it with the overburden material. A review of the typical surface soils in the area indicates that there will be a suitable depth of soft soils available to use as a soil cover. To prevent fines being washed into the open matrix of the waste rock a filter layer will be required beneath the soil cover. This could be formed from a well graded gravel or sand material. The cover should be vegetated with a deep rooting grass species that can thrive in well drained soils.
Side slopes	Slope stability analysis to be undertaken at detailed design stage. Slope angles natural angle of repose are proposed.
Access and Access control	Proposed access and haul roads will be used for access. Between 1 and 1.5 m high safety berms would be placed around the perimeter of the open pit mining areas.
Waste Minimisation	Waste rock will be used to backfill the open pits as part of rehabilitation. Any additional waste rock material will be transported for disposal off site.
Dust control	No dust control will be provided at the waste rock stockpile because these are not seen as a significant dust emission sources.
Closure	All the waste rock material will be removed to backfill the open pits. Any additional waste rock material will be transported for disposal off site.

The safety classification for the waste rock dump was determined in accordance with the South African Code of Practice for Mine Residue Deposits (SANS 10286:1998) and the requirements of Section 73 of the MPRDA Regulations (GNR 527 of 2004). The summarised safety classification is included in Table 3-10 below.

TABLE 3-10: SAFETY CLASSIFICATION CRITERIA FOR THE WASTE ROCK DUMP

Criteria No.	Criteria		Comment	Safety Classification
1	No. of Residents in Zone of Influence	0 (Low hazard) 1 -10 (Medium hazard) >10 (High hazard)	No residents were noted within the zone of influence.	Low Hazard
2	No. of Workers in Zone of Influence	<10 (Low hazard) 11 – 100 (Medium hazard) >100 (High hazard)	Some workers will be located in the zone of influence, as the stockpile of the WRD will take place next to the void.	Low Hazard
3	Value of third party property in zone of influence	0 – R2 Million (Low hazard) R2 – R20 million (Medium hazard) >R20 million (High hazard)	Informal settlements to the south and the north, property value does not exceed R 2 million. The characteristics of the waste rock dump is such that catastrophic failures will be localised.	Low Hazard
4	Depth to underground	>200 m (Low hazard) 50m – 200m (Medium	The underground workings in proximity to the proposed opencast	Low Hazard

Criteria No.	Criteria		Comment	Safety Classification
	mine workings	hazard)	areas is deeper than 200 m.	
		<50 m (High hazard)		

With reference to Table 3-10 above, the waste rock dumps are classified as a low safety risk.

General environmental classification of waste rock

The acid base accounting and geochemical modelling have indicated that due to the absence of iron sulphide minerals the risk of the development of acid mine drainage conditions in the waste rock environment is negligible. In addition the leach tests and geochemical model, which was developed to evaluate the leach tests, shows that the risk of leaching of contaminants from the waste rock is negligible. The waste rock dumps associated with the West Wits Project are classified as having a potentially very low significant environmental impact in the mitigated scenario (see Appendix D).

Environmental classification for the waste rock stockpile in accordance with NEM:WA

In accordance with Section 5 GN. 632 of the NEM:WA the waste rock dump needs to be classified taking into account Regulation 8 of GN R. 634 of 2013, which references the following associated National Norms and Standards:

- National Norms and Standards for the assessment of waste for landfill disposal (GN R.635 of 2013).
- National Norms and Standards for disposal of waste to landfill (GN R. 636 of 2013).

An assessment of the waste rock that would be generated was undertaken by GeoDyn Systems (GeoDyn, 2019). Although the results of the waste assessment indicate that the waste rock is classified as a Type 3 waste which requires a Class C barrier system, a risk based approach has been used in line with the DWS accepted proposal by the Chamber of Mines of South Africa in June 2016. This risk based approach allows for representations to be made on alternative barrier systems for Mine Residue Deposits and Stockpiles (29 June 2016). The risk assessment enables an evaluation of the efficacy of the alternative barrier system to prevent pollution as required in terms of section 19 (1) and (2) of the NEM:WA (Singh, 2016).

As the purpose of the Norms and Standards is to protect water resources it is appropriate to consider the potential water quality risk associated with the waste rock dumps at the proposed West Wits Mine, rather than a formulaic application of the Norms and Standards for the following reasons:

- a Class C barrier system is impractical for a waste rock dump due to the possibility of failure;
- the leachable concentrations of all the constituents are below the LCT0 limit, indicating a low seepage risk;
- the waste rock material comprises minerals which are very stable in the specific mining environment;
- the waste rock material as well as the secondary mineral products form very slowly as the waste rock minerals weather and have the capacity to remove contaminants from solution through the process of adsorption;
- the waste rock material will be placed dry and does not contain waste water; and
- the waste rock material contains no iron sulphide materials, is non-hazardous and therefore the risk of the formation of acid mine drainage conditions is negligible (Section 6.4.1.1).

Taking the above into consideration it was recommended by GeoDyn that a Class D barrier system (stripping topsoil and base preparation) is considered appropriate for the waste rock dumps for the proposed project.

3.2.12 NON-MINERALISED WASTE MANAGEMENT

General and hazardous waste

General and hazardous waste as defined under NEM:WA will be generated and temporarily stored at the proposed mining operation during the operational phase.

Illegally dumped general and hazardous waste exists within the project footprint. The final management of this waste is yet to be determined. The proposed project would require the bulldozing, sorting and disposal of this waste on site.

A waste management procedure will be developed for the project.

A description of the types of waste likely to be associated with the proposed project including the method of storage and disposal are provided in Table 3-11.

TABLE 3-11: GENERAL AND HAZARDOUS WASTE ASSOCIATED WITH THE PROJECT

<table>
<tr><th>Type of waste</th><th>Description of waste</th><th>Method of storage</th><th>Disposal</th></tr>
<tr><td>General waste</td><td>Pallets and wooden crates, rubber, cardboard, paper, cable drums, metal cut-offs, scrap metal, general domestic waste such as food and packaging, building rubble and waste concrete</td><td>General waste existing on site and generated by the proposed project will be collected and temporarily stored on site at the waste/salvage yard in designated skips.</td><td rowspan="4">A facility for the bailing, sorting, re-use and recycling of waste will be provided within the temporary storage area. Disposal of general or hazardous waste might take place at the mine;
Inert rock material and construction rubble will be used on site for fill and levelling of roads in and around the mine (suitable roadbed material). The material would remain if it supported the post-closure land use, would be stored until final disposal in the open pits or underground mine voids or stored until it is reused.
Brine and gypsum generated by the wastewater treatment plant would need to be stored until it can be removed by a reputable waste contractor on a regular basis for disposal at a licensed facility.
(e.g. Marie Louise Waste Disposal Site; and Holfontein Disposal Site for hazardous</td></tr>
<tr><td rowspan="3">Hazardous waste</td><td>Contaminated wooded crates, printer cartridges, batteries, fluorescent bulbs, paint, solvents, empty hazardous material containers, empty hazardous chemical containers/drums and drums and gypsum and brine from the water treatment plant</td><td>Hazardous waste existing on site and generated by the proposed project will be collected and temporarily stored on site at the waste/salvage yard in designated containers and skips in bunded work areas.</td></tr>
<tr><td>Contaminated soil</td><td>Contaminated soil will be collected and treated in-situ, bio-remediated in a facility, or removed and dealt with as hazardous waste by temporarily storage in designated drums at the waste/salvage yard</td></tr>
<tr><td>Hydrocarbons (oil, grease)</td><td>Used oil and grease will be stored in drums in bunded areas at the</td></tr>
</table>

SLR

		salvage yard. The yard will have a dedicated used oil storage area which will include a concrete slab, proper bunding and an oil sump. The bunds will be able to accommodate 110 % of the container contents and include a sump and oil trap.	waste).
	Used explosive packaging	Collected and temporary stored in designated skips at the waste/salvage yard.	
Medical waste	Swabs, bandages	Medical waste will be stored in sealed containers in a bunded store.	

Sewage

Portable toilets and temporary ablution facilities would be utilised until such time as the sewage collection and pump stations, and change houses are operational. Portable toilets would continue to be used at active mining areas. Portable toilets would be serviced by external service providers on a regular basis.

No sewage treatment plants would be established as part of the project to treat sewage. The sewage collection and pump stations would be connected to the municipal bulk sewage treatment infrastructure.

3.2.13 Other support services

Other support services associated with the proposed project and located within the two infrastructure complexes include the following:

- Lamp room;
- Change house;
- Office complex (including mine offices, kitchen, canteen, training centre, mustering/gathering centre and medical centre);
- Designated stores and store yards for the storage of oil, lubricants, paint, spare belts, rope and rigging;
- Workshops;
- Bioremediation facility for the treatment of soil through hydrocarbon contamination;
- Designated parking areas will be established at the shaft complexes for employees and visitors. In addition to this a designated bus/taxi rank and bus shelter will be established at the shaft complex.
- Fuel storage facilities (diesel and HFO) and refuelling bays - located at the infrastructure complexes with a combined capacity of 20 000 litres;
- Perimeter lighting at the infrastructure complexes;
- Security office at main gate and drop off zone; and
- Perimeter fencing and lighting.

3.2.14 Workforce and housing

It is expected that the opencast mining operations would require between 40 and 50 employees.

During the construction phase for the underground mining operations it is expected that a contractor would require up to a maximum of 50 staff. The operational phase would require between 950 and 1 105 full-time employees (at peak production). Local labour would be sourced where possible. No project or mine housing would be provided during construction and operational phases. As housing areas are situated within close proximity to the areas of operation employees would be sourced from the local communities and the greater Johannesburg area.

3.2.15 Security and access control

Perimeter fencing is planned around the two infrastructure complexes. These fences would be maintained for the duration of the project. Access control and a security office would be established at the entrance to each of the infrastructure complexes. Between 1 and 1.5 m high safety berms would be placed around the perimeter of the open pit mining areas.

3.2.16 Decommissioning and Rehabilitation

The environmental objective for closure is to minimise the impacts associated with the closure and decommissioning of the mine and to restore the land to a useful land use not dissimilar to the pre-mining land use. The conceptual closure plan objectives and principles include the following:

- Create a physically stable, safe, rehabilitated landscape that limits long-term environmental degradation, thus enabling the successful establishment of the planned post-mining land use;
- Ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine site or individual facilities, as well as to sustain catchment yield as far as possible after closure;
- Limit the possible health and safety threats to humans and animals using the rehabilitated mine site as it becomes available;
- Re-instate a suitable land capability over the mine site to facilitate the progressive implementation of the planned post-mining land use;
- Create a landscape that is self-sustaining and over time will converge to the desired ecosystem structure, function and composition;
- Encourage, where appropriate and as aligned to the planned post-mining land use, the re-establishment of native vegetation on the rehabilitated mine site such that the terrestrial biodiversity is largely re-instated over time; and
- Ensure that there is constructive engagement and alignment with local communities and regulatory authorities regarding the proposed end land use.

4 POLICY AND LEGISLATIVE CONTEXT

In accordance with the EIA Regulations 2014 (as amended), all legislation and guidelines that have been considered in the EIA process must be documented. A summary of the applicable legislative context is provided in Table 4-1. Legislative requirements specific to each specialised area are outlined in the respective specialist reports included as appendices to this report.

TABLE 4-1: LEGAL FRAMEWORK

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
Mineral and Petroleum Resources Development Act, 2002 (No. 28 of 2002) (MPRDA) and Regulations, as amended	Table 0-1.	West Wits has applied to the DMR for a mining right in terms of the MPRDA.
Mine Health and Safety Act, 1996 (No. 29 of 1996)(MHSA) and Regulations	Sections 3.2 and 6.4.2.	The buffer zones prescribed have informed project planning. Once specialist studies have been completed, a risk assessment will be used to inform a safety buffer for third party structures and surfaces.
National Environmental Management Act, 1998 (No. 107 of 1998) (NEMA), as amended	Section 3.1.	An integrated NEMA and NEM:WA application has been submitted to the DMR.
Environmental Impact Assessment Regulations, 2014 (EIA Regulations 2014) and Environmental Impact Assessment Regulations Listing notices 1, 2 and 3 published in terms of NEMA in Government Notices 982, 983, 984 and 985 of 4 December 2014 (as amended by Government Notices 324, 325, 326 and 327 of 7 April 2017)		
National Environmental Management: Waste Act, 2008 (No 59 of 2008) (NEM:WA)		
List of Waste Management Activities published in terms of NEM:WA in Government Notice 921 of 29 November 2013 (as amended)		
Waste Classification and Management Regulations published in terms of NEM:WA in Government Notice 634 of 2013	Section 3.2.11.	These regulations have informed the planning and management of waste for the project. These regulations have governed the waste type assessment methodology used for the project.
Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation, published in terms of NEM:WA in Government Notice 632 of 2015 (as amended)		
National Norms and Standards for the Storage of Waste, published in terms of NEM:WA in Government Notice 926 of 2013		
National Norms and Standards for the Sorting, Shredding, Grinding, Crushing, Screening or Baling of General Waste, published in terms of NEM:WA in Government Notice 1093 of 2017		

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
National Waste Information Regulations published in terms of NEM:WA in Government Notice 625 of 2012		
National Norms and Standards for the Assessment of Waste for Landfill Disposal, published in terms of the NEM:WA in Government Notice 635 of August 2013		
National Norms and Standards for the Remediation of Contaminated Land and Soil Quality in the Republic of South Africa, published in terms of the NEM:WA in Government Notice 331 of May 2014		
Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, published in terms of NEMA in Government Notice 1147 of 2015 (as amended)	Sections 18 and 28.	These regulations have informed the financial provisioning for the project.
Guideline on the Need and Desirability, Department of Environmental Affairs, 2017	Section 5.	This guideline has informed the consideration of the need and desirability aspects of the proposed project.
Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, 2017	Section 6.2.	This guideline has informed the public participation process for the project.
National Guideline on minimum information requirements for preparing Environmental Impact Assessments for mining activities that require environmental authorisation, published in terms of NEMA in Government Notice 86 of 2018	Table 0-1.	This guideline has been taken into account as part of project planning.
National Water Act, 1998 (No. 36 of 1998) (NWA)	Sections 3.1.3, 3.2.7, 3.2.8 and 3.2.9.	A water use license would be required for the project. This would be applied for towards the end of the EIA process. These regulations have informed the planning and management of water and stormwater arising from the proposed project.
Regulations on Use of Water for Mining and Related Activities aimed at the Protection of Water Resources published in terms of NWA in Government Notice 704 of 1999		
Regulations Regarding the Procedural Requirements for Water Use Licence Applications and Appeals published in terms of NWA in Government Notice 267 of March 2017		
Regulations Requiring that the Taking of Water for Irrigation Purposes be Measured, Recorded and Reported published in terms of NWA in Government Notice 131 of 17 February 2017.		
Several General Authorisations have been published in terms of Section 39 of the NWA (various dates)		
Regulations regarding the Safety of Dams, published in terms of NWA in Government Notice 139 of 24 February 2012		
Purification of Waste Water or Effluent, published in terms of the Water Act, 1956 in Government Notice 991 of 18 May 1984		
Regulations for the erection, enlargement, operation and registration of Water Care Works, published in terms of the Water Act, 1956 in Government notice 2834 of 7 February 1986		
National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)	Sections 6.4.1.8, 27 and	These regulations have informed the planning and management of

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
List of Activities which Result in Atmospheric Emissions, published in terms of NEM:AQA in Government Notice 893 of 2013 (as amended)	29.	emissions from the proposed project.
National Ambient Air Quality Standards (NAAQS), published in terms of NEM:AQA in Government Notice 1210 of 2009		
National Dust Control Regulations, published in terms of NEM:AQA in Government Notice 827 of 2013		
National Atmospheric Emission Reporting Regulations, published in terms of NEM:AQA in Government Notice 283 of 2015		
National Greenhouse Gas Emission Reporting Regulations , published in terms of NEM:AQA in Government Notice of July 2017	Sections 6.4.1.2, 27 and 29.	Establishes a single national reporting system for the transparent reporting of greenhouse gas emissions and pollution prevention plans. This would be required in the operational phase.
National Pollution Prevention Plans Regulations, published in terms of NEM:AQA in Government Notice of July 2017	Sections 6.4.1.2, 6.4.1.8, 27 and 29.	
National Nuclear Regulator Act, 1999 (Act No. 47 of 1999) (NNRA).	Section 6.4.1.9.	These regulations have informed the planning and management for the handling of gold and uranium ore from the proposed project.
Regulations on Safety Standards and Regulatory Practices (and associated Regulatory Documents), No. R. 388 of 2006.		
Hazardous Substances Act, 1973 (Act No. 15 of 1973) (HAS)	Sections 3.2.11, 3.2.12, 27 and 29.	These regulations have informed the planning and management of hazardous substances for the proposed project.
National Forest Act, 1998 (Act No. 84 of 1998) (NFA)	Section 6.4.1.5.	Permit(s) will be required if any protected species are cut, removed and/or translocated from the project footprints.
Transvaal Nature Conservation Ordinance 12 of 1983		
National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003) (NEM:PAA)	Section 6.4.1.5.	These regulations have informed the planning and management of the proposed project. The proposed project footprint does not overlap with any existing protected areas or any areas identified for protected area expansion.
National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004) (NEM:BA)	Section 6.4.1.5.	Biodiversity was taken into account as part of project planning.
Alien Invasive Species Regulations, published in terms of NEM:BA in Government Notice 598 of 2014		
Alien and Invasive Species List, Government Notice 864 of 2016		
Mining and Biodiversity Guideline (2013)		
Draft National Biodiversity Offset Policy, 2017		
National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)	Section 6.4.1.5.	Biodiversity was taken into account

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
Conservation of Agricultural Resources Act, 1993 (Act No. 43 of 1993) (CARA) and the Conservation of Agricultural Resources Act Regulations, Government Notice 1048 of 1984		as part of project planning.
National Heritage Resource Act, 1999 (No. 25 of 1999) (NHRA)	Section 6.4.1.13.	Heritage has been taken into account as part of project planning
Gauteng Provincial Environmental Management Framework, published in terms of NEMA in Government Notice 164 of 2018	Sections 5.5 and 6.4.1.14.	These regulations have informed the planning and management of the proposed project.
Spatial Planning and Land Use Management Act, 2013 (No. 16 of 2013) (SPLUMA)		
National Development Plan 2030		
Gauteng Spatial Development Framework 2030		
Draft Integrated Development Plan (IDP), 2018/2019 review, City of Johannesburg		
Spatial development framework (SDF) 2040, City of Johannesburg		
Several By-laws, City of Johannesburg		
City of Johannesburg Land Use Scheme, 2017, City of Johannesburg Metropolitan Municipality in Government Notice 1189 of 2017		

5 NEED AND DESIRABILITY OF THE PROJECT

Mines across the West Wits mining right application area (namely Durban Roodepoort Deep and Rand Leases) closed prematurely in early 2000. Despite these closures, significant mineable resources still remain within the application area.

Over the last few years West Wits has focussed on establishing code compliant and exploration target resources using relevant historical data, in addition to exploration activities. Based on this work, West Wits has identified a feasible ore body that it believes is worth developing further. The mining operation would produce run-of-mine ore containing gold, uranium and silver. This ore would be sold to downstream existing beneficiation operations in Gauteng. The anticipated market prices in the medium and long-term are considered by West Wits to be favourable for project development.

The further development of the project would allow for the rehabilitation of historically impacted land located within the proposed West Wits project footprints that was abandoned and not fully completed by previous mining companies. A number of housing development applications have been submitted to the municipality for approval. However, where there is a mineral resource the DMR does not allow development that could result in sterilization of a mineral. Thus, if the mineral is mined it allows for the opportunity for development to take place. Mining and rehabilitation of the proposed open pit areas would take between three and five years to complete. The availability of land for future housing would help to address the housing backlog experienced by the City of Johannesburg, while at the same time creating socio-economic benefits for the communities and economy. The project would also result in the closure of access points to dangerous historical workings within the project footprints often targeted by informal miners (Zama Zamas), which pose health and safety risks to surrounding communities.

The DEA guideline on need and desirability (GN R891, 20 October 2017) notes that while addressing the growth of the national economy through the implementation of various national policies and strategies, it is also essential that these policies take cognisance of strategic concerns such as climate change, food security, as well as the sustainability in supply of natural resources and the status of our ecosystem services. Thus, the over-arching framework for considering the need and desirability of development in general is taken at the policy level through the identification and promotion of activities / industries / developments required by civil society as a whole. The DEA guideline further notes that at a project level (as part of an EIA process), the need and desirability of the project should take into consideration the content of regional and local plans, frameworks and strategies.

5.1 NATIONAL POLICY AND PLANNING FRAMEWORK

This section aims to provide an overview of the national and regional policy and planning context relating to the mining sector within South Africa and Gauteng.

5.1.1 NATIONAL DEVELOPMENT PLAN 2030

The National Development Plan (NDP) aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality by 2030. The core elements of a decent standard of living identified in the plan are:

- housing, water, electricity and sanitation;
- safe and reliable public transport;
- quality education and skills development;
- safety and security;
- quality health care;
- social protection;
- employment;
- recreation and leisure;
- clean environment; and
- adequate nutrition.

The NDP provides the context for all growth in South Africa, with the overarching aim of eradicating poverty and inequality between people in South Africa through the promotion of development. The NDP provides a broad strategic framework, setting out an overarching approach to confronting poverty and inequality based on six focused and interlinked priorities. One of the key priorities is "faster and more inclusive economic growth". In order to transform the economy and create sustainable expansion for job creation, an average economic growth exceeding 5% per annum is required. The NDP sets out that transforming the economy also requires changing patterns of ownership and control.

It is also acknowledged that environmental challenges are in conflict with some of these development initiatives. As such, it is emphasised that there is also a need to:

- protect the natural environment;
- enhance the resilience of people and the economy to climate change;
- reduce carbon emissions in line with international commitments;
- make significant strides toward becoming a zero-waste economy; and
- reduce greenhouse gas emissions and improve energy efficiency.

5.1.2 NEW GROWTH PATH 2010

South Africa has embarked on a new economic growth path in a bid to create 5million jobs and reduce unemployment from 25% to 15% over the next ten (10) years. The plan aims to address unemployment, inequality and poverty by unlocking employment opportunities in South Africa's private sector and identifies seven job drivers. These job drivers have the responsibility to create jobs on a large scale. The seven key economic sectors or "job drivers" for job creation are listed below:

- infrastructure development and extension: Public works and housing projects;
- agricultural development with a focus on rural development and specifically
- "Agro-Processing";
- mining value chains;
- manufacturing and industrial development (IPAP);
- knowledge and green economy;
- tourism and services; and
- informal sector of economy

5.1.3 National Framework for Sustainable Development (2008)

The purpose of the National Framework on Sustainable Development is to enunciate South Africa's national vision for sustainable development and indicate strategic interventions to re-orientate South Africa's development path in a more sustainable direction. It proposes a national vision, principles and areas for strategic intervention that will enable and guide the development of the national strategy and action plan.

The National Framework on Sustainable Development seeks to build on existing programmes and strategies that have emerged in the first 14 years of democracy. It aims to identify key, short, medium and long–term challenges in our sustainable development efforts, sets the framework for a common understanding and vision of sustainable development; and defines strategic focus areas for intervention (DEAT, 2008).

5.1.4 Industrial Policy Action Plan

The overall focus of the Industrial Policy Action Plan (IPAP2) is to create jobs in the manufacturing sector and has three focus areas:

- to promote labour intensive industries,
- to broaden participation in economic transformation,
- and to raise competitiveness in manufacturing.

IPAP focus areas are exports, industrial capacity, technology, skills development, and employment.

5.1.5 National Spatial Development Perspective (2006)

The NSDP 2006 provides a framework for a focused intervention by the State in equitable and sustainable development. It represents a key instrument in the State's drive towards ensuring greater economic growth, buoyant and sustained job creation and the eradication of poverty. It provides:

- a set of principles and mechanisms for guiding infrastructure investment and development decisions;
- a description of the spatial manifestations of the main social, economic and environmental trends that should form the basis for a shared understanding of the national space economy; and
- an interpretation of the spatial realities and the implications for government intervention.

5.1.6 Regional and Local Policy and Planning Framework

This section aims to provide an overview of the regional and local policy and planning context relating to the proposed development.

5.1.6.1 Gauteng Employment and Growth Strategy (GEGDS) (2009 to 2014)

The strategy was formulated by the Department Economic Development. The strategy is based on innovation, green growth and an inclusive economy. The five strategic pillars are:

- Improved economic efficiency: logistics, electricity supply, ICT, sectoral focus on automotive industry, tourism, clothing, textile, footwear, heavy metals, furniture, construction, mining, agriculture, petro-chemicals, services and transport.
- Employment creation: Prevent job losses in distressed sectors, utilize the CWP with a focus on food security, youth development, environmental quality, housing upgrades, partnerships with schools, utilise the EPWP in collaboration with the private sector, promotion of youth employment and

entrepreneurship, focus on labour intensive sectors such as construction, transport, tourism, agriculture, food, manufacturing, green economy.

- Increased economic equity and ownership: SMME development, access to quality education, support cooperatives, procurement support.
- Putting people first, invest in local people: Safety nets, basic needs, education, health care, social security.
- Sustainable communities and social cohesion: Rural and agricultural development, food security, safe communities, mobility.

5.1.6.2 Gauteng Spatial Development Framework (GSDF)

The Gauteng Spatial Development Framework (GSDF) 2011 was the first attempt at an integrated, coherent vision of settlement form, transportation and economic development for the province. However, it was not implemented as intended, resulting in a slow pace of spatial, economic and social transformation in the province. In 2015, the Gauteng Provincial Government decided to review the GSDF 2011, a decision that was also prompted by the Spatial Planning and Land Use Management Act (SPLUMA) (Act 16 of 2013), which came into force on 1 July 2015. This resulted in the GSDF 2030, which seeks to direct, guide, focus as well as align, coordinate and harmonise all development spending in the province, to ensure rapid, sustainable and inclusive provincial economic growth and township redevelopment, therefore enabling decisive spatial transformation.

Towards the realisation of the above and beyond, the GSDF 2030 puts forward a spatial development logic based on five focus areas:

- Focus Area 1 – Shared Economic Prosperity: Maintaining and deepening the economic productive capacity of those areas where a large part of the provincial economy is concentrated.
- Focus Area 2 – Socio-economic Integration: Pursuing densification, diversification and integration in areas where a significant part of the provincial economy is concentrated, where the State owns significant tracts of land, and land prices are not as prohibitive as in the economic core areas.
- Focus Area 3 – Economic Consolidation: Focusing township redevelopment, including nodal and corridor development, in townships where most people live, that are most accessible and connected via public transport to the economic core areas and similar township areas, and could develop diverse economic activities.
- Focus Area 4 – Social and Local Economic Support: Enhancing public transport connections with townships where fewer people live and hence economic accessibility is poorer, while at the same time focusing on skills development and supporting local economic development initiatives.
- Focus Area 5 – Rural Enterprise Support: Protecting those parts of the province that provide key environmental support services, are environmentally sensitive, have been formally demarcated as conservation areas, have high agricultural potential, or are used as or have the potential for eco-tourism and rural economic activities.

The sections of West Wits mining area either falls or is in close proximity to areas identified for focus on Shared Economic Prosperity, focus on Socio-economic Integration or focus on Social and Local Economic Support.

One of the challenges, the Gauteng government faces is the fact that mining, including the area in which the West Wits project is located, has fragmented urban areas. Therefore one of the objectives of the GSDF 2030 is to utilise the mining belt to re-shape the Apartheid city structure by developing these areas and linking outlying areas such as Soweto to their surroundings. However, in terms of the MPRDA perspective, such areas should not be redeveloped until such time as the mineral resources have been accessed.

According to the GDSF 2030, some areas associated with historical mining are regarded as polluted and will require significant rehabilitation before they can be utilised for redevelopment purposes. This being said, a rehabilitated mining belt holds many opportunities for spatial integration.

5.1.6.3 Gauteng Province Environmental Management Framework, 2014 (GPEMF)

The study area where the mining activity is proposed is located within Control Zone 1 of the GPEMF. The intention with this zone is to streamline urban development activities in it and to promote development infill, densification and concentration of urban development, in order to establish a more effective and efficient city region that will minimise urban sprawl into rural areas. The General Guidelines for these zones should be applied to the proposed mining activity. The guidelines should be implemented through the EIA process. According to the GEMF, the proposed activity or land use is in line with Zone 1.

5.1.6.4 City of Johannesburg Metropolitan Municipality Spatial Development Framework 2040

The SDF for Johannesburg 20404 is a city-wide spatial policy document that identifies the main challenges and opportunities in the city, sets a spatial vision for the future city, and outlines a set of strategies to achieve that vision.

The core objective of the SDF 2040 is to create a spatially just world class African city. The SDF 2040 is premised on spatial transformation, defined through the principles of equity, justice, resilience, sustainability and urban efficiency which it seeks to translate into a development policy.
The Spatial Development Framework thus seeks to address five major issues in Johannesburg's spatial and social landscape:

- Increasing pressure on the natural environment and green infrastructure.
- Urban sprawl and fragmentation.
- Spatial inequalities and the job-housing mismatch.
- Exclusion and disconnection emanating from:
  - high potential underused areas (the mining belt and the Modderfontein area);
  - securitisation and gated developments, and disconnected street networks (high cul-de-sac ratios and low intersection densities).
- Inefficient residential densities and land use diversity.

5.2 CONSISTENCY WITH POLICY AND PLANNING CONTEXT

The previous sections have considered the policy and planning context at national, regional and local level, which are relevant to the proposed West Wits Mining Project. As highlighted above, there is a drive from national and provincial Governments to stimulate development and grow the economy of South Africa with a strong focus on job creation in all sectors. Mining and the mining value chain have been identified as drivers of economic growth and job creation, and are considered important in the Gauteng provincial economy.

The proposed project is considered to be consistent with and in support of the broad national policy framework for the development of mining in South Africa. At the regional level, it is deemed consistent with the Gauteng PSDF and the SDF of the City of Joburg. The proposed West Wits Mining Project would be located inside the urban edge, and thus it will be vital that consideration is given to the integration of the post mining land use into local town planning. The project would have local benefits through the provision of employment opportunities and stimulation of opportunities for local goods and service providers.

5.3 CONSISTENCY WITH NEMA PRINCIPLES

The national environmental management principles contained in NEMA serve as a guide for the interpretation, administration and implementation of NEMA and the EIA Regulations. In order to demonstrate consistency with the NEMA principles, a discussion of how these principles are taken into account during the EIA process is provided in Table 4-1 below.

TABLE 5-1: CONSIDERATION OF THE NEMA PRINCIPLES IN RELATION TO THE PROPOSED PROJECT

National Environmental Management Principles	Comment
(2) *Environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably.*	Mining has long been one of the key drivers of economic growth and employment in South Africa. The proposed West Wits Mining Project would enable mineral resources to be accessed and thus serve the developmental interests of people. The **Scoping and EIA** process identifies the needs and interests of potentially affected parties and attempts to address issues and concerns raised through the course of the study.
(3) *Development must be socially, environmentally and economically sustainable.*	Government has set development goals aimed at reducing poverty, unemployment and inequality. The New Growth Path identifies the mining value chain as one of the seven key economic sectors for job creation. Mining is promoted in the national, regional and local policy and planning frameworks, thus the proposed development is deemed acceptable in principle. The specific sustainability of the proposed project is assessed during the **Scoping and EIA** process.
(4)(a) *Sustainable development requires the consideration of all relevant factors including the following:* (i) *That the disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;* (ii) *that pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;* (iii) *that the disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied;* (iv) *that waste is avoided, or where it cannot be*	The **Scoping and EIA** process considers potential social, economic, biophysical impacts that could result through the implementation of the proposed. Measures to avoid, minimise and/or remedy potential pollution and/or degradation of the environment that may occur as a result of the proposed West Wits Mining Project are detailed in the EMPr.

National Environmental Management Principles	Comment
altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner; *(v) that the use and exploitation of non-renewable natural resources is responsible and equitable, and takes into account the consequences of the depletion of the resource;* *(vi) that the development, use and exploitation of renewable resources and the ecosystems of which they are part do not exceed the level beyond which their integrity is jeopardised;*	
(4)(a)(vii) that a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and	Assumptions, uncertainties and limitations associated with the compilation of the EIAR are included in the EIA. Compliance with the various legislative requirements is presented in the EIA
(4)(a)(viii) that negative impacts on the environment and on people's environmental rights be anticipated and prevented, and where they cannot be altogether prevented, are minimised and remedied.	The **Scoping and EIA** process considers and assesses the identified potential social, economic and biophysical impacts of the project. The EMPr provides the recommended management measures to mitigate the significance of identified impacts.
(4)(b) Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated, and it must take into account the effects of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option.	The **Scoping and EIA** process that is being followed recognises that all elements of the environment are linked and interrelated. The DMR, as the decision-making authority, will be responsible for taking all aspects of the environment, including whether or not the potential impacts of the project would unfairly discriminate against any person, into consideration when making a decision regarding the proposed West Wits Mining Project.
(4)(c) Environmental justice must be pursued 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.	
(4)(d) Equitable access to environmental resources, benefits and services to meet basic human needs and ensure human well-being must be pursued and special measures may be taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination.	The proposed West Wits Mining Project is not anticipated to limit access to environmental resources that meet basic human needs.
(4)(e) Responsibility for the environmental health and safety consequences of a policy, programme, project, product, process, service or activity exists throughout its life cycle.	West Wits Mining Limited is committed to comply with environmental health and safety obligations of the West Wits Mining Project.
(4)(f) The participation of all interested and affected parties in environmental governance must be promoted, and all people must have the opportunity to develop the understanding, skills and capacity	The public participation process has been undertaken in accordance with the requirements of the EIA Regulations 2014.

National Environmental Management Principles		Comment
	necessary for achieving equitable and effective participation, and participation by vulnerable and disadvantaged persons must be ensured.	
(4)(g)	*Decisions must take into account the interests, needs and values of all interested and affected parties, and this includes recognizing all forms of knowledge, including traditional and ordinary knowledge.*	The **Scoping and EIA** process has taken into the account the interests, needs and values of all I&APs, through the submission of comments on the proposed project, during the Scoping and EIA phases of the project. Thus, the decision-makers will have all the necessary information before them on which to base an informed decision.
(4)(h)	*Community wellbeing and empowerment must be promoted through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means.*	The Scoping Report and EIAR prepared for the proposed project will be made available to communities for review and comment.
(4)(i)	*The social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.*	The **Scoping and EIA** process considers identified potential social, economic, biophysical impacts of the project in an integrated manner. The significance of these impacts is assessed in the EIA phase according to pre-defined rating scales. The impact assessment is presented in the EIA.
(4)(j)	*The right of workers to refuse work that is harmful to human health or the environment and to be informed of dangers must be respected and protected.*	West Wits Mining Limited (and its appointed contractors) would be required to comply with the Occupational requirements of the Mine Health and Safety Act. An Environmental Awareness Plan has been prepared, which requires that staff be informed about any aspects of their work that may pose a danger to the environment.
(4)(k)	*Decisions must be taken in an open and transparent manner, and access to information must be provided in accordance with the law.*	As mentioned previously, the public consultation process is being undertaken in accordance with the requirements of the EIA Regulations 2014 (as amended) and will allow for the distribution of the Scoping Report and EIAR for public review and comment. This information will be provided in an open and transparent manner.
(4)(l)	*There must be intergovernmental co-ordination and harmonisation of policies, legislation and actions relating to the environment.*	The public participation process for the proposed project provides an opportunity for the Organs of State to provide comment on the proposed project and address any potential conflicts between policies or other developmental proposals administered by them that may be in conflict with the proposed project before decision-making.
(4)(m)	*Actual or potential conflicts of interest between organs of state should be resolved through conflict resolution procedures.*	It is not anticipated that the proposed project would result in any conflicts between organs of state.
(4)(n)	*Global and international responsibilities relating to the environment must be discharged in the national*	The DMR, as the decision-making authority, will be responsible for taking cognisance of any

National Environmental Management Principles		Comment
	interest.	international obligations that could have an influence on the project.
(4)(o)	*The environment is held in public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people's common heritage.*	The **Scoping and EIA** process considers and assesses the identified potential social, economic, biophysical impacts of the project.
(4)(p)	*The costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment.*	As the holder of the authorisation, West Wits Mining Limited will be responsible for the implementation of the measures included in the EMPr.
(4)(q)	*The vital role of women and youth in environment management and development must be recognised and their full participation therein must be promoted.*	The public participation process for the proposed project has been and will continue to be inclusive of women and the youth.
(4)(r)	*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.*	The **Scoping and EIA** process undertaken for the proposed project identified relevant sensitive and/or vulnerable areas and assessed potential impacts. Appropriate mitigation measures were proposed.

5.4 SECURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES

Due to the nature of mining projects, impacts on sensitive biodiversity areas including aquatic ecosystems, linkages between biodiversity areas and related species and the role that they play in the ecosystem are probable. A mine also has the potential to directly disturb vegetation, vertebrates and invertebrates. In addition to this, soil is a valuable resource that supports a variety of ecological functions. Mining also has the potential to damage soil resources through physical disturbance and/or contamination, which has a direct impact on the potential loss of the natural capability of the land.

The project area has been selected on the basis of the presence of economically mineable resources. Most of the proposed mining areas and infrastructure complexes would be located on land that has been impacted by historical and current mining activities, overgrazing and urbanisation. As part of the EIA, independent biodiversity and soil specialists were appointed to determine the sensitivity of the mining area. Sensitive ecological areas are associated with watercourses and more specifically the Klip River which runs along the western boundary of the mining right application area and the valley bottom wetlands and pans within the mining right application area (considered by the biodiversity specialist to be of intermediate sensitivity). Species of conservation concern with the highest probability of occurrence within the mining right application area, includes the African Star Grass (*Hypoxis hemerocallidea)* and Century Plant (*Boophone disticha)*. However, due to the level of habitat transformation already associated with the mining right application area and surroundings, the probability of occurrence is low (below 60%) (refer to Section 6.4.1.6 for further information). Linked to this, is the loss of soil functionality and related land capability as an ecological driver for vegetation and ecosystems that rely on soil (refer to Appendix E for the detailed assessment). The project plan and site layout avoids the more sensitive watercourse areas where possible, while still ensuring engineering feasibility and financial viability.

The findings of the assessment indicate that potential impact significance associated with the proposed project can be mitigated to an acceptable level with the implementation of design control measures and mitigation measures (refer to Appendix D for the detailed assessment). Measures that were considered to avoid the destruction and disturbance of biodiversity and the loss of soil resources include limiting the mine footprint to what was absolutely necessary. Where sensitive biodiversity areas cannot be avoided, management actions focus on ensuring ecological sustainability through rehabilitation that aims at achieving a final end land use of green belts and parks (except in areas where the end land use would be residential, commercial and industrial). Specific mitigation measures are outlined in the EMPr (Section 27).

5.5 PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT

Community/society priorities are officially expressed through public documents including the provincial and municipal growth and development strategy and spatial development framework documents. In this regard the West Wits mining right application falls within an area defined in the City of Johannesburg spatial development framework (SDF) 2040 as a Transformation Zone. The SDF lists the unlocking of the mining belt as a strategic mechanism for addressing historical spatial discontinuity between the northern and southern parts of Johannesburg. This would be achieved by identifying opportunities and interventions that allow for road linkages, mixed use redevelopments and rehabilitation of degraded and damaged land.

In terms of the MPRDA perspective, such areas should not be redeveloped until such time as the known and accessible mineral resources have been developed. While portions of the mining right area are targeted for development, the current status of the area potentially poses a number of challenges to these. The highly disturbed and unrehabilitated nature of the post-mining landscape results in environmental risk and liability that should be resolved. On-going illegal mining presents a security, safety and environmental risk to the communities, which come at a cost to the South African, provincial and local governments. Formalisation, completion and appropriate rehabilitation of the area could enable appropriate and effective economic and social development of the area in future.

The proposed project would potentially result in positive socio-economic impacts. The proposed project would benefit society and the surrounding communities both directly and indirectly by generating additional employment of between 950 and 1 105 employees at the proposed operation, and through the extraction of mineral resources and beneficiation of mineral resources within Gauteng. Direct economic benefits would be derived from wages, taxes and profits. Indirect economic benefits would be derived from the procurement of goods and services and the spending power of employees (refer to Appendix Q for the detailed Socio-economic assessment).

Through employment, persons at the mine would also gain skills involved in the construction and operation of a mine. The proposed development would also ensure local economic development through the implementation of projects identified in the Social and Labour Plan. West Wits is fully committed to implementing development plans and projects that will facilitate local community development in the area surrounding its project in line with the provisions of the Broad-Based Socio-Economic Empowerment Charter for the South African Mining Industry.

Management measures that will be implemented to further enhance positive socio-economic impacts in addition to employment of people in local communities (as far as possible) include formal bursary and internship plan and skills development provided to people in the closest communities, and the implementation of a mentorship programmes. West Wits will also align with transformation targets and implement an Employment Equity strategy and plan for the West wits Project, which will focus on ensuring that the proposed mine's management structure as well as core and critical skills will comprise above 40% Historical Disadvantaged South Africans (HDSAs). Further to this, the proposed development will also ensure local economic development (LED) through the implementation of projects identified in the social and labour plan (SLP).

Employment and economic development has the potential to improve livelihoods of individuals living in the local area through increased disposable income for individuals and households and the flow of revenue into local services and support sectors. The degree to which this impact would benefit local people and communities depends on the number of new opportunities realised locally and the manner in which income is used to benefit households and individuals.

The projects identified in the SLP are in line with the City of Johannesburg Integrated Development Plans. The components that form the basis of the West Wits Project's LED approach include Aggregate/ crushed stone supply, Removal of alien invasive vegetation, Agriculture development, Construction incubator training and SMME skills development and waste recycling. West Wits has also committed to join surrounding property developers in the development of a school and a clinic.

Due to the expectation of employment associated with mining-related projects there is a potential for negative socio-economic impacts to occur (Appendix Q). In this regard, an influx of job seekers to an area and disruption of movement patterns by increased traffic may in turn increase pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. The loss of livelihoods for those dependent on illegal mining activities is also a negative socio-economic impact that will occur as a result of the project. Management actions to manage and remedy these impacts include the implementation of a health policy on HIV/AIDs and tuberculosis, working together with local and regional authorities to address social service constraints and to monitor and prevent the development of informal settlements. In addition to this, formal communication structures and procurement procedures are required.

6 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT ON THE SITE INCLUDING THE PROCESS FOLLOWED TO DEFINE THE PREFERRED DEVELOPMENT ALTERNATIVES

6.1 DETAILS OF THE DEVELOPMENT FOOTPRINT CONSIDERED

This section describes land use or development alternatives and alternative means of carrying out the operation that have been considered for the proposed project, and the consequences of not proceeding with the proposed project.

The main project alternatives to be considered include:
- Property or locality;
- Type of activity;
- Design or layout;
- Technology;
- Operational aspects; and
- The “no-go” alternative.

6.1.1 PROPERTY OR LOCALITY ALTERNATIVES

The property on which the actual open pit and underground mining related activities takes place is dependent on the location of the target mineral resource. It follows that no alternatives could be considered for the open pit and underground mining areas.

6.1.2 TYPE OF ACTIVITY

The shallow ore reserves that were identified during prospecting would be developed in the form of open pit mining, as these areas cannot be accessed using underground mining methods. The deeper ore bodies can only be mined by underground mining, as has been undertaken historically in the area. Once the open pit mining areas have been mined and rehabilitated the land would be made available for housing and/or industrial developments earmarked for the area and/or agricultural activities.

For the underground mining, the positioning of the infrastructure complexes was informed by the position of potentially mineable resources, the fact that the land has been disturbed by previous mining activities and infrastructure and to ensure a feasible access point to the mineable resource.

The location of the open pit mining areas was informed by the presence of economically mineable resources to which West Wits would have access. The layouts of the open pit operations have been designed to optimise the extraction of mineral resources.

6.1.3 DESIGN OR LAYOUT

During the scoping phase of the project, two design or layout alternatives were considered for each of the five open pit mining areas. The outcome of the discussion concluded that Option 1 was the preferred layout of all five open pit mining areas.

Based on the outcomes of the public participation process and the findings of the various specialist studies, no layout and orientation alternatives were identified or considered for the infrastructure complexes to access the underground mining areas.

6.1.4 OPERATIONAL ASPECTS

Access to and from the proposed Mona Lisa Bird Reef open pit mining area would be required via a new access road and should avoid the Goudrand Township. Two alternative points for the proposed access road to link up with Randfontein Road (Road R41) have been considered:

- Option 1: Via a new intersection with Randfontein Road (Road R41) west of the Goudrand township; or
- Option 2: Via an internal haul road to the east from where access could be gained to and from Randfontein Road (Road R41) via Gustav Street at Point G (refer to Figure 3-10).

The preferred access route option 2 was selected due to the following reasons: intersection performance evaluations indicated that excessive upgrades and a traffic light signal would be required for route option 1 which is not viable in terms of costs and the short lifespan of the Mona Lisa open pit mining area.

6.1.5 THE NO-GO ALTERNATIVE

The assessment of this option requires a comparison between the options of proceeding with the project with that of not proceeding with the project. Proceeding with the project attracts potential economic benefits and potential negative environmental and social impacts. Not proceeding with the project leaves the status quo, but with potential loss in employment opportunities and revenue generation which will be created from proceeding with the development.

In the “no-go” scenario, the current land use activities will remain in force and illegal mining will continue without formal economic benefit to the local, regional and national economy. Housing developments will however be able to proceed, but not without removing available minerals resources and rehabilitating the area first. This will however require the necessary authorisations from the DMR.

Should the proposed development not proceed the potential opportunity to develop and grow existing industries, manufacturing and distribution facilities surrounding the proposed mining right area may not take place.

6.2 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

A public participation process has and continues to be undertaken to inform the EIA process. This section provides a description of the engagement process with interested and affected persons (I&APs) followed during the course of the EIA process. Supporting documentation is included in various appendices.

This section describes the public participation process (PPP) undertaken to date in line with Chapter 6 of the EIA Regulations (2014), as amended. The intention of the PPP is to inform interested and affected parties (I&APs), in sufficient detail, of the proposed project in order that I&APs may contribute meaningfully to the EIA process.

A PPP was undertaken to inform the original mining right and environmental application that was lodged in April 2018. The PPP included notification of I&APs through distribution of a Background Information Document (BID), placement of a series of newspaper advertisements, placement of site notices over several occasions, distribution of flyers, radio announcements, focussed engagement and meetings with community structures, public scoping meetings and review of the original Scoping Report and/or summary. Although a new PPP is being undertaken in support of the current application, a detailed understanding of the I&AP groups and related concerns and issues was gleaned from this process. The nature of the project (that is, open pit and underground mining) and overall project location has not changed and therefore this knowledge is deemed relevant to the current application.

A key aspect of public consultation is the notification of landowners, occupiers and users within and adjacent to the application area. Due to the extent of the project and the project's location within and adjacent to urban and built-up areas the notification period is still underway and a host of measures are being put in place to reach relevant stakeholders. Key stakeholders identified for the project include:

I&APs:

- The landowners and mining right holders who have been identified as an I&AP within the proposed mining right application area include:
  - Vector Logistics;
  - Harmony;
  - Durban Roodepoort Deep;
  - Firmabuild;
  - AfriSam;
  - City of Johannesburg;
  - Ansec;
  - Calgro M3;
  - Dino Properties (Pty) Ltd;
  - Rand Leases, including Tenants AC Signs & Markings (Pty) Ltd, B & V Mining and Slabs, EC Incinerator Services (Pty) Ltd, High Flame (Pty) Ltd, Maxam Dantex South Africa (Pty) Unit 4, Mlilo Projects (Pty) Ltd, Much Asphalt (Pty) Ltd, SCK Fuel Distributors CC;
  - Lake Leases / Villa Fantasia;
  - Iprop;
  - Living Africa;
  - Solar Reserve;
  - Sasol;
  - Transnet; and
  - Eskom etc.
  - Non-government organisations (NGOs) and / or community representation include:
  - The Roodepoort Communities Against Mining Campaign (CAM) representing the Residential Areas of Roodepoort that includes Florida, Hamberg, Georginia South, Cresswell Park, Fleurhofdale, Fleurhof, Meadowlands, Soweto, Matholesville, Goudrand, Witpoortjie as well as the Roodepoort CBD and Commercial and Industrial areas next to the rights description. Including places of worship like mosques and churches as well as schools;
  - Federation for a Sustainable Environment (FSE); and
  - West Wits Community Forum.

Regulatory authorities:

- Department of Mineral Resources (DMR).
- Department of Water and Sanitation (DWS).
- Department of Agriculture, Forestry and Fisheries (DAFF).
- Department of Rural Development and Land Reform (DRDLR): Land Claims Commissioner.
- Department of Economic Development.
- Department of Roads and Transport (DRT).
- Gauteng Department of Agriculture and Rural Development (GDARD).
- South Africa Heritage Resource Agency (SAHRA).
- Provincial Heritage Resources Authority Gauteng (PHRAG).

Local authorities:

- City of Johannesburg Parks and Zoo.
- City of Johannesburg Human Settlements, Health, Land Use Planning and City Transformation.
- City of Johannesburg Health Department.
- City of Johannesburg Metropolitan Municipality.
- Roodepoort Magisterial District Municipality; and
- relevant ward councillors.

Parastatals:

- Eskom; and
- Rand Water.

The I&AP database for the project is included in Appendix B. The database is updated on an on-going basis throughout the EIA process.

6.2.1 PUBLIC PARTICIPATION PROCESS UNDERTAKEN DURING SCOPING

The objective of the scoping public participation process was to notify I&APs about the proposed project and EIA process, provide a reasonable opportunity to register on the project database and to provide comments. Steps undertaken during the Scoping Phase are described in Table 6-1 below. Supporting documentation is included in Appendix B.

TABLE 6-1: PUBLIC PARTICIPATION PROCESS UNDERTAKEN DURING THE SCOPING PHASE

Task	Description	Date
Notification - regulatory authorities and IAPs		
Consultation with land claims commissioner	The land claims commissioner was consulted in order to verify if any land claims had been lodged on any of the proposed farms. Refer to Appendix B for a copy of the response received from the land claims commissioner.	May 2018
Landowner notification	The landowners as identified above were informed in writing.	August 2018
Distribution of the background information flyer	A background information flyer was compiled and distributed by email and hand-delivery to I&APs and authorities on the project's public involvement database. The purpose of the background information flyer was to inform I&APs and authorities about the proposed project, the environmental assessment process and means of providing input into the environmental assessment process. The flyer included images to assist with explaining the project.	August 2018

<table>
<tr><th>Task</th><th>Description</th><th>Date</th></tr>
<tr><td>Site notices</td><td>Site notices in a mixture of English, Afrikaans, Zulu and Sotho were placed at key conspicuous positions in and adjacent to the project area.</td><td>August 2018</td></tr>
<tr><td>Newspaper advertisements</td><td>Block advertisements were placed in the Daily Sun, Roodepoort Record, The Citizen, The Sowetan, Dobsonville Urban News and Government Gazette.</td><td>August 2018</td></tr>
<tr><td>Radio announcement</td><td>Radio announcements were made on Jozi FM.</td><td>August 2018</td></tr>
<tr><td colspan="3">Scoping stage meetings and comments received</td></tr>
<tr><td>Public open day sessions and focussed meetings</td><td>Public open day sessions and focussed group meetings were held as follows:
an open day session at the Bramfischerville Multi-Purpose Centre on 22 August 2018;
an open day session at the Roodepoort City Hall on 23 August 2018;
an open day session at Moses Kotane Primary School on 24 August 2018;
an open day session at Matholesville Hall on 25 August 2018;
an open day session at the AME Church Meadowlands on 29 August 2018;
a focussed meeting with the Lawyers of Human Rights representing CAM on December 2018;
a focussed meeting with the Ward 70 Councillor and committee members on 12 September 2018;
a focussed meeting with Rand Leases on 5 September and 6 November 2018;
a focussed meeting with CAM on 6 March 2019;
The purpose of the sessions were to:
provide I&APs with an opportunity to:
raise any issues and concerns (both positive or negative);
provide input on any environmental sensitivities and potential impacts;
record issues within the formal assessment process so that they can be addressed during the course of the EIA;
outline the way forward.</td><td>August 2018 to March 2019</td></tr>
<tr><td colspan="3">Review of Scoping Report</td></tr>
<tr><td>Public review of Scoping Report</td><td>Copies of the Scoping Report were made available for public review from 1 August to 3 September 2018. Copies of the report were made available on the SLR website and at the following public venues:
Roodepoort Civic Centre;
Witpoortjie Library;
Braamfischerville Multipurpose Centre;
Moses Kotane Primary School;
Solplaatjie Hall;
Meadowlands Library;
SLR's website www.slrconsulting.com.
SLR's offices in Johannesburg; and
electronically on a CD, on request.</td><td>Aug – Sept 2018</td></tr>
</table>

Task	Description	Date
	Summaries of the report were e-mailed to I&APs and authorities that are registered on the public involvement database. In addition, IAPs were notified when the draft Scoping Report was available for review via SMS.	
Authority review of Scoping Report	Copies of the Scoping Report were made available for regulatory authority review from 1 August to 3 September 2018.	Aug – Sept 2018
Comments received	Comments made during open day sessions and focused meetings, and written correspondence received from I&APs have been collated into an Issues and Concerns Table (see Appendix B).	On-going

6.2.2 PUBLIC PARTICIPATION PROCESS UNDERTAKEN DURING EIA PHASE

This EIA Report provides opportunity for I&APs to comment on the proposed project and findings of the EIA process. Steps being undertaken during the EIA Phase are summarised in Table 6-2 below.

TABLE 6-2: PUBLIC PARTICIPATION PROCESS DURING THE EIA PHASE

Task	Description	Date
Review of the EIA Report	The EIA Report **was** made available for a 30-day review and comment period from **20 May to 25 June 2019** (excluding public holidays). Copies of the report **were** made available on the SLR website and at the following public venues: • Roodepoort Civic Centre; • Witpoortjie Library; • Braamfischerville Multipurpose Centre; • Moses Kotane Primary School; • Solplaatjie Hall; • Meadowlands Library; and • SLR's offices in Johannesburg. Copies of the report **were** made available electronically on a CD, on request. Executive Summaries of the report **were** e-mailed to registered I&APs and authorities. In addition, I&APs were notified when the report was available for review via SMS. A notification advertisement **was** also placed in the Daily Sun, Roodepoort Record, The Citizen, The Sowetan, Dobsonville Urban News on 21/23/24 May 2019.	May to June 2019

Task	Description	Date
Focussed group EIA feedback meetings	**Focussed group EIA feedback meetings were held as follows:** • **a focus group meeting at the Dobsonville Community Centre with the Councillor of Ward 48 on 6 June 2019;** • **a focus group meeting at the Roodepoort City Hall with the Councillor of Ward 127 on 7 June 2019;** • **a focus group meeting at the Meadowlands Service Centre with the Councillors of Wards 41 and 43 on 10 June 2019;** • **a focus group meeting with Calgro M3 on 20 June 2019;** • **a focus group meeting at the Bramfischerville Multipurpose Centre with the Councillors of Wards 44, 49 and 128 on 21 June 2019;** • **a focus group meeting with the City of Joburg on 21 June 2019;** • **a focus group meeting with MaxamDantex on 26 June 2019;** • **The purpose of the meetings were to provide I&APs an opportunity to interact with the SLR and West Wits project team to provide comments on the outcome of the EIA process and related EIA Report.**	**June 2019**
Submission of EIA Report for decision-making	Following closure of the commenting period, all comments received **were** incorporated and responded to in an Issues and Concerns Table. Where required the EIA Report **has been** updated to address comments received. The table including I&AP comments **have been** submitted to the DMR for consideration and decision-making.	**July 2019**
I&AP notification of decision	After the DMR has reached a decision, registered I&APs will be notified of the outcome of the application, the reasons for the decision and details of the appeal process.	DMR decision: Expected to be within 107 calendar days from submission to DMR.

6.3 SUMMARY OF ISSUES RAISED BY I&APS

All views, issues and concerns raised throughout the EIA process have been captured into the Issues and Concerns report (see Appendix C). Full copies of the comments submitted are included in Appendix B. Broadly the key topics that were raised include the following:

- Vibration and blasting impacts due to underground mining;
- Health concerns as a result of impacts derived from a reduction in air quality, increased radiation levels and water pollution;
- Water and electricity supply;
- Impacts on third party infrastructure owners and property developers;
- Loss of terrestrial and aquatic biodiversity, including wetlands;
- Impact on the availability of clean water and impacts on downstream environments;
- Impact on properties directly and indirectly affected by mining (landowners, people living on the land, tenants);
- Traffic impacts and impacts to road infrastructure;
- Employment structures to be followed;
- Skills development.

6.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE PROJECT AND ALTERNATIVES

All project-related infrastructure and associated activities would be undertaken within the proposed West Wits mining right application area (project area). Environmental attributes within the project area have been altered by historic mining-related facilities and/ or activities.

For the purposes of providing context and background, this section provides baseline information on relevant environmental (geographical, physical, biological, social, economic, heritage and cultural) aspects associated with the proposed project and the project area. These environmental aspects provide the basis from which to understand potential impacts, including cumulative impacts, associated with the proposed project. Information in this chapter has been sourced from specialist studies undertaken as part of this EIA process (where applicable) and site visits by the SLR project team. Data collection methods are outlined in the specialist reports included as appendices to this report.

6.4.1 BASELINE ENVIRONMENT

6.4.1.1 Geology

The geology of a particular area can influence a number of aspects of the environment. Of relevance to the proposed project is the link to the presence and quality of groundwater and the movement of the groundwater in the rock strata as well as the potential for acid generation and/or leaching of parameters at concentrations higher than applicable water quality limits. A description of the geology in relation to these is provided below.

a. Regional geology

The dominant geological formations found within the project area are those of the Central Rand Group and the Klipriviersberg Group within the Witwatersrand Supergroup and the Ventersdorp Supergroup, respectively. These supergroups are dominated by quartzite, shale and the following mining target conglomerates; North Reef, Main Reef, Main Reef Leader, South Reef, Livingstone Reef, Bird Reef, Monarch Reefs, Kimberley Reefs and Ventersdorp Contact Reef. The Central Rand Group is divided into two sub-divisions; the older Johannesburg (containing the Main, Randfontein, Luipaardsvlei, Krugersdorp, and Booysens formations) and the younger Turffontein (containing the Kimberley, Elsburg and Mondeor formations) subgroups. The Venterspost formation of the Kliprivierberg Group contains the Ventersdorp Contact Reef. A depiction of the stratigraphy of the geology underlying the site is provided in Figure 6-1.

The Witwatersrand Supergroup stretches through the North West, Gauteng and the Free State Provinces. It has a geological time which ranges in age from 2.7 Ga to 2.4 Ga and coincides with the emplacement of Vredefort Dome of (2.023 Ga) and the Bushveld Igneous Complex. The gold ore within the Witwatersrand Supergroup occurs in reefs, or thin bands between 20 to 540 m in thickness that are mined at depths down to 4 000 m. Silver and iridium are recovered as gold-refining by-products.

b. Local geology

The northern perimeter of the project area follows the outcrop of the Johannesburg Subgroup which is overlain towards the south by strata of the Turffontein Subgroup. Volcanic rocks of the Ventersdorp Supergroup outcrop in the southwestern portion of the project area. A circular outcrop of Transvaal Supergroup sedimentary rocks is found in the central southern portion of the project area. These Transvaal

Supergroup rocks predominantly consist of dolomite, with the Black Reef present at its base (Figure 6-1 - *Dwyka Tillite v Karoo (Pd); Malmani dolomite (Vmd); Black Reef quartzite (Vbr); Ventersdorp andesite (Rk); Quartz Comglomerate and sandy shale (Rt); Shale (Rb); Quartzite and conglomerate (Rjo); Shale, Comglomerate and Quartzite (Rj)).*

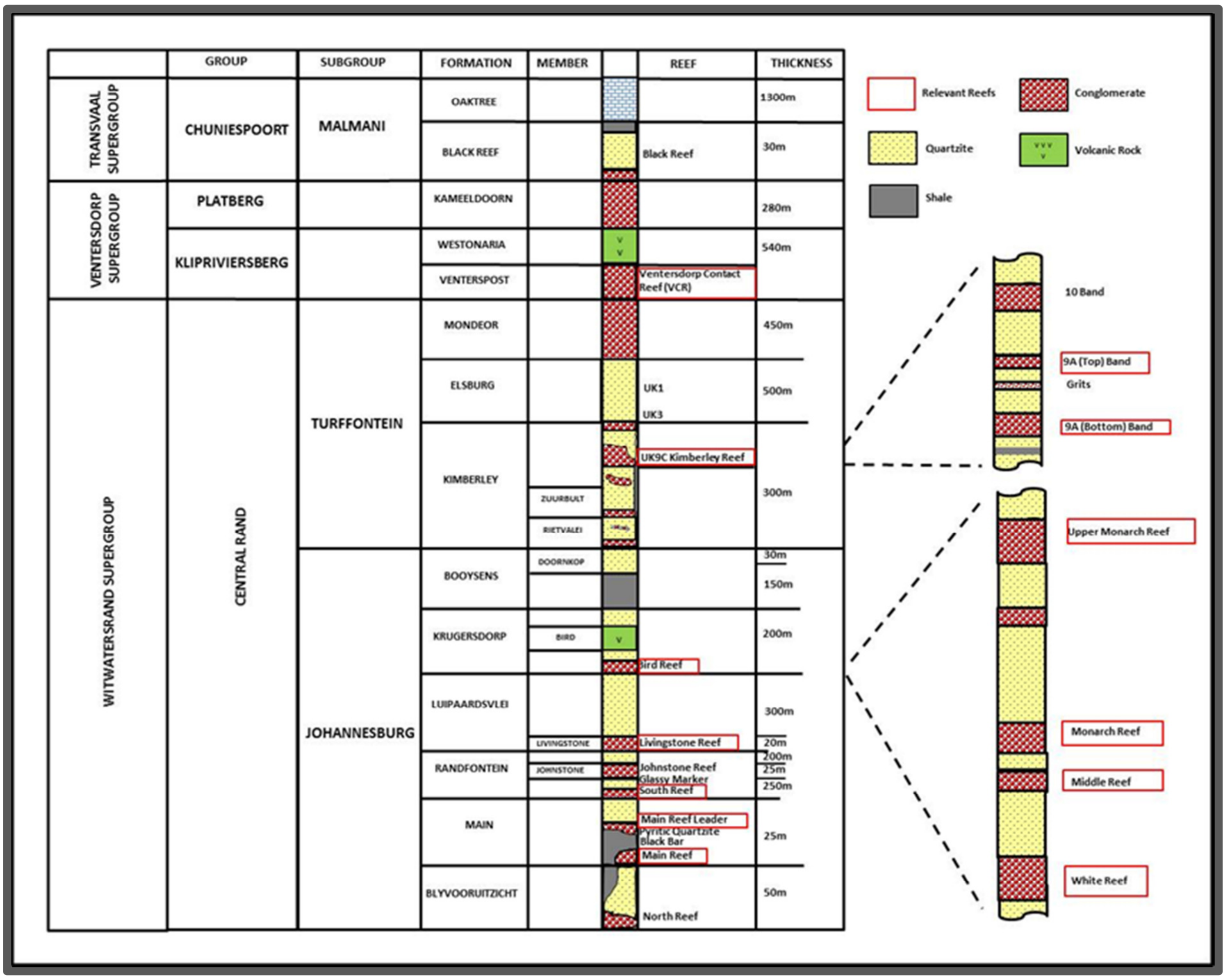


FIGURE 6-1: STRATIGRAPHIC COLUMN OF THE GEOLOGY OF THE MINING RIGHTS APPLICATION AREA

d. Geochemistry

Information in this section was sourced from the geochemical assessment conducted by GeoDyn Systems (GeoDyn) (refer to Appendix H). The assessment included:

- Waste classification of selected waste rock samples in terms of the Waste Classification and Management Regulations (Regulation 635 (R635) promulgated in terms of the National Environmental Management: Waste Act (Act 59 of 1009));
- Acid base accounting tests using selected waste rock samples to determine the potential for material to generate acid mine drainage;
- Leachate tests using selected waste rock samples to determine the parameters that may leach from the temporary WRDs and underground mine voids; and
- Geochemical modelling to quantify the risk of the formation of acid mine drainage conditions and/or the presence of elevated concentrations of metal(loid)s.

The tests followed prescribed methods as described in the geochemical report (refer to Appendix H). Five waste rock samples were collected for this study, which were composited into representative samples for each open pit, and subjected to laboratory analysis at an accredited laboratory.

The key findings of the geochemical assessment are as follows:

- Risk of acid mine drainage: The acid base accounting and geochemical modelling have indicated that due to the absence of iron sulphide minerals the risk of the development of acid mine drainage conditions in the waste rock environment is negligible;
- Potential for leaching of contaminants: The leach tests and geochemical model, which was developed to evaluate the leach tests, shows that the risk of leaching of contaminants from the waste rock is negligible. This includes the metalloid arsenic. This is also due to the absence of iron sulphide as well as the stability of the minerals comprising the waste rock. There is some risk that nitrate concentrations could be elevated due to blasting in the underground operations using ammonium nitrate-based explosives. The potential for elevated nitrate concentrations is not considered a post-closure problem, as the source of the nitrates would cease as soon as blasting ceases; and
- Waste classification: Based on the criteria specified in R635, the waste rock samples are classified as Type 3 due to some parameters exceeding the LCTO and LCT1 thresholds. In terms of the classification this type of waste requires a Type C engineered barrier system. However, Geodyn has recommended that the waste material class be reduced to Class D due to the stability of the waste rock material as well as the negligible risk of the formation of acid mine drainage conditions. A Class D barrier system (stripping topsoil and base preparation) is therefore considered appropriate for the temporary waste rock dumps for the proposed project.

6.4.1.2 Climate

Various aspects of climate influence the potential for environmental impacts and related project design. Of relevance to the proposed project are those aspects that influence air dispersion and related dust control, rehabilitation planning and surface water and groundwater management. An overview of climatic data used to inform the modelling and prediction of impacts, and planning of management measures is provided below. Detailed information is provided in the referenced specialist studies.

a. Regional climate

West Wits falls within the Highveld Climatic Zone. Of the mean annual precipitation, 85% falls during summer thunderstorms. The thunderstorms generally occur every three to four days in summer and are of short duration and high intensity. Temperatures in this climatic zone are generally mild, but low minima can be experienced in winter due to clear night skies. Frost characteristically occurs in the winter months (SLR, 2012).

b. Rainfall and evaporation

Rainfall for the site was considered from available South African Weather Services (SAWS) and Department of Water and Sanitation (DWS) stations. The data indicates a mean annual precipitation (MAP) of 683 mm (SLR, 2019b). Evaporation records show a mean annual evaporation of 1 266 mm (SLR, 2019b). Average evaporation figures exceed average rainfall figures by 584 mm.

c. Temperature

Minimum, maximum and average temperatures for West Wits, for the period 2015 to 2017 (using WRF meteorological data), indicate temperatures ranging from 2.7°C (in winter) to 32.9°C (in summer). Average temperatures were in the region of 18.0°C (Airshed, 2019a).

d. Wind and atmospheric stability

The vertical dispersion of pollution is largely a function of the wind field. The wind speed determines both the distance of downward transport and the rate of dilution of pollutants. The period wind field and diurnal variability in the wind field are shown in Figure 6-2 wind roses, while the seasonal variations are shown in Figure 6-3 wind roses. The wind roses comprise 16 spokes, which represent the directions from which winds blew during a specific period. The colours used in the wind roses below, reflect the different categories of wind speeds; the yellow area, for example, representing winds in between 4 and 5 m/s. The dotted circles provide information regarding the frequency of occurrence of wind speed and direction categories. The frequency with which calms occurred, i.e. periods during which the wind speed was below 1 m/s are also indicated.

The wind regime for the area is dominated by north-north-easterly flow fields. The northerly wind flow is more dominant during day-time conditions, with north-north-easterly wind flow more dominant during the night. Calm conditions occurred 2 % of the period (APP, 2019).

During the summer and spring months, wind from the north sector dominates, with stronger winds of more than 6 m/s occurring. Infrequent winds occur from the southern sector. During autumn, the winds increase in frequency from the southern sector. Winter months reflect an increase in flow from the south (APP, 2019).

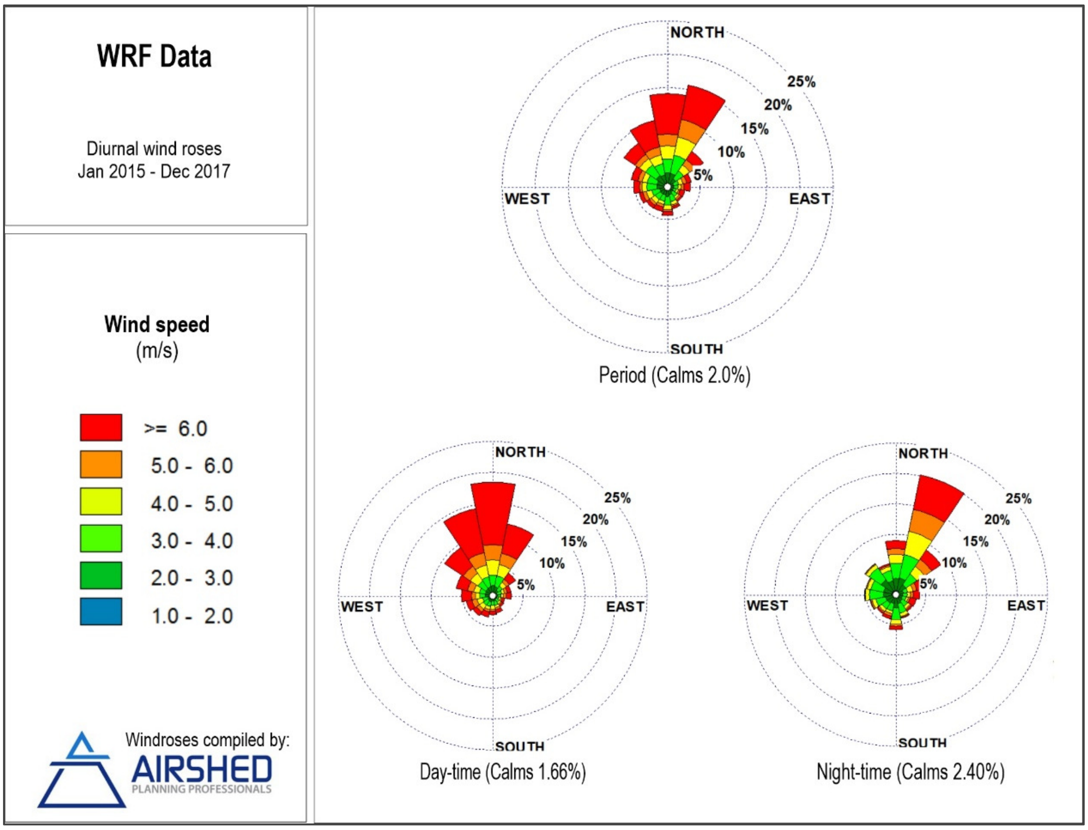


FIGURE 6-2: PERIOD, DAY-, AND NIGHT-TIME WIND ROSES (WRF DATA, JANUARY 2015 TO DECEMBER 2017) (APP, 2019)

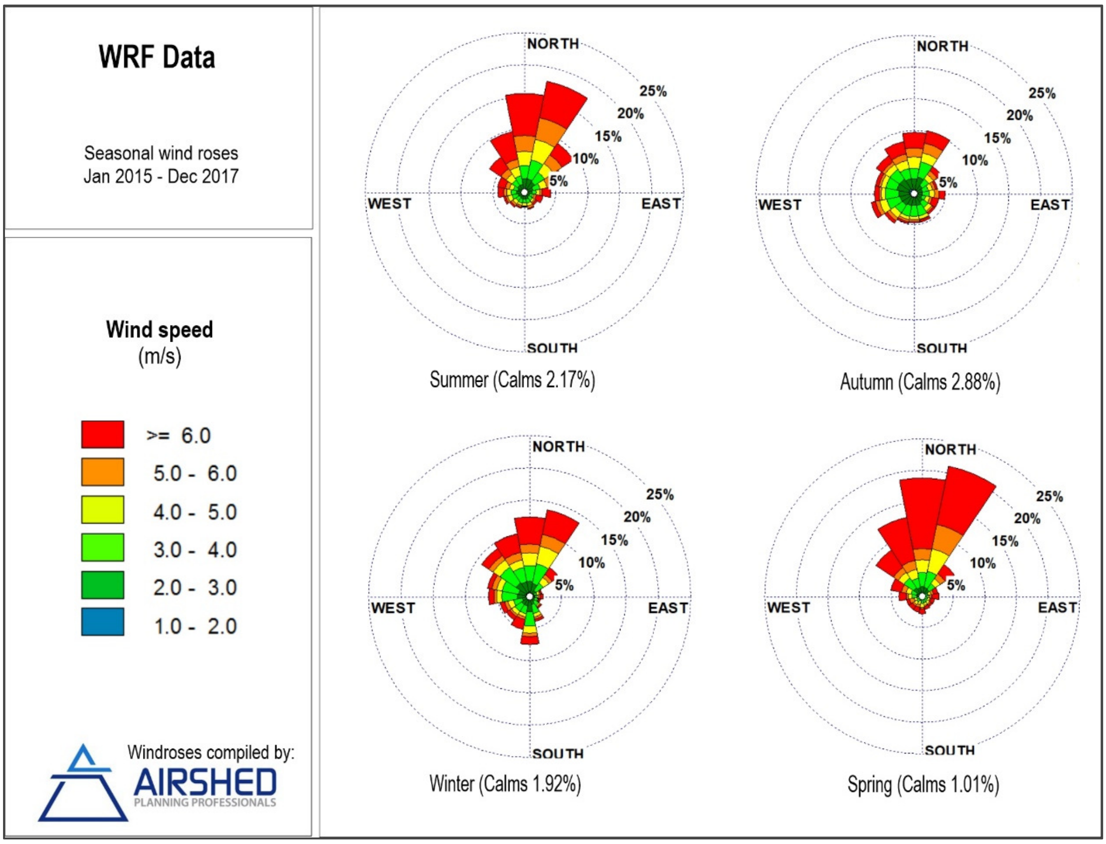


FIGURE 6-3: SEASONAL WIND ROSES (WRF DATA, JANUARY 2015 TO DECEMBER 2017) (APP, 2019)

The atmospheric boundary layer constitutes the first few hundred metres of the atmosphere. During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface. Night times are characterised by weak vertical mixing and the predominance of a stable layer. These conditions are normally associated with low wind speeds and less dilution potential. During windy and/or cloudy conditions, the atmosphere is normally neutral. For low level releases, the highest ground level concentrations would occur during weak wind speeds and stable (night-time) atmospheric conditions. Calm periods were however limited to 1 to 2 % as shown in the wind roses above.

6.4.1.3 Topography

The topography of a particular area determines a number of factors including the underlying geology, flow of surface water, and in many cases, also groundwater; the type of biodiversity and land use; the aesthetic appearance of the area and climatic factors such as wind speeds and direction.

The project area consists of plains with interspersed hills, with a dominant hill crest in the north where previous mining activities have impacted on the outcrop. The general elevation across the project area varies from 1 600 to 1 780 m above mean sea level (mamsl), with a generally slope to the south-west. Historical mining activities have altered the natural topography with the presence of various old slimes dams scattered throughout the project area.

The Klip River, a perennial watercourse flows from north to south along the western boundary of the proposed mining right application area. Six other drainage lines which are all tributaries of the Klip River flow through the site.

Historical and current mining activities and numerous tailings storage facilities have altered the local topography and natural drainage patterns. Project related activities are planned to take place within these altered landscapes.

6.4.1.4 Soils and land capability

Soils are a significant component of most ecosystems. As an ecological driver, soil is the medium in which most vegetation grows and a range of vertebrates and invertebrates exist. In the context of mining operations, soil is even more significant if one considers that mining is a temporary land use where after rehabilitation (using soil) is the key to re-establishing post closure land capability that will support post closure land uses.

Mining projects have the potential to damage soil resources through physical loss of soil and/or the contamination of soils, thereby impacting on the soils’ ability to sustain natural vegetation and altering land capability. Contamination of soils may in turn contribute to the contamination of surface and groundwater resources. Loss of the topsoil resource reduces chances of successful rehabilitation and restoration.

a. Dominant Soil Forms

The project area is dominated by anthrosols, which are soils that have been heavily modified due to long-term human activity, such as irrigation. Witbank/Industria/Johannesburg anthrosols make up approximately 56 % of the project area. This soil has a wildlife or wilderness land capability. Built-up areas occupy approximately 22 % of the project area and have non-arable soils. Mispah/ Glenrosa and Kroonstad/ Longland soils make up 16 % and 2 % of the project area respectively and are classified as arable. More detail is provided in Table 6-3 below, and the soils spatial distribution is shown in Figure 6-4.

TABLE 6-3: DOMINANT SOIL FORMS IN THE PROJECT AREA (SAS, 2019)

Soil form	Land capability	Total area (ha)	% of Project area
Witbank/Industria/Johannesburg (anthrosols)	Wildlife/wilderness (Class VIII)	1 198.2	56.32
Built-up areas (residential, industrial, commercial areas and access roads)	Non-arable	471.73	22.17
Artificial water features		5.40	0.25
Hutton/Clovelly	Arable (Class II)	39.79	1.87
Westleigh/Avalon	Arable (Class IV)	16.54	0.78
Kroonstad/Longlands	Grazing (Class V)	47.43	2.29
Mispah/Glenrosa		348.58	16.39
Total project area		**2 127.40**	**100**

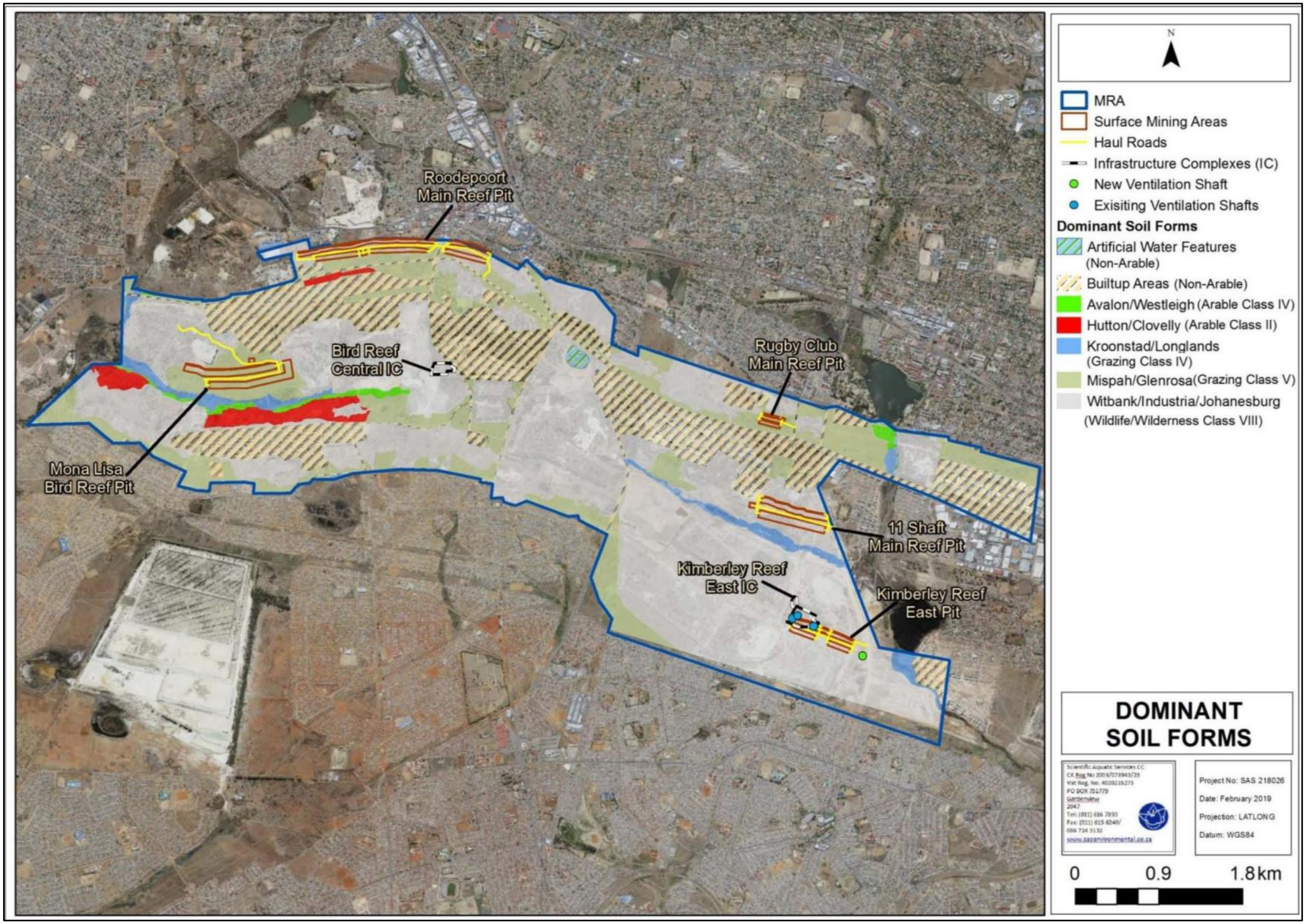


FIGURE 6-4: SPATIAL DISTRIBUTION OF DOMINANT SOIL FORMS IN THE PROJECT AREA (SAS, 2019)

b. Soil chemical characteristics

The following main conclusions can be drawn regarding the soils in the project area (SAS, 2019):

- pH: The majority of the soil samples have a low pH, with acidic soils noted particularly in close proximity to an old tailings facility within the Vogelstuisfontein area. The acidity of these soils can likely be attributed to the historical mining activities occurring within the surrounding areas. Low pH soils have low agricultural value, this is due to a release of aluminium that can stunt a plant's growth and alter nutrient intake. Some plants may also suffer with manganese and iron toxicity that causes yellow spots and leads to browning and leaf death;
- Electrical conductivity (EC**)** is a measure of the amount of soluble salts in the soil solution. There is no formally derived guideline value for EC, however the laboratory analysis indicates that the EC of some soils are contaminated to some degree;
- Cyanide contamination was not detected;
- Macronutrients: Selected essential macronutrients were analysed and most of the sampled soils show significantly high concentrations of calcium (Ca), magnesium (Mg), potassium (K) and sodium (NA). Excessive macronutrients will result in poor growth and development of plants. While there are no formally derived guideline values for essential macronutrients (Ca, Mg, Na, K) in soil, these elements are typically regulated by pH and their availability for plant uptake is generally enhanced under favourable pH conditions in the range of 5.5 – 7.0 in order to avoid plant nutrient deficiencies. The pH of soils in the project area are however outside of this range. The soil samples indicate a deficiency in phosphorus, which can delayed maturity in plants. The deficiency is likely to occur on lower pH soils, and tends to induce dispersion. This results in poor soil structure and soils which are more susceptible to erosion; and
- Micronutrients: Selected essential micronutrients were analysed, namely manganese (Mn), nickel (Ni), and copper (Cu). Low pH levels tend to increase the concentration of these elements and they become toxic to plants if there is an excess in the soil. The results indicate that the majority of the elements are available in excess, which can be attributed to low pH levels of the soils within the project area;
- Heavy metals such as Mn, Cu, Ni and iron (Fe) are essential elements with key roles in plant functions. These elements are required in relatively low concentrations for them to be useful to plants. However, the laboratory analysis indicates elevated concentrations of these elements in the soils. This likely creates toxic conditions in the soil, thus leading to the soils having low agricultural potential.

In summary, the project area is dominated by soils that have been heavily modified due to long-term human activity. Soils are generally not suitable for cultivation or grazing, and various additional factors such as effective rooting depth, anoxic conditions and lack of soil medium make the project area mostly unsuitable for agriculture. Soils have elevated concentrations of several heavy metals, macro and micronutrients and low pH which can likely be attributed to the historical mining activities occurring within the surrounding areas. The soils are additionally expected to be susceptible to erosion.

c. Land capability

The majority of soils in the project area are unsuitable for cultivation as shown in Table 6-3. Some soils are suitable for wildlife or wildness use, however this land use is not practical since the surrounding areas are largely urbanised. In addition, SAS notes several factors which make the project area unsuitable for agriculture (SAS, 2019):

- Shallow effective rooting depth due to shallow indurated bedrock of the Mispah, Glenrosa. As such, these soils are not considered to contribute significantly to agricultural productivity;
- Limited root growth as a result of anoxic conditions due to periodic waterlogging of the Kroonstad/Longlands soil forms associated with the watercourses; and
- Lack of soil medium for plants and crop growth as a result of historic mine infrastructure, residential, commercial and industrial areas, and anthrosols not suited for cultivation.

6.4.1.5 Biodiversity

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. Biodiversity and ecosystems influence soils, food and fuel supply, shelter and building materials, water, atmospheric gases, climate and weather, pests and diseases and genetic resources.

The establishment of infrastructure and mining activities have the potential to result in the loss of vegetation, habitat and related ecosystem functionality through physical disturbance and/or contamination of soil and/or water resources. As a baseline, this section provides an outline of habitat types occurring in the project area and the status of the habitats, highlights the occurrence of sensitive ecological environments including sensitive/ endangered species (if present) that require protection and/or additional management actions should they be disturbed.

a. Terrestrial Conservation Characteristics

STS has compiled a summary of the key conservation characteristics of the project area – refer to Table 6-4. Relevant mapping figures are provided in the biodiversity report (refer to Appendix F). The following main points can be summarised from this information (STS, 2019):

- The project area falls within the Grassland Biome and is situated within the Soweto Highveld Grassland, an endangered vegetation type;
- The Mona Liza Bird Reef Pit and the Rugby Club Main Reef Pit opencast and associated infrastructure areas fall within a Critical Biodiversity area (CBA);
- The 11 Shaft Main Reef Pit partly intersects an Ecological Support Area (ESA);
- The project area falls within ecosystems classified as Critically Endangered (CR) and Vulnerable (VU); and
- The project area and proposed infrastructure areas fall within areas of moderate, high and highest biodiversity importance.

This summary is drawn from databases and it was therefore important that fieldwork was conducted to determine the actual baseline conditions in the project area.

TABLE 6-4: DESKTOP TERRESTRIAL CONSERVATION CHARACTERISTICS FOR THE PROJECT AREA (QUARTER DEGREE SQUARE (QDS) 2627BB) (STS, 2019)

<table>
<tr><th colspan="3">DETAILS OF THE PROJECT AREA IN TERMS OF MUCINA & RUTHERFORD (2012)</th><th colspan="2">GAUTENG CONSERVATION PLAN (C-PLAN v3.3, 2011)</th></tr>
<tr><td>Biome</td><td colspan="2">According to Mucina and Rutherford (2012), the project area falls within two biomes. The project area is located in the Grassland Biome.</td><td rowspan="2">Critical Biodiversity Areas (CBAs)</td><td rowspan="2">The project area is located in, and surrounded by, numerous Critical Biodiversity Areas (CBAs). None of the Infrastructure Complexes falls within a CBA. The Mona Liza Bird Reef Pit and the Rugby Club Main Reef Pit opencast and associated infrastructure areas fall within a CBA.
CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an areas' biodiversity characteristics, spatial configuration and requirement for meeting both biodiversity pattern and ecological process targets.</td></tr>
<tr><td>Bioregion</td><td colspan="2">The project area lies within the Grassland Biome is located within the Mesic Highveld Grassland Bioregion.</td></tr>
<tr><td>Vegetation Type</td><td colspan="2">The project area lies within the Grassland Biome is situated within the Soweto Highveld Grassland.</td><td>Ecological Support Areas (ESA)</td><td>The project area is located in and surrounded by, numerous Ecological Support Areas (ESAs. None of the Infrastructure Complexes is located within an ESA. The 11 Shaft Main Reef Pit partly intersects an ESA.
ESAs are natural, near-natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support CBAs and/or Protected Areas.</td></tr>
<tr><th colspan="5">DESCRIPTION OF THE VEGETATION TYPE(S) RELEVANT TO THE PROJECT AREA (MUCINA & RUTHERFORD 2012)</th></tr>
<tr><td>Vegetation Type</td><td colspan="4">Soweto Highveld Grassland (Gm 8)</td></tr>
<tr><td rowspan="6">Climate Information</td><td colspan="4">Summer-rainfall region</td></tr>
<tr><td>MAP* (mm)</td><td>662</td><td rowspan="5">Distribution</td><td rowspan="5">Mpumalanga, Gauteng (and to a very small extent also in neighbouring Free State and North-West) Provinces</td></tr>
<tr><td>MAT* (°C)</td><td>14.8</td></tr>
<tr><td>MFD* (Days)</td><td>41</td></tr>
<tr><td>MAPE* (mm)</td><td>2060</td></tr>
<tr><td>MASMS* (%)</td><td>75</td></tr>
<tr><td>Altitude (m)</td><td colspan="4">1 420–1 760 m</td></tr>
<tr><td>Geology, Soils & Hydrology</td><td colspan="4">Shale, sandstone or mudstone of the Madzaringwe Formation (Karoo Supergroup) or the intrusive Karoo Suite dolerites which feature prominently in the area. In the south, the Volksrust Formation (Karoo Supergroup) is found, and in the west, the rocks of the older Transvaal, Ventersdorp and Witwatersrand Supergroups are most significant. Soils are deep, reddish on flat plains and are typically Ea, Ba and Bb land types.</td></tr>
<tr><td>Conservation</td><td colspan="4">Endangered. Target 24%. Only a handful of patches statutorily conserved (Waldrift, Krugersdorp, Leeuwkuil, Suikerbosrand, and Rolfe's Pan Nature Reserves) or privately conserved (Johanna Jacobs, Tweefontein, Gert Jacobs, Nikolaas and Avalon Nature Reserves, Heidelberg Natural Heritage Site).</td></tr>
</table>

Vegetation & landscape features	Gently to moderately undulating landscape on the Highveld plateau supporting short to medium-high, dense, tufted grassland dominated almost entirely by *Themeda triandra* and accompanied by a variety of other grasses such as *Elionurus muticus, Eragrostis racemosa, Heteropogon contortus* and *Tristachya leucothrix*. In places not disturbed, only scattered small wetlands, narrow stream alluvia, pans and occasional ridges or rocky outcrops interrupt the continuous grassland cover.
CONSERVATION DETAILS PERTAINING TO THE PROJECT AREA (VARIOUS DATABASES)	
NBA (2011)	The entire portion of the project area falls within an area that is currently **not protected.**
National Threatened Ecosystems (2011)	The project area mainly falls within ecosystems classified as Critically Endangered (CR) and Vulnerable (VU) **.** More specifically, the Mona Lisa Bird Reef Pit completely falls within a CR area. The remainder of 11 Shaft Main Reef Pit partly intersects a small part of a CR ecosystem on its eastern side with the majority of the western side falling within a VU area. Additionally, the Rugby Club Main Reef Pit and the Kimberley Reef East Pit are situated within VU ecosystem. Of the Infrastructure Complexes, the Bird Reef Central Infrastructure complex and the Kimberley Reef East Infrastructure complex falls within VU ecosystems. Areas within CR and VU ecosystems fall within the endangered Soweto Highveld Grassland vegetation and has been identified in the Gauteng C-Plan as Critical Biodiversity Areas and Ecological Support Areas. These areas have not been afforded any protection (NBA, 2011) and this adds to their threat status.
SACAD (2017)	The project area does not fall within a Conservation Area (CA). The Magaliesberg Biosphere Reserve is approximately 10km north-west of the project area**.**
SAPAD (2017)	The project area does not fall within a Nature Reserve (NR); however, it is located ± 8 km west of the Melville Koppies NR and ± 9.6 km north-west of the Olifantsvlei NR. No other Protected Area is within 10 km of the project area.
NPAES	The project area does not fall within a formally protected area; however, several formally protected reserves are within 10 km of the project area. This includes Walter Sisulu National Botanical Garden (± 6.1 km north), Ruimsig Municipal Nature Reserve (± 8.5 km north), Kloofendal Municipal Nature Reserve (± 2.5 km north) and Melville Koppies Municipal Nature Reserve (± 8 km west).
IBA (2015)	The project area does not fall within an Important Bird Area (IBA); however, the Magaliesberg IBA is approximately 10 km to the north of the project area**.**
IMPORTANCE OF THE PROJECT AREA ACCORDING TO THE MINING AND BIODIVERSITY GUIDELINES (2013)	
Moderate Biodiversity Importance	The central parts of the project area fall within areas of Moderate Biodiversity Importance. The project area is also surrounded by areas of Moderate Biodiversity Importance. The 11 Shaft Main Reef Pit, Kimberley Reef East Pit and the Kimberley Reef East Infrastructure complex are situated within areas of Moderate Biodiversity Importance. **Biodiversity priority areas:** Ecological support areas, vulnerable ecosystems, MRAs for protected area expansion (land-based and offshore protection). **Risk for mining:** Moderate risk for mining. **Implications for mining:** These areas are of moderate biodiversity value. EIAs and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, identifying features (e.g. threatened species) not included in the existing datasets, and on providing site-specific information to guide the application of the mitigation hierarchy. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.
High Biodiversity Importance	The northern-most portion of the project area overlaps with a larger area of High Biodiversity Importance. The Bird Reef Central infrastructure complex and the Roodepoort Main Reef Pit falls within areas of High Biodiversity Importance. **Biodiversity priority areas:** Protected area buffers (including buffers around National Parks, World Heritage Sites* and Nature Reserves), Transfrontier Conservation Areas (remaining areas outside of formally proclaimed protected areas), other identified priorities from provincial spatial biodiversity plans, high water yield areas, Coastal Protection Zone, Estuarine functional zone.

	Risk for mining: High risk to mining **Implications for mining:** These areas are important for conserving biodiversity, for supporting or buffering other biodiversity priority areas, for maintaining important ecosystem services for particular communities or the country as a whole. An environmental impact assessment should include an assessment of optimum, sustainable land use for a particular area and will determine the significance of the impact on biodiversity. Mining options may be limited in these areas, and red flags for mining projects are possible. Authorisations may set limits and specify biodiversity offsets that would be written into licence agreements and/or authorisations.
Highest Biodiversity Importance	The Rugby Club Main Reef Pit, a small part on the eastern side of the 11 Shaft Main Reef Pit, and the entire Mona Lisa Bird Reef Pit are located within areas of Highest Biodiversity Importance. **Biodiversity priority areas:** Critically endangered and endangered ecosystems, Critical Biodiversity Areas (or equivalent areas) from provincial spatial biodiversity plans, River and wetland Freshwater Ecosystem Priority Areas (FEPAs), and a **1km buffer** around these FEPAs, Ramsar Sites. **Risk for mining:** Highest risk for mining. **Implications for mining:** Environmental screening, EIA's and their associated specialist studies should focus on confirming the presence and significance of these biodiversity features, and to provide a site-specific basis on which to apply the mitigation hierarchy to inform regulatory decision making for mining, water use licences, and environmental authorisations. If they are confirmed, the likelihood of a fatal flaw for new mining projects is very high because of the significance of the biodiversity features in these areas and the associated ecosystem services. These areas are viewed as necessary to ensure the protection of biodiversity, environmental sustainability, and human well-being.

CBA = Critical Biodiversirty Areas; ESA = Ecological Support Area; IBA = Important Bird and Biodiversity Areas; MAP – Mean annual precipitation; MAT – Mean annual temperature; MAPE – Mean annual potential evaporation; MFD = Mean frost days; MASMS – Mean annual soil moisture stress (% of days when evaporative demand was more than double the soil moisture supply); NBA = National Biodiversity Assessment; NPAES = National Protected Areas Expansion Strategy; SACAD = South African Conservation Areas Database; SAPAD = South African Protected Areas Database.

b. Habitat Units

Four habitat units have been determined to occur in the project area (STS, 2019) as described in Table 6-5 below and shown in Figure 6-5. All of these habitat units have been impacted to varying degrees by historic and current anthropogenic activities.

TABLE 6-5: HABITAT UNITS IN THE PROJECT AREA (STS, 2019)

Habitat unit	Description
Secondary Grassland	Small pockets of modified grassland. Dominated by alien and invasive plant species as a result of historic and current anthropogenic activities including edge effects from the surrounding residential developments, illegal dumping and ongoing illegal mining activities. Low fauna and flora habitat provision capability. Low diversity and abundance of faunal species of conservation concern.
Degraded Grassland	Significantly modified ecological condition. High abundance of alien and invasive flora species such as *Tagetes minuta*, *Eucalyptus camaldulensis*, *Acacia mearnsii* and *Melia azedarach*. Habitat suitability for faunal and floral species has been significantly compromised and reduced, notably for species of conservation concern.
Freshwater features	Several watercourses and wetland have been identified within the project area: • A Channelled Valley Bottom Wetland feature (CVB2) lies approximately 200 m from the proposed Mona Lisa Brid Reef Pit. This wetland is dominated by reed species (*Phragmites australis* and *Typha capensis*). The excessive sediment substrate allowed for the invasion of a monoculture of *Phragmites australis*, dominating the largest extents of the wetland, reduces the available substrate for other indigenous species to establish. Due to this monoculture, floral biodiversity is low, but the wetland still has the potential to provide habitat for faunal species. The proliferation of alien and invasive floral species was also noted at the outer edges of the wetland and where infrastructure (i.e. road crossings) have been constructed. • A Channelled Valley Bottom Wetland feature (CVB3) lies approximately 50 m from the proposed 11 Shaft Main Reef Pit. This wetland features also extend approximately 400 m east of the Kimberley Reef East Pit and Kimberley Reef East IC. This wetland feature drains from the Florida Dam downstream into the Fleurhof Dam. A large degree of vegetation removal has occurred within and along this wetland system due to the development of road infrastructure and residential development. Even though the permanent zone of the wetland could be considered well vegetated, the outer edges of the wetland have very little to no indigenous vegetation remaining, and thus no suitable buffer zone to aid in protecting the wetland from the surrounding activities. The western portion of this wetland system was however dominated by reed species (*Phragmites australis* and *Typha capensis*), which provides habitat and refugia for some less sensitive avifaunal and smaller faunal species. • The Klip River is located on the western boundary of the project

Habitat unit	Description
	area. The watercourses within the project area have all been impacted upon to some degree, due to historical and ongoing surrounding agricultural and mining activities.
Transformed habitat	Associated with previous and current mining infrastructure such as slimes dams, derelict / abandoned buildings and water dams. The floral diversity and habitat suitability for species of conservation concern has been significantly modified, with a high abundance of alien and invasive flora species such as *Tagetes minuta*, *Eucalyptus camaldulensis*, *Acacia mearnsii* and *Melia azedarach*.
Built-up areas	Areas have been completely cleared of natural vegetation and replaced with urban residential dwellings, recreational areas, industrial areas and manufacturing and distribution facilities. Vegetation associated with this habitat unit includes garden ornamentals and landscape vegetation. None of the mining infrastructures, or operations is located within this habitat unit.

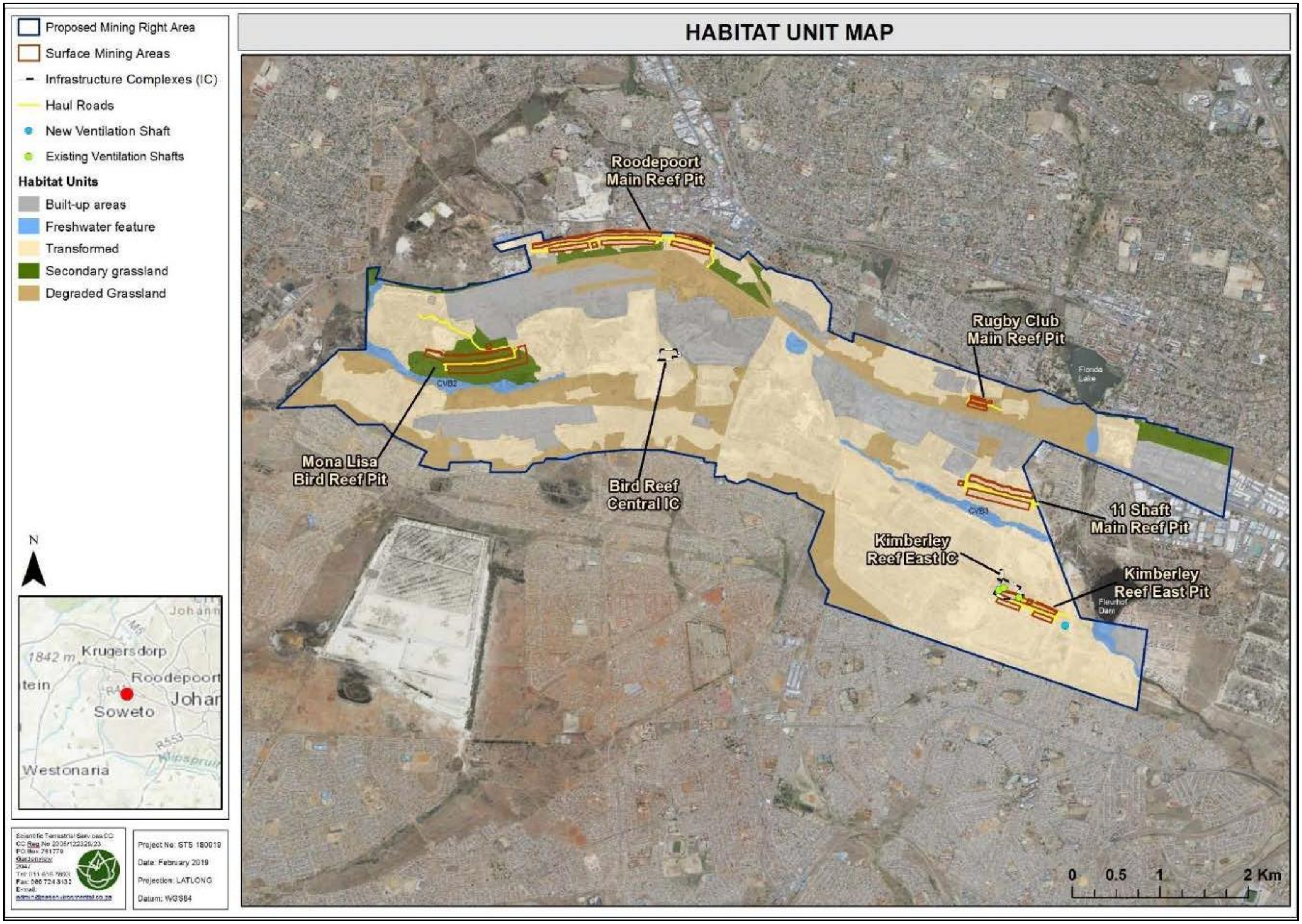


FIGURE 6-5: CONCEPTUAL ILLUSTRATION OF THE HABITAT UNITS WITHIN THE PROJECT AREA (STS, 2019)

c. Aquatic Ecosystem Characterisation

SAS has compiled a summary of the key conservation characteristics of the project area – refer to Table 6-6. Relevant mapping figures are provided in the freshwater assessment report (refer to Appendix F). The following main points can be summarised from this information (SAS, 2019):

- The Klip River has been determined to be seriously to critically modified;
- Several wetlands (natural and artificial) occur in the project area and are considered moderately modified to critically modified;
- The project area is located in the Mesic Highveld Grassland Group 3 wetland vegetation type, which is classified as Critically endangered;
- The most proximal sub-quaternary catchment is C22A-01315 and has a present ecological status (PES) of E (significantly modified), moderate ecological importance and moderate ecological sensitivity; and
- There are several buffers associated with the wetlands and rivers in the project area.

SAS identified several watercourses during the field assessment. These watercourses, which include wetlands, are described in Table 6-7 and shown in relation to proposed infrastructure in Figure 6-6. Table 6-7 furthermore describes any mine infrastructure to be located within 500 m of these watercourses.

The watercourses which lie within 500 m of proposed infrastructure were assessed in detail during the field assessments. The results of the field assessments are summarised in Table 6-8. These results show that the watercourses have all been impacted upon to varying degrees by the historical and current surrounding agricultural, urbanisation and mining activities.

There are buffer zones enforced by GN 509 of 2016 which apply to the watercourses in the project area:

- A 500 m buffer zone applies to all wetlands; and
- A 100 m buffer zone of the 1:100 year floodline, whichever is greatest, applies to the Klip River.

The GDARD also applies buffer zones in terms of the Minimum Requirements for Biodiversity Assessments (2014), however, these buffer zones are smaller than those imposed by GN 507, being 30 m for wetlands and 32 m for rivers. These buffer zones must be considered with regard to the proposed infrastructure layout.

The proposed mining activities situated further than 500 m of a watercourse are considered to have a negligible impact on those watercourses due to the topography and the existing developments within the project area, and have therefore not been further assessed by SAS.

TABLE 6-6: DESKTOP FRESHWATER RESOURCES CHARACTERISTICS FOR THE PROJECT AREA (ADAPTED FROM SAS, 2019B)

AQUATIC ECOREGION AND SUB-REGIONS IN WHICH THE PROJECT AREA IS LOCATED			
Ecoregion	Highveld		
Catchment	Vaal		
Quaternary Catchment	C22A		
WMA	Upper Vaal		
subWMA	Downstream Vaal Dam		
DOMINANT CHARACTERISTICS OF THE HIGHVELD ECOREGION LEVEL 2 (11.01) (KLEYNHANS *et al.*, 2007)			
Ecoregion	Highveld (11.01)	Rainfall concentration index	55 to 64
Dominant primary terrain morphology	Plains: Low relief, plains	Rainfall seasonality	Early to mid-summer
Dominant primary vegetation types	Rocky Highveld Grassland, Mixed Bushveld	Mean annual temp. (°C)	14 to 18
Altitude (m a.m.s.l)	1300 to 1900	Winter temperature (July)	0 to 20
MAP (mm)	500 to 700	Summer temperature (Feb)	12 to 30
Coefficient of Variation (% of MAP)	20 to 34	Median annual simulated runoff (mm)	20 to 60

DETAIL OF THE PROJECT AREA IN TERMS OF THE NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREA (NFEPA) (2011) DATABASE	
FEPACODE	The project area is located within a subWMA not considered important in terms of River or Fish conservation (FEPACODE = 0)
NFEPA Wetlands	According to the NFEPA database, a natural wetland flat is located within the project area which is moderately modified (WETCON = C). Several seep wetlands are located within the project area, these are considered to be heavily to critically modified (WETCON: Z1 and Z3). Two depression wetlands are located within the south western portion of the investigation area, which is considered to be modified (WETCON: Z1).
Wetland vegetation Type	The project area is located within the Mesic Highveld Grassland Group 3 wetland vegetation type, which is classified as Critically Endangered (SANBI, 2012; Mbona *et al*, 2014). These are sensitive vegetation types that have been afforded hardly any to no protection, thus, this could lead to limitations on the potential for mining activities to be authorised and/or biodiversity offsets may need to be specified.
NFEPA Rivers	According to the NFEPA database the Klip River is located on the western boundary of the project area. This river is in a seriously modified to critically/extremely modified (RIVCON = EF) ecological condition. The DWS PES 1999 data indicate this river to be in a seriously modified to critically/extremely modified condition (PES 1999 Class E - F).

ECOLOGICAL STATUS OF THE MOST PROXIMAL SUB-QUATERNARY REACH (DWS, 2014)	
Sub-quaternary reach	C22A-01315 (Klip)
Assessed by expert?	Yes
PES Category Median	E: Loss of natural habitat, biota and basic ecosystem functions is extensive. Modifications to the aquatic ecology are generally-too-frequently present where, for most categories, only small areas are not yet affected.

GAUTENG CONSERVATION PLAN (C-Plan V3.3, 2011)	
Critical Biodiversity Areas (CBAs)	The project area is located in, and surrounded by, numerous Critical Biodiversity Areas (CBAs). None of the Infrastructure Complex areas are located within a CBA. The Mona Lisa Bird Reef Pit and the Rugby Club Main Reef Pit open cast areas fall within CBAs. CBAs include natural or near-natural terrestrial and aquatic features that were selected based on an areas' biodiversity characteristics, spatial configuration and requirement for meeting both biodiversity pattern and ecological process targets.
Ecological	The project area is located in, and surrounded by, numerous Ecological Support Areas (ESAs).

Mean Ecological Importance (EI) Class	Moderate. Ecological importance of aquatic fauna is high. Habitat diversity and integrity is perceived of low-moderate sensitivity, with migration links all of moderate sensitivity.
Mean Ecological Sensitivity (ES) Class	Moderate Ecological sensitivity of riparian/wetland fauna is moderate – very high; however, habitat and vegetation are of low sensitivity
Stream Order	1.0
Default Ecological Class (based on median PES and highest EI or ES mean)	C (Moderate)

Support Areas (ESAs)	None of the Infrastructure Areas are located within an ESA, however, the 11 Shaft Main Reef Pit partly intersects an ESA. ESAs are natural, near-natural, degraded or heavily modified areas required to be maintained in an ecologically functional state to support CBAs and/or Protected Areas.
Wetland and River Buffer	The GDARD C-Plan V3.3 (2011) indicates several non-perennial river buffers associated with the investigation area of the project area. This includes the Klip River buffer that traverses the western border of the project area with another river buffer located within the eastern portion of the investigation area. In addition, wetland buffers are indicated to be mainly located within the western portion of the project area and within the eastern portion of the investigation area. This includes the Klip River buffer that traverses the southwestern border of the project area and the Hugenote Spruit traversing the western border. Two dams are indicated to be associated with the project area, i.e. Florida Lake bordering the northern border of the project area and Fleurhof Dam falling within the eastern portion of the project area. Additionally, several pans, wetland and waterbody buffers are indicated within the project area.
Urban Edge and Gauteng Environmental Management Framework (2015)	Although rescinded as a policy document in the Gauteng Spatial Development Framework in 2011, the Urban Edge nevertheless remains a useful indicator of where concentration [of development] should occur. According to the Gauteng C-Plan (2011) and the Gauteng EMF (2015), the project area is located within the Urban Edge and the EMF Zone 1 (urban development zone) with some of the central areas of the project area considered EMF Zone 5 (industrial or large commercial focus zone).

CBA = Critical Biodiversity Area; DWS = Department of Water and Sanitation; EI = Ecological Importance; ES = Ecological Sensitivity; ESA = Ecological Support Area; m.a.m.s.l = Metres Above Mean Sea Level; MAP = Mean Annual Precipitation; NFEPA = National Freshwater Ecosystem Priority Areas; PES = Present Ecological State WMA = Water Management Area.

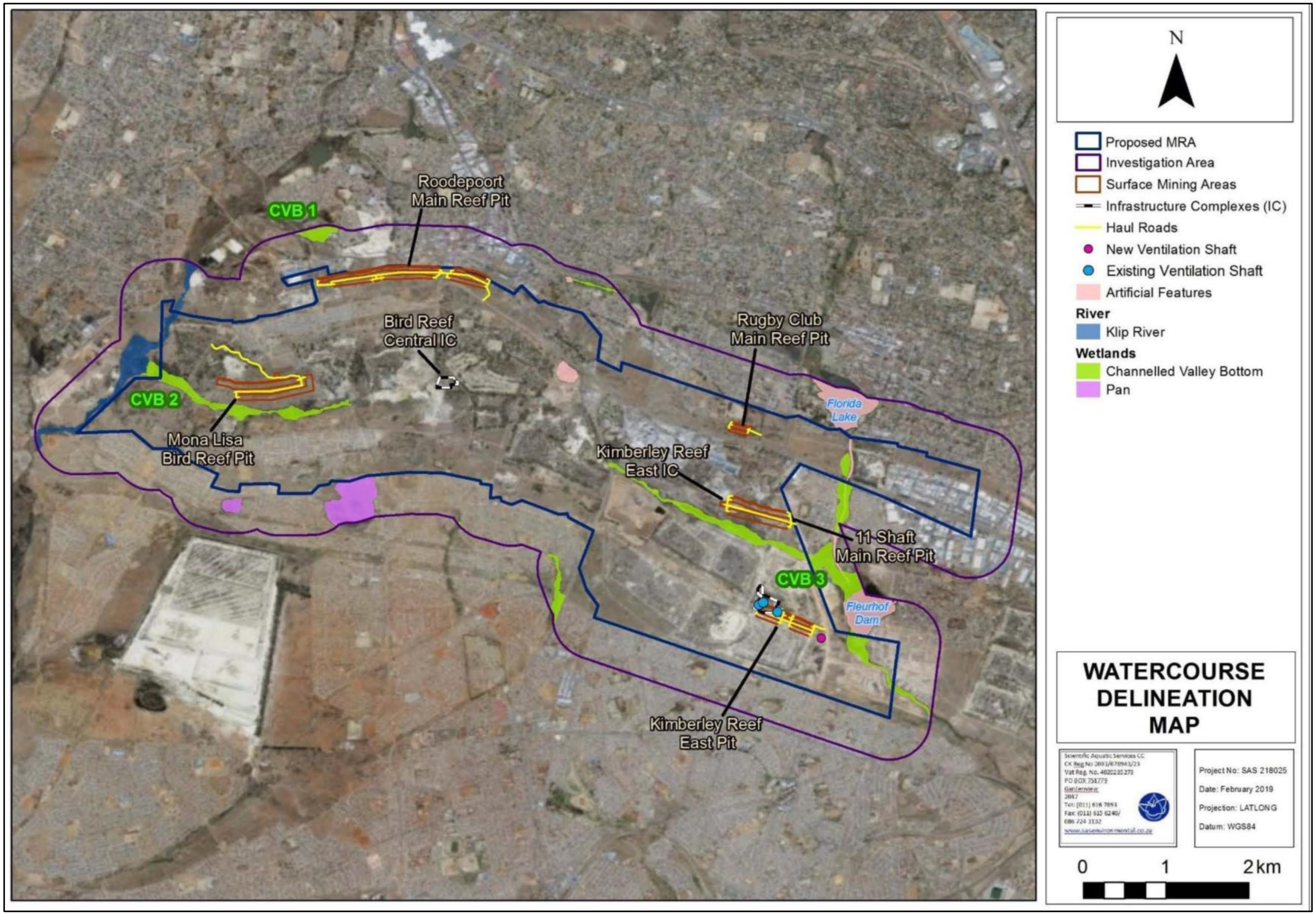


FIGURE 6-6: WATERCOURSES IDENTIFIED WITHIN THE PROJECT AREA SHOWN IN RELATION TO THE PROPOSED MINING INFRASTRUCTURE (SAS, 2019B)

TABLE 6-7: DESCRIPTION OF WATERCOURSES IDENTIFIED IN THE PROJECT AREA (SAS, 2019B)

Watercourse	Locality within the MRA		Proposed mining activity within 500m of the watercourse	General Characteristics
Klip River system	Located on the western boundary of the project area.		Mona Lisa Bird Reef Pit (Haul road associated with this open pit area is approximately 505 m east of the river, whilst all other activities are approximately 760 m east of the river).	This river flows in a north to south direction. It is surrounded by residential (formal and informal) developments and is traversed several times by road infrastructure.
Channelled Valley Bottom (CVB) Wetlands Group 1	CVB 1	Located within the north western portion of the investigation area, outside of the project area.	Roodepoort Main Reef Pit (The western portion of the open pit area and associated topsoil dump is approximately 415 m upgradient/south of this CVB)	These wetlands are mainly surrounded by residential (formal and informal) developments and are currently impacted by historical mining activities (i.e. receives seepage from tailing facilities upstream) and informal agricultural fields.
	CVB 2	Located within the western portion of the project area.	Mona Lisa Bird Reef Pit (The waste rock dump associated with this open pit area is located approximately 57 m and the open pit area approximately 214 m upgradient/north of this CVB)	
Channelled Valley Bottom (CVB) Wetlands Group 2	CVB 3	Located within the eastern portion of the project area and investigation area.	11 Shaft Main Reef Pit (The open pit area is located approximately 54 m north of the wetland) Kimberley Reef East Pit & Infrastructure Complex (IC) (A portion of the haul road, open pit area and the waste rock dump is located approximately 412 m west of the wetland. The IC is located approximately 780 m west of the wetland) Kimberley Reef (KR) new ventilation shaft (Located approximately 280 m west of the wetland)	This is a wetland system which drains from the Florida dam (located within the north-eastern portion of the investigation area) into the downstream Fleurhof Dam. The western portion of this wetland system is surrounded by historical mining activities, whilst the northern and southern portions are surrounded by urban built-up areas. Portions of this wetland system have been canalised as part of the stormwater management of the area.

TABLE 6-8: SUMMARY OF WATERCOURSE FIELD ASSESSMENTS (SAS, 2019B)

Watercourse	Locality within Project Area	Present Ecological Status (PES)		Ecoservices		Ecological Importance and Sensitivity (EIS)		Recommended Ecological Category (REC)	
Klip River	Located on the western boundary of the project area. The Mona Lisa Bird Reef Pit is approximately 760 m east of the river.	C/D (Moderate to Largely Modified)	Receives polluted waters from its catchment. Impacts have largely altered the hydrological regime of the river leading to the disturbance of the vegetation component and geomorphological integrity of the river.	Inter-mediate	Provides intermediate to moderately high level of regulating and supporting services (i.e. flood attenuation, streamflow regulation and the assimilation of nutrients and toxicants). Plays an important role in providing suitable areas for cultivation, but with the consequence being the removal of indigenous marginal vegetation along the river thus limiting its ability to provide faunal habitat.	B (High)	High EIS attributed to the CBA classification. Offers hydro-functionality as it is not very sensitive to any further changes in floods and/or water quality. However, it is the opinion of the ecologist that this river should rather be considered to fall within a moderate EIS category due to its overall degraded nature.	D (Largely Modified)	The proposed activities could contribute to the cumulative impacts of the historical mining activities impacting on the river, and potential edge effects could occur on this system. No further degradation should be permitted.
Channelled Valley Bottom wetland (CVB) 2	Located within the western portion of the project area. The Mona Lisa Bird Reef Pit is located approximately 57 m north of this CVB.	D (Largely Modified)	Modifications have primarily impacted on the hydrological regime and the vegetation component which include the proliferation of alien and indigenous invasive flora, and the removal of natural vegetation. The construction of instream dams, the influx of stormwater	Inter-mediate	Despite the wetland having an overall reduced ecological integrity, functioning remains at an intermediate level, particularly in terms of eco-services such as flood attenuation, streamflow regulation and cultivated foods (mainly because of the surrounding agricultural activities). The wetland is not considered important for	B (High)	The wetland is located within a CBA. The wetland is considered to be ecologically important and sensitive. Biodiversity may be sensitive to flow and habitat modifications. Considered to have high ecological importance based on the hydro-functional importance assessment	D (Largely Modified)	The wetland is of intermediate ecological importance. No further degradation should be permitted.

Watercourse	Locality within Project Area	Present Ecological Status (PES)		Ecoservices		Ecological Importance and Sensitivity (EIS)		Recommended Ecological Category (REC)	
			runoff and the surrounding mining activities (with specific mention of seepage from a tailings dam into this wetland) has significantly impacted the hydrological regime of these wetlands.		education and research, or tourism and recreation, mainly due to the disposal of litter and evidence of surface water discoloration (potentially from the surrounding mining activities). Nevertheless, the robust reed species provides habitat for less sensitive faunal species.		(i.e. flood attenuation and stream flow regulation) and not necessarily on ecological sensitivity.		
Channelled Valley Bottom wetland (CVB) 3	Located within the eastern portion of the project area and investigation area. The 11 Shaft Main Reef Pit is located approximately 54 m north of the wetland.	D (Largely Modified)	The surrounding activities have impacted the wetland and significantly altered the hydrological and vegetation components of the wetland system. The construction of instream dams within the upstream and downstream portions has impacted on the geomorphological and hydrological components of the wetland.	Moderately Low/ Inter-mediate	Plays an intermediate role in attenuating floods and regulating the flow of water, especially since high flood peaks are expected during high rainfall events. Most of the other direct benefits (such as biodiversity maintenance and tourism and recreational value) are considered moderately low, as the surrounding anthropogenic activities have degraded the overall wetland ecological state and thus is the wetland system not considered important for tourism (low scenic value) or for recreational activities.	B (High)	Considered of high ecological importance based on the hydro-functional importance assessment (i.e. flood attenuation and stream flow regulation) and not necessarily for its ecological sensitivity. Therefore, it is the opinion of the freshwater ecologist that this wetland should rather be considered to fall within an EIS C category (Moderate).	D (Largely Modified)	The wetland is considered to be of intermediate ecological importance in terms of its hydrological functioning. No further degradation should be permitted.

d. Fauna species found within the Project Area

Faunal diversity has been negatively affected within the project area as a result of anthropogenic activities that have transformed faunal habitat. A full list of species found is provided in the biodiversity report (refer to Appendix F). The species found during fieldwork are summarised as follows (STS, 2019).

- Mammals: Only signs (i.e. spoor and faeces) of common mammal species, e.g. *Cryptomys hottentotus* (Common Mole Rat) and *Canis mesomelas* (Black Backed Jackal) were observed during the field assessments. These species have the ability to adapt to areas that have been impacted by anthropogenic activities and urban encroachment. Common species found include domestic dogs, goats, cattle.
- Avifauna: avifaunal diversity was intermediate and comprised mainly of common species adapted to high levels of anthropogenic activities/change. Species include *Streptopelia capicola* (Cape Turtle Dove), *Ardea melanocephala* (Black-headed Heron) and *Ploceus velatus* (Southern Masked-weaver).
- Amphibians: No amphibians were observed during the field assessment. Availability of habitat and breeding areas within the Freshwater habitat unit and immediate surrounding area allows an inference of a higher amphibian diversity than that which was observed during the field assessment. Species likely to inhabitant these areas include *Cacosternum boettgeri* (Common Caco) and *Schismaderma carens* (Red Toad).
- Reptiles: A low reptile diversity was observed during the field assessment. However, this is likely due to the secretive nature of many reptile species. It is likely that the focus area will have a moderately low reptile diversity. Only common species, e.g. *Trachylepsis punctatissima* (Montane Speckled Skink) was observed during the summer and winter field assessments.
- Insecta: Overall, insect diversity is considered to be intermediate. This may be attributed to the anthropogenic activities within the focus area such as alien and invasive plant proliferation and uncontrolled veld fires. Only common insect species of the area were observed, with the highest invertebrate population density being present within the Secondary Grassland habitat unit.
- Arachnids: While very few arachnid species were observed, this is likely due to the secretive nature of many arachnid species. It is expected that the Secondary Grassland habitat unit is likely to be inhabited by a number of common arachnid species, such as *Olurunia ocellate* (Grass Funnel-web Spider).

e. Alien and invasive plant species found within the Project Area

Alien and invasive floral species are floral species that are of exotic origin and are invading previously pristine areas or ecological niches. Many alien species were identified during the field assessment, and a full list is provided in the biodiversity report (refer to Appendix F). This includes sixteen species listed as NEMBA Category 1b, three as NEMBA Category 2 and one as NEMBA Category 3. Most of the species identified comprised forbs and woody species, with some areas being more invaded than others, e.g. areas with higher disturbance have both a higher abundance and density of AIP (roadsides, Transformed habitat unit) (STS, 2019).

f. Medicinal plant species found within the Project Area

Medicinal plant species are not necessarily indigenous species, with many of them regarded as alien invasive weeds. Many medicinal species were identified during the field assessment, and a full list is provided in the biodiversity report (refer to Appendix F). The species found are common, widespread species and not confined to the project area; nor are they unique within the region. However, *Hypoxis hemerocallidea* and *Boophone disticha* are classified as Declining in the Gauteng Province, mainly due to the rapid urbanisation in Gauteng, which has caused a decline in available natural habitat. These species, if present, would need to be rescued and relocated to suitable habitat outside of the disturbance footprint area, which should be undertaken by a qualified specialist (STS, 2019).

g. Fauna and Flora Species of Conservation Concern

Threatened species are those species facing a high risk of extinction for various reasons such as habitat loss, unsustainable use and so forth. Any species which is classified by the IUCN as Critically Endangered (CR), Endangered (EN) or Vulnerable (VU) is considered to be a threatened species. In order to identify any faunal species of conservation concern, STS considered if suitable habitat is available to support any such species, conducted fieldwork and consulted the GDARD conservation lists and relevant databases.

No faunal species of conservation concern were identified during the field assessment. In addition, no faunal species of conservation concern are considered to have a probability of occurrence of 60 % or higher within the project area, due to the severe habitat transformation associated with the area.

STS however noted that *Atelerix frontalis* (Southern African Hedgehog) is listed as Protected (GDARD, 2014b) and as Near Threatened by the Red Data Book of the Mammals of South Africa (EWT, 2012). This species is likely to use the Freshwater habitat unit and surrounding grassland areas including Secondary Grassland that acts as a corridor linkage to more favourable habitat within the immediate surrounding areas (STS, 2019). Thus, habitat for this species still needs protection as it is facing increasing threats due to habitat degradation and collection for the illegal pet trade.

Floral Species of Conservation Concern (SCC) are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories Extinct in the Wild (EW), Regionally Extinct (RE), Near Threatened (NT), Critically Rare, Rare and Declining. In order to identify any floral species of conservation concern, STS considered if suitable habitat is available to support any such species, conducted fieldwork and consulted the South African National Botanical Institute (SANBI) PRECIS Red Data Listed plants and GDARD conservation lists. No floral species of conservation concern were identified during the field assessment. However, STS has determined that *Hypoxis hemerocallidea* (African star grass) (Declining) and *Boophone disticha* (tumbleweed) (Declining) have the highest probability of occurrence within the project area, but this is still below 60 %. This is attributed to the level of habitat transformation already associated with the project area and immediate surrounds.

h. Habitat sensitivity mapping

STS has developed a habitat sensitivity map for the project area based on (STS, 2019):

- Presence of or potential for floral and faunal species of conservation concern;
- Habitat integrity and current levels of disturbance;
- Threat status of the habitat type;
- Presence of unique landscapes; and
- Overall levels of biodiversity.

The sensitivity ratings are provided in Table 6-9, along with the conservation objectives and development implications. In this regard the Freshwater Features habitat unit has been assigned the highest sensitivity mapping, that of intermediate ecological sensitivity. The Secondary Grassland has a moderately low sensitivity, while the remaining habitat types are given a low sensitivity. Refer to Figure 6-7 for the sensitivity mapping.

TABLE 6-9: HABITAT SENSITIVITY AND CONSERVATION OBJECTIVES (STS, 2019)

Habitat Unit	Sensitivity	Conservation Objective	Development Implications
Freshwater features	Intermediate	Preserve and enhance biodiversity of the habitat unit and surrounds while optimising development potential.	This habitat unit is of intermediate ecological sensitivity, due to its function and ecological state. In this regard, maintaining migratory corridors and connectivity along the Freshwater system is deemed essential. Several watercourses were identified within the project area.
Secondary Grassland	Moderately Low	Optimise development potential while improving biodiversity integrity of surrounding natural habitat and managing edge effects.	The floral composition present within the focus areas are considered to be in a transition between a pioneer and sub-climax state as a result of anthropogenic activities which have contributed to alien and invasive plant proliferation. This habitat unit provides food resources to several faunal species. This results in a moderately low ecological importance and sensitivity for the Secondary Grassland Habitat Unit. Therefore, it is highly unlikely to support any floral species of conservation concern. The proposed mining activities are therefore likely to have moderately low to low impact significance on the habitat unit, given the degree of historical disturbances, leading to the current transformed ecological state. Care must be taken to limit edge effects on the surrounding natural areas.
Degraded Grassland Transformed Grassland Built-up areas	Low	Optimise development potential.	No faunal or floral species of conservation concern were found in these habitat units, as preferred habitat is not present. Taking into consideration the existing urban surroundings and edge effects thereof, and low diversity of indigenous floral species, proposed mining activities are therefore likely to have a low impact significance on the flora habitat.

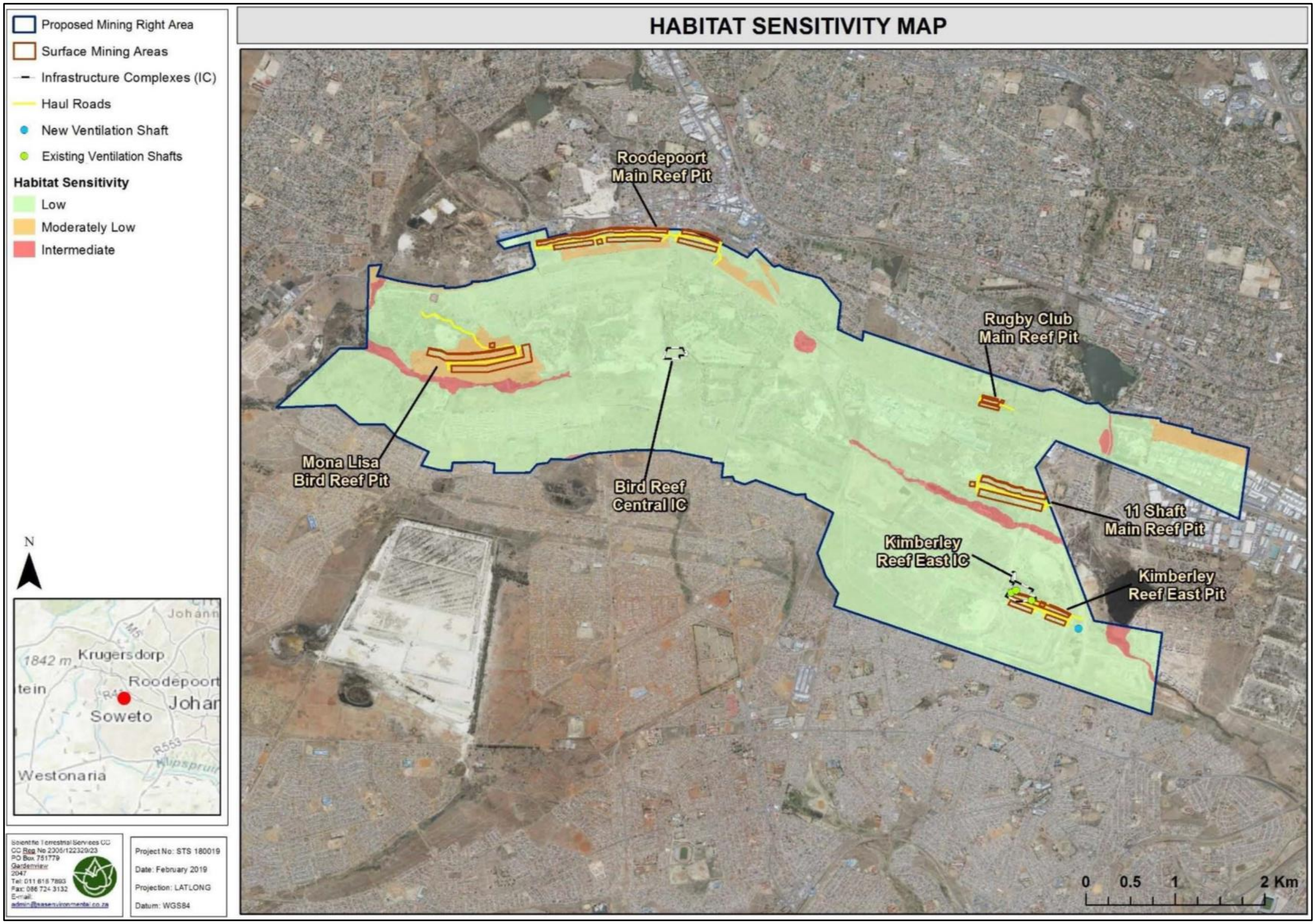


FIGURE 6-7: HABITAT SENSITIVITY MAP FOR THE PROJECT AREA (STS, 2019)

6.4.1.6 Surface water

Surface water resources include rivers, drainage lines, paths of preferential flow of stormwater runoff and dams. Mine related activities have the potential to alter the drainage of surface water through the establishment of infrastructure and/or result in the contamination of the surface water resources through seepage and/or spillage of process materials, non-mineralised (general and hazardous) and mineralised wastes.

a. Catchment

South Africa is divided into nine water management areas (WMAs), and each WMA is made up of several quaternary catchments which relate to the drainage regions of South Africa. The proposed project falls within the in the upper reaches of the Upper Vaal WMA 5, approximately 60 km downstream of the Vaal Barrage. All runoff from the project area ultimately drains westward into the Orange River.

The Upper Vaal WMA includes a number of large river systems covering a large catchment area. This WMA includes dams important for South Africa's water supply. These include the Vaal Dam, Grootdraai Dam and Sterkfontein Dam, all located upstream of the project area.

The project area falls entirely within the quaternary catchment C22A, which has a catchment area of 548 km^2 and a mean annual runoff of 28.06 million cubic meters (mcm), draining into the Klip River before the confluence with the Rietspruit River.

b. Local drainage

Three local catchments were delineated from drainage lines and surface topography labelled 1 – 3 in Figure 6-8. The contributing catchment of the Klip River (Catchment 1) is the largest with an area of 84.4 km^2 while catchment 2 has the smallest area of 6.7 km^2. Catchment 3 is in the north eastern end of the site boundary and has an area of 29.1 km^2 (SLR, 2019). Monthly flows have been estimated for the three identified catchments and shows that Catchment 3 has the lowest flow, which corresponds to the smaller catchment size. The estimated flows have been used in the stormwater management planning for the project area.

The Klip River is a perennial watercourse (WRC, 2012, cited in SLR, 2019) which originates approximately 4 km north of the proposed project area (refer to Figure 6-8). The river flows south along the western boundary of the project area. There are six drainage lines, all tributaries of the Klip River (D1 – D6) which all flow through the project area (refer to Figure 6-8) (SLR, 2019):

- The north eastern tributary (D1) of the Klip River flows through the site westwards, originating on the slopes of old tailing facilities. The D1 drainage line is overgrown with reeds and flows south of the Mona Lisa pit and north of the Kimberley West pit. Both of these pits are situated on the slopes and any drainage from these areas will flow into the river channel. A depression caused by past mining activities collects water in the upper reach of the catchment and any excess water from this depression will flow into a disturbed drainage channel. Eroded material from the old slimes dams flows into the drainage channel and is likely to impact upon the water quality of the receiving watercourse. Evidence of this can be seen in the discoloration of the water in the receiving watercourse.

  The D1 drainage channel is restricted and flows between two man-made dams, before the confluence with the Klip River in the west. The channel is highly disturbed and does not follow a natural channel path but rather flows through abandoned mine workings. The channel is non-perennial and flows are not expected during winter months.

FIGURE 6-8: LOCAL HYDROLOGY (SLR, 2019)

- D2 originates on the slopes and consists of seepage water from the slimes dam located upstream of the drainage tributary. D2 flows in a south westerly direction and will transport surface water into the Klip River at the most south western edge of the proposed mining right boundary.
- D3 and D4 form their own local catchment and originate in the centre of the proposed mining site, with very limited flow they drain south east through a rural area.
- D5 drains through a valley and passes over old slime dam deposits that are currently being reworked and moved. D5 then discharges into the Fleurhof Dam at the east end of the prospecting boundary. Drainage line D5 is considered non-perennial and did not flow during the site visit.
- D6 drains through the Florida Lake to the north of the proposed project area boundary and flows southwards carrying any surface water downstream into the Fleurhof Dam. The Fleurhof Dam was not overflowing, therefore no water was released downstream of the dam and surface water from the Fleurhof Dam will collect in the dam until the full capacity is reached before being discharged downstream.

Drainage lines D3 to D6 form part of the tributaries flowing into the Klip River that then drains south-east through quaternary catchment C22D until it joins with the Rietspruit River in quaternary catchment C22C. The mouth of the Klip River is at Vereeniging where it flows into the Vaal River, which is a tributary of the Orange River.

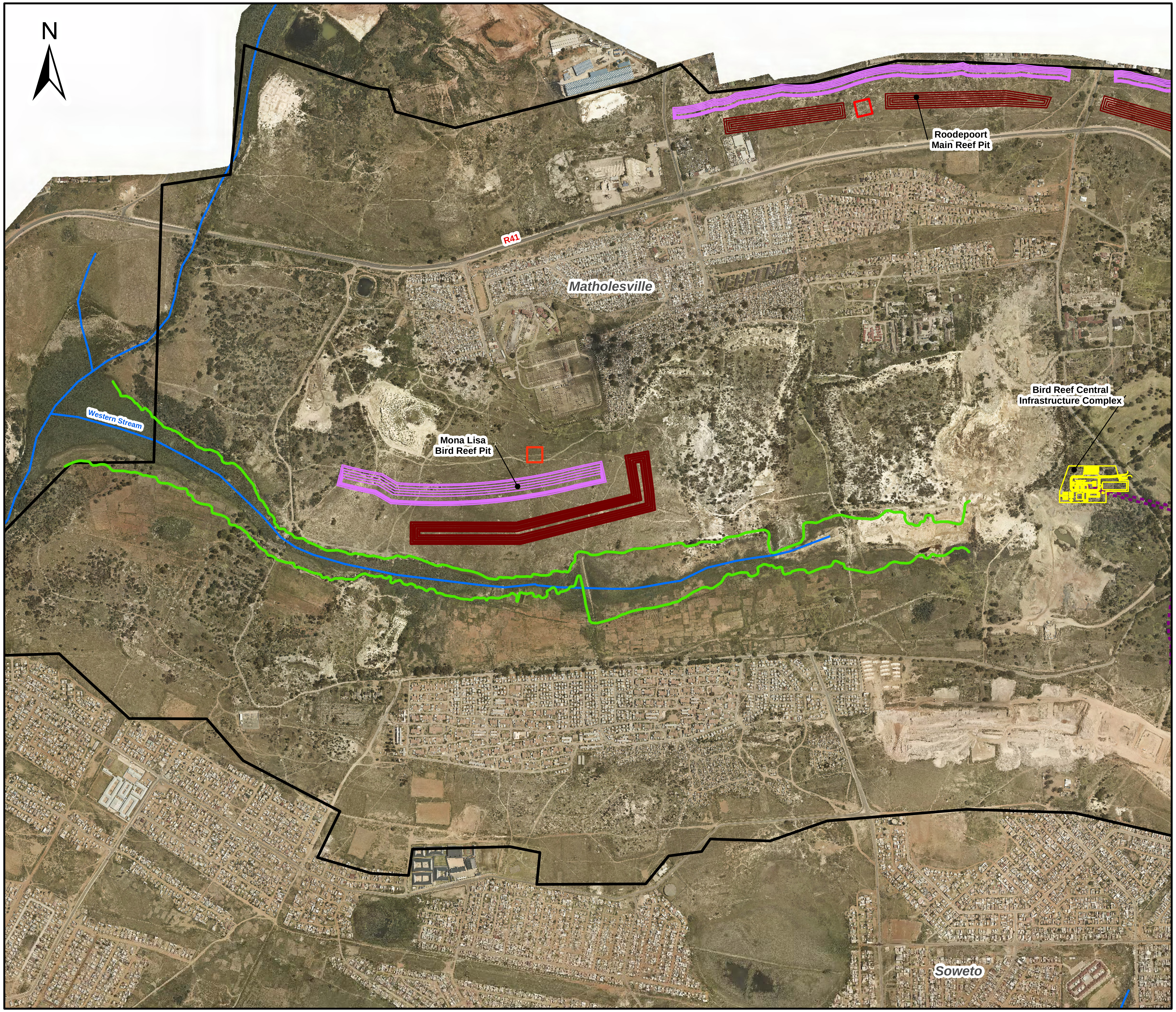
Photographs of the various watercourses and the man-made depressions and dams are provided in the surface water report (refer to Appendix G).

c. Floodlines

Floodlines for the 1:100-year recurrence interval were determined for the current river network passing through the project area and presented in Figure 6-9 and Figure 6-10. These floodlines have been used in project planning to minimise impacts on flood zones.

d. Wetlands

There are several wetlands and pans within the project area according to the National Freshwater Ecosystem Priority Areas (NFEPA) wetland GIS metadata (SANBI, 2011) (refer to Figure 6-8). The upper reaches of the Klip River are comprised of some wetland areas which have a low gradient and slope towards the south. Very low flow velocities are expected in these areas (SLR, 2019).



Legend

- Mining Right Area
- Pit
- Waste Rock Dump
- ROM Ore Stock Pile Crusher Area
- Infrastructure Complexes
- Underground Workings
- Non Perennial Watercourse
- 1 : 100 Year Floodline

Kilometers

0 0.15 0.3 0.6

Scale: 1:12 500 @ A3

Projection: Transverse Mercator

Datum: Hartebeeshoek, Lo27

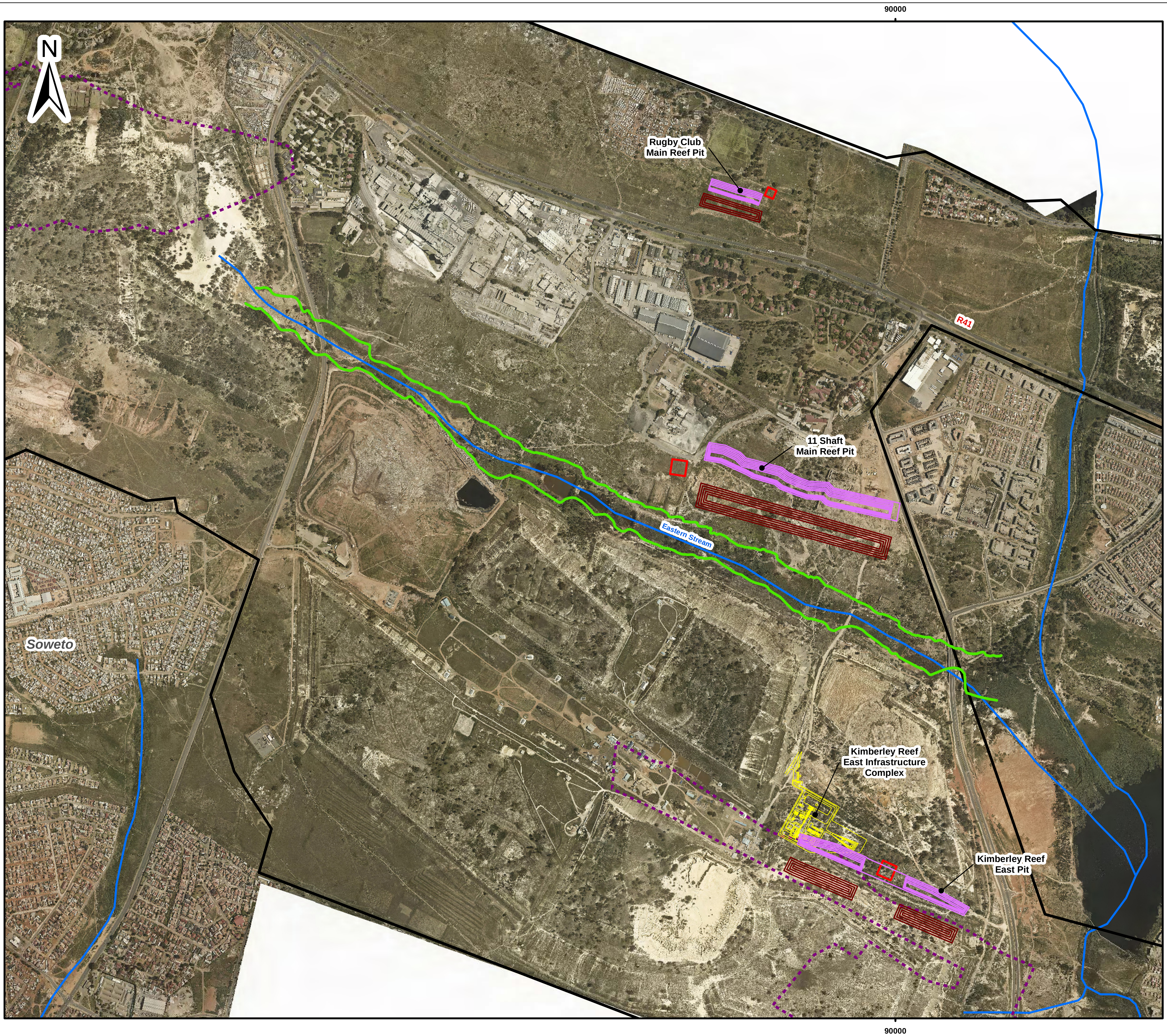
WEST WITS

1 : 100 Floodlines West

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

720.13087.00002

2019/04/01



Legend

- Mining Right Area
- Pit
- Waste Rock Dump
- ROM Ore Stock Pile Crusher Area
- Infrastructure Complexes
- Underground Workings
- Non Perennial Watercourse
- 1 : 100 Year Floodline

Kilometers

0 0.15 0.3 0.6

Scale: 1:12 500 @ A3

Projection: Transverse Mercator

Datum: Hartebeeshoek, Lo27

WEST WITS

1 : 100 Floodlines East

SLR

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Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.13087.00002	2019/04/01

e. Surface water quality

A hydrocensus was undertaken by NOA Agencies (Pty) Ltd in March 2018 to collect groundwater and surface water samples. Four streams were sampled during the hydrocensus (refer to Table 6-10).

TABLE 6-10: SURFACE WATER MONITORING HYDROCENSUS POINTS AT WEST WITS (SLR, 2019)

Sample ID	Co-ordinates		Description
	Latitude	Longitude	
WITStream 1	-26.17845	27.83636	Drainage D1, stream south of Mona Lisa, flowing westwards
WITStream 2	-26,16916	27.8336	Headwaters of the Klip River at the culvert of road R41, flowing southwards
WITStream 3	-26,19532	27.90214	Drainage D5, at the culvert south east of 11 Shaft, stream flowing East into Fleurhof dam
WITStream 4	-26,19361	27.8976	Upstream of WITStream 3 in the same drainage, before tailings dam

The water quality results were compared to the in-stream water quality guidelines (WQG) for the Klip River catchment as set out by the Klip River Forum. The Klip River Forum is constituted in terms of the National Water Act, 1998 (Act 36 of 1998) and is a non-profit organisation consisting of stakeholders actively participating in sustainable water resource management of the Klip River Catchment and its associated tributaries. The water quality results were also compared to the South African National Standards (SANS) 241 and DWS drinking water guidelines. The water quality results are provided in Table 6-11 and Table 6-12 below.

The water quality sampling showed that (SLR, 2019):

- All four samples were not suitable for human consumption;
- The samples showed elevated concentrations of aluminium, calcium, iron, magnesium, potassium, ammonia, sulphate, manganese, nickel and uranium;
- WITStream 3 also showed high concentrations of lead;
- WITStream 2 showed elevated levels of *E.coli* while all other elements were within drinking water standards. This sampling point is in the headwaters of the Klip River and has not yet had any polluted flows from mining areas contributing to the water channel; and
- The pH of WitsStream 1, 3 and 4 ranged between 3.3 and 4.5, indicating the likely presence of acid mine drainage from existing mine residue facilities.

TABLE 6-11: SURFACE WATER HYDRO-CHEMICAL RESULTS COMPARED TO KLIP RIVER WQG (NOA, 2018)

Determinant	Unit	WIT Stream 1	WIT Stream 2	WIT Stream 3	WIT Stream 4
pH at 25°C	pH units	**4.5**	7.0	**3.4**	**3.3**
Electrical Conductivity at 25°C	mS/m	*103*	32	**306**	**293**
Aluminium	mg/l	**5.00**	<0.02	**11.4**	**14.0**
Ammonia	mg/l	**7.88**	<0.11	**48**	**15.3**
Chloride	mg/l	26	19.8	**227**	**249**
Fluoride	mg/l	<0.03	0.10	<0.03	<0.03
Iron	mg/l	<0.02	<0.02	*1.46*	**1.88**
Magnesium	mg/l	29	11.0	**84**	**85**
Manganese	mg/l	**4.78**	0.10	**18.1**	**29**
Nitrate	mg/l	0.06	1.30	**31.5**	2.20
Sodium	mg/l	34	21	**175**	**186**
Sulphate	mg/l	**597**	83	**1392**	**1322**

Normal text = ideal; underline = acceptable; *italics* = tolerable; **bold** = unacceptable.

TABLE 6-12: SURFACE WATER HYDRO-CHEMICAL RESULTS COMPARED TO SANS 241 AND DWS DRINKING WATER STANDARDS (NOA, 2018)

Determinant	Unit	*Ideal Catchment Background*	Acceptable Management Target	**Tolerable Interim Target**	Unacceptable	WIT Stream 1	WIT Stream 2	WIT Stream 3	WIT Stream 4
pH at 25°C	pH units	*6 - 9*			<6; >9	4.5	*7.0*	3.4	3.3
Electrical Conductivity at 25°C	mS/m	*<80*	80 - 100	**100 - 150**	>150	**103**	*32*	306	293
Aluminium	mg/l		<0,3	**0,3 - 0,5**	>0,5	5.00	*<0.02*	11.4	14.0
Ammonia	mg/l	*<0,5*	0,5 - 1,5	**1,5 - 4,0**	>4,0	7.88	*<0.11*	48	15.3
Chloride	mg/l	*<50*	50 - 75	**75 - 100**	>100	*26*	*19.8*	227	249
Fluoride	mg/l	*<0,19*	0,19 - 0,7	**0,7 - 1,0**	>1,0	*<0.03*	*0.10*	*<0.03*	*<0.03*
Iron	mg/l	*<0,5*	0,5 - 1,0	**1,0 - 1,5**	>1,5	*<0.02*	*<0.02*	**1.46**	1.88
Magnesium	mg/l	*<8,0*	8 - 30	**30 - 70**	>70	29	11.0	84	85
Manganese	mg/l	*<1,0*	1 - 2	**2 - 4**	>4,0	4.78	*0.10*	18.1	29
Nitrate	mg/l	*<2,0*	2 - 4	**4 - 7**	>7,0	*0.06*	*1.30*	31.5	2.20
Sodium	mg/l	*<50*	50 - 80	**80 - 100**	>100	*34*	*21*	175	186
Sulphate	mg/l	*<200*	200 - 350	**350 - 500**	>500	597	*83*	1392	1322

f. Surface water use

The pre-project baseline surface water quality within the project area and surrounds is highly impacted and is not fit for human consumption. Use of surface water for subsistence irrigation and washing of clothes was noted during specialist site visits.

6.4.1.7 Groundwater

Groundwater is a valuable resource and is defined as water which is located beneath the ground surface in soil/rock pore spaces and in the fractures of lithological formations. Activities such as the handling and storage of hazardous materials and handling and storage of mineralised and non-mineralised wastes have the potential to result in the loss of groundwater resources, both to the environment and third-party users, through pollution. In addition, where mining requires dewatering in order to provide a safe working environment and for water supply, there is the potential for a dewatering cone to develop and this can result in a loss of water supply to surrounding users. To understand the basis of these potential impacts, a baseline situational analysis is described below.

a. Groundwater occurrence

Groundwater occurrence in the Witwatersrand and Ventersdorp geological sequence is generally associated with zones of deep weathering, faulting and/or jointing. The depth of weathering is generally not known due to a lack of information. Groundwater is often encountered in both the saturated weathered material below the regional groundwater rest level and in the transition zone between weathered and fresh formations.

The dolomitic zone is characterised by highly fractured chert layers. From a groundwater perspective, the chert content is the most important, with the chert-rich formations forming the main aquifers. The dissolution of calcite along fractures, together with folding and faulting, has resulted in well-developed aquifers in the dolomite, with a high transmissivity and large storativity.

A characteristic of the area is a series of cross-cutting lineaments representing faults and dykes. The dykes are not 100% impermeable, but are at least several orders of magnitude less permeable than the dolomite. They therefore divide the dolomite into a series of characteristic compartments. Of relevance to the proposed mining area are the Zuurbekom and Upper Klip River dolomitic compartments. The Klip River dyke bisects the proposed mining area. It runs from the centre of Roodepoort, across the circular dolomitic deposit and down to the centre of Lenasia. The dolomite to the east of the dyke is known as the Upper Klip River Compartment and to the west as the Zuurbekom Compartment.

b. Aquifer characteristics

The local weathered aquifers generally support moderate yielding boreholes (less than 1 L/s). Most fault and joint zones in the deeper fractured aquifers are steeply dipping structures that tend to narrow and even pinch out at depth, with a corresponding decrease in permeability. The porosity is usually less than 1% while the fresh rock may be regarded as impermeable.

The aquifer classification system defines the dolomite in the area as a major aquifer region, which is a high-yielding system of good water quality. The Witwatersrand and Ventersdorp systems are classified as minor aquifers (Noa, 2019).

Aquifer susceptibility is a qualitative measure of the relative ease with which a groundwater body can potentially be contaminated by anthropogenic activities and includes both aquifer vulnerability and the relative importance of the aquifer in terms of its classification. The Witwatersrand and Ventersdorp formations have a low susceptibility to contamination. The dolomite in the circular outcrop and towards the south (downgradient) is highly susceptible to contamination (Noa, 2019).

c. Groundwater levels and flow

Groundwater level data was sourced for 18 boreholes monitored by DWS. Four boreholes are in the Upper Klip River compartment and 14 boreholes in the Zuurbekom compartment. The proposed project lies within the Zuurbekom compartment. The monitoring data indicates groundwater levels vary between 11 and 55 m below ground level (bgl). The average water levels are approximately 25 to 30 m bgl. This relates to the areas south of the proposed mining areas and located directly on the dolomite. Groundwater in the Klip River area can be divided into numerous small compartments based on groundwater levels. These compartments appear to be in connection with the Klip River.

Based on the 2018 hydrocensus survey conducted by Noa, the groundwater level in the project area and surrounds vary from 4.4 meters below ground level (mbgl) in the Hamberg residential area to a maximum depth of 36.2 mbgl south of the Durban Deep Golf Course. The southern measurement could potentially reflect groundwater level already impacted by dewatering activities due to mining. The hydrocensus data and the information collected from the DWS monitoring boreholes indicate groundwater levels of between 4.5 m and 12 mbgl in the up-gradient or upstream Roodepoort residential areas (Noa, 2019).

Groundwater movement often mimics the topography and generally flows towards the south. The Roodepoort residential areas are located upstream of the proposed mining areas and the Braamfischerville and Soweto residential areas and the dolomites lie downstream.

d. Groundwater quality

Groundwater samples were collected from six boreholes during the 2018 hydrocensus conducted by Noa. The water samples were analysed, and the results were compared against the SANS 241:2015 Drinking Water Standards, as well as the Klip River WQO. The water quality sampling showed that (Noa, 2019) (refer to Table 6-14):

- Water in all of the boreholes sampled is not suitable for human consumption;
- The pH in WITBH1 was low at 3.4, indicating acid conditions. This borehole also had elevated concentrations of sulphate, aluminium, calcium, lead, manganese, nickel, uranium and ammonia. This borehole is however not in use;
- WITBH2 showed elevated concentrations of sulphate, fluoride, magnesium, sodium, uranium and nitrate. This borehole is used at the Golf Club as water supply to the toilets;
- WITBH 3 generally complies with the Klip River instream WQOs, but has very high concentrations of *E.Coli*. The bacteria concentrations exceed the acute health limits. This borehole is currently the only source of water to this private property. The cause is unknown and could relate to the nearby stream and wetlands or septic tanks and sewage present in the local aquifers; and
- WITBH4, WITBH5 and WITBH6 generally compiled with the Klip River instream WQOs, with the exception of parameter in most cases. Nitrate concentrations were notably high in WITBH4 and WITBH6, while uranium concentrations were elevated in WITBH6. WITBH6 is used for garden irrigation in the Hamburg residential area.

Natural dolomitic groundwater is essentially a Ca/Mg-bicarbonate type, alkaline and with an EC of less than 70 mS/m. The existing impacts in the catchment have modified the natural water quality over most of the dolomitic areas. The favourable aquifer characteristics of high transmissivity, storativity and rapid recharge mean that the dolomite aquifers located downstream from the project area are vulnerable to contamination.

TABLE 6-13: GROUNDWATER MONITORING HYDROCENSUS POINTS AT WEST WITS (NOA, 2019)

Sample ID	Co-ordinates		Water use
	Latitude	Longitude	
WITBH 1	26,18319	27,85684	No pump equipped
WITBH 2	26,17559	27,86703	Toilets at Golf club
WITBH 3	26,1709	27,82188	Domestic and Swimming pool
WITBH 4	26,16607	27,87327	Domestic
WITBH 5	26,17104	27,88611	None
WITBH 6	26,17184	27,88884	Garden

TABLE 6-14: GROUNDWATER HYDRO-CHEMICAL RESULTS COMPARED TO KLIP RIVER WQG (NOA, 2018)

Determinant	Unit	WITBH 1	WITBH 2	WITBH 3	WITBH 4	WITBH 5	WITBH 6
pH at 25°C	pH units	**3.4**	6.6	6.4	7.0	6.5	6.9
Electrical Conductivity at 25°C	mS/m	**187**	*132*	11.7	18.9	9.7	50
Chloride	mg Cl/ℓ	37	36	12.6	16.7	3.78	28
Sulphate	mg SO_4/ℓ	**1144**	**742**	<0.21	2.02	8.40	74
Fluoride	f the	<0.03	*0.99*	0.05	0.09	0.21	0.13
Dissolved Aluminium	mg Al/ℓ	**60**	<0.02	<0.02	<0.02	<0.02	<0.02
Dissolved Iron	mg Fe/ℓ	0.07	<0.02	<0.02	<0.02	<0.02	<0.02
Dissolved Magnesium	mg Mg/ℓ	*65*	**82**	5.93	14.9	1.71	18.6
Dissolved Manganese	mg Mn/ℓ	**9.25**	0.26	<0.02	0.02	0.12	<0.02
Sodium	mg Na/ℓ	49	59	6.61	4.83	6.61	20
Nitrate	mg N/ℓ	**9.78**	2.40	*4.20*	**12.6**	0.77	**10.0**
Ammonia	mg N/ℓ	*1.69*	0.24	<0.11	<0.11	0.31	<0.11

Normal text = ideal; underline = acceptable; *italics* = tolerable; **bold** = unacceptable.

e. Groundwater users

Information presented in the DWS dolomite study (DWAF 2006) indicates that groundwater in the Zuurbekom compartment is used predominantly for mining and municipal use. In the Klip River compartment agriculture plays a more dominant role with a much smaller use from domestic and municipal requirements (Noa, 2019).

Groundwater is used as a resource in the project area, although most areas receive municipal water. Known groundwater uses include grey water for toilet systems, domestic use, swimming pools and garden irrigation. Groundwater monitoring wells also occur within the area.

During the 2018 hydrocensus 13 boreholes were identified – refer to Figure 6-11. Only three boreholes were in use, for domestic and swimming pool use – refer to Table 6-13. Additional properties were visited but were indicated to not have any boreholes. Further detail is provided in the groundwater study report (refer to Appendix H).

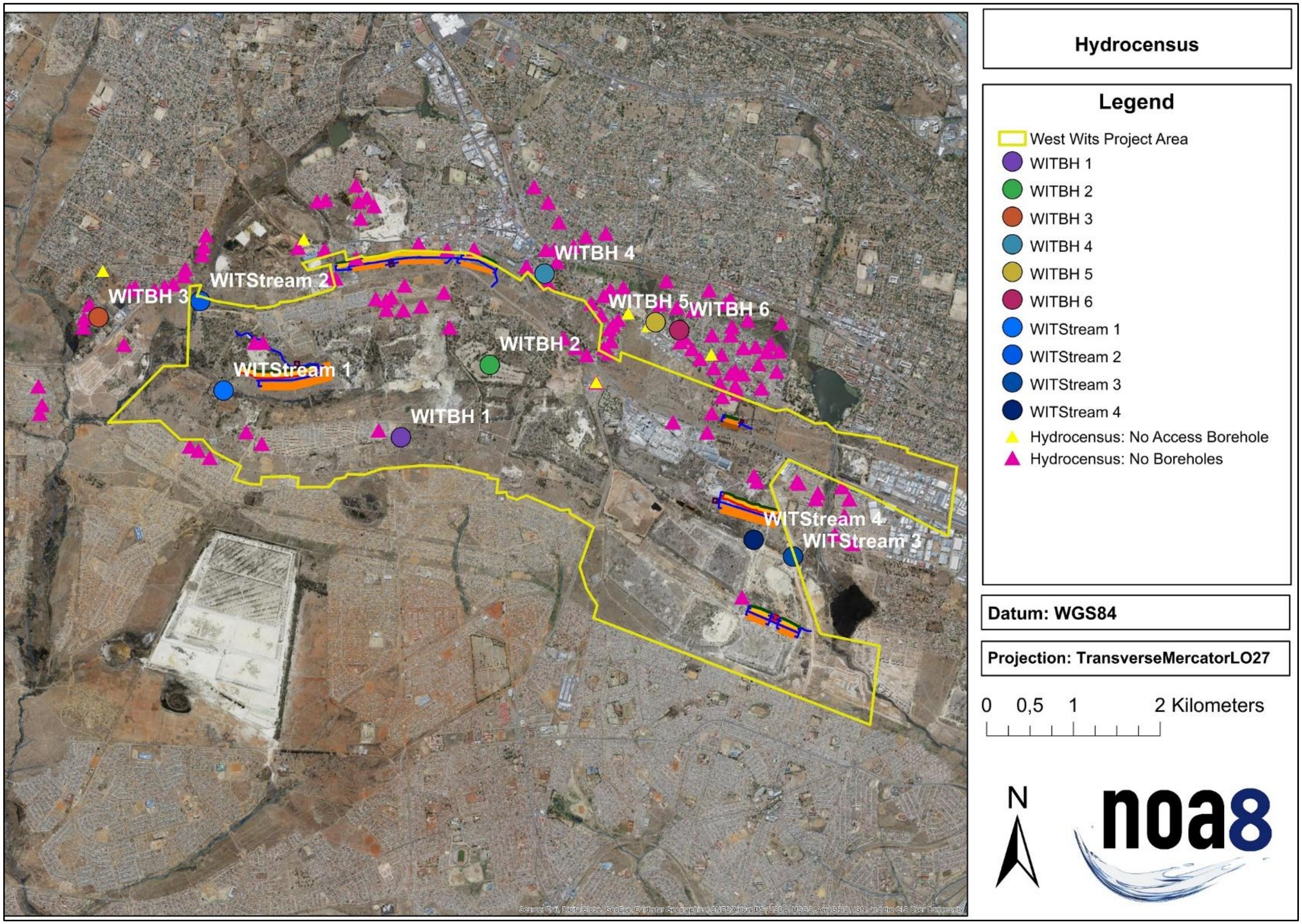


FIGURE 6-11: HYDROCENSUS BOREHOLES (NOA, 2019)

6.4.1.8 Air quality

A change in ambient air quality can result in a range of impacts which in turn may cause a disturbance and/or health impacts to nearby receptors. Existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. To understand the basis of these potential impacts, a baseline situational analysis is described below.

a. Priority Area

The mining right application area falls just outside of the Vaal Triangle Airshed Priority Area (VTAPA). The Vaal Triangle Airshed was declared the first priority area on 21 April 2006. As such, new developments in the VTAPA which are associated with atmospheric emissions and hence the potential for contributing to air pollutant concentrations are being subject to intense scrutiny by national air pollution control officers.

b. Ambient air quality

Ambient air quality in the project area is likely to be influenced by local sources as well as emissions from various remote sources. The most significant of these sources within the Soweto and Roodepoort region include:

- fugitive dust emissions from current mining operations and historical dumps;
- vehicle tailpipe emissions;
- blasting operations at mines;
- vehicle entrained dust from paved and unpaved roads;
- household fuel combustion by means of coal, wood and paraffin;
- biomass and veld burning; and
- various miscellaneous fugitive dust sources, including: agricultural activities, and wind erosion of open areas.

High dust fallout rates recorded at all current sampling locations during the windy spring months from September to November 2018 indicates that wind erosion is also likely a significant source of dust emissions in the study area.

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 also been found to contribute significantly to background fine particulate concentrations over the interior (Andreae, et al., 1996; Garstang, et al., 1996; Piketh, et al., 1996, as cited in APP, 2019a).

c. Monitoring data

Data from a dustfall monitoring network operated close to the project area was obtained for the year 2017 – refer to Figure 6-12 for the location of the monitoring points. The available data is provided in Table 6-15 and has been was compared to the National Dust Control Regulations (NDCR) dustfall limits (600 mg/m²/day for residential areas and 1 200 mg/m²/day for non-residential areas). The NDCR allows for two exceedances in a year, not sequential months.

FIGURE 6-12: CURRENT DUSTFALL SAMPLING NETWORK (APP, 2019)

The results show that the NDCR for non-residential areas were exceeded at Modise, Maswanganyi and George Thengwani, and for residential areas were exceeded at Moreroa and Yvonne Meno from September to the end of 2017. The high variability between dust fallout rates at each sampling location indicates that dust fallout at each location is likely mainly influenced by localised sources. High dust fallout rates at all sampling locations during the windy spring months from September to November indicates that wind entrainment is likely a significant source of dust emissions in the study area (APP, 2019a).

TABLE 6-15: DUST FALLOUT DATA FOR THE PERIOD 2017 (APP, 2019A)

Sampling Site	Sampling month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Modise	424	573	182	233	97	447	997	543	**6492**	**5327**	**4588**	**2029**
Mashilane	123	214	111	108	No data	No data	No data	No data	No data	No data	No data	No data
Moreroa	366	211	277	292	227	410	211	247	**3308**	**1114**	**1640**	**730**
Maswanganyi	195	340	295	175	193	376	No data	266	**2495**	**2792**	**2172**	**1843**
George Thengwani	482	342	185	238	551	373	442	356	**6193**	**3243**	**1888**	**1118**
Yvonne Meno	167	342	147	109	383	196	332	269	**1681**	**803**	**952**	202
Anna Doornkop	204	324	246	217	259	198	66	63	No data	**675**	378	327

Bold text notes exceedance of NDCR limits (600 mg/m²/day for residential areas and 1 200 mg/m²/day for non-residential areas).

d. Potential receptors

Potential receptors in the vicinity of the West Wits operations include the residential areas located around the proposed open pit and infrastructure complexes, which provide access to the underground workings. These areas are shown in Figure 6-13.

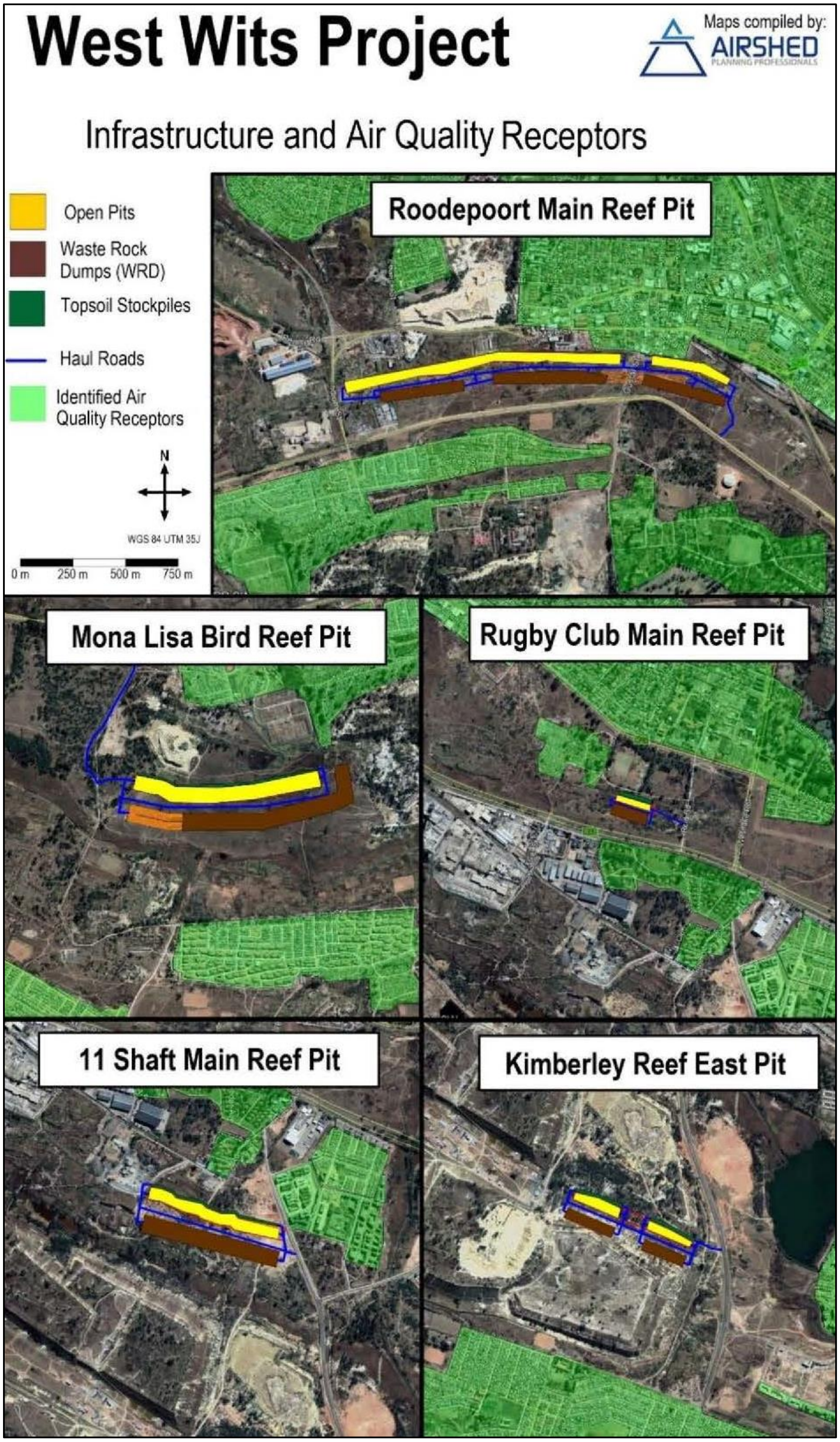


FIGURE 6-13: POTENTIAL AIR QUALITY RECEPTORS (APP, 2019A)

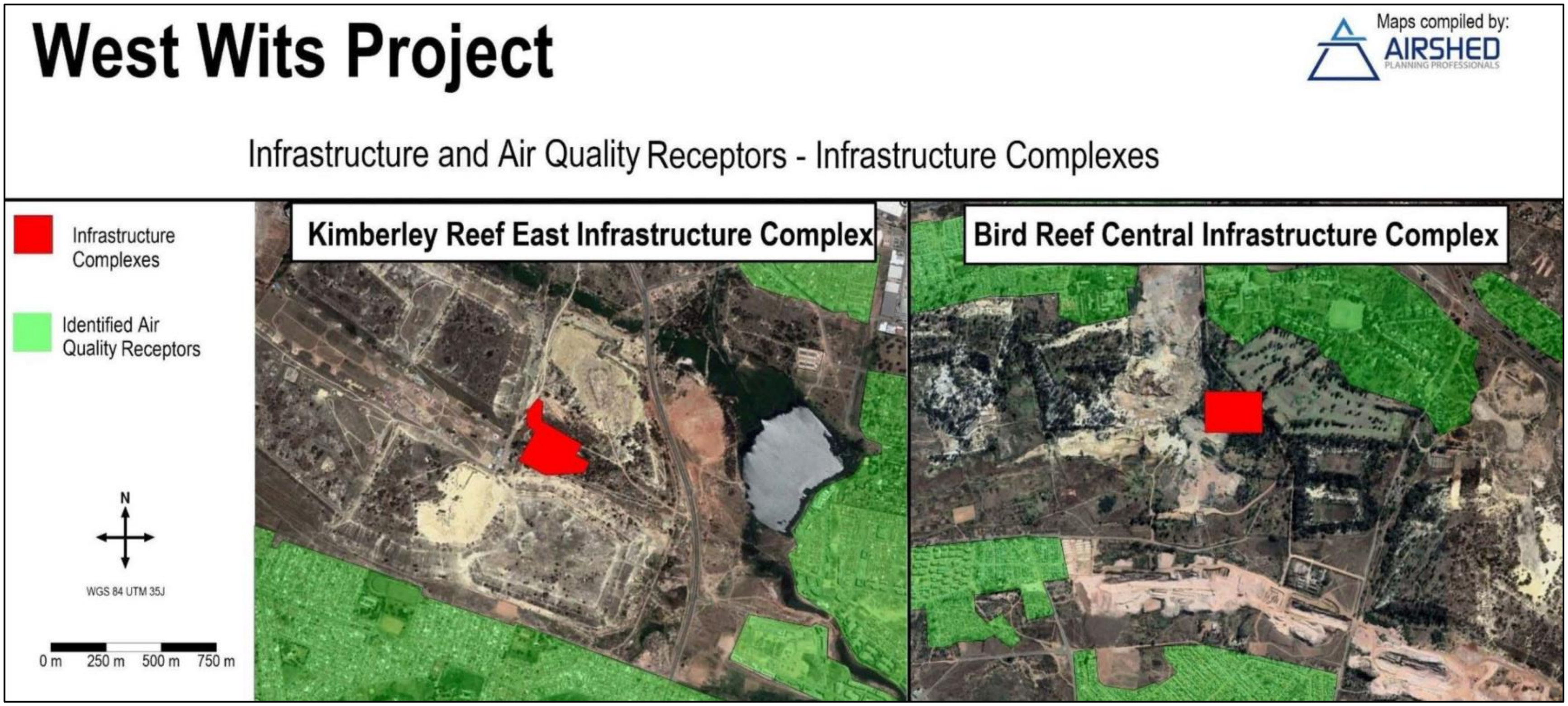


FIGURE 6-13: POTENTIAL AIR QUALITY RECEPTORS (APP, 2019A)

6.4.1.9 Radiation

Radioactivity is found everywhere in nature. Naturally occurring radioactivity is either produced from cosmic ray interactions or naturally found in the sands, soils, and minerals in the earth's crust. The materials in which these radionuclides are found are called Naturally Occurring Radioactive Materials or NORMs. Since NORM is found everywhere on earth, it means that all life on earth are continuously exposed to radiation through the air we breathe, the water we drink, the food we eat and the ground we walk, work, or play on. This constant radiation results in what is called a background dose.

Gold mines are potentially associated with radiological impacts. These impacts could potentially occur through the following pathways:

- Inhalation of radioactive material (e.g. radon gas, dust); and
- Ingestion of water potentially contaminated with radioactivity and the ingestion of food potentially contaminated with radioactive material (from water and dust fallout).

Rock samples were collected from the current operations at Sol Plaatjies (ore samples), the Kimberley Reef Pit (ore sample and waste rock sample) as well as a background soil sample obtained some distance away from the proposed operations. The naturally occurring radionuclide activity concentrations for all the rock and soil samples are well below the regulatory limit of 500 Bg/kg (or 0.5 Bq/g). This means that the proposed operations do not fall under the National Nuclear Regulator (NNR) Act. It is therefore expected that the doses from all pathways from the proposed project will be far less than the dose limit where health impacts could occur.

6.4.1.10 Noise

Certain noise generating activities associated with mining operations could cause an increase in ambient noise levels in and around the mining area. This may cause a disturbance to nearby receptors. Land uses surrounding the mine will be described in Section 6.4.2. To understand the basis of these potential impacts, a baseline situational analysis is described below.

a. Ambient noise environment

Day and night-time noise measurements were conducted in March 2018 at six sampling locations as shown in Figure 6-14. However, due to safety considerations no night time measurements were conducted at three of the locations 4, 5 and 6.

The results of the sampling are provided in Table 6-16 and were compared to the South African National Standards (SANS) 10103 guidelines. These guidelines are in line with those published by the International Finance corporation (IFC) of the World Bank in their General Environmental Health and Safety (EHS) Guidelines and World Health Organisation (WHO) Guidelines for Community Noise.

The results show that the recorded noise at all sampling locations during the daytime survey were similar to those given in the SANS 10103 for suburban and urban districts (<60 dBA). Noise at sampling locations 2 and 3 were typical for suburban and urban districts at night-time (<55 dBA), while the noise recorded at sampling location 1 more closely resembled that of a central business district due to heavy traffic on the R41 road. The main sources of noise within and around the project area were noted to include:

- natural sounds from animals and birds;
- school activities;

- community activities;
- mining activities;
- industrial activities;
- heavy road traffic; and
- air traffic.

TABLE 6-16: NOISE MONITORING RESULTS (APP, 2019B)

Sampling site	Day-time $L_{Req,d}$ (dBA)	Night-time $L_{Req,d}$ (dBA)	Day/night $L_{R,dn}$ (dBA)
1	59.9	54.7	62.1
2	45.5	44.7	50.9
3	47.1	47.5	53.5
4	54.7	45.0*	54.8
6	51.7	45.0*	53.1
6	48.2	40.0*	48.9

* No night-time readings due to security considerations. SANS 10103 typical night time outdoor rating levels were assumed based on day-time measurements.

b. Potential receptors

Potential receptors of project-related noise are the same as those identified as air quality receptors, and include residential area, schools, hospitals and clinics – refer to Figure 6-14.

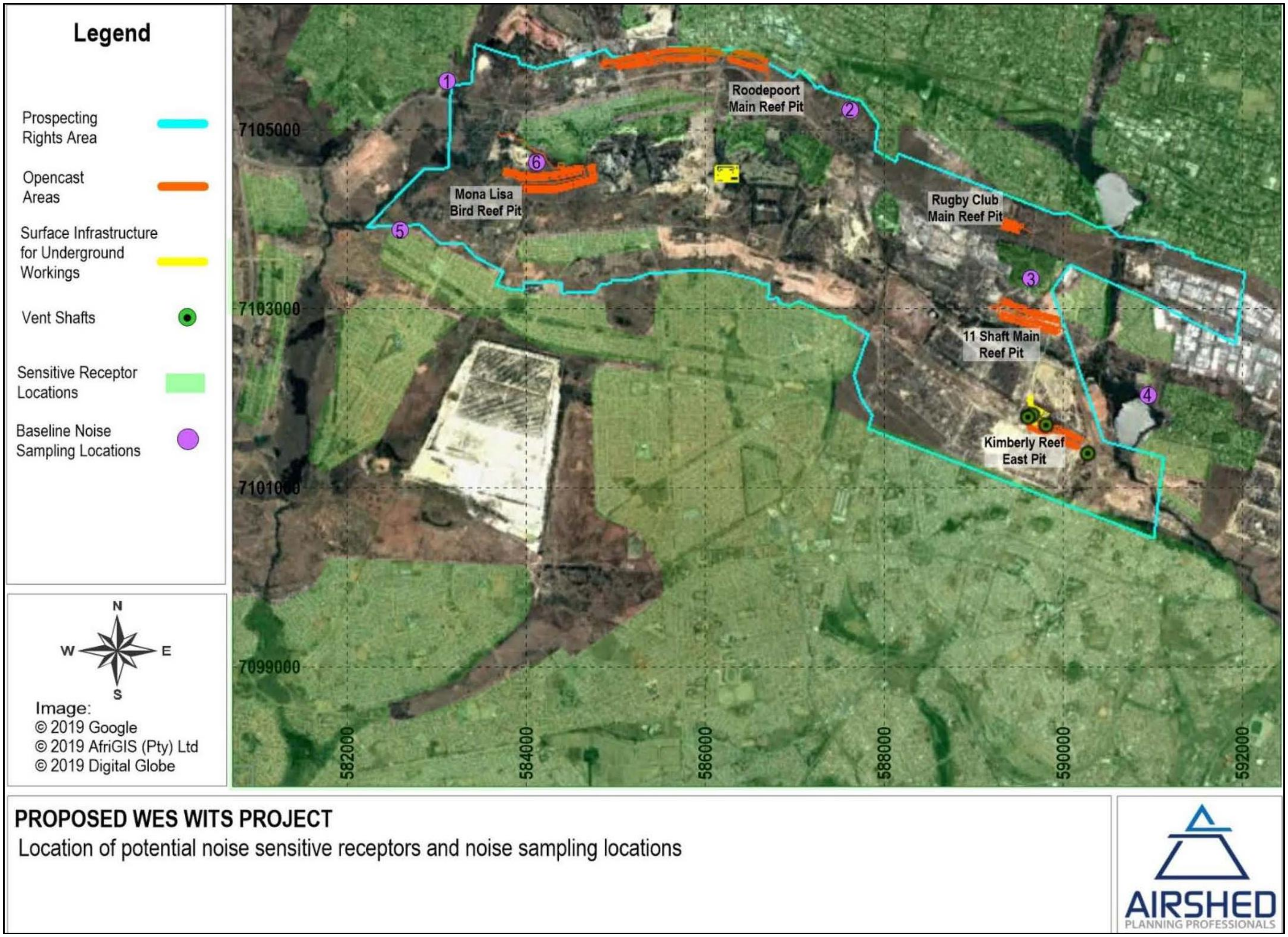


FIGURE 6-14: NOISE SAMPLING LOCATIONS AND POTENTIAL RECEPTORS (APP, 2019B)

6.4.1.11 Visual

Project-related activities have the potential to alter the landscape character of the site and surrounding area through the establishment of both temporary and permanent infrastructure. To understand the basis of these potential impacts, a baseline situational analysis is described below.

a. Landscape character and visual adsorption capacity

The project area has been impacted upon by various historic and current mining and agriculture activities, as well as urban development. The dominant landscape form is horizontal and rolling with relatively flat to gently to moderately undulating landscape in the surrounding areas. The landscape is considered to be discordant in terms of the relationship between the vertical and horizontal landscape elements. This because the project area is dominated by urban built-up areas, historic and active mining activities and associated structures and to a lesser extent degraded openveld and watercourses, thus vertical elements are more prominent in the area (STS, 2019B).

The visual adsorption capacity was determined using a scoring system taking into account factors such as vegetation cover and density, soil contrast where bare soils with little vegetation cover offer contrast to the vegetation cover, visual variety where there are natural features such as watercourses or man-made features such as infrastructure, topographical diversity and the time it would take the vegetation to recover from the proposed project. The visual adsorption capacity for all of the areas proposed for surface infrastructure was determined to be medium.

b. Landscape Quality

The landscape quality was determined using a scoring system taking into account factors such as the landform, vegetation cover, presence of water features, colour variations, adjacent scenery and cultural modifications such as remnants of historic mining activities. The landscape quality for all of the areas proposed for surface infrastructure was determined to be medium.

c. Sense of place

A sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. It is created by the land use, character and quality of a landscape, as well as by the tangible and intangible value assigned thereto (STS, 2019B).

The sense of place associated with the proposed surface infrastructure areas are related to the landscape character type of the greater area, which is the MRA. The MRA comprises gently to moderately undulating terrain dominated by urban infrastructure and mining activities. The level of movement and activity within the project area is relatively high due to the commercial and industrial areas as well as active mining taking place in the area, thus it can be described as busy with a lot of vehicular and pedestrian movement.

The sense of place associated with the project area is not highly significant when compared to its surroundings but may be considered to be of importance due its location within open veld in an urban area (STS, 2019B).

d. Visual exposure

The proposed infrastructure areas visibility can be summarised as follows (STS, 2019B):

- Kimberley Reef East Pit and Kimberly Infrastructure Complex: Situated within a heavily disturbed area, where historic mining activities took place and the remnants of ventilation shafts and other mining surface infrastructure are present. Screened from visual receptors by remnant mine dumps and dense vegetation. Visual exposure is therefore expected to be minimal to negligible on the receiving environment;
- 11 Shaft Main Reef Pit: Situated within a heavily disturbed area where historic mining activities took place. Surrounded by remnant mine dumps and rubbish dumps and old mining surface infrastructure is present within the area. Visual exposure to visual receptors is expected be minimal to negligible.
- Roodepoort Main Reef and Rugby Club Main Reef open pit areas: Expected to have the most significant visual impact on the receiving visual environment due to the close proximity of the R41 roadway, other local roads, residential areas, formal and informal settlements and business areas. Motorists are generally classified as visual receptors of low sensitivity due to their momentary views and experience of the receiving environment. Existing infrastructure such as buildings, walls and vegetation from the open veld areas and ornamental plants associated with the houses serve to obscure the view from some visual receptors within the surrounding area.
- Mona Lisa Bird Reef Pit: Expected to have a moderately high visual exposure on the receiving environment, due to Solplaatje having a direct view of the proposed pit. The visual character of the area is negatively impacted on by current mining activities (UpwardSpiral Mining), powerlines and the Eskom Princess CNC Substation present within close proximity to the proposed Mona Lisa Bird Reef Pit. Therefore, the current mining activities and anthropogenic structures are likely to detract visual attention from the proposed mining activities.
- Bird Reef Central Infrastructure Complex: Situated within an area where historic mining infrastructure such as the vertical shaft and remnants of the foundation and walls of buildings are present. The vegetation in the surrounds are well established (dense and tall), obscuring the proposed infrastructure site from motorists utilising the unpaved road situated directly adjacent to it as well as the Durban Deep Golf Course immediately northeast of the site. Aside from the unpaved road and Golf Course, there are no other potential receptors in the area that will have visual exposure of the site. However, according to IEMA (2002) users at recreational facilities are considered as highly sensitive receptors, therefore this infrastructure area has a moderate visual intrusion.

e. Visual receptors sensitivity

STS identified eight key observation points at receptors surrounding the proposed infrastructure areas. These points were evaluated with regard to receptor sensitivity. The results of this assessment are provided in Table 6-17 and show sensitive receptors in residential areas within 2 km of the proposed infrastructure areas. Mapping showing the location of the key observation points are provided in the visual report (refer to Appendix N).

TABLE 6-17: KEY OBSERVATION POINTS AND RECEPTOR SENSITIVITIES FOR THE PROPOSED INFRASTRUCTURE AREAS (STS, 2019B)

No.	Key Observation Points Location	Visibility	Receptor Sensitivity	Motivation
KOP1	±2 km west of the Roodepoort Main Reef Pit within the Grobler Park residential area	Limited	High – permanent residents in the vicinity of KOP1. Moderate – road users with a limited viewing time	Existing vegetation within the residential area and surrounding area as well as houses, warehouses and buildings, and existing mine dumps in the region will limit the view of the proposed Roodepoort Main Reef Pit.
KOP2	±880 m north of the Roodepoort Main Reef Pit within the Davidsonville residential area	None	High – permanent residents in the vicinity of KOP2. Moderate – road users with a limited viewing time.	Vegetation, houses within the Davidsonville and existing mine dumps present within the line of sight, renders the Roodepoort Main Reef Pit not visible.
KOP3	±200 m southeast of the Roodepoort Main Reef Pit on the Randfontein Road	High	Moderate – road users with a limited viewing time	The WRD of Roodepoort Main Reef Pit will be significantly visible from main road situated approximately 200 m away.
KOP4	±1.48 km north of the Rugby Club Main Reef Pit within the Hamberg residential area	Limited	High – permanent residents in the vicinity of KOP4 Moderate – road users with a limited viewing time	The topography of the surrounding area as well as existing vegetation and buildings, almost completely obscures the view toward Rugby Club Main Reef Pit.
KOP5	Directly south of the Rugby Club Main Reef Pit on Main Reef Road, adjacent to Rand Leases.	High	Moderate – people at their work place and road users with a limited viewing time	The Rugby Club Main Reef Pit will be highly visible to motorists traveling on Main Reef Road as well as people at their place of work at Rand Leases. The Rugby Club Main Reef Pit will have a high visual intrusion on the receiving environment.
KOP6	Directly adjacent to the Bird Reef Central Infrastructure Complex and Durban Deep Golf Club	High	High – People at the Durban Deep Golf Course Moderate – road users with a limited viewing time	The historic shaft that will be refurbished for the project is visible through the surrounding dense vegetation. Motorists however have a momentary view thereof, and vegetation associated with the Durban Deep Golf Course also partially obscures the view towards the shaft.
KOP7	±460 m south of the Mona Lisa Bird Reef Pit, within Solplaatje residential area	High	High – permanent residents in the vicinity of KOP7 Moderate – road users with a limited viewing time	The Mona Lisa Bird Reef Pit will be highly visible to residents of Solplaatje thus the pit will have a high visual intrusion on the receiving environment, especially to the south (Solplaatje residential area).
KOP8	±1.84 km west of the Mona Lisa Bird Reef Pit at a housing development.	Limited	High – permanent residents in the vicinity of KOP8 Moderate – road users with a limited viewing time	Due to the existing mine dumps in the area, the proposed Mona Lisa Bird Reef Pit will somewhat blend in with the surroundings, thus limiting the visual intrusion thereof.

6.4.1.12 Traffic

Traffic from mining developments has the potential to affect the capacity of existing road networks as well as result in noise, air quality and public road safety issues. This section provides an overview of the current road network, conditions and road use. Understanding the layout, use and conditions of transport systems relevant to the proposed project area provides a basis for understanding a change as a result of project contributions.

a. Existing road network

The existing road network and intersections relevant to the proposed project are shown in Figure 6-15. The northern section of the project area is crossed by the R41 (Mainreef/Randfontein) provincial road. Cemetery Road feeds off Mainreef road to the south and runs through the project area linking Roodepoort in the north to Soweto in the south.

b. Traffic data

In order to gain a better understanding of the existing traffic patterns and movements adjacent to the proposed mining development, 12-hour manual traffic counts were conducted at the existing intersections that would potentially be affected by the proposed mining development. It is standard traffic engineering practice to conduct at least 12-hour manual traffic counts, as close as possible to a month-end Friday when traffic movement is expected to be at its highest. 12-hour manual traffic counts were conducted in April 2018 at the following intersections under investigation:

- Point D: Intersection of Randfontein Road (Road R41) and Corlette Avenue;
- Point E: Intersection of Randfontein Road (Road R41) and Mathews Goniwe Drive;
- Point F: Intersection of Randfontein Road (Road R41), Iridium Street and Nick Toomey Boulevard;
- Point G: Intersection of Randfontein Road (Road R41) and Gustaf Street; e)
- Point H: Intersection of Randfontein Road (Road R41), Miles Stoker Road, Main Reef Road and Cemetery Road;
- Point I: Intersection of Main Reef Road (Road R41) and Reid Road; g)
- Point J: Intersection of Main Reef Road (Road R41) and Westlake Road; and
- Point K: Intersection of Main Reef Road (Road R41) and Mine Road.

TABLE 6-18: EXISTING TRAFFIC VOLUMES AT KEY INTERSECTIONS (SIYAZI, 2019)

Intersection	Number of vehicles AM peak	Number of vehicles PM peak
D	3 500	3 918
E	2 828	3 074
F	4 066	4 339
G	3 945	3 839
H	5 195	5 265
I	5 066	3 692
J	6 246	4 350
K	5 553	3 605

The traffic counts showed that the R41 is currently heavily congested during peak hours and the vehicle capacity of the roadway is insufficient. From observations it is possible to assume that much of current vehicle traffic volumes along the road comes from and goes to the west of Roodepoort (Randfontein direction as well as to and from the north and south of Road R558) and utilises R41 to gain access from and to Johannesburg central business district (CBD) area and surrounding suburbs (Siyazi, 2019).

c. Planned roads in the vicinity of the Proposed Project

The following planned future roads were identified in the Gauteng Roads Atlas 2015/2016:

- Proposed extension of Road N17 south of the proposed project; and
- Proposed Road PWV5 west of the proposed project.

However according to Siyazi, these developments are not planned for in the near future and it is anticipated that they will not have an impact on the proposed project (Siyazi, 2019).

d. Pedestrian activities

Pedestrians activity was observed at all of the relevant intersections during the manual traffic counts.

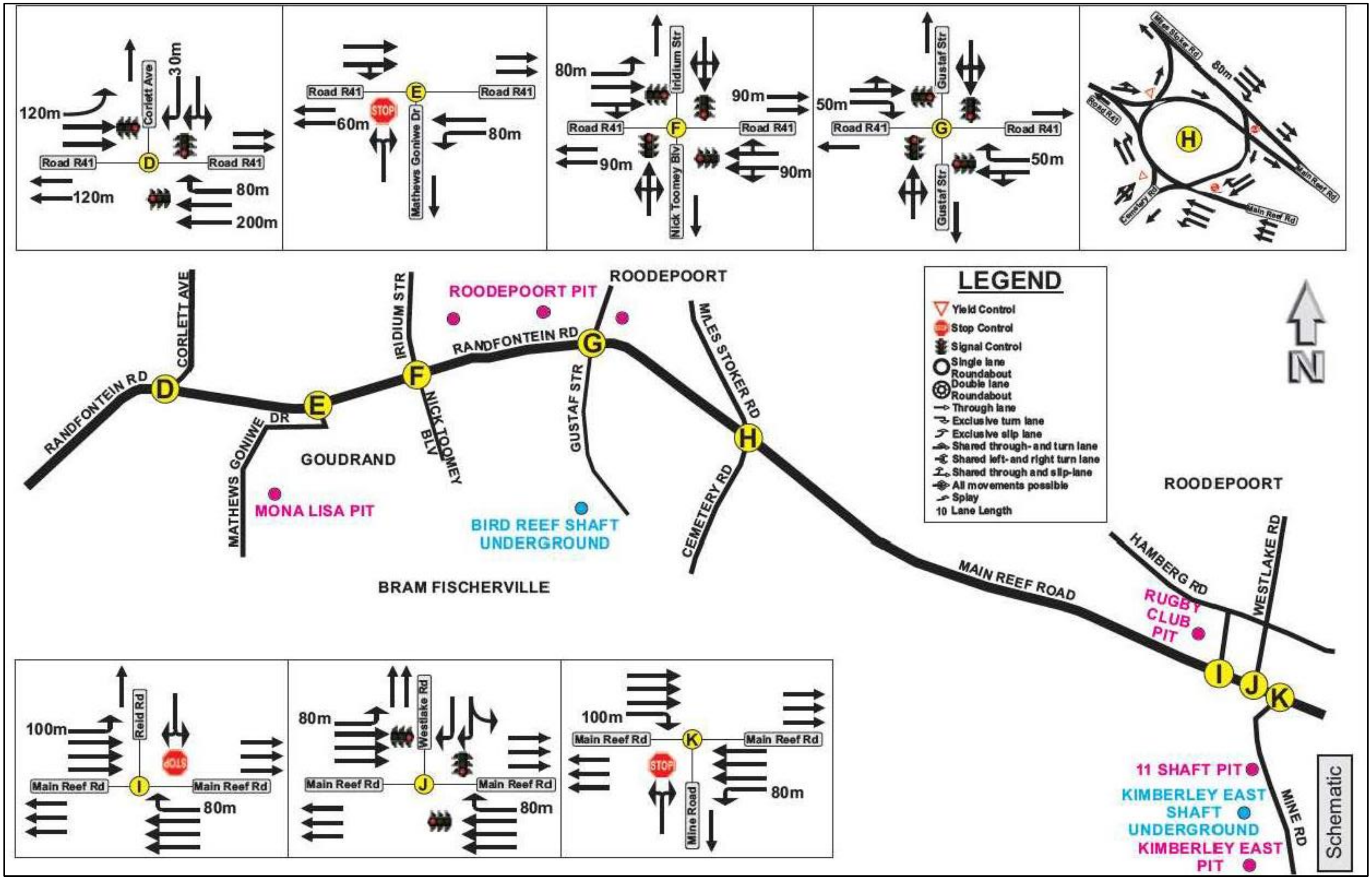


FIGURE 6-15: EXISTING ROAD NETWORK (SIYAZI, 2019)

6.4.1.13 Heritage, cultural and paleontological resources

Heritage, cultural and paleontological resources are important to the history of South Africa and are protected by national legislation. This section describes the existing status of the heritage and cultural environment that may be affected by the project. Heritage (and cultural) resources include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

Paleontological resources are fossils, the remains or traces of prehistoric life preserved in the geological (rock stratigraphic) record. They range from the well-known (such as dinosaur and mammoth bones) to the more obscure but nevertheless scientifically important fossils (such as palaeo-botanical remains, trace fossils, and microfossils). Paleontological resources include the casts or impressions of ancient animals and plants, their trace remains (for example, burrows and trackways), microfossils (for example, fossil pollen and diatoms), and un-mineralised remains (for example, bones of Ice Age mammals).

Mining projects have the potential to damage heritage (including cultural) and palaeontological resources through physical loss of these resources. These resources are unique and non-renewable and as such, impacts on these resources can be significant.

a. Heritage resources

The greater Roodepoort region has been extensively altered by historical mining activities since the farms Vogelstruisfontein, Roodepoort, Langlaagte and the two portions comprising Paardekraal (in Krugersdorp) were proclaimed as public diggings by the then ZAR government in 1886. The expansion of gold prospecting activities in and around the farm Roodepoort, resulted in the need for a town. By February 1887, the first residential stands of what would become Roodepoort were sold. Heritage resources found within the project area therefore include many mining related heritage resources. This is described in the sections below.

Eighteen heritage resources were found within the proposed infrastructure footprints – refer to Table 6-19 below and Figure 6-16. A full description, including photographs are provided in the specialist report (Refer to Appendix P). Most of these resources have a low heritage rating, and several have a medium rating as shown in the table. Two resources have a medium/high heritage significance (PGS, 2019):

- WW016 – a historical house that is likely to be between 60-100 years (possibly Victorian) is located within the proposed ore trucking road. A photo of the house is provided in Photo Plate 6-1 below. This house is located 82 m south of the existing main trucking road is likely associated with the DRD mine. This house should be retained and avoided and will require a buffer zone of 50 m, should any development activity take place here. If avoidance is not feasible, a permit from the Gauteng Provincial Heritage Resources Authority will be required for any destruction or removal of the structure in terms of the NHRA; and
- WW018 – several mining structures and a historical headgear are located in the proposed Bird Reef/Central circular shaft footprint. Photo Plate 6-2 below shows the headgear which still has a sign labelling it as "Durban Deep" and is fenced off with a gate and a security guard. The survival of such headgear structures is extremely rare according to PGS, and it is directly associated with the DRD Mine, which was one of the earliest gold mines in the Roodepoort and Johannesburg area. The other structure remains survive in various stages of dilapidation with several as foundation only. Some are constructed of stone and others of cement. The headgear should be avoided if possible and retained *in situ,* if this is

feasible. A buffer zone of at least 50 m is required should any development activity take place here. The existing fence should be retained. If avoidance is not feasible, a permit from the Gauteng Provincial Heritage Resources Authority will be required for any destruction or removal of the headgear structure.

Two cultural resources of medium significance were also found as shown in Table 6-19 below and comprise two open air religious sites (shown in Figure 6-16). These are living heritage sites under the NHRA. Any alteration these sites will require stakeholder engagement and consent (e.g. local community/ church group).

PHOTO PLATE 6-1: HISTORICAL HOUSE (WW016) (PGS, 2019)

PHOTO PLATE 6-2: METAL HEADGEAR (PART OF WW018) (PGS, 2018)

TABLE 6-19: HERITAGE RESOURCES IN RELATION TO PROPOSED FOOTPRINT AREAS (PGS, 2019)

Resource Number	Resource Type	Heritage Significance	Impact Zone
WW001	Historical mining structure remains	Low	Roodepoort Main Reef pit footprint
WW002	Open air religious site	**Medium**	Roodepoort Main Reef pit footprint
WW003 and WW003-1	Historical mining structure remains	Low	11 Shaft Main Reef pit footprint
WW004	Historical mining structure remains	Low	11 Shaft Main Reef pit footprint
WW005	Historical mining structure remains	Low	Kimberley Reef East infrastructure footprint
WW006	Historical mining remains - adit	Low	Kimberley Reef East infrastructure footprint
WW007	Historical mining structure remains	Low	Kimberley Reef East infrastructure footprint
WW008	Historical mining structure remains	Low	11 Shaft Main Reef pit footprint
WW009 and WW009-1	Historical mining structure remains	Low	11 Shaft Main Reef pit footprint
WW010	Open air religious sites	**Medium**	Roodepoort Main Reef pit footprint
WW011	Historical structures	**Medium**	Ore trucking road
WW012	Historical mining structure remains	Low	Ore trucking road
WW013	Three historical houses	**Medium**	Ore trucking road
WW014	One historical house	**Medium**	Ore Trucking road
WW015	One historical house	**Medium**	Ore Trucking road
WW016	One historical house	**Medium/High**	Ore Trucking road

Resource Number	Resource Type	Heritage Significance	Impact Zone
WW017	Pipeline remains	Very Low	Mona Lisa Bird Reef pit footprint
WW018	Several mining structures remains and a historical headgear	**Medium/High**	Bird Reef/ Central Circular Shaft footprint

In addition to the heritage resources listed in the table above, six heritage resources were found within the project area - refer to Figure 6-16. These resources include historical houses, old mining structures including an old mine shaft, and two informal burial grounds of high grading/significance – refer to Table 6-20. Section 36(5) and (6) of the NHRA requires that consultation and agreement be reached with "communities and individuals who by tradition have an interest in such grave or burial ground". Damage to the burial grounds was noted during the fieldwork, with dumping occurring at both sites. Stakeholders would therefore need to be consulted on management measures to be implemented to prevent further damage. Some of these resources are located close to proposed infrastructure and therefore care must be taken to prevent any damage to these resources.

TABLE 6-20*:* HERITAGE RESOURCES WITHIN THE PROJECT AREA (PGS, 2019)

Resource Number	Type	Heritage Significance	Impact Zone
WW019	Four historical houses	Medium	South of Mona Lisa Bird Reef pit
WW020	One historical house	High	North-east of Bird Reef/ Central Circular Shaft
WW021 and WW021-1	Old mine shaft and foundation remains of mining structures	Low	Close to Roodepoort Main Reef Pit
WW022-1 to WW022-3-	Very large informal burial ground	High	Between Bird Reef/ Central Circular Shaft and Mona Lisa Bird Reef Pit
WW023	Historical mine compound and hospital remains	Low/medium	Between Bird Reef Central Circular Shaft and Mona Lisa Bird Reef
WW024	Informal burial ground	High	North of Bird Reef/ Central Circular Shaft, close to Ore transport road

It should be noted that no archaeological material or sites were identified in the project area. However, occasional finds of stone tools have been recorded in previous studies of the larger area, and an historic midden was identified by Birkholtz (2008) in the Creswell Park area. This indicates the possibility of sub-surface archaeological material being uncovered by the proposed activities (PGS, 2019).

FIGURE 6-16: HERITAGE RESOURCES IN THE PROJECT AREA (PGS, 2019)

b. Palaeontological resources

A palaeo-sensitivity map on the SAHRIS database was consulted to determine the potential for paleontological resources to occur in the proposed project area. The project area lies in a low sensitivity area and therefore no palaeontological studies are required. A map showing the low sensitivity area is provided in the PGS report (refer to Appendix P).

PGS conducted further research using the SAHRIS database, which yielded a previous Palaeontological Impact Assessment (PIA) report for the Rand Leases Ext. 13 development (Rubidge 2011, as cited in PGS, 2019) and a SAHRA response letter to West Wits for the farm Roodepoort (SAHRA, 2014, as cited in PGS, 2019). Both of these information sources confirmed the low palaeontological significance of the underlying geology in this area. Rubidge stated the underlying geology is the Precambrian Booysens Formation, Johannesburg Subgroup, of the Witwatersrand Supergroup which is Precambrian in age and not known to contain fossils. The SAHRA letter stated that since the proposed prospecting project was situated in an area of low palaeontological significance, no palaeontological studies would be required (PGS, 2019).

6.4.1.14 Socio-economic profile

Mining operations have the potential to result in both positive and negative socio-economic impacts. The positive impacts are usually economic in nature with mines contributing directly towards employment, procurement, skills development and taxes on a local, regional and national scale. In addition, mines indirectly contribute to economic growth in the national, local and regional economies by strengthening the national economy and because the increase in the number of income earning people has a multiplying effect on the trade of other goods and services in other sectors.

The negative impacts can be both social and economic in nature. Mines can cause an influx of people seeking job opportunities which can lead to increased pressure on basic infrastructure and services (housing, health, sanitation and education), informal settlement development, increased trespassing, increased crime, introduction of diseases and disruption to the existing social structures within communities. Mines can also cause a change to not only pre-existing land uses, but also the associated social structure and meaning associated with these land uses and way of life. This is particularly relevant in the closure phase when the economic support provided by mines ends, the natural resources that were available to the pre-mining society are reduced, and the social structure that has been transformed to deal with the threats and opportunities associated with mining finds it difficult to readapt.

The project area is located in the City of Johannesburg Metropolitan Municipality (CoJ) of the Gauteng Province. Various wards fall within and adjacent to the project area.

a. Demographic analysis

Table 6-21 provides a summary of the key demographics for the project area and surrounds. This table also provides information on the household dynamics. The household dynamics within the study area is a key determinant of the demand for services and employment. The average household size is indicative of the quality of life in a study area. This connection is based on the following principle: In areas where average household size is higher the number of dependents is also expected to be greater and thus income per person will be lower. The age and gender composition of a population can have a considerable impact on socio-economic development in a study area. It is indicative of the size of the labour force, worker migration and the demands for health care and other social services (Mercury, 2019).

TABLE 6-21: DEMOGRAPHIC INDICATORS (COMMUNITY PROFILE 2016) (MERCURY, 2019)

DEMOGRAPHIC	GAUTENG	COJ	WARD ANALYSIS				
			WARD 49	WARD 70	WARD 71	WARD 84	WARD 127
Total population	13.4 million	4.95 million	46 251	31 023	33 179	33 179	38 731
Number of households	5 million	1.9 million	14 625	11 249	10 536	10 536	11 249
Population density (people per km^2)	7.7	3 003	3 135	893	2 825	2 825	2 126
Average household size	3	3	3	3	3	3	2
Female headed households	1.8m	0.7m	5 967	4 015	3 150	3 513	4 477
Young (0-18)	4 million	1.5 million	15 170	7 412	8 639	8 309	11 070
Mid (19 – 60)	8.6 million	3.2 million	30 465	21 240	21 116	22 391	27 299
Elderly (60+)	0.75 million	0.27 million	617	2 371	1 718	2 480	363

b. Socio-economic profile

Table 6-22 provides additional socio-economic information for the project area and surrounds.

TABLE 6-22: KEY SOCIO-ECONOMIC INFORMATION IN THE PROJECT AREA AND SURROUNDS (SUMMARISED FROM MERCURY, 2019)

Aspect	Details
Language	The most prevalent language spoken in the City of Joburg is isiZulu (24 %). Within Ward 70 and 84, the most prevalent language is English (51 %) followed by Afrikaans (48 %). In Ward 127 the most prevalent language is Setswana (23 %).
Household Income	16 to 17 % of the Gauteng and City of Joburg households have no income, this is also similar to Ward 127, where 30 % of the households have no income. The other towns have between 14 to 21 % of households with no income.
Literacy rates, skills and education	Approximately 44 % of the population over the age of 20 years in the affected Wards have attained a matric. Approximately 7 % of the population over the age of 20 years in the affected awards have under-graduate education, with 3 % having post-graduate education.
Employment Status	Unemployment levels in the affected wards are higher than the Gauteng and City of Joburg averages, at approximately 21 %. Employment is the highest in the towns of Georgina and Roodepoort, which is the seen as established urban centres in the study area. The formal sector accounts for approximately 80 % of employment in the affected Wards, followed by 11 % in private households.
Housing	Approximately 29 % of households in the municipality as a whole are renting accommodation or staying with family members. 38.1% of households own their property and have paid it off, while 14 % of households are currently still paying off home loans. Approximately 55 % of houses are brick structures, with 10 % being informal dwellings.

Aspect	Details
Water and Sanitation	Approximately 95 % of households in the affected Wards have access to serviced (piped) water. Less than 1 5 of households access water through a spring, borehole or river, while 2 % use water tankers. Most households have flush toilets (88 %) while 3 % used pit latrines, and 4 % use chemical toilets.
Refuse Removal	Most of the households in the affected Wards have regular refuse removal (93 %). From observations during the site visit it was also evident that many use unauthorized sites to dump refuse.
General health and welfare	HIV/AIDS in South Africa has increased rapidly over the past decade. Current prevalence in City of Joburg Metro is 30 %. Recent statistics indicate that HIV/AIDS prevalence is increasing in Gauteng, therefore policies and awareness campaigns have not impacted significantly on the ground.
Crime Statistics	In terms of the latest statistics in Gauteng, 4 382 murders were committed in Gauteng of these 190 were domestic violence incidents, 105 were because of mob justice, 82 due to taxi violence and 25 were related to illegal mining. The precincts closest to the project area show the following statistics: Dobsonville has the highest reported crime at 30 %, followed by Roodepoort at 28 %, Florida at 23 % and Meadowlands at 19 %.

c. Towns and settlements

The broader project area is located amongst existing towns and settlements. The closest formal towns are described in Table 6-23 below. This table also provides available socio-economic information for these towns.

TABLE 6-23: CLOSEST FORMAL TOWNS AND BASIC SOCIO-ECONOMIC INFORMATION (MERCURY, 2019)

Town	General description	Basic socio-economic information
Roodepoort and Roodepoort North	Roodepoort Central is located north of the Mining Right Application (MRA) area and makes up the central business district of Roodepoort housing a number of Commercial and Light Industrial Activities, with some residential activities to the far west. Roodepoort North is north-east of the MRA area with mostly residential areas, educational, institutional and some commercial activities.	• Households: in Roodepoort North 1 095 households make up a population of 3 567 people with an average household size of 3. • Density: the suburb covers an area of 62.2 ha with a density of approximately 57 people per hectare. • Economically active population: 71 % of the total population (between ages of 19 and 60), with the youth and elderly making up 29 %. • Employment: Of the economically active population 62 % are employed, 14 % unemployed, 2 % are discouraged work seekers and 22 % are not economically active. • Income: The average annual household income is R20 000 – R300 000. 29 % of the households earn less than R840 per month (R10 000 per annum). • Services: the municipality supplies the area with water, electricity, sewerage and refuse removal.
Durban Roodepoort Deep	Durban Roodepoort Deep (DRD) is located central to the MRA area. DRD is an old mining town where the old mining houses are partly being rent-out to local people and some houses are being occupied illegally. There are a number of houses that have been either broken down by the landowners or vandalized to such an extent that they are uninhabitable. Most commercial activities are informal such as car workshops, tuck-shops, shebeens and other types of informal commercial activities. There are also old Recreation areas established during the operational time of the old mine such as a golf course, rifle range and other sport grounds. To the east some light industrial land use activities take place, mostly panel beating, car parts and spares, etc.	• Households: 303 households making up a population of 747 people with an average household size of 2. • Economically active population: 87 % of the total population (between ages of 19 and 60), with the youth and elderly making up 13 %. • Employment: Of the economically active population 67 % are employed and 32 % unemployed. • Income: The average annual household income is R20 000 – R75 000. 28 % of the households earn less than R840 per month (R10 000 per annum). • Services: The area was previously supplied with water, electricity, sewerage and refuse removal from the municipality, but the services were cut in 2014. The Durban Deep Primary school used to provide Educational services to the community but has since closed due to a lack of services.
Sol Plaatjie	Sol Plaatjie is located within the MRA area to the south of the operations. Land use in this suburb is mostly residential, institutional (churches), and recreation activities with some commercial activities (home based businesses, cafes, shops). There are also old hostels present in the community, and an informal settlement (21 % of the	• Households: 3 633 households making up a population of 9 141 people with an average household size of 4. • Economically active population: 52 % of the total population (between ages of 19 and 60), with the youth and elderly making up 48 %. • Employment: Of the economically active population 36 % are employed and 42 %

Town	General description	Basic socio-economic information
	households) just south of the community. The community has agricultural land where food is produced located just north of the community.	unemployed and 22 % discouraged work seekers. • Income: The average annual household income is R10 000 – R40 000. 58 % of the households earn less than R840 per month (R10 000 per annum). The community is extremely poor and far below the ward average and that of City of Joburg. • Services: The area is supplied with water, electricity, sewerage and refuse removal. Some households have private boreholes. • General dust comment: The community experiences severe dust pollution from the old Tailings Storage Facility, especially in the winter months.
Creswell Park	Creswell Park is located to the north-east, of the MRA Area. Land use in this suburb is mostly residential with a limited commercial activity (filling station, guesthouse and some shops).	• Households: 264 households making up a population of 810 people with an average household size of 4. Economically active population: 85 % of the total population (between ages of 19 and 60), with the youth and elderly making up 16 %. • Employment: Of the economically active population 73 % are employed and 27 % unemployed. • Income: The average annual household income is R40 000 – R300 000. 11 % of the households earn less than R840 per months (R10 000 per annum). • Services: the municipality supplies water, electricity, sewerage and refuse removal.
Rand Leases Area	The Rand Leases Gold Mining Company was established in the early 1900's. After closure in 1971, followed by various ownership changes and the re-opening of mining operations, work eventually ceased in the 1990's because of a decreasing gold price. The mining hostel, was one of two worker residential compounds that existed during mining operations, and was referred to as Rand Leases 'B' Compound, built in the early 1940's. Since 2011 Calgro M3 has been redeveloping the farm Vogelstruisfontein 231 IQ, which includes the Old Rand Leases Mine Hostel, into residential units. This public-private partnership with the City of Johannesburg has resulted in the completion of low-, medium- and high-density residential units. The Rand Leases Area (RLA) is located within the MRA area. There are however two informal settlements located on the property, at the landfill site and the second just south of Florida Lake. The most part of the area's land use is historical mining areas, the landfill and industrial activities.	• Households: 957 households making up a population of 1 938 people with an average household size of 2. • Economically active population: 86 % of the total population (between ages of 19 and 60), with the youth and elderly making up 14 %. • Employment: Of the economically active population 48 % are employed and 34 % unemployed. • Income: The average annual household income is R20 000 – R75 000. 53 % of the households earn less than R840 per month (R10 000 per annum). • Services: Some of the areas are supplied with water, electricity, sewerage and refuse removal from the municipality, but the informal settlements are supplied with sporadic water supply and sanitation services.
Florida and	Florida and Florida Lake is located just north of the Mining Right Application (MRA) area. The closest part of Florida consists of the	• Households: 6 970 households in Florida making up a population of 20 082 people with an

Town	General description	Basic socio-economic information
Florida Lake	Florida Lake, park and recreational activities. Florida Lake consist of industrial (on its eastern boundary), commercial and residential land use activities.	average household size of 3. In Florida Lake there are 829 households with a population of 2 820 (average household size of 3). • Economically active population: 72 % of the total population (between ages of 19 and 60), with the youth and elderly making up 28 %. • Employment: Of the economically active population in Florida 68 % are employed, 9 % unemployed and 22 % are not participating in the labour market. In Florida Lake the economic active population is 7 % of which 73 % is employed and 8 % unemployed. • Income: The average annual household income for Florida and Florida Lake is between R75 000 – R600 000. 12 % of the households in Florida and 10 % in Florida Lake earn less than R840 per months (R10 000 per annum). • Services: The area is supplied with water, electricity, sewerage and refuse removal by the Municipality.
Matholesville	Matholesville, also known as Goudrand, is located within the MRA area, just south of the Roodepoort Main Reef Opencast and just north of the Mona Lisa Opencast operations. Land use in this settlement is mostly residential, institutional (churches), educational and some commercial activities (home based businesses, cafes, shops). The community has agricultural land where food is produced located just north of the community. There is a growing information settlement just south of the formal areas, close to the Eskom's Princess substation located to the west of the town.	• Unemployment in Matholesville is higher than the Gauteng and City of Joburg averages. (No other information available at the time of compiling this report)
Georgina	Georgina is located to the north and north-east of the MRA area. Land use in this suburb is mostly residential, institutional (churches), recreation activities, public open spaces but limited commercial activities (home based businesses, cafes, shops). To the north of the suburb is the Tornado Retirement Centre.	• Households: 762 households residing making up a population of 2 469 people with an average household size of 3. • Economically active population: 73 % of the total population (between ages of 19 and 60), with the youth and elderly making up 27 %. • Employment: Of the economically active population 92 % are employed and 7 % unemployed and the remaining percentage are discouraged work seekers. • Income: The average annual household income is R75 000 – R300 000. 23 % of the households earn less than R840 per month (R10 000 per annum). • Services: The area is supplied with water, electricity, sewerage and refuse removal by the municipality.

d. Illegal artisanal mining

Hundreds of out-of-work miners and immigrants try to make a living through illegal mining of the old underground mining shafts and tunnels. The miners work shallow portions of mines, specifically at the Durban Roodepoort Deep sites. It is believed that there are about 350 illegal miners in this area, who in turn support approximately 10 dependents each. It is believed that these miners live close to the mine areas, and it is expected most likely in either abandoned housing or backyard rooms / shacks (Mercury, 2019).

e. Planned housing development initiatives

There are initiatives for the improvement and expansion of housing development and integrated mixed housing programmes in the area surrounding the project area. These include (Mercury, 2019):

- Goudrand Mega City: A mixed-use residential and commercial development, known as the Goudrand Mega City is planned to be developed on Portions of the Remainder of Portion 1 and Portions of the Remainder of Portion 5 and Portion 404 (a portion of Portion 1 of the Farm Roodepoort 237IQ). The Goudrand Mega City is only planned to take place after the rehabilitation of the open cast operations and is therefore not envisaged to have an impact on the proposed mining development.
- Witpoortjie Development: The project will comprise a mixed-use development consisting of 5 300 units. The project is an infill and integrated housing development between the existing Witpoortjie, Leratong and Bram Fischerville townships.
- Spitz development: The proposed project aims to develop the site as a mixed use, residential township in the affordable to middle income bonded housing market. The proposed development will include a residential component of varying market and density ranges including educational, commercial and social land uses. The project is currently still in permitting stage.

The planned housing developments have been considered with respect to the proposed project.

6.4.2 LAND USES

Mining activities have the potential to affect land uses both within the project area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts. The key related potential environmental impacts are: loss of soil, loss of biodiversity, pollution of water, dewatering, air pollution, noise pollution, visual impacts and the influx of job seekers with related social ills.

a. Surface rights

Surface rights within the project area are held by private individuals, companies, property developers, Gauteng provincial government, the local municipality and parastatals (Figure 6-25).

b. Mineral / Prospecting rights

West Wits currently holds a prospecting right (GP 30/5/1/1/2/10035 PR) over various portions of the farms Roodepoort 236 IQ, Roodepoort 237 IQ, Tshekisho 710 IQ, Uitval 677 IQ, Vlakfontein 238 IQ, Vogelstruisfontein 231 IQ, Vogelstruisfontein 233 IQ, Witpoortjie 245 IQ, Glenlea 228 IQ. The prospecting right (MPT No. 29/2016) was ceded from Mintails SA Soweto Cluster (Proprietary) Limited to West Wits. Consent for the transfer of the prospecting right in terms of Section 11(2) of the MPRDA was granted by the DMR in 2018.

Third party mineral rights' holders exist within the project area and to the east, along the Central Rand Goldfield.

c. Land claims

Consultation with the Department of Rural Development and Land Reform was undertaken regarding the lodging of land claims within the project area. The Department's response has indicated that a number of land claims were lodged for properties within the mining right application area when the process was re-opened in 2015. However, processing of these land claims has been delayed due to administrative issues. Further information is included in Appendix B.

d. Traditional authorities

No traditional authority has jurisdiction over the project area.

e. Land use within and surrounding the project area

Land uses associated with the project area include a combination of informal settlements, low-cost and high-cost residential areas, community and municipal facilities, agricultural areas, recreational areas, industrial areas, manufacturing and distribution facilities, commercial businesses, historical mine housing and historical mine infrastructure (slimes dams, shafts, derelict/abandoned buildings and water dams), illegal informal mining activities, mining activities, open land, substations and powerlines, gas and petrol pipelines, service and road infrastructure. Surrounding land uses are similar to those listed above.

Within the proposed opencast mining areas and infrastructure complexes, the existing land uses are a mixture of historical mine infrastructure (shafts and/or derelict/abandoned buildings), illegal informal mining activities, illegal dumping of waste, open land and in some instances service infrastructure.

A preliminary list of land uses surrounding the proposed opencast mining areas and infrastructure complexes are outlined in Table 6-24. Distances selected are for reference purposes and do not necessarily represent an impact zone.

TABLE 6-24: PRELIMINARY LIST OF LAND USES SURROUNDING THE PROPOSED OPENCAST MINING AREAS AND INFRASTRUCTURE COMPLEXES

Mining activity	Infrastructure and land uses	
	Within 100 m	Within 500 m
Opencast mining areas		
Mona Lisa Bird Reef pit	Slimes dam and associated mining activities, power lines, open land, a gravel road, a tributary of the Klip River, proposed solar plant development, proposed housing development	Eskom substation, outskirts of Goudrand, outskirts of Solplaatjie, agricultural fields
Roodepoort Main Reef pit	Road infrastructure including Main Reef road, commercial businesses, residential and commercial business areas of the Roodepoort CBD, power lines, substations, a section of the railway line, proposed housing development, Transnet pipeline	Additional commercial businesses, a slimes dam and southern section of Davidsonville, a larger light industrial area of the Roodepoort CBD, southern section of Roodepoort residential area, sections of Matholesville, Rand Water pipelines
Rugby Club Main Reef pit	Illegal informal mining activities, rugby club, road infrastructure including Main Reef road, Transnet pipeline	Illegal informal mining activities, informal settlement, road infrastructure including Albertina Sisulu road, southern outskirts of Florida Lake residential area, commercial and light industrial

Mining activity	Infrastructure and land uses	
	Within 100 m	Within 500 m
		areas, a substation, residential structures south of Main Reef road, Sasol pipeline, Rand Water pipelines
11 Shaft Main Reef pit	Demolished/abandoned structures of a substation, access road, open land, light industrial businesses, high density residential development, proposed industrial development, Rand Water pipelines	Slimes dam, road infrastructure, a larger section of the high density residential development, a drainage channel
Kimberley Reef East pit	Slimes dams, open land, Rand Water pipelines	Commercial business, road infrastructure, Fleurhof dam
Infrastructure complexes		
Bird Reef Central Complex	Power line, open land, golf course, slimes dams, road infrastructure	Open land, larger section of the golf course, slimes dams, residential structures, Rand Water pipelines
Kimberley Reef East Shaft	Commercial business, slimes dams, open land, Rand Water pipelines	Larger area of the commercial business, road infrastructure

f. Planned land uses and developments

There are initiatives for the improvement and expansion of housing development and integrated mixed housing programmes in the area (Figure 6-17).

6.4.3 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

The environmental features in the project area are described in Section 6.4.1 above, however the notable environmental features are the Klip River flowing along the western boundary of the proposed mining right area and the six drainage lines flowing through the project area feeding into the Klip River, and the valley bottom wetlands and pans within the proposed mining right application area. Infrastructure within and close to the project area is discussed in Section 6.4.2 above and illustrated on Figure 0-2.

6.4.4 ENVIRONMENT AND CURRENT LAND USE MAP

A conceptual map showing topographical information as well as land uses on and immediately surrounding the West Wits Mining right application area is provided in Figure 6-18.

6.5 ENVIRONMENTAL IMPACTS AND RISKS OF PROJECT ALTERNATIVES

As noted in Section 6.1, no location or layout alternatives are being considered and as such an assessment of alternatives is not applicable to the project.

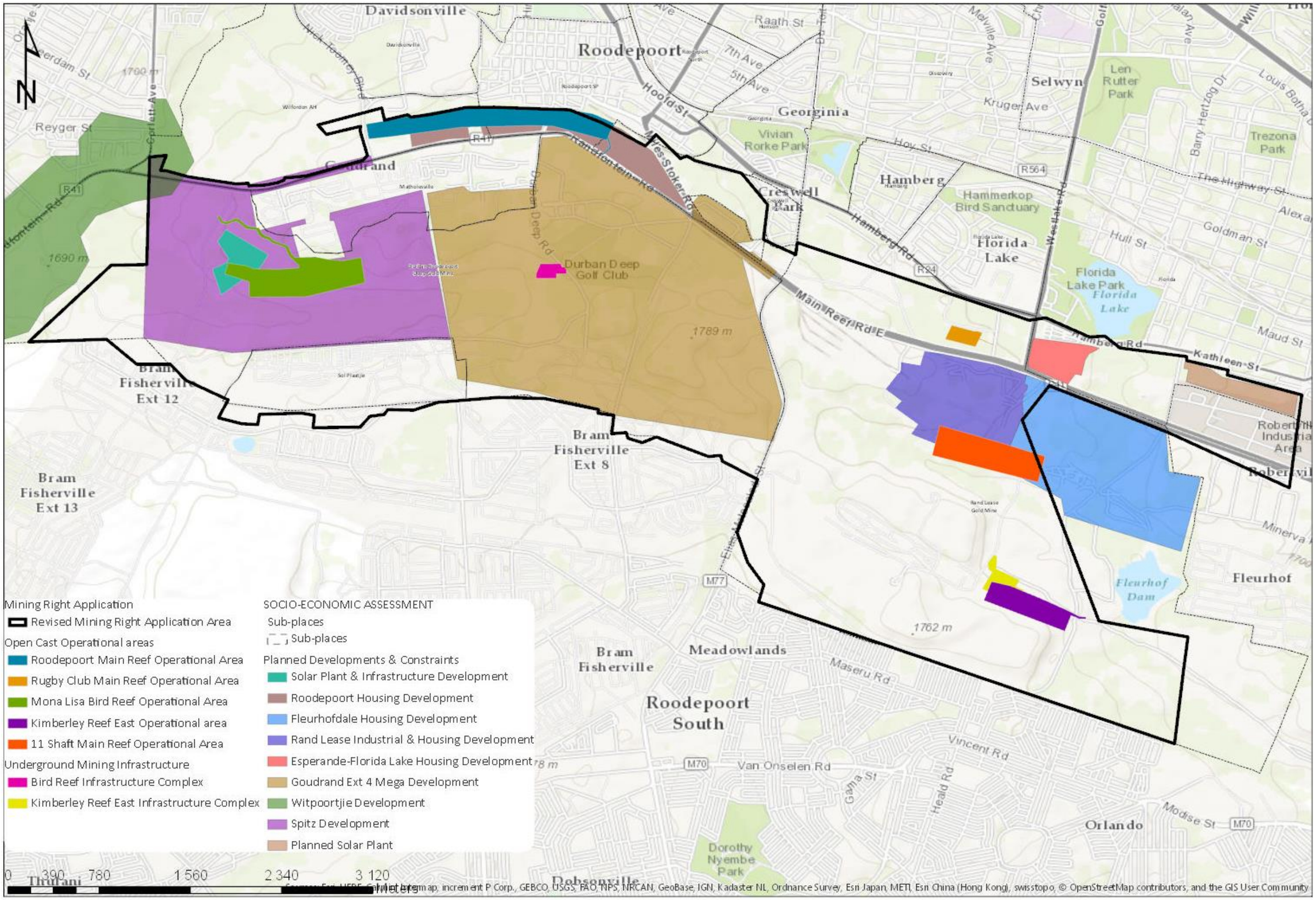
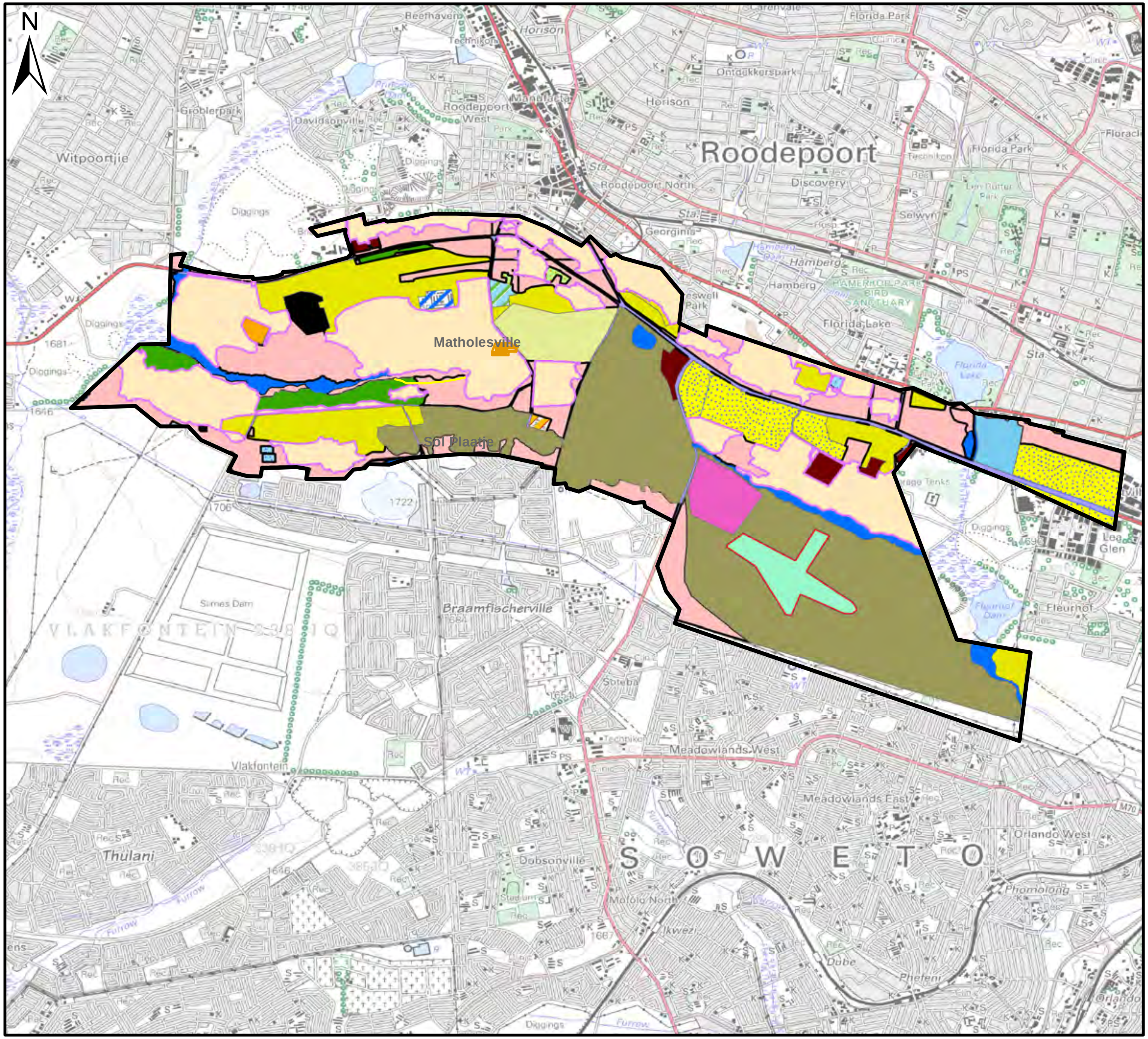


FIGURE 6-17: PLANNED DEVELOPMENT IN THE MINING RIGHT APPLICATION AREA (MERCURY, 2019)



Legend

Land Use

- Access Roads
- Animal Clinic
- Commercial Area
- Cultivation
- Durban Deep Golf Course
- Eskom Substation
- Excavated Area
- Explosives Testing
- Historical Mining
- Industrial Area
- Landfill Site
- Mining Office
- Office Complex
- Open Space
- Primary School
- Princess Dump
- Residential Area
- Sport Field
- Water Resources
- Wildlife/Wilderness

Proposed Mining Right Application Area

Kilometers

0 0.75 1.5 3

Scale: 1:71 584

Projection: Transverse Mercator

Datum: WGS84

WEST WITS MINING RIGHT

Figure 6-18

Land Use Map

SLR

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6.6 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method used for the assessment of environmental issues is set out in Table6-25. This assessment methodology enables the assessment of environmental issues including: cumulative impacts, the severity of impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated.

TABLE6-25: IMPACT ASSESSMENT METHODOLOGY

Note: Part A provides the definition for determining impact consequence (combining intensity, spatial scale and duration) and impact significance (the overall rating of the impact). Impact consequence and significance are determined from Part B and C. The interpretation of the impact significance is given in Part D.

PART A: DEFINITION AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of severity, spatial extent and duration**
Criteria for ranking of the SEVERITY of environmental impacts	**H**	Substantial deterioration (death, illness or injury). Recommended level will often be violated. Vigorous community action.
	M	Moderate/ measurable deterioration (discomfort). Recommended level will occasionally be violated. Widespread complaints.
	L	Minor deterioration (nuisance or minor deterioration). Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	L+	Minor improvement. Change not measurable/ will remain in the current range. Recommended level will never be violated. Sporadic complaints.
	M+	Moderate improvement. Will be within or better than the recommended level. No observed reaction.
	H+	Substantial improvement. Will be within or better than the recommended level. Favourable publicity.
Criteria for ranking the DURATION of impacts	**L**	Quickly reversible. Less than the project life. Short term
	M	Reversible over time. Life of the project. Medium term
	H	Permanent. Beyond closure. Long term.
Criteria for ranking the SPATIAL SCALE of impacts	**L**	Localised - Within the site boundary.
	M	Fairly widespread – Beyond the site boundary. Local
	H	Widespread – Far beyond site boundary. Regional/ national

PART B: DETERMINING CONSEQUENCE					
			SEVERITY = L		
DURATION	Long term	**H**	**Medium**	**Medium**	**Medium**
	Medium term	**M**	**Low**	**Low**	**Medium**
	Short term	**L**	**Low**	**Low**	**Medium**
			SEVERITY = M		
DURATION	Long term	**H**	**Medium**	**High**	**High**
	Medium term	**M**	**Medium**	**Medium**	**High**
	Short term	**L**	**Low**	**Medium**	**Medium**
			SEVERITY = H		
DURATION	Long term	**H**	**High**	**High**	**High**

	Medium term	M	**Medium**	**Medium**	**High**
	Short term	L	**Medium**	**Medium**	**High**
			L	**M**	**H**
			Localised Within site boundary Site	Fairly widespread Beyond site boundary Local	Widespread Far beyond site boundary Regional/ national
			SPATIAL SCALE		

PART C: DETERMINING SIGNIFICANCE					
PROBABILITY (of exposure to impacts)	Definite/ Continuous	**H**	**Medium**	**Medium**	**High**
	Possible/ frequent	**M**	**Medium**	**Medium**	**High**
	Unlikely/ seldom	**L**	**Low**	**Low**	**Medium**
			L	**M**	**H**
			CONSEQUENCE		

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
High	It would influence the decision regardless of any possible mitigation.
Medium	It should have an influence on the decision unless it is mitigated.
Low	It will not have an influence on the decision.

***H = high, M= medium and L= low and + denotes a positive impact.**

6.7 POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY AND ALTERNATIVES

As noted in Section 6.1, the only alternatives considered were for the access route to the Mona Lisa pit; no other location or layout alternatives are being considered. The preferred project alternative is assessed in Section 8.

6.8 POSSIBLE MANAGEMENT ACTIONS THAT COULD BE APPLIED AND THE LEVEL OF RESIDUAL RISK

A summary of issues and concerns raised by I&APs during the EIA process is provided in Section 6.3. Possible management actions that could be applied and the level of residual risk are outlined in the impact assessment and management plan.

A list of the potential impacts identified by SLR, the project specialists and/or raised by I&APs, as well as the possible management and mitigation measures, is provided in Table 6-26. The level of residual risk after management or mitigation, associated with the proposed project, is also estimated.

6.9 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

As noted in Section 6.1, the only alternatives considered were for the access route to the Mona Lisa pit; no other location or layout alternatives are being considered.

6.10 STATEMENT MOTIVATING THE PREFERRED ALTERNATIVE

With reference to Sections 6.1, the only alternatives considered were for the access route to the Mona Lisa pit. The preferred access route was selected due to the following reasons: intersection performance evaluations indicated that excessive upgrades and a traffic light signal would be required for the alternative route option which is not viable in terms of costs and the short lifespan of the Mona Lisa open pit mining area.

TABLE 6-26: MITIGATION MEASURES AND ANTICIPATED LEVEL OF RESIDUAL RISK

No.	Activity	Potential Impact	Possible Mitigation	Level of Residual Risk
1	All Activities [Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas]	Loss of soil resources and land capability through physical disturbance	See management actions included under Issue 1 (Appendix D).	**Low**
2	All Activities	Loss of soil resources and land capability through contamination	See management actions included under Issue 2 (Appendix D).	**Low**
3	All Activities	Physical destruction of biodiversity	See management actions included under Issue 3 (Appendix D).	**Low**
4	All Activities	General disturbance of biodiversity	See management actions included under Issue 4 (Appendix D).	**Low**
5	All Activities Discharge of excess water	Alteration of surface drainage patterns	See management actions included under Issue 5 (Appendix D).	**Medium**
6	All Activities Discharge of excess water	Contamination of surface water	See management actions included under Issue 6 (Appendix D).	**Medium-Low**
7	Open pit and Underground mining - dewatering	Reduction of water availability to third parties	See management actions included under Issue 7 (Appendix D).	**Low**
8	All Activities General site management	Groundwater contamination	See management actions included under Issue 8 (Appendix D).	**Low**
9	All Activities	Change in ambient air concentrations	See management actions included under Issue 9 (Appendix D).	**Medium**
10	Site preparation Earthworks Civil works Underground mining Opencast mining	Increase in Greenhouse Gas emissions	See management actions included under Issue 10 (Appendix D).	**Medium**

No.	Activity	Potential Impact	Possible Mitigation	Level of Residual Risk
	Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation			
11	Underground mining Opencast mining Mineralised waste Maintenance and aftercare of rehabilitated areas	Radiation Impact	Not Applicable - See discussion included under Issue 11 (Appendix D).	**N/A**
12	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Increase in ambient noise levels	See management actions included under Issue 12 (Appendix D).	**Low**

No.	Activity	Potential Impact	Possible Mitigation	Level of Residual Risk
13	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Change in landscape and related visual impacts	See management actions included under Issue 13 (Appendix D).	**Medium** (Construction, Operational, Decommissioning) **Low** (Closure)
14	Overall development of the mine Operation of the mine Rehabilitation of the open pit areas Overall decommissioning of the mine and rehabilitation	Economic impact (positive and negative)	See management actions included under Issue 14 (Appendix D).	**High +**
15	Underground mining Opencast mining Mineralised waste	Loss and sterilisation of mineral resources	Not Applicable - See discussion included under Issue 15 (Appendix D).	-
16	All Activities	Inward migration and social ills	See management actions included under Issue 16 (Appendix D).	**Low**
17	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of livelihood for illegal miners	See management actions included under Issue 17 (Appendix D).	**Medium**
18	All Activities	Social benefits associated with employment and economic development	See management actions included under Issue 18 (Appendix D).	**High +**

No.	Activity	Potential Impact	Possible Mitigation	Level of Residual Risk
19	Transport system	Road disturbance and traffic safety	See management actions included under Issue 19 (Appendix D).	**Medium**
20	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Non-mineralised waste Demolition Rehabilitation	Safety risks to third parties	See management actions included under Issue 20 (Appendix D).	**Low** (Construction, Operational, Decommissioning) **Medium +** (Closure)
21	Site preparation Earthworks Civil works Opencast mining Transport system Mineralized waste Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Increase in health risks to receptors	See management actions included under Issue 21 (Appendix D).	**Low**
22	Underground mining Opencast mining	Blasting and Vibration Impacts	Not Applicable - See discussion included under Issue 22 (Appendix D).	-
23	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Land use impact	See management actions included under Issue 23 (Appendix D).	**Medium** (Construction, Operational And Decommissioning) **Medium +** (Closure)

No.	Activity	Potential Impact	Possible Mitigation	Level of Residual Risk
24	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Damage to or disturbance of heritage (including cultural) and palaeontological resources resulting in a loss of the resource	See management actions included under Issue 24 (Appendix D).	**Low**

7 FULL DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY, ASSESS AND RANK THE IMPACTS AND RISKS THE ACTIVITY WILL IMPOSE ON THE PREFERRED SITE THROUGH THE LIFE OF THE ACTIVITY

7.1 DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY IMPACTS

Environmental and socio-economic impacts associated with the project were identified through site visits undertaken by SLR, consideration of the project description, site layout and the specialist studies. As part of the public participation process, I&APs (Section 6.2) were given an opportunity to provide input to the project at the public open day sessions and focussed meetings, and through the review of the background information flyer, adverts, site notices and the Scoping Report. I&APs will be given a further opportunity to provide input through the review of the EIA Report and/or summary. The feedback received from I&APs also provided input into the identification of environmental and socio-economic impacts.

7.2 DESCRIPTION OF THE PROCESS UNDERTAKEN TO ASSESS AND RANK THE IMPACTS AND RISKS

A description of the assessment methodology used to assess the severity of identified impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated is provided in Section 6.6.

7.3 A DESCRIPTION OF THE ENVIRONMENTAL IMPACTS AND RISKS IDENTIFIED DURING THE ENVIRONMENTAL ASSESSMENT PROCESS

A description of the environmental impacts and risks identified during the EIA is included in Section 8 and Appendix D.

7.4 ASSESSMENT OF THE SIGNIFICANCE OF EACH IMPACT AND RISK AND AN INDICATION OF THE EXTENT OF TO WHICH THE ISSUE AND RISK CAN BE AVOIDED OR ADDRESSED BY THE ADOPTION OF MANAGEMENT ACTIONS

The assessment of the significance of potential impacts, including the extent to which impacts can be avoided or mitigated, is included in Section 7.3 and 8 and Appendix D.

8 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

A summary of the assessment of the biophysical and socio-economic impacts associated with the proposed project is provided in Table 8-1 below. A full description of the assessment is included in Appendix D.

TABLE 8-1: ASSESSMENT OF SIGNIFICANT IMPACTS AND RISKS

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
1	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of soil resources and land capability through physical disturbance	Soil and land capability	Construction Operational Decommissioning Closure	**High**	• Demarcation of project footprint • Soil management procedures • Control through appropriate design • Manage through dust suppression and fire prevention plans • Closure planning and rehabilitation • Erosion control	**LOW**	Can be managed /mitigated and avoided for areas outside of the approved footprint
2	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use	Loss of soil resources and land capability through contamination		Construction Operational Decommissioning Closure	**Medium**	• Soil management procedures • Control through appropriate design • Control through waste management practices • Implement education and training	**LOW**	Can be managed /mitigated and avoided for areas outside of the approved footprint

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas					• Remedy through emergency response procedures (see Section 30.2)		
3	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Physical destruction of biodiversity	Biodiversity	Construction Operational Decommissioning Closure	**Medium**	• Control through appropriate design • Limit project footprint • Search and rescue of flora and fauna • Designation of no-go areas • Manage alien invasive species • Control through permits for removal • Rehabilitation	**LOW**	Can be managed /mitigated and avoided for areas outside of the approved footprint
4	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use	General disturbance of biodiversity		Construction Operational Decommissioning Closure	**Medium**	• Control through appropriate design • Limit project footprint • Search and rescue of flora and fauna • Designation of no-go areas	**LOW**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas					• Manage alien invasive species • Manage through training and monitoring • Control through permits for removal • Remedy through emergency response procedures (see Section 30.2) • Manage through implementing groundwater, surface water, soil, light, and dust mitigation • Rehabilitation		
5	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Discharge of excess water	Alteration of surface drainage patterns	Surface water	Construction Operational Decommissioning Closure	**High**	• Manage through storm water control • Manage through design • Control through water use licence requirements • Manage through monitoring • Update water balance • Remedy through emergency response procedures (see Section 30.2)	**MEDIUM**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Maintenance and aftercare of rehabilitated areas							
6	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Discharge of excess water Maintenance and aftercare of rehabilitated areas	Contamination of surface water		Construction Operational Decommissioning Closure	**High**	• Manage through appropriate design • Manage through Storm water Management Plan • Manage through waste management practises • Manage through inspections and maintenance • Control through water use licence requirements • Surface water monitoring • Remedy through emergency response procedures (see Section 30.2) • Rehabilitation	**MEDIUM-LOW**	Can be managed/ mitigated
7	Open pit and Underground mining - dewatering	Reduction of water availability to third parties	Groundwater	Operational	**Low** (open pit and underground)	• Update hydrocensus • Update groundwater model • Groundwater monitoring • Additional drilling of boreholes and aquifer testing • Manage through alternatives or compensation (if needed)	**LOW**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
8	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare of rehabilitated areas	Groundwater contamination		Construction Operational Decommissioning Closure	**Low**	• Update hydrocensus • Update groundwater model • Groundwater monitoring • Additional drilling of boreholes and aquifer testing • Manage through alternatives or compensation (if needed) • Remedy through emergency response procedures (see Section 30.2)	**LOW**	Can be managed/ mitigated
9	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Change in ambient air concentrations	Air	Construction Operational Decommissioning Closure	**High**	• Manage through best practice measures • Dust control and dust fall out monitoring • Manage through service and maintenance • Air quality monitoring • Complaints register • Rehabilitation	**MEDIUM**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Maintenance and aftercare of rehabilitated areas							
10	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition	Increase in Greenhouse Gas emissions	Greenhouse Gases	Construction Operational Decommissioning	**High**	• Manage through greenhouse gas reduction strategy	**MEDIUM**	Can be managed/ mitigated
11	Mineralised waste Opencast mining Underground mining Maintenance and aftercare of rehabilitated areas	Radiation Impact	Radiation	Operational Decommissioning Closure	**Low**	• No mitigation measures are deemed necessary	N/A	No mitigation measures are deemed necessary by the specialist
12	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste	Increase in ambient noise levels	Noise	Construction Operational Decommissioning	**Medium** (Open Pit) **Low** (Underground)	• Minimise through use of appropriate equipment and appropriate equipment orientation, • Minimise through maintenance • Control through design and berms • Complaints register	**LOW** (open pit and underground)	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Support services Demolition							
13	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Change in landscape and related visual impacts	Visual	Construction Operational Decommissioning Closure	**High**	• Limit project footprint • Limit vegetation removal • Litter and dust management • Manage through visual controls • Rehabilitation	**MEDIUM** (Construction, operational, decom-missioning) **LOW** (Closure)	Can be managed/ mitigated
14	Overall development of the mine Operation of the mine Rehabilitation of the open pit areas Overall decommissioning of the mine and rehabilitation	Economic impact (positive and negative)	Socio-economic	Construction Operational Decommissioning	**Medium +**	• Control through good communication, recruitment and procurement processes • Manage through policy development and implementation • Rehabilitation	**HIGH +**	Can be managed/ mitigated
15	Mineralised waste Opencast mining Underground mining	Loss and sterilisation of mineral resources		Operational	-	-	-	-
16	Site preparation Earthworks Civil works Underground mining	Inward migration and social ills		Construction Operational Decommissioning Closure	**High**	• Control through the monitoring of living conditions of employees, recruitment processes,	**LOW**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas					disease management • Manage through Influx and Land use Management Plan • Complaints register • Manage through stakeholder engagement • Remedy through emergency response procedures (see Section 30.2)		
17	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of livelihood for illegal miners		Operational Decommissioning Closure	**High**	• Manage through collaboration with applicable departments and organisations • Control through recruitment processes	**MEDIUM**	Can be managed/ mitigated
18	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system	Social benefits associated with employment and economic development		Construction Operational Decommissioning Closure	**Medium +**	• Control through the monitoring of living conditions of employees, recruitment processes, disease management • Manage through Influx	**HIGH +**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas					and Land use Management Plan • Complaints register Manage through stakeholder engagement		
19	Transport system	Road disturbance and traffic safety	Traffic	Construction Operational Decommissioning	**High**	• Road maintenance and upgrades • Control through a transport safety programme • Remedy through emergency response procedures (see Section 30.2)	**MEDIUM**	Can be managed/ mitigated
20	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Non-mineralised waste Demolition Rehabilitation	Safety risks to third parties	Health and Safety	Construction Operational Decommissioning Closure	**High**	• Control through security • Manage through patrolling • Manage through education and training • Remedy through emergency response procedures (see Section 30.2) • Rehabilitation	**LOW** (construction, operational, decommissioning) **MEDIUM +** (closure)	Can be managed/ mitigated
21	Site preparation Earthworks	Increase in health risks to		Construction Operational	**Medium** (inhalation	• Manage through air quality, surface and	**LOW** (inhalation	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Civil works Opencast mining Transport system Mineralized waste Support services Rehabilitation Maintenance and aftercare of rehabilitated areas	receptors		Decommissioning Closure	health & cancer health) **Low** (systemic (non-cancer) health)	groundwater quality management and monitoring measures identified	health, systemic (non-cancer) health, and cancer health)	
22	Underground mining Opencast mining	Blasting and Vibration Impacts	Blasting and vibration	Operational	-	-	-	-
23	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Land use impact	Land uses	Construction Operational Decommissioning Closure	**High** (Construction, Operational and Decommissioning)	• Manage through stakeholder engagement • Manage through implementation of EMP commitments • Rehabilitation • Remedy through emergency response procedures (see Section 30.2)	**MEDIUM** (Construction, Operational and Decommissioning) **MEDIUM +** (Closure)	Can be managed/ mitigated
24	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use	Damage to or disturbance of heritage (including cultural) and palaeontological resources	Heritage and cultural	Construction Operational Decommissioning	**High**	• Control through avoidance (where possible) • Control through permit applications (where necessary) • Remedy through chance	**LOW**	Can be managed/ mitigated

No.	Activity	Potential Impact	Affected Aspect	Phase	Significance (unmitigated)	Management actions Type	Significance (mitigated)	Extent to which the impact can be avoided or mitigated
	Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	resulting in a loss of the resource				find procedures (see Table D 4, Appendix D)		

9 SPECIALIST REPORT FINDINGS

Recommendations from specialist studies have informed the impact assessment (Table 9-1). The complete specialist reports have been attached at the appendices to this EIA and EMPr.

TABLE 9-1: SPECIALIST RECOMMENDATIONS

Study undertaken	Recommendation of specialist	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
Soil and Land Capability	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Terrestrial Biodiversity – Flora and fauna	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Aquatic Biodiversity	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Surface Water	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Groundwater	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Air Quality	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Climate Change	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Radiation	• No mitigation measures are proposed due to the Very Low impact significance.	-	-
Noise	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Visual	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Economic	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Social	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Traffic	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D

Study undertaken	Recommendation of specialist	Specialist recommendations that have been included in the EIA Report (mark with an x)	Reference to applicable section in this report
Blasting and Vibration	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Archaeology and Cultural Heritage	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Geochemistry	• All recommendations from the specialist study have informed the impact assessment and are included in the EMPr.	X	Sections 8 and 27 Appendix D
Closure	• All recommendations from the specialist study have informed the closure and rehabilitation plan.	X	Sections 3.2.16 and 28

10 ENVIRONMENTAL IMPACT STATEMENT

10.1 SUMMARY OF KEY FINDINGS OF THE EIA

This section provides a summary of the findings of identified and assessed potential impacts on the receiving environment in both the unmitigated and mitigated scenarios. A summary of the potential impacts (as per Section 8), associated with the preferred alternatives (as per Section 6), in the unmitigated and mitigated scenarios for all project phases is included in Table 10-1 below.

TABLE 10-1: SUMMARY OF POTENTIAL PROJECT-RELATED IMPACTS

Potential impact	Incremental significance	
	Unmitigated	Mitigated
Biophysical		
Loss of soil resources and land capability through physical disturbance	**High**	**Low**
Loss of soil resources and land capability through contamination	**Medium**	**Low**
Physical destruction of biodiversity	**Medium**	**Low**
General disturbance of biodiversity	**Medium**	**Low**
Alteration of surface drainage patterns	**High**	**Medium**
Contamination of surface water	**High**	**Medium-Low**
Reduction of water availability to third parties	**Low**	**Low**
Groundwater contamination	**Low**	**Low**
Change in ambient air concentrations	**High**	**Medium**
Increase in Greenhouse Gas emissions	**High**	**Medium**
Radiation Impact	**Low**	N/A
Increase in ambient noise levels	**Medium** (Open Pit) **Low** (Underground)	**Low**
Change in landscape and related visual impacts	**High**	**Medium** (Construction, Operational, Decommissioning) **Low** (Closure)
Socio-economic		
Economic impact (positive and negative)	**Medium +**	**High +**
Loss and sterilisation of mineral resources	-	-
Inward migration and social ills	**High**	**Low**
Loss of livelihood for illegal miners	**High**	**Medium**
Social benefits associated with employment and economic development	**Medium +**	**High +**
Road disturbance and traffic safety	**High**	**Medium**
Safety risks to third parties	**High**	**Low** (Construction, Operational, Decommissioning) **Medium +** (Closure)

Potential impact	Incremental significance	
	Unmitigated	Mitigated
Increase in health risks to receptors	**Medium** (inhalation health & cancer risk) **Low** (systemic non-cancer risk)	**Low** (Inhalation Health, Systemic Health, And Cancer Risk)
Blasting and Vibration Impacts	-	-
Land use impact	**High** (Construction, Operational and Decommissioning)	**Medium** (Construction, Operational And Decommissioning) **Medium +** (Closure)
Heritage and cultural		
Damage to or disturbance of heritage (including cultural) and palaeontological resources resulting in a loss of the resource	**High**	**Low**

- denotes 'No impact' or 'No contribution'   Ratings are negative unless otherwise specified

The assessment of the proposed project has shown that it has the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments. These impacts could occur both within and surrounding the mining right application area. At the same time the project would have a number of positive economic impacts.

The potential mitigated impacts on the biophysical environment are assessed to range between low to medium significance. In the case of the open pit mining activities, the impacts, especially visual and noise, would be of short duration of between five and nine months at each of the proposed open pit mining areas. Following rehabilitation of the open pits, these impacts would be negligible.

The underground mining operations of 20 years would be of a long term duration. In the case of the proposed Kimberley Reef East IC its location in-between existing slimes dams, would substantially reduce the severity and spatial scale of the operations. The Bird Reef Central IC would be closer to receptors and would thus require more careful implementation of mitigation measures. Noise impacts from ventilation shafts at both infrastructure complexes would be reduced through efficient engineering designs. With mitigation the potential impacts on the biophysical environments can be mitigated to acceptable levels. However, specialist findings should be verified as part of the WULA and prior to mining commencing underground, this specifically relates to the Groundwater.

The proposed project would contribute positively towards to the local, regional and national economy through capital investment, creation of employment and revenue generation potential. The community based projects and implementation of the mine's social and labour plan would have direct social development and employment benefits for the relevant communities. With the implementation of the necessary mitigation, the economic and social impacts have been assessed as being of high positive significance.

Where the project aligns its timeline to support post-closure housing and other property development the economic benefits of both the mining and alternative land use can be realised. The short duration of the open cast activities are considered to have a minimal impact on their future planned programmes.

The impact of blasting and vibration is considered to be of negligible significance, given the increasing depth of the mining activity and the small charge masses being fired at any one time. It is therefore highly unlikely that any disturbances would be felt by surface receptors around the mining right application area.

With the implementation of the appropriate mitigation, the heritage and cultural impacts are assessed to be low significance. .

Should the proposed mining development not proceed, the potential opportunity to develop and grow existing industries, manufacturing and distribution facilities surrounding the proposed mining rights area would be substantially reduced and in certain cases areas could not occur due to mineral reserves, still being in place.

As depicted in the impact summary table and discussed above, the assessment of impact significance with mitigation, indicates negative impacts of only low to medium impact significance. At the same time the positive social and economic impacts are seen considered to be of high significance.

Thus, assuming the effectively implemented of the project mitigation in the EMP, the assessed impact significance levels are not such that they should stop the project proceeding.

10.2 FINAL SITE MAP

The final preferred site layout plan is included in Section 3.2.

10.3 SUMMARY OF THE POSITIVE AND NEGATIVE IMPLICATIONS AND RISKS OF THE PROPOSED ACTIVITY AND IDENTIFIED ALTERNATIVES

With reference to Sections 6.1 and 6.9, no location or layout alternatives were considered and as such this section is not applicable.

11 IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES FOR INCLUSION IN THE EMPR

Based on the outcome of the EIA and where applicable the recommendations from specialists the proposed management objectives and outcomes specific to the proposed project and for inclusion into the EMPr are detailed in this section. Specific environmental objectives to control, remedy or prevent potential impacts emanating from the proposed project are provided in Table11-1 below.

TABLE11-1: MANAGEMENT OBJECTIVES AND OUTCOMES

Aspect	Management objective	Outcome
Soil and land capability	To minimise the loss of soil resources and related land capability through physical disturbance, erosion, compaction and soil pollution.	Handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-mining land capability.
Biodiversity	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical and general disturbance.	Limit the area of disturbance as far as practically possible.
Surface water	To prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow and to prevent pollution of surface water resources.	Ensure surface water quality remains within acceptable limits for both domestic and agricultural purposes to prevent pollution of surface water resources and related harm to surface water users. Ensure that the reduction of the volume of runoff into the downstream catchment is limited to what is necessary and that natural drainage patterns are re-established as part of rehabilitation in order to prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow.
Groundwater	To prevent pollution of groundwater resources and related harm to water users and to prevent losses to third party water users.	Ensure groundwater quality remains within acceptable limits for both domestic and agricultural purposes. To ensure that groundwater continues to be available to current users.
Air	To prevent air pollution health impacts.	Ensure that any pollutants emitted as a result of the project remains within acceptable limits so as to prevent health related impacts.
Greenhouse Gases	To limit greenhouse gas emissions from the project.	Ensure that the greenhouse gas reduction strategy is implemented.
Radiation	To prevent health related impacts from radiation.	To ensure that the dose limit is not exceeded.
Noise	To prevent public exposure to disturbing noise.	Ensure that any noise generated as a result of the project remains within acceptable limits to avoid the disturbance of third

Aspect	Management objective	Outcome
		parties.
Visual	To limit negative visual impacts.	Limit negative visual views.
Socio-economic	To limit inward migration and related social impacts and enhance positive economic impacts and to limit the loss of livelihood by illegal miners and the associated value chain. To prevent unacceptable mineral sterilisation.	Work with existing structures and organisations to establish and maintain a good working relationship with surrounding communities, local authorities and landowners in order to limit the impacts associated with inward migration. Enhance the positive economic impacts by working together with existing structures and organisations. Minimise the sterilisation of economic minerals as far as possible.
Traffic	To prevent transport related accidents and/or injury to people and livestock.	Ensure the mine's use of public roads is done in a responsible manner to reduce the potential for safety and vehicle related impacts on road users.
Health and Safety	To prevent human health effects due to the proposed project and protect third parties, infrastructure and animals.	Protect third parties and communities from hazardous substances and to protect third parties, infrastructure and animals from project activities.
Blasting	To prevent harm to people, animals and structures.	Protect third party property from mine-related activities. Where damage is unavoidable, to work together with the third parties to achieve a favourable outcome. Ensure public safety.
Land uses	To prevent unacceptable negative impacts on surrounding land uses.	Minimise the impact on land uses to as little as possible in order to prevent unacceptable impacts on surrounding land uses and their economic activity.
Heritage and cultural	To minimise the disturbance of heritage and palaeontological resources.	Protect resources where possible. If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements.

12 FINAL PROPOSED ALTERNATIVES

With reference to Sections 6.1 and 6.9, no location or layout alternatives were considered and as such this section is not applicable.

13 ASPECTS FOR INCLUSION AS CONDITIONS OF THE AUTHORISATION

Management actions including monitoring requirements, as outlined in Sections 27 and 29 respectively, should form part of the conditions of the environmental authorisation.

With reference to Regulation 26 of GNR 982 of NEMA, additional conditions that should form part of the environmental authorisation that are not specifically included in the EMPr report include compliance with all applicable environmental legislation whether specifically mentioned in this document or not and which may be amended from time to time.

14 ASSUMPTIONS, UNCERTAINTIES, LIMITATIONS AND GAPS IN KNOWLEDGE

Assumptions, uncertainties and limitations have been discussed throughout the EIA and EMPr. Specific reference to these are included in the specialist reports attached as appendices.

15 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

15.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

The assessment of the proposed project presents the potential for significant negative impacts to occur (in the unmitigated scenario in particular) on the bio-physical, cultural and socio-economic environments both within and surrounding the mining right application area. With mitigation these potential impacts can be prevented or reduced (see Section 10).

It follows that provided the EMP is effectively implemented there is no environmental, social or economic reason why the project should not proceed.

15.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

15.2.1 SPECIFIC CONDITIONS FOR INCLUSION IN THE EMPR

Refer to Section 13.

15.2.2 REHABILITATION REQUIREMENTS

Refer to Section 28.

16 PERIOD FOR WHICH AUTHORISATION IS REQUIRED

Environmental authorisation is required for a total life of mine of 25 years comprising five years for the open pit operations followed by 20 years for the underground mining operation.

17 UNDERTAKING

I, Marline Medallie, the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

- the information provided herein is correct;
- comments and inputs from stakeholders and I&APs have been included and correctly recorded in this report;
- inputs and recommendations from the specialist reports have been included where relevant; and
- any information provided to I&APs and any responses to comments or inputs made is correct or was correct at that time.

Unsigned copy for public review	2019-05-20
Signature of EAP	Date

Unsigned copy for public review	2019-05-20
Signature of commissioner of oath	Date

18 FINANCIAL PROVISION

18.1 METHOD TO DERIVE THE FINANCIAL PROVISION

RS Mellett (Pty) Ltd (RSM) consolidated the closure cost estimations undertaken by Golder and EPCM for the proposed project. The financial provision has been prepared in accordance with GNR 1147 of the National Environmental Management Act (107/1998): Regulations pertaining to the financial provision for prospecting, exploration, mining or production operations, published 20 November 2015 (Financial Provisioning Regulations, 2015), as amended. In terms of these regulations, an applicant must determine the financial provision through a detailed itemisation of all activities and costs, calculated on the actual costs of implementation of the measures required for:

- Annual rehabilitation, as per Appendix 3 of the regulations;
- Final rehabilitation, decommissioning and closure of the mining or production operations at the end of life of the operations, as per Appendix 4 of the regulations; and
- Remediation of latent or residual environmental impacts which may become known in the future, as per Appendix 5 of the regulations.

The amount determined for financial provision for the project is provided in Section 28.

18.2 CONFIRM THAT THE AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE

The amount can be provided from operating expenditure.

19 DEVIATIONS FROM SCOPING REPORT AND APPROVED PLAN OF STUDY

19.1 DEVIATION FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

The assessment methodology used in the assessment of potential impacts (see Section 6.6) is as per the approved Plan of Study for EIA presented in the final Scoping Report.

19.2 DEVIATION FROM THE SCOPING REPORT

Deviations from the Scoping Report are outlined in Table 19-1 below together with a motivation for the deviation.

TABLE 19-1: DEVIATIONS FROM THE SCOPING REPORT

No.	Deviation from scoping report	Motivation
1.	The mining right application area included in the Scoping Report has been reduced in size from 6 149.75 ha to 2 072.2 ha.	The proposed mining right area has been reduced in size to exclude certain farm portions, based on requests from various landowners following landowner consultation, landowner negotiations and agreements that are in place at the time of writing the EIA Report.
2.	The proposed mining permit application areas for the Creswell Park and Kimberley West open pit mining areas have been excluded from proposed mining right application area.	Two separate mining permit application processes are in process and do therefore not form part of the EIA in support of the mining right application process.
3.	The life of mine of the open pit mining areas included in the Scoping Report has been reduced and the scheduling adjusted.	The proposed life of mine and scheduling of the open pit mining areas have been adjusted based on requests from various landowners and developers following landowner/developers consultation, landowner/developer negotiations and agreements that are in place at the time of writing the EIA Report.
4.	The life of mine of has been reduced from 25 years to 20 and 10 years for the Kimberley Reef East and the Bird Reef Central underground mining areas, respectively.	The proposed life of mine of the underground mine working has been reduced based on the results from prospecting which have refined the resource.
5.	**The working depth to interception of the reef has been reduced from 100 m to 50 m for both the Kimberley Reef East and the Bird Reef Central underground mining areas.**	**The working depth has been reduced based on the results from prospecting which have refined the resource.**

20 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

20.1 IMPACT ON THE SOCIO-ECONOMIC CONDITIONS OF ANY DIRECTLY AFFECTED PERSON

The impacts associated with socio-economic conditions are discussed in Section 7.3. Management and management actions identified to address any socio-economic impacts are included in Section 27.

20.2 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

Not applicable. No national estate will be affected as part of the project.

21 OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF THE ACT

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

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

22 DETAILS OF THE EAP

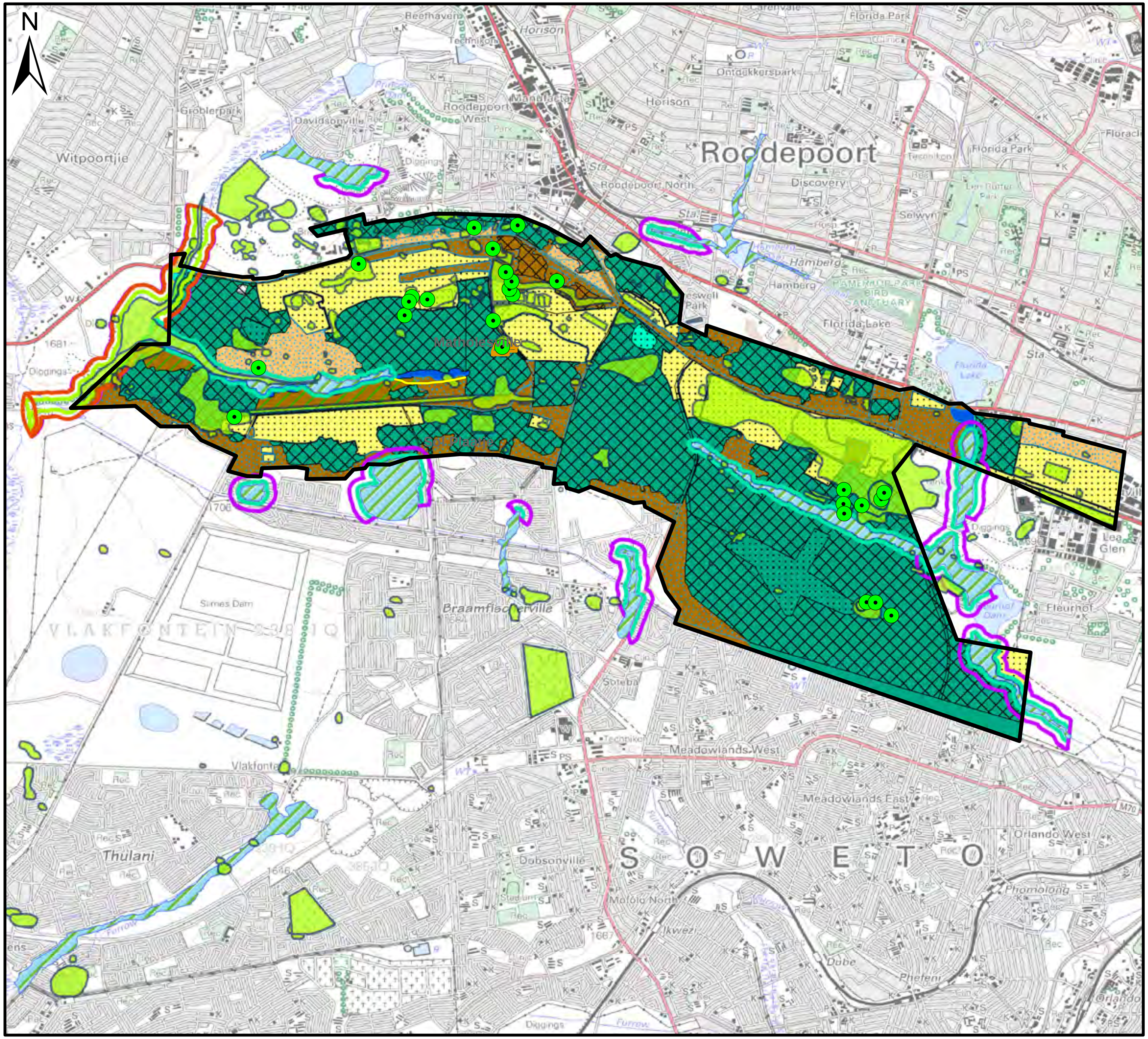
The details of the EAPs who undertook the EIA process and prepared this EMPr are provided in Part A, Section 1.

23 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

The activities covered by this EMPr are fully described in Part A, Section 3.

24 COMPOSITE MAP

A composite map including all proposed surface infrastructure superimposed on environmentally sensitive areas of the preferred site is included in Figure 24-1.



Legend

Habitat Units

- Built-up areas
- Degraded Grassland
- Freshwater feature
- Secondary grassland
- Transformed

Land Capability

- Arable (Class II)
- Arable (Class IV)
- Grazing (Class V)
- Non-Arable
- Wildlife/Wilderness (class VIII)
- 32m Setback Area GDARD
- 30m Setback Area GDARD
- 100m Zone of Regulation GN704
- 100m Zone of Regulation GN509
- wetlands
- Proposed Mining Right Application Area

Heritage Sensitivity

- Heriyage Sites
- Heritage Sensitivity

Kilometers

0 0.75 1.5 3

Scale: 1:71 584

Projection:Transverse Mercator

Datum: WGS84

WEST WITS MINING RIGHT

Figure 24-1

Composite Map

SLR

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720.13087.00001

May 2019

25 DESCRIPTION OF THE IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENT

25.1 DETERMINATION OF CLOSURE OBJECTIVES

The closure objectives for the proposed project will be determined taking into account the existing type of environment as described in Section 6.4, in order to ensure that the closure objectives strive to minimise the impacts associated with the closure and decommissioning of the mine and to restore the land to a useful land use not dissimilar to the pre-mining land use.

25.2 PROCESS FOR MANAGING ENVIRONMENTAL DAMAGE AS A RESULT OF UNDERTAKING THE ACTIVITY

The management actions outlined in Section 27 have been identified in order to manage and reduce impacts associated with the proposed project in order to prevent unnecessary damage to the environment. In the event that incidents occur that may result in environmental damages the emergency response procedure as outlined in Section 30.2 will be implemented to avoid pollution or degradation.

25.3 POTENTIAL RISK OF ACID MINE DRAINAGE

With reference to Section 6.4.1.1, geochemical tests and analysis indicate that waste rock material at the proposed West Wits Mine would have a low potential to generate acid drainage due to no iron sulphur content.

25.4 STEPS TAKEN TO INVESTIGATE, ASSESS AND EVALUATE THE IMPACT OF ACID MINE DRAINAGE

With reference to Section 25.3, the waste rock material is not acid generating and as such this section is not applicable.

25.5 ENGINEERING OR MINE DESIGN SOLUTIONS TO AVOID OR REMEDY ACID MINE DRAINAGE

With reference to Section 25.3, the waste rock material is not acid generating and as such this section is not applicable.

25.6 MEASURES IN PLACE TO REMEDY RESIDUAL OR CUMULATIVE IMPACT FROM ACID MINE DRAINAGE

With reference to Section 25.3, the waste rock material is not acid generating and as such this section is not applicable.

25.7 VOLUMES AND RATE OF WATER USE FOR MINING

Water for the proposed project would be sourced from the local municipality. The volume of potable water required as part of the proposed project include 1 500 m^3/month.

25.8 HAS A WATER USE LICENCE BEEN APPLIED FOR?

A water use license application is required for the proposed project. The DWS has been notified that a water use license application will be submitted as part of the proposed project. In this regard a copy of the notice of intent letter submitted to the DWS in included in **Appendix B**.

25.9 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

The assessment of potential impacts is included in Section 8 and Appendix D. Management actions which will be implemented to avoid and minimise potential impacts are detailed in Section 27.

26 IMPACT MANAGEMENT OUTCOMES

Table 26-1 below provides a description of the outcomes and identifies the standard of impact management required in order to manage, remedy, control or modify potential impacts. The management actions identified to achieve these outcomes and objectives are described in Section 27.

TABLE 26-1: DESCRIPTION OF IMPACT MANAGEMENT OUTCOMES

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of soil resources and land capability through physical disturbance	Soil and land capability	Construction Operational Decommissioning Closure	• Demarcation of project footprint • Soil management procedures • Control through appropriate design • Manage through dust suppression and fire prevention plans • Closure planning and rehabilitation • Erosion control	To minimise the loss of soil resources and related land capability through physical disturbance, erosion and compaction.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition	Loss of soil resources and land capability through contamination		Construction Operational Decommissioning Closure	• Soil management procedures • Control through appropriate design • Control through waste management practices • Implement education and training • Remedy through emergency response procedures (see Section 30.2.2)	To minimise the loss of soil resources and related land capability through soil pollution.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Rehabilitation Maintenance and aftercare of rehabilitated areas					
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Physical destruction of biodiversity	Biodiversity	Construction Operational Decommissioning Closure	• Control through appropriate design • Limit project footprint • Search and rescue of flora and fauna • Designation of no-go areas • Manage alien invasive species • Control through permits for removal • Rehabilitation	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical disturbance.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	General disturbance of biodiversity		Construction Operational Decommissioning Closure	• Control through appropriate design • Limit project footprint • Search and rescue of flora and fauna • Designation of no-go areas • Manage alien invasive species • Manage through training and monitoring • Control through permits for removal • Remedy through emergency response procedures (see Section 30.2) • Manage through implementing groundwater, surface water, soil, light, and dust mitigation • Rehabilitation	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through general disturbance.
Site preparation	Alteration of	Surface	Construction	• Manage through storm water control	To prevent unacceptable

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Discharge of excess water Maintenance and aftercare of rehabilitated areas	surface drainage patterns	water	Operational Decommissioning Closure	• Manage through design • Control through water use licence requirements • Manage through monitoring • Update water balance • Remedy through emergency response procedures (see Section 30.2)	alteration of drainage patterns and related reduction of downstream surface water flow.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Discharge of excess water Maintenance and aftercare of rehabilitated areas	Contamination of surface water			• Manage through appropriate design • Manage through Storm water Management Plan • Manage through waste management practises • Manage through inspections and maintenance • Control through water use licence requirements • Surface water monitoring • Remedy through emergency response procedures (see Section 30.2.2) • Rehabilitation	To prevent pollution of surface water resources.
Underground mining - dewatering	Reduction of water availability to	Groundwater	Operational	• Update hydrocensus • Update groundwater model • Groundwater monitoring	To prevent losses to third party water users.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
	third parties			• Additional drilling of boreholes and aquifer testing • Manage through alternatives or compensation (if needed)	
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition General site management Rehabilitation Maintenance and aftercare of rehabilitated areas	Groundwater contamination		Construction Operational Decommissioning Closure	• Update hydrocensus • Update groundwater model • Groundwater monitoring • Additional drilling of boreholes and aquifer testing • Manage through alternatives or compensation (if needed) • Remedy through emergency response procedures (see Section 30.2.2)	To prevent pollution of groundwater resources and related harm to water users.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Change in ambient air concentrations	Air	Construction Operational Decommissioning Closure	• Manage through best practice measures • Dust control and dust fall out monitoring • Manage through service and maintenance • Air quality monitoring • Complaints register • Rehabilitation	To prevent air pollution health impacts.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition	Increase in Greenhouse Gas emissions	Greenhouse Gases	Construction Operational Decommissioning	• Manage through greenhouse gas reduction strategy	To limit greenhouse gas emissions from the project.
Mineralised waste Opencast mining Underground mining Maintenance and aftercare of rehabilitated areas	Radiation Impact	Radiation	Operational Decommissioning Closure	• No mitigation measures are deemed necessary	To prevent health related impacts from radiation.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition	Increase in ambient noise levels	Noise	Construction Operational Decommissioning	• Minimise through use of appropriate equipment and appropriate equipment orientation, • Minimise through maintenance • Control through design and berms • Complaints register	To prevent public exposure to disturbing noise.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Change in landscape and related visual impacts	Visual	Construction Operational Decommissioning Closure	• Limit project footprint • Limit vegetation removal • Litter and dust management • Manage through visual controls • Rehabilitation	To limit negative visual impacts.
Overall development of the mine Operation of the mine Rehabilitation of the open pit areas Overall decommissioning of the mine and rehabilitation	Economic impact	Socio-economic	Construction Operational Decommissioning	• Control through good communication, recruitment and procurement processes • Manage through policy development and implementation • Rehabilitation	To enhance positive economic impacts.
Mineralised waste Opencast mining Underground mining	Loss and sterilisation of mineral resources		Operational	• No mitigation measures are deemed necessary	To prevent unacceptable mineral sterilisation.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Inward migration and social ills		Construction Operational Decommissioning Closure	• Control through the monitoring of living conditions of employees, recruitment processes, disease management • Manage through Influx and Land use Management Plan • Complaints register • Manage through stakeholder engagement • Remedy through emergency response procedures (see Section 30.2)	To limit inward migration and related social impacts.
Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Loss of livelihood for illegal miners		Operational Decommissioning Closure	• Manage through collaboration with applicable departments and organisations • Control through recruitment processes	To limit the loss of livelihood by illegal miners and the associated value chain.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Social benefits associated with employment and economic development		Construction Operational Decommissioning Closure	• Control through the monitoring of living conditions of employees, recruitment processes, disease management • Manage through Influx and Land use Management Plan • Complaints register • Manage through stakeholder engagement	To enhance positive social impacts.
Transport system	Road disturbance and traffic safety	Traffic	Construction Operational Decommissioning	• Road maintenance and upgrades • Control through a transport safety programme • Remedy through emergency response procedures (see Section 30.2.2)	Ensure the mine's use of public roads is done in a responsible manner to reduce the potential for safety and vehicle related impacts on road users.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Non-mineralised waste Demolition Rehabilitation	Safety risks to third parties	Health and Safety	Construction Operational Decommissioning Closure	• Control through security • Manage through patrolling • Manage through education and training • Remedy through emergency response procedures (see Section 30.2.2) • Rehabilitation	Protect third parties, infrastructure and animals from project activities.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Mineralized waste Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Increase in health risks to receptors		Construction Operational Decommissioning Closure	• Manage through air quality, surface and groundwater quality management and monitoring measures identified	Protect third parties and communities from hazardous substances.
Underground mining Opencast mining	Blasting and Vibration Impacts	Blasting and Vibration	Operational	• No mitigation measures are deemed necessary	To prevent harm to people, animals and structures.
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Land use impact	Land uses	Construction Operational Decommissioning Closure	• Manage through stakeholder engagement • Manage through implementation of EMP commitments • Rehabilitation • Remedy through emergency response procedures (see Section 30.2)	Minimise the impact on land uses to as little as possible in order to prevent unacceptable impacts on surrounding land uses and their economic activity.

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management objectives)
Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Damage to or disturbance of heritage (including cultural) and palaeontological resources resulting in a loss of the resource	Heritage and cultural	Construction Operational Decommissioning	• Control through avoidance (where possible) • Control through permit applications (where necessary) • Remedy through chance find procedures (see Table D 4, Appendix D)	Protect resources where possible. If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements.

27 IMPACT MANAGEMENT ACTIONS

Management actions identified to prevent, reduce, control or remedy the assessed impacts are presented in Table 27-1 below.

The action plans include the timeframes for implementing the management actions together with a description of how management actions comply with relevant standards. Management actions and recommendations identified by specialists have been summarised and are included in the table below.

TABLE 27-1: DESCRIPTION OF IMPACT MANAGEMENT ACTIONS

No.	Activity	Potential Impact	Management actions	Time Period for Implementation	Responsible parties	Compliance with Standards
1	All Activities [Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas]	Loss of soil resources and land capability through physical disturbance	See management actions included under Issue 1 (Appendix D).	All Phases	Environmental manager	Not applicable
2	All Activities	Loss of soil resources and land capability through contamination	See management actions included under Issue 2 (Appendix D).	All Phases	Environmental manager	Not applicable
3	All Activities	Physical destruction of biodiversity	See management actions included under Issue 3 (Appendix D).	All Phases	Environmental manager	Permit applications must made to the applicable departments to obtain the required permission to cut, removed and/or translocated from the project footprints protected species in terms of the NFA and the Transvaal Nature Conservation Ordinance 12 of 1983.

No.	Activity	Potential Impact	Management actions	Time Period for Implementation	Responsible parties	Compliance with Standards
						The management action to implement an alien invasive species programme is in accordance with the NEM:BA Alien and Invasive Species Regulations (2014) that requires the control of invasive species
4	All Activities	General disturbance of biodiversity	See management actions included under Issue 4 (Appendix D).	All Phases	Environmental manager	Permit applications must made to the applicable departments to obtain the required permission to cut, removed and/or translocated from the project footprints protected species in terms of the NFA and the Transvaal Nature Conservation Ordinance 12 of 1983. The management action to implement an alien invasive species programme is in accordance with the NEM:BA Alien and Invasive Species Regulations (2014) that requires the control of invasive species
5	All Activities Discharge of excess water	Alteration of surface drainage patterns	See management actions included under Issue 5 (Appendix D).	All Phases	Environmental manager	Construct, operate and maintain storm water management facilities in in a manner that ensures compliance with Regulation 704 of 1999 in terms of the NWA. Submit a water use licence application for authorisation in terms of the NWA for dirty water containment facilities. Comply with the requirements of the WUL.
6	All Activities Discharge of excess water	Contamination of surface water	See management actions included under Issue 6 (Appendix D).	All Phases	Environmental manager	Construct, operate and maintain storm water management facilities in in a manner that ensures compliance with Regulation 704 of 1999 in terms of the NWA. Submit a water use licence application for authorisation in terms of the NWA for dirty water containment facilities. Comply with the requirements of the WUL.
7	Open pit and Underground mining - dewatering	Reduction of water availability to third parties	See management actions included under Issue 7 (Appendix D).	Operational	Environmental manager	Submit a water use licence application for authorisation in terms of the NWA for dirty water containment facilities. Comply with the requirements of the WUL.
8	All Activities General site management	Groundwater contamination	See management actions included under Issue 8 (Appendix D).	All Phases	Environmental manager	Construct, operate and maintain storm water management facilities in in a manner that ensures compliance with Regulation 704 of 1999 in terms of the NWA.

No.	Activity	Potential Impact	Management actions	Time Period for Implementation	Responsible parties	Compliance with Standards
						Submit a water use licence application for authorisation in terms of the NWA for dirty water containment facilities. Comply with the requirements of the WUL.
9	All Activities	Change in ambient air concentrations	See management actions included under Issue 9 (Appendix D).	All Phases	Environmental manager	National Atmospheric Emission Reporting Regulations in terms of the National Environmental Management: Air Quality Act (No. 39 of 2004) requires that holders of Mining Rights register on the National Atmospheric Emissions Inventory System (NAEIS) and to ensure that annual monitoring reports are uploaded onto the NAEIS. Dust fallout monitoring will follow the ASTM D1739 (1970) method as required by the National Dust Control Regulations.
10	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Increase in Greenhouse Gas emissions	See management actions included under Issue 10 (Appendix D).	Construction Operational Decommissioning	Environmental manager	Report on greenhouse gas emissions in accordance with the requirements of the National Greenhouse Gas Emission Reporting Regulations, published in terms of NEM:AQA.
11	Underground mining Opencast mining Mineralised waste Maintenance and aftercare of rehabilitated areas	Radiation Impact	Not Applicable - See discussion included under Issue 11 (Appendix D).	Operational Decommissioning Closure	Not applicable	Not applicable
12	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system	Increase in ambient noise levels	See management actions included under Issue 12 (Appendix D).	Construction Operational Decommissioning	Environmental manager	Not applicable

No.	Activity	Potential Impact	Management actions	Time Period for Implementation	Responsible parties	Compliance with Standards
	Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation					
13	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Change in landscape and related visual impacts	See management actions included under Issue 13 (Appendix D).	All Phases	Environmental manager	Not applicable
14	Overall development of the mine Operation of the mine Rehabilitation of the open pit areas Overall decommissioning of the mine and rehabilitation	Economic impact (positive and negative)	See management actions included under Issue 14 (Appendix D).	Construction Operational Decommissioning	Stakeholder manager	Not applicable
15	Underground mining Opencast mining Mineralised waste	Loss and sterilisation of mineral resources	Not Applicable - See discussion included under Issue 15 (Appendix D).	Operational	Not applicable	Not applicable
16	All Activities	Inward migration and social ills	See management actions included under Issue 16 (Appendix D).	All Phases	Stakeholder manager	Not applicable
17	Underground mining Opencast mining Transport system Power supply and use	Loss of livelihood for illegal miners	See management actions included under Issue 17 (Appendix D).	Operational Decommissioning Closure	Stakeholder manager	Not applicable

No.	Activity	Potential Impact	Management actions	Time Period for Implementation	Responsible parties	Compliance with Standards
	Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas					
18	All Activities	Social benefits associated with employment and economic development	See management actions included under Issue 18 (Appendix D).	All Phases	Stakeholder manager	Not applicable
19	Transport system	Road disturbance and traffic safety	See management actions included under Issue 19 (Appendix D).	Construction Operational Decommissioning	Environmental manager	Not applicable
20	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Non-mineralised waste Demolition Rehabilitation	Safety risks to third parties	See management actions included under Issue 20 (Appendix D).	All Phases	Environmental manager	Not applicable
21	Site preparation Earthworks Civil works Opencast mining Transport system Mineralized waste Demolition Rehabilitation Maintenance and aftercare of rehabilitated areas	Increase in health risks to receptors	See management actions included under Issue 21 (Appendix D).	Construction Operational Decommissioning	Environmental manager	Not applicable
22	Underground mining	Blasting and	Not Applicable - See	Operational	Environmental	Compliance with Explosives Act, 2003(No. 15 of 2003)

No.	Activity	Potential Impact	Management actions	Time Period for Implementation	Responsible parties	Compliance with Standards
	Opencast mining	Vibration Impacts	discussion included under Issue 22 (Appendix D).		manager	and the Mine Health and Safety Act, 1996 (No. 29 of 1996)
23	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Land use impact	See management actions included under Issue 23 (Appendix D).	All Phases		Not applicable
24	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Damage to or disturbance of heritage (including cultural) and palaeontological resources resulting in a loss of the resource	See management actions included under Issue 24 (Appendix D).	Construction Operational Decommissioning	Environmental manager	Compliance with the National Heritage Resource Act, 1999 (No. 25 of 1999) in the event of any chance finds.

28 FINANCIAL PROVISION

28.1 DETERMINATION OF THE AMOUNT OF THE FINANCIAL PROVISION

28.1.1 DESCRIPTION OF THE CLOSURE OBJECTIVES AND THE ALIGNMENT WITH THE BASELINE ENVIRONMENT

The environmental objective for closure is to minimise the impacts associated with the closure and decommissioning of the mine and to restore the land to a useful land use not dissimilar to the pre-mining land use. The conceptual closure plan objectives and principles include the following:

- Create a physically stable, safe, rehabilitated landscape that limits long-term environmental degradation, thus enabling the successful establishment of the planned post-mining land use;
- Ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine site or individual facilities, as well as to sustain catchment yield as far as possible after closure;
- Limit the possible health and safety threats to humans and animals using the rehabilitated mine site as it becomes available;
- Re-instate a suitable land capability over the mine site to facilitate the progressive implementation of the planned post-mining land use;
- Create a landscape that is self-sustaining and over time will converge to the desired ecosystem structure, function and composition;
- Encourage, where appropriate and as aligned to the planned post-mining land use, the re-establishment of native vegetation on the rehabilitated mine site such that the terrestrial biodiversity is largely re-instated over time; and
- Ensure that there is constructive engagement and alignment with local communities and regulatory authorities regarding the proposed end land use.

The post-mining land uses related to the proposed five opencast pits are described in the Golder rehabilitation and closure report (refer to Appendix S) as follows (Golder, 2019):

- Rugby Club Main Reef pit: the land owner is currently in a planning phase and is considering either residential or mixed industrial development;
- Roodepoort Main Reef pit: the land owner has planned public open or green belt spaces;
- 11 Shaft Main Reef pit: the land owners have earmarked these areas for mixed industrial, residential developments and the construction of bulk service infrastructure;
- Mona Lisa Bird Reef pit: the landowners plan to construct mixed residential developments post closure; and
- Kimberley East pit: part of the area will be used to access the surface infrastructure planned to service the proposed underground operation which will continue beyond the opencast mining operations.

28.1.2 CONFIRMATION THAT THE CLOSURE OBJECTIVES HAVE BEEN CONSULTED WITH LANDOWNERS AND I&APS

The broad closure objectives were outlined in the Scoping Report which was made available to IAPs, including landowners for review and comment. Further to this IAPs, including landowners, will be given a further opportunity to review the closure objectives associated with the proposed project as part of the review of the EIA and EMP report.

28.1.3 REHABILITATION PLAN

The scale and aerial extent of the proposed activities at closure is indicated on the plans provided in the Golder and EPCM reports (refer to Appendix S).

According to the Financial Provisioning Regulations, 2015 (GNR 1147), the objective of the annual rehabilitation plan is to:

- Review concurrent rehabilitation and remediation activities already implemented;
- Establish rehabilitation and remediation goals and outcomes for the forthcoming 12 months, which contribute to the gradual achievement of the post-mining land use, closure vision and objectives identified in the holder's final rehabilitation, decommissioning and mine closure plan;
- Establish a plan, schedule and budget for rehabilitation for the forthcoming 12 months;
- Identify and address shortcomings experienced in the preceding 12 months of rehabilitation; and
- Evaluate and update the cost of rehabilitation for the 12-month period and for closure, for purposes of supplementing the financial provision guarantee or other financial provision instrument.

Opencast mining and concurrent rehabilitation are planned as follows in year 1 (Golder, 2019):

- The Rugby Club Main Reef pit will be mined out and rehabilitated in year 1;
- The Roodepoort Main Reef pit boxcut will be established and the second stage concurrent backfilling will be completed; and
- The 11 Shaft Main Reef pit boxcut will be completed.

The rehabilitation objectives for the first year of opencast mining are as follows (Golder, 2019):

- Ensure that trained staff and management measures are in place to strip and store topsoil correctly to minimise mixing, losses and compaction;
- Limit the disturbed footprint size to the planned activities only; and
- Continually monitor concurrent backfill and rehabilitation measures and ensure that learnings are fed back into the planning to continually improve the rehabilitation implementation for the remaining pits.

The total area disturbed in the first year is 20 ha, while only 2 ha will be rehabilitated. This is because all three opencast pits will be developed in the first year. The rehabilitation backlog will be caught up in year 2, leaving only the Kimberly East Reef pit to be addressed at the end of opencast operations. Opencast mining is currently planned to be completed within 21 months.

The final rehabilitation plan includes the following (Golder, 2019 and EPCM, 2019):

- Opencast pits: Concurrent backfilling of the opencast pits during the operations will limit the mass earthworks required to backfill the final voids. Final rehabilitation and closure measures, once mining has ceased, will include the filling and sloping of all voids (the Kimberley East Reef pit), replacement of topsoil, soil fertility testing and amelioration if necessary, ripping of soils to alleviate compaction and surface scarification, followed by vegetation establishment;

- Topsoil berm footprints (once the topsoils have been removed and used for rehabilitation): Final rehabilitation will include soil fertility testing and amelioration if necessary, ripping of soils to alleviate compaction and surface scarification, followed by vegetation establishment;
- Overburden/ Waste Rock stockpiles: Any remaining material will be removed and used to fill remaining voids in the mining areas or disposed of off-site. Final rehabilitation will include soil fertility testing and amelioration if necessary, ripping of soils to alleviate compaction and surface scarification, followed by vegetation establishment;
- Haul roads: the haul roads will remain intact and handed over to the next land users;
- General surface rehabilitation: The rehabilitated areas will be integrated with the surrounding drainage framework. This may include polishing and shaping with a dozer or grader or constructing small contour berms across the site. The areas will be backfilled and shaped to be free-draining, topsoil will be replaced and vegetation established.

28.1.4 COMPATIBILITY OF THE REHABILITATION PLAN WITH THE CLOSURE OBJECTIVES

The rehabilitation plan will be developed to be compatible with the closure objectives given that the closure objectives were taken into account during the determination of the financial provision.

28.1.5 CALCULATE AND STATE THE QUANTUM OF THE FINANCIAL PROVISION

To be provided.

Based on the estimated rehabilitation and closure costs outlined in the consolidated financial provision report compiled by RSM (refer to Appendix S), the financial provision is calculated at (RSM, 2019):

- Consolidated liability for the life of mine (30-year period): R 43 869 526; and
- LoM closure liability: R 7 794 455 (including VAT);

28.1.6 CONFIRMATION THAT THE FINANCIAL PROVISION WILL BE PROVIDED

A financial provision will be provided.

29 MECHANISMS FOR MONITORING COMPLIANCE WITH AND PERFORMANCE AGAINST THE EMPR

Environmental impacts requiring monitoring are listed in Table29-1 below.

As a general approach, West Wits will ensure that the monitoring programmes comprise the following:

- a formal procedure;
- appropriately calibrated equipment;
- where sample require analysis they will be preserved according to laboratory specifications;
- an accredited, independent, commercial laboratory will undertake sample analyses;
- parameters to be monitored will be identified in consultation with a specialist in the field and/or the relevant authority;
- if necessary, following the initial monitoring results, certain parameters may be removed from the monitoring programme in consultation with a specialist and/or the relevant authority;
- monitoring data will be stored in a structured database;
- data will be interpreted and reports on trends in the data will be compiled by an appropriately qualified person on a quarterly basis; and
- both the data and the reports will be kept on record for the life of mine.

TABLE29-1: MONITORING OF COMPLIANCE AND PERFORMANCE IN TERMS OF EMPR

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>1</td><td>EMPr monitoring and performance assessment for overall impact of the project</td><td>EMPr, EA conditions, project scope as provided for in this report</td><td>Site inspection and verification of monitoring data against EMPr and EA conditions
In compliance with NEMA</td><td>Construction Manager, EO and ECO
SHE Manager</td><td>Internal reports - Monthly (ECO)

External audit to DMR - Annually</td></tr>
<tr><td>2</td><td>EMPr monitoring and performance assessment for overall impact of the project</td><td>As above and including method statements and procedures</td><td>As above including photographic record, incident register, complaints register</td><td>Construction Manager, EO and ECO
SHE Manager</td><td>Internal reports - Weekly (EO)

Monthly (ECO)</td></tr>
<tr><td>4</td><td>Site preparation
Earthworks
Civil works
Opencast mining
Transport system
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Demolition
Maintenance and aftercare of rehabilitated areas</td><td>General disturbance of biodiversity</td><td>The areas of disturbance will be monitored to ensure edge effects such as erosion and alien and invasive plant species proliferation do not affect the adjacent areas.

An alien invasive species management and monitoring programme will be implemented throughout the mining areas.

The watercourses (including wetlands) within 500 m of proposed mine infrastructure will be monitored to determine whether contamination is leaching from the mine infrastructure. Should contamination be detected, the mine will implement additional management and mitigation measures to prevent further contamination and attempt to remedy the contamination. This may include the installation of interception boreholes to remove and treat contaminated water.</td><td>EO and ECO
SHE Manager</td><td>Monthly</td></tr>
<tr><td>5</td><td>Site preparation
Earthworks
Opencast mining
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Discharge of excess water
Demolition
Maintenance and aftercare of rehabilitated areas</td><td>Alteration of surface drainage patterns</td><td>Surface water volume and level monitoring programme
<table>
<tr><th>Element</th><th>Description</th></tr>
<tr><td>Flow Volumes</td><td>In channels and pipelines and at abstraction and discharge facilities on site, including pit dewatering.</td></tr>
<tr><td>Water Levels</td><td>In dams and channels to ensure freeboard is maintained.</td></tr>
<tr><td>Stormwater management</td><td>Inspection of channels, silt traps, culverts, pipeline, dam walls and dams for signs of erosion, cracking, silting and blockages of inflows, to check performance of system.</td></tr>
<tr><td>Meteorological data</td><td>Measure rainfall for water balance updates where possible.</td></tr>
</table>
The monitoring plan will be reviewed periodically to ensure appropriateness of sites and sampling frequency during operation.</td><td>EO and ECO
SHE Manager</td><td>Flow - Monthly to update and calibrate water balance.
Levels - Monthly through the dry season and weekly through the wet season or after storm events.
Water management - Weekly to monthly during the wet season and after storm events or as per site management schedule.
Monthly in dry season.
Meteorological data - Daily</td></tr>
</table>

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td>6</td><td>Site preparation
Earthworks
Civil works
Underground mining
Opencast mining
Transport system
Power supply and use
Water supply and use
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Discharge of excess water
Demolition
Maintenance and aftercare of rehabilitated areas</td><td>Contamination of surface water</td><td>Surface water quality monitoring will be continued on a monthly basis at the hydrocensus points, as well as other key points in the project area in order to detect changes in surface water quality. The table below presents the proposed monitoring points; however some reasonable adjustments may be made based on factors such as accessibility and safety. The discharge points are still to be determined by the project team, but it will be important to monitor both the discharge quality as well as suitable points up and downstream of each discharge in order to monitor the impact of each discharge on the receiving watercourse.
The parameters to be analysed are listed below. These parameters have been selected on the basis of the hydrocensus monitoring data for parameters that exceeded the relevant guidelines.
The monitoring plan will be reviewed periodically to ensure appropriateness of sites and sampling frequency during operation.

Surface Water Quality Monitoring Points
<table>
<tr><th>Monitoring Point</th><th>Description</th></tr>
<tr><td>WITStream 1 (hydrocensus point)</td><td>Drainage D1, stream south of Mona Lisa, flowing Westwards</td></tr>
<tr><td>WITStream 2 (hydrocensus point)</td><td>Headwaters of the Klip River at the culvert of road R41, flowing southwards</td></tr>
<tr><td>WITStream 3 (hydrocensus point)</td><td>Drainage D5, at the culvert south east of 11 Shaft, stream flowing East into Fleurhof dam</td></tr>
<tr><td>WITStream 4 (hydrocensus point)</td><td>Upstream of WITStream 3 in the same drainage, before tailing workings</td></tr>
<tr><td>Discharge points (at discharge, upstream and downstream)</td><td>Still to be determined.</td></tr>
</table></td><td>EO and ECO
SHE Manager</td><td>Surface water quality – Monthly</td></tr>
<tr><td></td><td>Open pit and Underground mining - dewatering</td><td>Reduction of water availability to third parties</td><td>Groundwater level monitoring will be continued key points in the project area in order to detect changes in water levels. Figure 29-1 presents the proposed groundwater monitoring points however some reasonable adjustments may be made based on factors such as accessibility and safety. The monitoring programme will require the drilling of additional boreholes, and aquifer testing.
The monitoring plan will be reviewed periodically to ensure appropriateness of sites and sampling frequency during operation. Monitoring will continue for at least two years after rehabilitation of each pit, or as agreed with the relevant regulatory authorities.</td><td>EO and ECO
SHE Manager</td><td>Groundwater level monitoring - Monthly</td></tr>
</table>

No.	Activity	Impact requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
	Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation Demolition Maintenance and aftercare of rehabilitated land	Groundwater contamination	Groundwater quality monitoring will be conducted at key points in the project area in order to detect changes in groundwater quality. Figure 29-1 presents the proposed groundwater monitoring points however some reasonable adjustments may be made based on factors such as accessibility and safety. The monitoring programme will require the drilling of additional boreholes, and aquifer testing. These new boreholes will be subjected to a once-off full suite of analysis (full spectrum of metalloids, uranium and thorium as well as micro and macro chemical parameters) to provide baseline data. The parameters to be analysed are listed below. These parameters have been selected on the basis of the hydrocensus monitoring data for parameters that exceeded the relevant guidelines. The monitoring plan will be reviewed periodically to ensure appropriateness of sites and sampling frequency during operation. Monitoring will continue for at least two years after rehabilitation, or as agreed with the relevant regulatory authorities. Water sampling will include the following: • Sampling will be conducted in accordance with the minimum requirements for water quality monitoring as specified in the Groundwater Sampling Comprehensive Guide (WRC, 2007); • Boreholes will be purged using an open-end bailer system to collect groundwater samples; • Certain water quality parameters will be measures in-situ using handheld instruments and recorded on field sheets. These parameters will include pH, EC, TDS and temperature; • All handheld apparatus will be calibrated prior to sampling; • In-situ parameter measurements will be used to determine the purging time as samples must be collected once field measurements have stabilised (if purging is required); • The field parameters measured will be recorded in a table including at least the following: Borehole Number; Coordinates (Latitude and Longitude); pH; EC (mS/m); TDS (mg/L); Temperature (°C); and Comments / Status. • The collected water samples will be submitted to a South African National Accreditation Systems (SANAS) accredited laboratory for chemical analysis.	EO and ECO SHE Manager	Groundwater quality monitoring – Monthly
	Site preparation Earthworks Civil works Underground mining Opencast mining Transport system Power supply and use	Change in ambient air concentrations and human health	The following monitoring will be conducted: • PM10 concentrations at the closest residential receptors located to the north or east of each the opencast mining operations (except the Mona Lisa pit, which has no nearby receptors). A suitable monitoring point/s must be identified by the mine's Environmental Department which is located closest to the opencast operations in each case. This monitoring will be used to assess baseline PM10 concentrations i.e. the status quo without the opencast operations active; and	EO and ECO SHE Manager	PM10 – Prior to construction phase of each of the opencast operations at the closest residential receptors located to the north or east of each the opencast mining operations, except the Mona

No.	Activity	Impact requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
	Water supply and use Mineralised waste Support services Rehabilitation Demolition Maintenance and aftercare of rehabilitated areas		• PM10 monitoring at these receptors (the residential areas to the north or east of each the opencast mining operations, with the exception of the Mona Lisa pit). Additional monitoring points can be added as deemed necessary by the mine's Environmental Department and may be in response to receiving air quality complaints. Monitoring values to be compared to South African National Air Quality Standards and modelled values presented in the air quality specialist report (Appendix J). If PM_{10} concentrations are found to be in exceedance of the NAAQS at the closest receptor locations this will be regarded as an indication of a potential for health effects and additional dust suppression measures will be investigated and implemented.		Lisa pit PM10 – For duration of the mining and rehabilitation phases at closest residential receptors located to the north or east of each the opencast mining operations, except the Mona Lisa pit

	Site preparation
	Earthworks
	Civil works
	Underground mining
	Opencast mining
	Transport system
	Power supply and use
	Water supply and use
	Mineralised waste
	Non-mineralised waste
	Support services
	Rehabilitation
	Demolition
		Increase in ambient noise levels	In the event that noise related complaints are received, short term (24-hour) ambient noise measurements will be conducted as part of investigating the complaints. The investigation of complaints will also need to include an investigation into equipment or machinery that likely result or resulted in noise levels annoying to the community. This could be achieved with source noise measurements. The results of the measurements will be used to inform any follow up interventions.
			The following procedure will be followed when conducting noise monitoring campaigns:
			• All campaigns will be designed and conducted by a trained specialist;
			• Sampling will be carried out using a Type 1 sound level meter (SLM) that meets all appropriate International Electro Technical Commission standards and is subject to annual calibration by an accredited laboratory;
			• The acoustic sensitivity of the SLM will be tested with a portable acoustic calibrator before and after each sampling session;
			• Samples of at least 10 min to 24 hours in duration which will be sufficient for statistical analysis will be taken with the use of portable SLM's capable of logging data continuously over the time period. Samples representative of the day- and night-time acoustic environment will be taken;
			• The following acoustic indices will be recoded and reported:
			  • LAeq (T): The A-weighted equivalent sound pressure level, where T indicates the time over which the noise is averaged (calculated or measured) (in dBA);
			  • LAIeq (T): The impulse corrected A-weighted equivalent sound pressure level, where T indicates the time over which the noise is averaged (calculated or measured) (in dBA);
			  • Statistical noise level LA90: The A-weighted 90% statistical noise level, i.e. the noise level that is exceeded during 90% of the measurement period. It is a very useful descriptor which provides an indication of what the LAeq could have been in the absence of noisy single events and is considered representative of background noise levels (LA90) (in dBA);
				EO and ECO
				SHE Manager
					Opencast mining operations: A once-off monitoring campaign will be conducted during the construction and operations for each opencast mining pit, at the closest potential receptor.
					
					Underground mining operations: A monitoring campaign will be conducted annually at the closest potential receptors to vent shafts.

<table>
<tr><th>No.</th><th>Activity</th><th>Impact requiring monitoring</th><th>Functional requirements for monitoring</th><th>Roles and responsibilities</th><th>Monitoring and reporting frequency and time period for management actions</th></tr>
<tr><td></td><td></td><td></td><td>

LAFmin: The A-weighted minimum sound pressure level recorded during the measurement period;
LAFmax: The A-weighted maximum sound pressure level recorded during the measurement period; and
octave band or 3rd octave band frequency spectra.

The SLM will be located approximately 1.5 m above the ground and no closer than 3 m to any reflecting surface;
Efforts will be made to ensure that measurements are not affected by the residual noise and extraneous influences, e.g. wind, electrical interference and any other non-acoustic interference, and that the instrument is operated under the conditions specified by the manufacturer. It is good practice to avoid conducting measurements when the wind speed is more than 5 m/s, while it is raining or when the ground is wet; and
A detailed log and record will be kept. Records will include site details, weather conditions during sampling and observations made regarding the acoustic environment of each site.

</td><td></td><td></td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Site preparation
Earthworks
Civil works
Underground mining
Opencast mining
Transport system
Power supply and use
Water supply and use
Mineralised waste
Non-mineralised waste
Support services
Rehabilitation
Demolition</td><td rowspan="2">Damage to or disturbance of heritage (including cultural) and palaeontological resources resulting in a loss of the resource</td><td>
<table>
<tr><th>Type</th><th>Resource No.</th><th>Location</th><th>Monitoring</th></tr>
<tr><td rowspan="2">Cultural sites within proposed infrastructure footprints.</td><td>WW002</td><td>Roodepoort Main Reef pit</td><td rowspan="2">Visual Inspection of site and buffer zone</td></tr>
<tr><td>WW010</td><td>Roodepoort Main Reef pit</td></tr>
</table>
</td><td>EO and ECO
SHE Manager</td><td>ECO checklist/ report

Quarterly monitoring during the Construction, Operation, and Decommissioning</td></tr>
<tr><td>
<table>
<tr><th>Type</th><th>Resource No.</th><th>Location</th><th>Monitoring</th></tr>
<tr><td rowspan="13">Historical structures within proposed infrastructure footprints.</td><td>WW001</td><td>Roodepoort Main Reef pit</td><td rowspan="13">Visual Inspection of site and buffer zone</td></tr>
<tr><td>WW003 and WW003-1</td><td rowspan="2">11 Shaft Main Reef pit</td></tr>
<tr><td>WW004</td></tr>
<tr><td>WW005</td><td rowspan="3">Kimberley Reef East infrastructure</td></tr>
<tr><td>WW006</td></tr>
<tr><td>WW007</td></tr>
<tr><td>WW008</td><td rowspan="2">11 Shaft Main Reef pit</td></tr>
<tr><td>WW009 and WW009-1</td></tr>
<tr><td>WW011 to WW016</td><td>Ore trucking road</td></tr>
<tr><td>WW017</td><td>Mona Lisa Bird Reef pit</td></tr>
<tr><td>WW018</td><td>Bird Reef/ Central Circular Shaft</td></tr>
</table>
</td><td>EO and ECO
SHE Manager</td><td>ECO checklist/ report

Quarterly monitoring during the Construction, Operation, and Decommissioning</td></tr>
</table>

No.	Activity	Impact requiring monitoring	Functional requirements for monitoring				Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
			Type	**Resource No.**	**Location**	**Monitoring**		
			Historical structures within project area, but outside infrastructure footprints.	WW019	South of Mona Lisa Bird Reef pit	Visual Inspection of site and buffer zone	EO and ECO SHE Manager	ECO checklist/ report Quarterly monitoring during the Construction, Operation, and Decommissioning
				WW020	North-east of Bird Reef/ Central Circular Shaft			
				WW021 and WW021-1	Close to Roodepoort Main Reef Pit			
				WW023	Between Bird Reef Central Circular Shaft and Mona Lisa Bird Reef			
			Type	**Resource No.**	**Location**	**Monitoring**		
			Burial Grounds within project area, but outside infrastructure footprints.	WW022-1 to WW022-3	Between Bird Reef/ Central Circular Shaft and Mona Lisa Bird Reef Pit	Visual Inspection of site and buffer zone	EO and ECO SHE Manager	ECO checklist/ report Quarterly monitoring during the Construction, Operation, and Decommissioning
				WW024	North of Bird Reef/ Central Circular Shaft, close to Ore transport road			

TABLE 29-2: WATER QUALITY MONITORING PARAMETERS

Aluminium	*Manganese*	Lead
Ammonium	*Nitrate (NO2 and NO3 as N)*	Magnesium
Arsenic	*pH at 25°C*	Uranium
Cadmium	*Phosphate*	Nitrate
Calcium	*Potassium*	*Zinc*
Chloride	*Silica*	*E-Coli / Total Coliforms*
Chromium (Cr)	*Sodium*	Sulphate as SO_4
Copper	*Sulphate*	
E.Coli	*Total Alkalinity (P and M)*	
Electrical Conductivity at 25°C (EC)	*Total Coliforms*	
Fluoride	*Total Dissolved Solids (TDS)*	
Hexavalent Chromium (Cr(IV))	*Total Hardness*	
Iron	*Turbidity*	

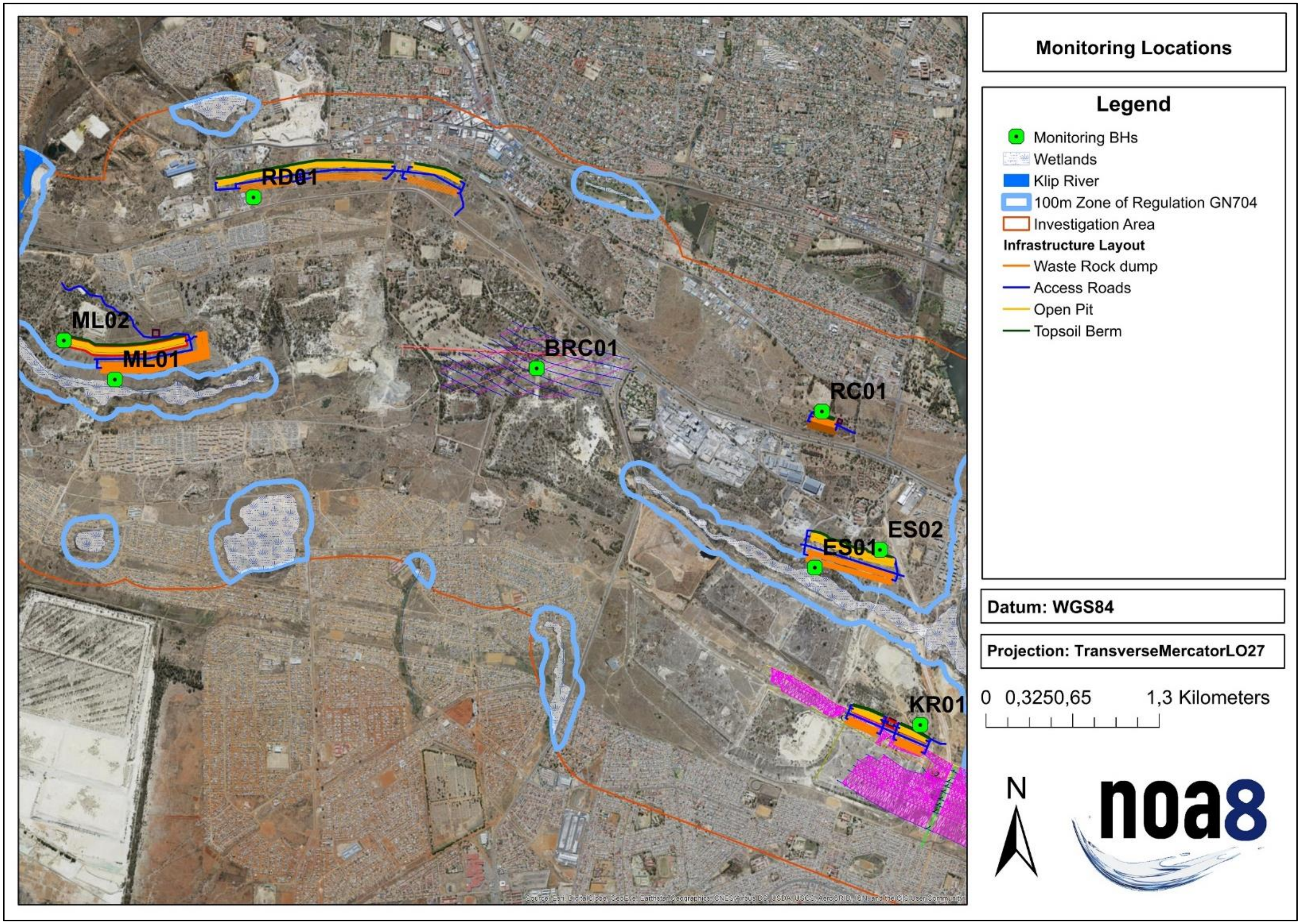

FIGURE 29-1: GROUNDWATER MONITORING POINTS (NOA, 2019)

30 ENVIRONMENTAL AWARENESS PLAN

30.1 MANNER IN WHICH APPLICANT INTENDS TO INFORM EMPLOYEES OF THE ENVIRONMENTAL RISKS

This section describes the environmental awareness plan for the West Wits Mining Project. The purpose of the environmental awareness plan is to ensure that all personnel and management understand the general environmental requirements of the site. In addition, greater environmental awareness must be communicated to personnel involved in specific activities which can have a significant impact on the environment and ensure that they are competent to carry out their tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable the mine to achieve the objectives of the environmental policy.

30.1.1 ENVIRONMENTAL POLICY

West Wits' environmental policy will be displayed prominently at the mine entrance and key notice boards at the mine's business units. As a minimum the environmental policy will include the following:

- to minimise the impact of West Wits' mining operations on the environment wherever possible;
- to comply with all applicable environmental legislation and the commitments contained in West Wits' EMPr;
- to ensure that all mine employees, contractors and sub-contractors:
  - are aware of the impact of their activities on the environment;
  - are informed about the measures required to prevent, mitigate and manage environmental impacts; and
  - apply these principles whilst carrying out their work.
- to establish and maintain a good relationship with surrounding communities, businesses and other interested and affected parties, with regard to the mine's activities;
- to develop a localised environmental strategy with the local authority and nearby industries; and
- to provide relevant and constructive consultation/public participation on the management of the potential environmental impacts posed by the mine in the future.

30.1.2 STEPS TO ACHIEVE THE ENVIRONMENTAL POLICY OBJECTIVES

The mine's environmental policy will be realised by setting specific and measurable objectives. It is proposed that new objectives are set throughout the life of mine, but initial objectives are as follows:

- Management of environmental responsibilities:
  - The mine will establish and appoint an Environmental/ Safety, Health and Environment (SHE) Manager at senior mine management level, who will be provided with all necessary resources to carry out the management of all environmental aspects of the site as a primary function, for example:
    - compliance with environmental legislation and EMPr commitments;
    - implementing and maintaining an environmental management system;
    - developing environmental emergency response procedures and coordinating personnel during incidents;
    - manage routine environmental monitoring and data interpretation;
    - environmental trouble shooting and implementation of remediation strategies; and
    - closure planning.

- Communication of environmental issues and information:
  - Meetings, consultations and progress reviews will be carried out, and specifically the mine will:
    - set the discussion of environmental issues and feedback on environmental projects as an agenda item at all company board meetings;
    - provide progress reports on the achievement of policy objectives and level of compliance with the approved EIA and EMPr to the Department of Mineral Resources;
    - ensure environmental issues are raised at monthly mine management executive committee meetings and all relevant mine wide meetings at all levels; and
    - ensure environmental issues are discussed at all general liaison meetings with local communities and other interested and affected parties.
- Environmental awareness training:
  - The mine will provide environmental awareness training to individuals at a level of detail specific to the requirements of their job, but will generally comprise:
    - basic awareness training for all prior to granting access to site (e.g. short video presentation requiring registration once completed). Employees and contractors who have not attended the training will not be allowed on site;
    - general environmental awareness training will be given to all employees and contractors as part of the SHE induction programme. All non-mine personnel who will be on site for more than five days must undergo the environmental induction training; and
    - specific environmental awareness training will be provided to personnel whose work activities can have a significant impact on the environment (e.g. workshops, waste handling and disposal, sanitation, etc).
- Review and update the environmental topics identified in the EMPr.
- All mine projects will be designed to minimise impact on the environment and to accomplish closure/rehabilitation objectives.
- West Wits will maintain records of all environmental training, monitoring, incidents, corrective actions and reports.
- Contractors and employees will be contractually bound to participate in the achievement of environmental policy objectives and compliance with the EIA and EMPr.

30.1.3 Training Objectives of the Environmental Awareness Plan

The environmental awareness plan ensures that training needs are identified and that appropriate training is provided. The environmental awareness plan should communicate:

- the importance of conformance with the environmental policy, procedures and other requirements of good environmental management;
- the significant environmental impacts and risks of individuals work activities and explain the environmental benefits of improved performance;
- individuals roles and responsibilities in achieving the aims and objectives of the environmental policy; and
- the potential consequences of not complying with environmental procedures.

30.1.3.1 General Contents of the Environmental Awareness Plan

To achieve the objectives of the environmental awareness plan the general contents of the training plans are as follows:

- Module 1 – Basic training plan applicable to all personnel entering the site:
  - short (15 minute) presentation to indicate the site layout and activities at specific business units together with their environmental aspects and potential impacts.

- individuals to sign off with site security on completion in order to gain access to the site.
- Module 2 – General training plan applicable to all personnel at the site for longer than 5 days:
  - general understanding of the environmental setting of the mine (e.g. local communities and businesses and proximity to natural resources such as rivers);
  - understanding the environmental impact of individuals activities on site (e.g. excessive production of waste, poor housekeeping, energy consumption, water use, etc);
  - indicate potential site specific environmental aspects and their impacts;
  - West Wits' environmental management strategy;
  - identifying poor environmental management and stopping work which presents significant risks;
  - reporting incidents;
  - examples of poor environmental management and environmental incidents; and
  - procedures for emergency response and cleaning up minor leaks and spills.
- Module 3 – Specific training plan:
  - environmental setting of the workplace (for example, proximity of watercourses, vulnerability of groundwater, proximity of local communities and businesses, etc);
  - specific environmental aspects, for example spillage of hydrocarbons;
  - impact of environmental aspects, for example hydrocarbon contamination of local watercourses resulting in loss of resource to downstream users;
  - West Wits' duty of care (specifically with respect to waste management); and
  - purpose and function of West Wits' environmental management system.

Individuals required to complete Module 3 (specific training module) will need to complete Modules 1 and 2 first. On completion of Module 3, individuals will be subject to a short test (written or verbal) to ensure the level of competence has been achieved. Individuals who fail the test will be allowed to re-sit the test after further training by the training department.

The actual contents of the training modules will be developed based on a training needs analysis.

Key personnel will be required to undergo formal, external environmental management training (e.g. how to operate the environmental management system, waste management and legal compliance).

In addition to the above West Wits will:

- conduct refresher training/presentations on environmental issues for mine employees (permanent and contractors) at regular intervals.
- promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine. These topics will be changed monthly, and will be reviewed annually by the Environmental Manager to ensure relevance.
- participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbor Week, World Environment Day and National Water Week.

30.2 MANNER IN WHICH RISKS WILL BE DEALT WITH TO AVOID POLLUTION OR DEGRADATION

30.2.1 ON-GOING MONITORING AND MANAGEMENT MEASURES

The monitoring programme as described in Section 29 will be undertaken to provide early warning systems necessary to avoid environmental emergencies associated with the proposed project.

30.2.2 Procedures in case of environmental emergencies

Emergency procedures apply to incidents that are unexpected and that may be sudden, and which lead to serious danger to the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed).

30.2.2.1 General Emergency Procedure

The general procedure that should be followed in the event of all emergency situations is outlined below.

During construction, the Construction Manager and ECO must be notified of an incident upon discovery.

- During operations, the incident must be reported immediately to Environmental Department for emergencies involving environmental impacts or to the Safety Department in the case of injury.
- Area to be cordoned off to prevent unauthorised access and tampering of evidence.
- If dams or storm water controls are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available). After hours the Plant Manager on shift must be notified.
- Take photographs and samples as necessary to assist in investigation.
- The Environmental Department must comply with Section 30 of the National Environmental Management Act (107 of 1998) such that:
  - The Environmental Department must immediately notify the Director-General (DMR, DWS, and Inspectorate of Mines as appropriate), the South African Police Services and relevant fire prevention service, the provincial head of GDARD or municipality, the head of the regional DWS office and any persons whose health may be affected, of:
    - the nature of the incident;
    - any risks posed to public health, safety and property;
    - the toxicity of the substances or by-products released by the incident; and
    - any steps taken to avoid or minimise the effects of the incident on public health and the environment.
  - The Environmental Department must as soon as is practical after the incident:
    - take all reasonable measures to contain and minimise the effects of the incident including its effects on the environment and any risks posed by the incident to the health, safety and property of persons;
    - undertake clean up procedures;
    - remedy the effects of the incident; and
    - assess the immediate and long term effects of the incident (environment and public health).
  - Within 14 days the Environmental Department must report to the Director-General (DMR, DWS, as appropriate), the provincial head of GDARD and the local municipality, the head of the regional DWS office such information as is available to enable an initial evaluation of the incident, including:
    - the nature of the incident;
    - the substances involved and an estimation of the quantity released;
    - the possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects);
    - initial measures taken to minimise the impacts;
    - causes of the incident, whether direct or indirect, including equipment, technology, system or management failure; and
    - measures taken to avoid a recurrence of the incident.

30.2.2.2 Identification of Emergency Situations

Emergency situations that have been identified for the proposed project are included in Section 7.3.

TABLE 30-1: EMERGENCY SITUATIONS AND RESPONSE

No.	Emergency Situation	Response in Addition to General Procedures
1	Spillage of chemicals, engineering substances and waste	Where there is a risk that contamination will contaminate the land (leading to a loss of resource), surface water and/or groundwater, the mine will: • Notify residents/users downstream of the pollution incident. • Identify and provide alternative resources should contamination impact adversely on the existing environment. • Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. tailings delivery pipeline, refuelling tanker) and the infrastructure 'made safe'. • Contain the spill (e.g. construct temporary earth bund around source such as road tanker). • Pump excess hazardous liquids on the surface to temporary containers (e.g. 210 litre drums, mobile tanker, etc.) for appropriate disposal. • Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.
2	Discharge of dirty water to the environment	Apply the principals listed for Item 1 above. To stop spillage from the dirty water system the mine will: • redirect excess water to other dirty water facilities where possible; • pump dirty water to available containment in the clean water system, where there is no capacity in the dirty water system; and • carry out an emergency discharge of clean water and redirect the spillage to the emptied facility. Apply for emergency discharge as a last resort.
3	Contamination of surface water	Personnel discovering the incident must inform the Environmental Department of the location and contaminant source. Apply the principals listed for Item 1 above. Absorbent booms will be used to absorb surface plumes of hydrocarbon contaminants. Contamination entering the surface water drainage system should be redirected into the dirty water system. The Environmental Department will collect in-stream water samples downstream of the incident to assess the immediate risk posed by contamination.
4	Groundwater contamination	Use the groundwater monitoring boreholes as scavenger wells to pump out the polluted groundwater for re-use in the process water circuit (hence containing the contamination and preventing further migration). Investigate the source of contamination and implement control/mitigation measures.
5	Burst water pipes (loss of resource and erosion)	Notify authority responsible for the pipeline (if not mine responsibility). Shut off the water flowing through the damaged area and repair the damage (if the mine's pipeline). Apply the principals listed for Item 1 above if spill is from the dirty/process water circuit.
6	Flooding from failure of surface water control infrastructure	Evacuate the area downstream of the failure. Using the emergency response team, rescue/recover and medically treat any injured personnel. Temporarily reinstate/repair storm water diversions during the storm event (e.g. emergency supply of sandbags). Close the roads affected by localised flooding or where a storm water surge has destroyed crossings/bridges.
7	Risk of drowning from falling into water dams	Attempt rescue of individuals from land by throwing lifeline/lifesaving ring. Get assistance of emergency response team whilst attempting rescue or to carry out rescue of people and/or animals. Ensure medical assistance is available to recovered individual.
8	Falling into excavations	Get assistance of emergency response team whilst attempting rescue or to carry out rescue of people and/or animals. Ensure medical assistance is available to recovered individual.

No.	Emergency Situation	Response in Addition to General Procedures
9	Veld fire	Evacuate mine employees from areas at risk. Notify downwind residents and industries of the danger. Assist those in imminent danger/less able individuals to evacuate until danger has passed. Provide emergency firefighting assistance with available trained mine personnel and equipment.
10	Road traffic accidents (on site)	The individual discovering the accident (be it bystander or able casualty) must raise the alarm giving the location of the incident. Able personnel at the scene should shut down vehicles where it is safe to do so. Access to the area should be restricted and access roads cleared for the emergency response team. Vehicles must be made safe first by trained professionals (e.g. crushed or overturned vehicles). Casualties will be moved to safety by trained professionals and provided with medical assistance. Medical centres in the vicinity with appropriate medical capabilities will be notified if multiple seriously injured casualties are expected. A nearby vet should be consulted in the case of animal injury.
11	Development of informal settlements	The mine will inform the local authorities (municipality and police) that people are illegally occupying the land and ensure that action is taken within 24 hours.

30.2.3 TECHNICAL, MANAGEMENT AND FINANCIAL OPTIONS

The technical, management and financial options that will be put into place to deal with the remediation of impacts in cases of environmental emergencies are described below.

- The applicant will appoint a competent management team with the appropriate skills to develop and manage a project of this scale and nature.
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the plan and mitigation measures as included in this EIA and EMP report.
- On an annual basis, WEST WITS will undertake a risk assessment as part of its auditing procedures to identify and check potential risks associated with its operations. The findings of the risk assessment will be reported to mine management to be actioned.
- As part of its annual budget, WEST WITS will allow a contingency for handling of any risks identified and/or emergency situations.
- Where required, WEST WITS will seek input from appropriately qualified people.

31 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The following documents will be submitted to the DMR from the start of construction until mine closure:

- As noted in Section 29, an environmental audit report in line with legislation relevant at the time, prepared by an independent person, will be submitted to the DMR at intervals indicated in the environmental authorisation. The purpose of the environmental audit report is to ensure compliance with the conditions of the environmental authorisation and the EMPr; and
- The financial provision will be updated in line with legislation relevant at the time on an annual basis and submitted to the DMR.

32 UNDERTAKING

I, Marline Medallie, the Environmental Assessment Practitioner responsible for compiling this report, undertake that:

- the information provided herein is correct;
- comments and inputs from stakeholders and I&APs have been included and correctly recorded in this report;
- inputs and recommendations from the specialist reports have been included where relevant; and
- any information provided to I&APs and any responses to comments or inputs made is correct or was correct at that time.

Unsigned copy for public review	2019-05-20
Signature of EAP	Date

Unsigned copy for public review	2019-05-20
Signature of commissioner of oath	Date

33 REFERENCES

Department of Water Affairs, August 2012: Aquifer Classification of South Africa.

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APPENDIX A: PROOF OF EAP QUALIFICATIONS AND CURRICULUM VITAE OF EAP

APPENDIX B: STAKEHOLDER ENGAGEMENT DOCUMENTS

APPENDIX C: COMMENTS AND RESPONSE TABLE

APPENDIX D: DETAILED ASSESSMENT OF POTENTIAL IMPACTS

DETAILED ASSESSMENT OF POTENTIAL IMPACTS

The potential impacts described in this appendix have been identified by the EIA project team with input from specialists, regulatory authorities and I&APs. The sequence in which these issues are listed are in no order of priority or importance. The assessment and rating of potential impacts have been provided by specialists. These are attached as appendices to the EIA and EMPr.

The impacts are assessed cumulatively where the potential impacts assessed represent the cumulative impact of the proposed project in the context of the baseline environment, i.e. with existing impacts.

The potential impacts are firstly rated with the assumption that no mitigation measures are applied and then secondly with mitigation, unless otherwise stated.

The mitigated assessment assumes that technical design controls, as included in the project scope (see Section 3.2), would be included in the detailed design of the project and implemented when the project components are constructed and operated.

A) IMPACT ON BIOPHYSICAL ENVIRONMENT

ISSUE 1 LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE

Information in this section was sourced from the soil and land capability impact assessment undertaken by Scientific Aquatic Services (SAS) (SAS, 2019) (refer to Appendix E).

Introduction

Soil is a valuable resource that supports a variety of ecological functions. Soil is the key to re-establishing post closure land capability. A number of activities/infrastructure and sources in all phases have the potential to disturb soil and related land capability through removal, compaction and/or erosion. In the construction and decommissioning phases these activities and sources are temporary in nature, usually existing from a few weeks to a few months. The operational phase will present more long-term activities. There will be no residual landforms after mine closure as ore will be taken off site for mineral processing and all waste rock material will be removed to backfill the open pits, or if necessary waste rock material will be disposed of offsite. The loss of soil resources has a direct impact on the potential loss of the natural capability of the land. This section therefore focuses directly on the potential for disturbance of the soil resources and the effect this has on land capability.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

<u>Severity/ nature</u>

The establishment of surface infrastructure to support the underground mining operations, as well as the temporary waste rock dumps and opencast mining operations have the potential to affect the soils' ability to sustain natural vegetation and alter land capability. Potential impacts could include:

- Soil erosion resulting from cleared and disturbed areas, leading to the loss of soils;
- Soil compaction resulting from increased traffic of mining equipment;
- Loss of soil depth and volume due to excavation associated with mining activities;
- Loss of potential agricultural soils.

As described in Section 6.4.1.4, the project area is dominated by soils that have been heavily modified due to long-term human activity. In addition, most of soils in the project area are unsuitable for cultivation. The opencast operations will result in a loss of soil depth and volume, since the ore material will be transported off-site and sold as product. Taking these factors into account, the potential impact on soil through physical disturbance is rated as having a high severity in the unmitigated scenario. With mitigation measures aimed at minimising disturbance and rehabilitating disturbed areas, the severity can be reduced to low.

<u>Duration</u>

In the unmitigated scenario, the loss of soil and related land capability is long term and will continue after the life of the proposed project. In the mitigated scenario, the soil is conserved and replaced in disturbed areas during rehabilitation, which reduces the duration of the impact to the life of the proposed project.

<u>Spatial scale/extent</u>

In both the unmitigated and mitigated scenarios for all phases of the project prior to closure, the potential loss of soil and land capability through physical disturbance will be restricted to within the proposed project area.

<u>Probability</u>

Without any mitigation, the probability of losing soil and related land capability is definite. With mitigation, the probability will be reduced because emphasis will be placed on soil conservation and site rehabilitation, including soil re-establishment.

<u>Significance</u>

In the unmitigated scenario the impact is high. In the mitigated scenario the significance of this impact is reduced to low.

<u>Summary of the loss of soil resources and land capability impact through physical disturbance per phase of the mine</u>

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	L	M	H	H
Mitigated	L	M	L	M	L	L

<u>Management objective</u>

The objective is to minimise the loss of soil resources and related land capability from physical disturbance, erosion and compaction.

Management actions

The following management actions will be implemented:

- During construction, operation and decommissioning, the soil management principles in Table D 1 will be implemented with regard to soil management.
- Dust suppression and fire prevention plans will be compiled to guide the construction works and protect soils.
- Although the WRDs will be temporary, compaction could result in long-term impacts, therefore every effort will be made to avoid placement of the WRD on natural soils, but rather on disturbed soils.

TABLE D 1: SOIL MANAGEMENT PRINCIPLES

Steps	Factors to consider	Detail
Delineation of areas to be stripped		The footprint of the proposed infrastructure area will be clearly demarcated to restrict vegetation clearing activities within the infrastructure footprint as far as practically possible. Stripping will only occur where soils are to be disturbed by activities and infrastructure that are described in the EIA and EMP report, and where a clearly defined end rehabilitation use for the stripped soil has been identified. Soil stripping should be conducted a suitable period ahead of mining. Bare soils will be regularly dampened with water to suppress dust during the construction phase, especially when strong wind conditions are predicted according to the local weather forecast.
Adjacent areas		All disturbed areas adjacent to the infrastructure complexes and opencast mine pits will be re-vegetated with an indigenous grass mix, if necessary, to re-establish a protective cover, in order to minimise soil erosion and dust emission.
Stripping	Topsoil	Excavation and long-term stockpiling of soil will be limited as far as practically possible. Stockpiled soils will therefore be stored for a maximum of 3-5 years. Concurrent rehabilitation will be conducted where practically possible to reduce the duration of stockpile storage in order to ensure that the quality of stored soil material does not deteriorate excessively, especially with regard to leaching and acidification. Topsoil horizons (A and B-horizons) are of higher quality and will be stored separately from lower quality underlying material to ensure sufficient volumes of high-quality soil is available for rehabilitation. Different soil type groups will be stockpiled separately to obtain the highest post-mining land capability possible.
Delineation of stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas.
	Designation of the areas	Soil stockpiles will be clearly identifiable in terms of soil type and the intended areas of rehabilitation. All topsoil will be stockpiled in areas clearly demarcated on the infrastructure layout and should be defined as no-go areas.
Stockpile management	Vegetation establishment and erosion control	Stockpiles will be revegetated to establish a vegetation cover as an erosion control measure. These stockpiles will also be kept free of alien vegetation at all times to prevent loss of soil quality.
	Storm water controls	Stockpiles will be established with storm water diversion berms to prevent run off erosion.

Steps	Factors to consider	Detail
	Height and slope	Soil stockpile height will be controlled to avoid compaction and damage to the underlying soils. Stockpile height will additionally be restricted to that which can be stored without additional traversing by machinery. A maximum height of 2-3 m will be implemented where practically possible. Stockpiles will be treated with temporary soil stabilisation methods; such as the application of organic matter to promote soil aggregate formation, leading to increased infiltration rate, thereby reducing soil erosion. The stockpiles side slopes should be flat enough to promote vegetation growth and reduce run-off related erosion.
	Waste	No waste material will be placed on the soil stockpiles.
	Vehicles	Equipment movement on top of the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.
Rehabilitation of disturbed land: restoration of land capability	Placement of soil	The recovered soils will re-used to rehabilitate the mine footprint following mine closure. During rehabilitation soil will be replaced to appropriate soil depths in the correct order, and areas will be covered to achieve an appropriate topographic aspect and attitude so as to achieve a free draining landscape that is as close as possible to the pre-mining land capability rating as possible. The slopes of the backfilled surfaces will therefore change gradually since abrupt changes in slope gradient increase the susceptibility for erosion initiation. Soil resources of similar characteristics will be imported back to the site to compensate for soil loss that will occur during mining activities. Infrastructure footprint areas will be ripped to alleviate compaction post closure before revegetation. The infrastructure footprints will be re-vegetated with a grass seed mixture as soon as possible, preferably in spring and early summer to stabilize the soil and prevent soil loss during the rainy season.
	Fertilisation	Soil fertility status will be determined by soil chemical analysis after levelling (before seeding/re-vegetation). Soil amelioration will be done according to soil analyses as recommended by a soil specialist, to correct the pH and nutrition status before revegetation.
	Erosion control	Erosion control measures will be implemented to ensure that the topsoil is not washed away and that erosion gulleys do not develop prior to vegetation establishment. If erosion is evident on the topsoil stockpiles, the side slopes will be stabilised through re-vegetation with indigenous species.
	Restore land function and capability	Landscape function analysis and restoration interventions will be applied to areas where soil has been replaced as part of rehabilitation, but the land function and capability has not been effectively restored.

Emergency situations

None identified.

ISSUE 2 LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH CONTAMINATION

Information in this section was sourced from the soil and land capability impact assessment undertaken by Scientific Aquatic Services (SAS) (SAS, March 2019) (refer to Appendix E).

Introduction

Mining projects in general have the potential to result in the loss of or damage to soil resources through contamination. Contamination of soil resources would result in a decrease in the rehabilitation and post-closure land use potential. Contamination of soil resources resulting from accidental spillage of hydrocarbons and other hazardous material, leading to altered soil chemistry. In addition, proliferation of alien vegetation due to disturbances could cause alterations in the soil quality and chemistry.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impacts

<u>Severity/nature</u>

In the unmitigated scenario, pollution of soils from numerous incidents can result in a loss of land capability as an ecological driver because it can create a toxic environment for vegetation and ecosystems that rely on the soil. It could also negatively impact on the chemistry of the soils such that current growth conditions are impaired. This is a medium severity in the unmitigated scenario.

In the mitigated scenario soil chemical pollution can be prevented or successfully mitigated when implementing the soil management plan diligently. Soil chemical pollution impacts should become negligible once the site has been successfully revegetated and vehicles and equipment are removed. The severity of this impact has been rated as low in the mitigated scenario.

<u>Duration</u>

In the unmitigated scenario, most pollution impacts and associated loss in land capability will remain long after closure. In the mitigated scenario most of these potential impacts should either be avoided or be remedied within the life of the project, which reduces the duration to low. This will be achieved by the effective reaction time of the clean-up team and the chosen remediation methods.

<u>Spatial scale/extent</u>

In both the unmitigated and mitigated scenarios for all phases, the potential loss of soil resources and associated land capability will be restricted to within the proposed project area.

Probability

Without any mitigation the probability of impacting on soils and land capability through pollution events is high. With mitigation, the probability will be reduced to low because emphasis will be placed on preventing pollution events and on quick and effective remediation if pollution events do occur.

Significance

In the unmitigated scenario, the significance of this potential impact is medium. In the mitigated scenario, the significance reduces to low.

Summary of the rated loss of soil resources and land capability through contamination impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	L	H	H	M
Mitigated	L	L	L	L	L	L

Management objective

The objective is to minimise the loss of soil resources and related land capability from contamination.

Management actions

Management measures that have been identified include the following:

- During the construction, operational and decommissioning phases, all hazardous chemicals (new and used), dirty water, mineralized wastes and non-mineralised wastes must be transported, handled and stored in such a manner that they do not pollute soils. This will be implemented through a procedure(s) covering the following:
    - Pollution prevention through basic infrastructure design.
    - Pollution prevention through maintenance of equipment. Maintenance of equipment should be done either on impermeable surfaces or drip trays should be used.
    - Pollution prevention through education and training of workers (temporary and permanent).
    - Pollution prevention through appropriate management of hazardous materials and waste.
    - The required steps to enable fast reaction to contain and remediate pollution incidents. In this regard the remediation options include containment and in situ treatment or disposal of contaminated soils as hazardous waste. In situ treatment is generally considered to be the preferred option because with successful in situ remediation the soil resourced will be retained in the correct place. The in-situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bio remediation at a designated area after which the soils are returned
    - Specifications for post rehabilitation audit to ascertain whether the remediation of any polluted soils and re-establishment of soil functionality has been successful and if not, to recommend and implement further measures

Emergency situations

In case of major spillage incidents, the emergency response procedure in Section 30.2.2 will be followed.

ISSUE 3 PHYSICAL DESTRUCTION OF BIODIVERSITY

Information in this section was sourced from the biodiversity impact assessment undertaken STS (STS, 2019A) and the freshwater assessment undertaken by SAS (SAS, 2019B) (refer to Appendix F).

Introduction

There are a number of activities/infrastructure in all phases that have the potential to destroy biodiversity in the broadest sense. In this regard, the discussion relates to the physical destruction of specific biodiversity areas, of linkages between biodiversity areas and related species which are considered to be significant because of their status, and/or the role that they play in the ecosystem.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

<u>Severity/nature</u>

Areas of high ecological sensitivity are functioning biodiversity areas with species diversity and associated intrinsic value. In addition, some of these areas host protected species. The linking areas have value because of the role they play in allowing the migration or movement of flora and fauna between the areas which is a key function for the broader ecosystem. The transformation of land for any purpose, including mining and associated activities, increases the destruction of the site-specific biodiversity, the fragmentation of habitats, reduces its intrinsic functionality and reduces the linkage role that undeveloped land fulfils between different areas of biodiversity importance.

The proposed infrastructure will not encroach on any watercourse or wetland in the project area. However, some activities will encroach on the legislated buffer zones for the wetlands (500 m buffer zone) and the Klip River (100 m or 1:100 year floodline, whichever is greatest). As described in the baseline section these watercourses have already been impacted upon to various degrees by historic activities, resulting in these systems being moderately to highly modified. Due to the small footprint area of the proposed Roodepoort Main Reef Pit within the 500 m the CVB 1 wetland and the Kimberley Reef East Pit within the 500 m of the CVB 3 wetland, limited direct impacts from the proposed mining activities is expected on the watercourses and associated aquatic ecosystems.

As described in the baseline section, the habitat within the project area has been significantly impacted upon by historic and current anthropogenic activities. Therefore habitats range in sensitivity from moderate for the Freshwater Feature habitat to low for the highly transformed habitat types. Biodiversity is generally low in all these areas and no faunal or floral species of concern were identified during fieldwork. It is however noted that the Freshwater Features habitat offers suitable habitat to the Southern African Hedgehog, which is protected by the Gauteng Province.

Taking the above into consideration, the severity has been rated as moderate in the unmitigated scenario, reducing to low with mitigation aimed at minimising impacts on the Freshwater Features habitat. Concurrent rehabilitation will be a key management measure especially in the opencast mining areas.

Duration

In the unmitigated scenario the loss of biodiversity and related functionality is long-term and will continue after the life of the mine. With mitigation, biodiversity and related functionality may be partially restored during the operational, decommissioning and closure phases. The duration is therefore high in the unmitigated scenario, reducing to medium in the mitigated scenario.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project area, the spatial scale of impacts will extend beyond this boundary in both the mitigated and unmitigated scenarios. Key related issues are the migration of species and the flow of nutrients. The spatial scale is therefore medium in both the unmitigated and mitigated scenarios.

Probability

Without mitigation the probability is definite. With mitigation, the probability may be reduced to low with effective management measures and concurrent rehabilitation where practically possible.

Significance

The significance of this impact is medium without mitigation, reducing to low with the effective mitigation measures.

Summary of the loss of biodiversity through physical destruction impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	L	M	M	M
Mitigated	L	M	L	L	L	L

Management objective

Minimise habitat destruction and fragmentation.

Management measures

Mitigation measures to be implemented during all project phases include the following:

- The areas of disturbance will be limited to what is absolutely necessary as defined for infrastructure in this EIA, and monitored to ensure edge effects such as erosion and alien and invasive plant species proliferation do not affect the adjacent areas. In this regard, maintaining migratory corridors and connectivity in the Freshwater and Secondary Grassland habitat units is deemed essential. As much indigenous vegetation will be retained as is practically possible;
- During the surveying and site-pegging phase of surface infrastructure, a search and rescue for possible floral species of conservation concern that will be affected by surface infrastructure will be undertaken, marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits (where necessary) will be applied for prior to removal of relocation of any species of conservation concern found. Such species will be handled with care and the relocation of these plant

species to nearby suitable similar habitat where deemed feasible will to be overseen by a suitably qualified botanist;

- Contractor laydown areas, material storage facilities and temporary stockpiles will be located outside of the watercourses and their regulated buffer zones;
- The watercourses, and their regulated buffer zones will be clearly demarcated and marked as a "no-go" areas unless authorised activities are allowed within this zone. Existing watercourse crossings will be used where possible to avoid driving through watercourses. Where is cannot be avoided, watercourse crossings should be made at right angles. Areas where bank failure is observed as a result of such watercourse crossings will be immediately repaired;
- The more sensitive faunal habitat (Freshwater features habitat) and associated buffer zones adjacent to footprint areas must be designated as No-Go areas, and no mining vehicles, personnel, or any other mining-related activities are to encroach upon these areas;
- All disturbed areas will be rehabilitated as soon as possible;
- Rehabilitation of natural vegetation will proceed in accordance with a rehabilitation plan compiled by a suitable specialist. This rehabilitation plan will consider ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken during mine closure;
- Rehabilitation trials will be continuously undertaken from the commencement of construction in order to determine the efficiency of rehabilitation methods and the suitability of flora propagated in the nursery for rehabilitation;
- Rehabilitation efforts and monitoring thereof will be implemented for a period of at least five years after decommissioning and closure.

Emergency situations

None identified.

ISSUE 4 GENERAL DISTURBANCE OF BIODIVERSITY

Information in this section was sourced from the biodiversity impact assessment undertaken STS (STS, 2019) and the freshwater assessment undertaken by SAS (SAS, 2019B) (refer to Appendix F).

Introduction

A number of activities/infrastructure have the potential to directly disturb vegetation, vertebrates and invertebrates in all project phases, particularly in the unmitigated scenario. The open pit mining operations will be of short duration. In the construction and decommissioning phases these activities are temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long-term occurrences such as the mine infrastructure complexes, while closure will present rehabilitated land that may have the potential for some latent impacts.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground and Opencast Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

In the unmitigated scenario, biodiversity may be disturbed in the following ways:

- Lighting can attract large numbers of invertebrates which become easy prey for predators. This can upset the invertebrate population balances;
- People may kill various types of species for food, for sport, for fire wood etc.;
- People may illegally collect and remove vegetation, vertebrate and invertebrate species;
- Excessive dust fallout from various dust sources (exposed areas, soil stockpiles etc.) may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation;
- Noise and vibration pollution (from vehicle movement, materials handling etc.) may scare off vertebrates and invertebrates. In some instances, the animals may be deterred from passing close to noisy activities which can effectively block some of their migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities;
- The increased presence of vehicles in the area can cause road kills especially if drivers speed;
- The presence of mine water impoundments may lead to drowning of fauna;
- Dewatering of the open pits (during the rainy season) may impact on surface water resources and the associated aquatic ecosystems if there is a hydraulic connection between surface and groundwater in these areas;
- Surface water contamination could affect organisms dependant on these resources for water and refuge; and
- An increase in pollution emissions and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates.

Taken together, the remaining potential disturbances will have a medium severity in the unmitigated scenario. In the mitigated scenario, many of these disturbances can be prevented or mitigated to acceptable levels, which reduces the severity to low.

Duration

In the unmitigated scenario, the impact is long term because where biodiversity is compromised, killed or removed from the area this impact is likely to exist beyond the life of the project. With mitigation this reduces to medium.

Spatial scale / extent

Given that biodiversity processes are not confined to the proposed project area, the spatial scale of general disturbances will extend beyond the site boundary in the unmitigated and mitigated scenarios. Key related issues are the migration of species and linkages between biodiversity areas. This is a medium spatial scale.

Probability

Without any mitigation, the probability of negatively impacting on biodiversity through multiple disturbance events is possible. With mitigation, the probability can be reduced to low because most of the disturbances can be controlled through implementation and enforcement of practices, policies and procedures.

Significance

In the unmitigated scenario, the significance of this potential impact is medium reducing to low with mitigation.

Summary of the general disturbance of biodiversity impact rating per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	M	H	M	M
Mitigated	L	M	M	L	L	L

Management objective

To minimise disturbance of biodiversity.

Management measures

Mitigation measures to be implemented during all project phases include the following:

- The areas of disturbance will be limited to what is absolutely necessary as defined for infrastructure in this EIA, and monitored to ensure edge effects such as erosion and alien and invasive plant species proliferation do not affect the adjacent areas. In this regard, maintaining migratory corridors and connectivity in the Freshwater and Secondary Grassland habitat units is deemed essential. As much indigenous vegetation will be retained as is practically possible;
- During the surveying and site-pegging phase of surface infrastructure, a search and rescue for possible floral species of conservation concern that will be affected by surface infrastructure will be undertaken, marked and where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits (where necessary) will be applied for prior to removal of relocation of any species of conservation concern found. Such species will be handled with care and the relocation of these plant species to nearby suitable similar habitat where deemed feasible will to be overseen by a suitably qualified botanist;
- Contractor laydown areas, refuelling areas and material storage facilities will be located outside of the watercourses and their regulated buffer zones;
- Temporary soil stockpiles height will be limited between two and three metres where possible and will be protected to prevent contamination of runoff and sedimentation of the downgradient watercourses in the vicinity of the proposed activities;
- The watercourses, and their regulated buffer zones will be clearly demarcated and marked as a “no-go” areas unless authorised activities are allowed within these zones. Existing watercourse crossings will be used where possible to avoid driving through watercourses. Where is cannot be avoided, watercourse crossings should be made at right angles. Areas where bank failure is observed as a result of such watercourse crossings will be immediately repaired;
- The temporary waste rock dumps and topsoil stockpiles will be located out of the watercourse regulated buffer zones and managed to prevent infiltration of sediment and contaminants to downstream watercourses;
- Dewatering boreholes will be considered, if deemed necessary, in order to minimise the creation of dirty water within the ventilation shaft, and this clean water should be used to recharge the natural watercourses within close vicinity of the ventilation shafts. If clean water is released into the wetlands, stormwater management outlets will be installed, with erosion prevention structures (such as reno-mattresses) to limit the velocity of stormwater inflow from eroding the wetlands;

- Any mining activities within regulated buffer zones of the wetlands will be undertaken with care to ensure that downstream impacts on the ecology of these systems do not occur. In this regard:
  - The temporary waste rock dumps and topsoil stockpiles will be managed to minimise infiltration of contaminants to the downgradient wetlands. Mitigation methods that will be considered include development of a downgradient berm and trench system to collect seepage which can be re-used in the mining processes;
  - Pollution prevention through infrastructure design, to prevent, eliminate and/or control the potential for groundwater pollution, in accordance with any recommendations made by a suitably qualified geohydrologist and the stormwater management plan (these are detailed in the groundwater and surface water impact assessment and mitigation sections above);
  - A groundwater monitoring programme will be implemented to detect any changes in groundwater quality;
  - A monitoring programme will be implemented for the downgradient wetlands to detect possible contamination emanating from the site. In the case of contamination being detected, the mine will investigate and implement additional mitigation measures. This could include the installation of interception boreholes to remove and clean contaminated water; and
  - Clean and dirty water separation systems will be implemented and maintained to ensure that any contaminated water does not reach the wetlands downgradient of the mining activities.
- Trapping, collecting or hunting of fauna or flora species will be prohibited during all phases of the proposed project;
- Road margins close to telephone lines and powerlines will be burned and/or mowed regularly to prevent microhabitat for small mammals that could be hunted by raptors. By keeping the grass height low, it lowers the possibility of raptors colliding with vehicles;
- More sensitive faunal habitat (Freshwater features habitat) and associated buffer zones adjacent to footprint areas will be designated as “no-go” areas, and no mining vehicles, personnel, or any other mining-related activities are to encroach upon these areas;
- Road margins close to telephone lines and power lines will be burned and/or mowed regularly to prevent microhabitat for small mammals that could be hunted by raptors. By keeping the grass height low, it lowers the possibility of raptors colliding with vehicles;
- Awareness campaigns will be implemented to inform all construction and mine workers, especially vehicle operators/drivers, of the importance of plant and animal species within the project area;
- Informal fires will be prohibited during all project phases;
- Edge effects of all construction and operational activities, such as erosion and alien plant species proliferation, which may affect faunal habitat, will be strictly managed in all areas of increased ecological sensitivity (Freshwater Features habitat);
- An alien invasive species management and monitoring programme will be implemented. The programme will continue to be implemented for a period of five years after decommissioning and closure;
- Surface water management measures as outline in section Issue 6 will be implemented. The clean and dirty water separation systems will be developed in such a way, along with the rest of the proposed mining activities, to reduce the footprint of the dirty water area and thus minimise the impact on catchment yield;
- Should contamination be detected in watercourses (including wetlands) in the project area, the mine will implement additional management and mitigation measures to prevent further contamination and attempt to remedy the contamination. This may include the installation of interception boreholes to remove and treat contaminated water;

- Groundwater management measures as outline in Issue 8 will be implemented;
- Soil management measures as outline in Issue 1 and Issue 2 will be implemented;
- Dust management measures as outline in Issue 9 will be implemented;
- Lighting pollution and its effect on fauna will be effectively mitigated with the following guidelines in mind:
  - Downward facing lights will be installed and limited to essential areas; and
  - Covers/light diffusers will be installed to lessen the intensity of illumination if at all possible.
- Rehabilitation of natural vegetation will proceed in accordance with a rehabilitation plan compiled by a suitable specialist. This rehabilitation plan will consider ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken during mine closure;
- Rehabilitation trials will be continuously undertaken from the commencement of construction to determine the efficiency of rehabilitation methods and the suitability of flora propagated in the nursery for rehabilitation;
- Rehabilitation efforts and monitoring thereof will be implemented for a period of at least five years after decommissioning and closure.

Emergency situation

In case of a major incident the emergency response procedure in Section 30.2.2 will be followed.

Monitoring

The areas of disturbance will be monitored to ensure edge effects such as erosion and alien and invasive plant species proliferation do not affect the adjacent areas.

An alien invasive species management and monitoring programme will be implemented throughout the mining areas.

The watercourses (including wetlands) within 500 m of proposed mine infrastructure will be monitored to determine whether contamination is leaching from the mine infrastructure. Should contamination be detected, the mine will implement additional management and mitigation measures to prevent further contamination and attempt to remedy the contamination. This may include the installation of interception boreholes to remove and treat contaminated water.

ISSUE 5 ALTERATION OF SURFACE DRAINAGE PATTERNS

Information in this section was sourced from the surface water study undertaken SLR (SLR, 2019) (refer to Appendix G).

Pre-mining natural drainage across the proposed project area is via preferential flow paths. With reference to the table below, there are a number of activities/infrastructure which will alter drainage patterns by reducing the volume of run-off into the downstream catchments. During the construction, operational and decommissioning phase, these activities will continue until such time as project infrastructure can be removed and/or the project areas are rehabilitated. During the closure phase rehabilitation will allow for the restoration of drainage patterns as far as practically possible. As part of the proposed project, rainfall and surface water run-off will be collected in all areas that have been designed with water containment infrastructure as required by legislation. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns. In addition, discharge of excess water also has the potential to alter drainage patterns.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation Discharge of excess water	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impacts

Severity/nature

During the construction, operation, decommissioning, and to a lesser extent, the closure phases, rainfall and surface water run-off will be collected in all areas that have been designed with water containment infrastructure. The collected run-off will therefore be lost to the catchment and can result in the alteration of drainage patterns. The collection of stormwater and physical alteration of drainage lines is estimated to reduce the catchment area for runoff to the streams by approximately 0.15 %. This is a very small area compared to the C22A Quaternary Catchment, therefore this impact is not considered to be significant.

The water balance shows that excess mine water will likely need to be treated (where required) and discharged into receiving watercourses during the wet season, and this also has the potential to change drainage patterns. The points of discharge for the excess water are yet to be determined, however, the volumes of water to be discharged are significant during the wet season. This impact is therefore rated as having a medium severity.

Duration

In the unmitigated scenario, the alteration of drainage patterns could extend beyond closure. In the mitigated scenario, the duration of the alterations will mostly be restricted to the phases before closure.

Spatial scale / extent

In the unmitigated and mitigated scenario, the physical alteration of drainage patterns will extend downstream beyond the site boundary.

Probability

The magnitude of the change in flows in receiving watercourses may well result in related flow impacts downstream, therefore the probability is medium in both the mitigated and unmitigated scenarios.

Significance

The significance is high in the unmitigated scenario reducing to medium with mitigation.

Summary of the rated alteration of natural drainage lines impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	M	H	M	H	M	H
Mitigated	M	L	M	M	M	M

Management objective

The objective is to prevent unacceptable alteration of drainage patterns and related reduction of downstream surface water flow.

Management actions

The following management measures will be implemented during all mine phases:

- Mine infrastructure will be constructed, operated and maintained so as to comply with the provisions of the National Water Act (36 of 1998) and Regulation 704 (4 June 1999) of any future amendments thereto. These include:
  - Separation of clean and dirty water systems;
  - The size of dirty water areas will be minimized and clean run-off and rainfall water will be diverted around dirty areas and back into the normal flow in the environment;
- The location of all activities and infrastructure will be outside of the flood lines of watercourses. If this is unavoidable the necessary exemptions/approvals will be obtained;
- Discharges will be in line with a Water Use License and in a manner that mitigates potential risks on downstream environments;
- Regularly update and refine the site wide water balance with the input of actual flow and discharge volumes to enable the water balance to be used as a decision-making tool for water management and impact management actions;
- All discharge points will be checked regularly to determine if energy dissipaters or other management measures are required.

Emergency situations:

For any emergency discharge incident, the emergency response procedure in Section 30.2.2 will be followed.

ISSUE 6 CONTAMINATION OF SURFACE WATER

Information in this section was sourced from the surface water study undertaken SLR (SLR, 2019) (refer to Appendix G).

Introduction

There are a number of pollution sources in all project phases of the proposed project that have the potential to pollute surface water, particularly in the unmitigated scenario. In the construction and decommissioning phases these potential pollution sources are temporary in nature. Although these sources may be temporary, the potential pollution may be long term. The operational phase will present more long-term potential sources and the closure phase will present rehabilitated areas that have the potential to contaminate surface water through long term seepage and/or run-off.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation	Underground and Opencast	Underground and Opencast	Maintenance and aftercare of

Construction	Operational	Decommissioning	Closure
Earthworks Civil works	Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation Discharge of excess water	Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	rehabilitated areas

Rating of impacts

Severity/nature

Surface water may collect contaminants (hydrocarbons, salts, and metals) from numerous sources.

In the unmitigated scenario, potential construction and decommissioning phase pollution sources include:

- Sedimentation from erosion;
- Spillage from portable toilets, spillage of construction fuel, lubricants, cement or leaks from vehicles and equipment.

Potential operational phase pollution sources include:

- Spills from sewage treatment plant, spillage of operational fuel, lubricants, cement or leaks from vehicles and equipment;
- Contaminated discharges from the dirty water control systems;
- Contaminated runoff from the temporary waste rock dumps and exposed rock in the opencast pits;
- Discharge of excess water that cannot be used on site;
- Sedimentation from erosion.

At elevated concentrations contaminants can exceed the relevant surface water quality limits imposed by DWS and can be harmful to humans and livestock if ingested directly and possibly even indirectly through contaminated vegetation, vertebrates and invertebrates (refer to the biodiversity section in this Appendix for the potential biodiversity impacts. This impact will not be assessed in this section. The quality of water to be discharged into receiving water bodies is not currently known, however the water may have a low pH and contain contaminants if not treated sufficiently. This impact has therefore been rated as having a high severity.

In the mitigated scenario, clean water will be diverted away from the project areas and contaminated run-off will be contained in the normal course. The quality of discharge water will be treated to a standard to be determined by DWS during the water use licencing process, although it is noted that the water quality in the project area is already not fit for human use. The discharges could potentially even improve the water quality in these receiving watercourses. The severity should therefore be reduced to medium.

Duration

In the unmitigated scenario, the contamination of surface water resources will occur for periods longer than the life of proposed project. With mitigation, pollution can be prevented and/or managed and as such the impacts can be reversed or mitigated within the life of proposed project.

Spatial scale / extent

In both the mitigated and unmitigated scenarios, the spatial scale is likely to extend beyond the project area because contamination is mobile once it reaches flowing watercourses.

Probability

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach surface water resources?
- Will people and livestock utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the surface water resources within the proposed project area. Excess water will be discharged directly into watercourses within the project area, although the exact discharge points are yet to be determined.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. Although surface water is already unfit for use, third parties were noted to be using surface water for subsistence irrigation and washing of clothes.

The third element is that it is likely that some contaminants will be at a level which is harmful to humans and livestock. This is influenced both by the quality of any discharged water and by the diluting effect of any rainwater particularly in the rainy season.

As a combination, when considering the nature and location of the proposed infrastructure in proximity to surface water resources, the unmitigated probability is medium. This can be reduced where water is discharged at suitable standards.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In the mitigated scenario, the significance is reduced to medium-low because of the reduction in severity and duration.

Summary of the rated contamination of surface water resources impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	M	H
Mitigated	M	M	M	M	M-L	M-L

Management objectives

Prevent and minimise further water quality impacts in the catchment from the proposed project.

Management measures

The following management measures will be implemented during all project phases:

- Mine infrastructure will be constructed and operated so as to comply with the National Water Act (36 of 1998) and Regulation 704 (4 June 1999).
- Silt will be managed by minimising the disturbance of soils, implementing sediment source and erosion controls, phasing of earthworks activities, diverting upslope runoff from entering the earthworks areas and containment of sediment runoff i.e. use of silt traps;
- Discharges of surface water will only occur in accordance with authorisations that are issued in terms of the relevant legislation specifications and must not result in negative health impacts for downstream surface water users. The relevant legislation specifications comprise any applicable authorisation/exemption, the National Water Act (36 of 1998) and Regulation 704;

- The design of all onsite access roads, plant areas, stockpiles, pump station etc. will include stormwater management and erosion control during both the construction and operational phases;
- Good housekeeping practices will be implemented and maintained by clean-up of accidental spillages, as well as ensuring all dislodged material such as from run-of-mine stockpiles are kept within the confined storage footprints;
- Clean-up material and materials safety data sheets for chemical and hazardous substances will be kept on site for immediate clean-up of accidental spillages of pollutants;
- Regular inspections and maintenance will be conducted of water management facilities, to inspect drainage structures and liners for any in-channel erosion or cracks, de-silting of silt traps/sumps and pollution control dams, and any pumps and pipelines will be maintained according to manufacturer's specifications;
- Vehicles and plant equipment servicing will be undertaken within suitably equipped facilities, either within workshops, or within bunded areas, from which any stormwater will be conveyed to a pollution control dam, after passing through an oil and silt interceptor;
- Water conservation and water demand management measures will be implemented to ensure that as much water as is possible, is collected and reused;
- Concurrent rehabilitation of disturbed areas will be conducted where practical;
- All hazardous chemicals (new and used), mineralized waste and non-mineralised waste will be handled in a manner that they do not pollute surface water. This will be implemented by means of the following:
  - Pollution prevention through basic infrastructure design;
  - Pollution prevention through maintenance of equipment;
  - Pollution prevention through education and training of workers (permanent and temporary);
  - Pollution prevention through appropriate management of hazardous, materials; and
  - The required steps to enable containment and remediation of pollution incidents.

Emergency situations

In case of a potentially polluting discharge incident that may result in the pollution of surface water resources, the emergency response procedure in Section 30.2.2 will be followed.

ISSUE 7 REDUCTION OF WATER AVAILABILITY TO THIRD PARTIES

Information in this section was sourced from the groundwater study undertaken by Noa Agencies (Noa, 2019) (refer to Appendix H).

Introduction

Dewatering activities are required to allow for safe mining operations. Dewatering activities have the potential to cause a lowering of groundwater levels which may cause a loss in water supply to surrounding borehole users if they are in the impact zone. Dewatering activities can also affect baseflow contributions to surface watercourses if there is a hydraulic link between the surface and groundwater. According to Noa, the Klip River groundwater compartments appear to be in connection with the Klip River. No other hydraulic connections have been identified (Noa, 2019).

Mine phase and link to project specific activities/infrastructure

Construction	Operation	Decommissioning	Closure
N/A		N/A	N/A
-	Open pit and Underground mining - dewatering	-	-

Rating of impact

Severity / nature

A three-dimensional groundwater model was developed to simulate the potential impact on the receiving environment associated with the various open pits and the underground mining operations. Dewatering at the five opencast pits and the underground mine areas were simulated.

Little to no mine dewatering is predicted to occur at the open pits due to the shallowness of the proposed open pits (i.e. <30m deep). During the wet season minor dewatering could be required due to seepage and runoff from the Waste Rock Dump (WRD) and local catchment. At the Mona Lisa open pit a relatively higher (although still considered by the specialist to be small) dewatering volume has been predicted. This is due to the proximity of the open pit to the Klipspruit River. At 11 Shaft open pit, dewatering could influence the flow of water along the adjacent drainage line. The assumption is made that the dewatered volume simulated in the numerical flow model is derived from shallow groundwater flow that contributes to baseflow of the watercourses. It is however noted by the specialist that water may not accumulate in the Mona Lisa open pit, especially during the dry seasons (Noa, 2019). This is rated as a medium severity for the Mona Lisa and 11 Shaft pits and low severity for all other open pits. Open pit dewatering cannot be mitigated as this is a potential result of excavation and intersecting the groundwater table.

The groundwater report provides mapping showing the predicted zones of dewatering for each open pit (refer to Appendix H). No third-party groundwater users were recorded within the zones of dewatering. The groundwater specialist has also indicated that there will be very little to no influence on the surface and shallow groundwater regime and third-party users (Noa, 2019).

The simulated dewatering volumes range between 500 and just over 2 000 m^3/day for Bird Reef Central and 800 and 3 600 m^3/day for Kimberley Reef East underground mine areas. Depending on whether structures are intersected underground, this volume could increase or decrease. Therefore these volumes should be used as a guide for planning and management purposes. Where dirty water is collected in the underground workings it will be pumped into historical underground workings/voids. A water pillar will remain between the project and the historical underground workings to prevent continuous dirty water from flowing. According to Noa, the simulated zones of influence should however not be measureable or notable, on or close to surface. Shallow groundwater levels would remain, mostly due to the low vertical hydraulic permeability of the shallower formations (Noa, 2019).

Dewatering activities in the underground mine are predicted to pose little to no impact on the surface and shallow groundwater regime and users. The severity has therefore been rated as low in both the unmitigated and mitigated scenarios.

Duration

The duration of the impact is linked to the duration of the dewatering and the recharge time thereafter. Noa notes that shallow groundwater levels remain even with the historical mining in the basins, mostly due to the low vertical hydraulic permeability of the shallower formations. Therefore, the duration is limited to less than the life of the project.

Spatial scale / extent

The spatial scale of the predicted dewatering cone will extend beyond the mining area but remain localised, which is a low spatial scale in both the unmitigated and mitigated scenarios.

Probability

No third-party groundwater users have been recorded in the zones of influence, furthermore dewatering is expected to have very little to no influence on the surface and shallow groundwater regime. However dewatering at the Mona Lisa has the potential to reduce the baseflow contribution to the Klipspruit River. The probability of impacts on third-party water users is therefore low in both the unmitigated and mitigated scenarios.

Significance

The significance is low in both the unmitigated and mitigated scenarios.

Summary of the rated dewatering impact for the open pit mining per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation – all pits except Mona Lisa						
Unmitigated	L	L	L	L	L	L
Mitigated	L	L	L	L	L	L
Operation –Mona Lisa						
Unmitigated	M	L	L	L	L	L
Mitigated	M	L	L	L	L	L

Summary of the rated dewatering impact for the underground mining per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation						
Unmitigated	L	L	L	L	L	L
Mitigated	L	L	L	L	L	L

Management objective

To prevent third-party groundwater user loss of water supply.

Management measures

The following management measures will be implemented:

- Prior to mining, an updated hydrocensus will be conducted in a 500 m radius around each opencast pit and the underground mining areas. The data recorded will be used to finalise the monitoring protocol and the groundwater flow model and associated management scenarios;
- All potentially affected third-party groundwater users identified in the updated hydrocensus will be included in the mine's groundwater monitoring program to ensure that changes in water depths can be identified;
- Additional drilling will be conducted at the Mona Lisa open pit to further investigate how dewatering may impact on the baseflow contribution to the Klipspruit River. Once drilling is completed, an aquifer test will be performed and the water sampled will be compared to the Klipspruit River water to establish a link, or absence there-of, between the potential dewatering at Mona Lisa and the Klipspruit River;
- Additional boreholes will be drilled at key locations to serve as monitoring boreholes (see monitoring programme). These boreholes will be subjected to aquifer testing;
- The underground mining areas will be further assessed by drilling boreholes to the proposed depth of mining, intersecting known geological units, fractures and mining sequence. These boreholes will also be subjected to aquifer testing;

- The groundwater model will be updated once the hydrocensus, monitoring and testing data is updated. The simulations will be re-run to determine if the predictions were accurate or if any changes to the management measures are required; and
- Although this is not expected, should the West Wits dewatering activities cause a loss of water supply to third parties, alternative water supply of equivalent or better quantity and quality will be provided to the affected user, or appropriate compensation will be provided by West Wits, until such time as the dewatering impacts cease.

Emergency situations

None identified.

ISSUE 8 GROUNDWATER CONTAMINATION

Information in this section was sourced from the groundwater study undertaken by Noa Agencies (Noa, 2019) (refer to Appendix H).

Introduction

There are a number of sources in all mine phases that have the potential to pollute groundwater. In the construction and decommissioning phases some of these potential pollution sources are temporary and diffuse in nature. Even though the sources are temporary in nature, related potential pollution can be long term. The operational phase will present more long-term potential sources (temporary waste rock dumps) and the closure phase will present backfilled pits, underground mining voids and rehabilitated land that may have the potential to pollute water resources through long term seepage and/or run-off. Pollution sources can also affect baseflow contributions to surface watercourses if there is a hydraulic link between the surface and groundwater. According to Noa, the Klip River groundwater compartments appear to be in connection with the Klip River (Noa, 2019).

There will be no residual landforms after mine closure as ore will be taken off site for mineral processing and all waste rock material will either be used to backfill the open pits, or transported for disposal off site.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Earthworks Civil works	Opencast mining Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services General site management Rehabilitation	Opencast mining Transportation Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated land

Rating of impacts

<u>Severity / nature</u>

Two types of contamination sources are broadly considered. The one type is diffused contamination which includes ad hoc spills and discharges of contaminant substances. The other type is point source contamination which includes more long-term sources such as the temporary waste rock dumps. A three-dimensional model was developed to simulate the potential contamination from the temporary WRDs (during operations) and backfilled opencast pits (post-closure). It is possible that the potential plume could

migrate to the Klipspruit River at the Mona Lisa opencast pit due to the possible connection between the groundwater and river baseflow.
The geochemical nature of the waste rock was assessed and is discussed in Section 6.4.1.1 of this report. The acid base accounting and geochemical modelling have indicated that due to the absence of iron sulphide minerals the risk of the development of acid mine drainage conditions in the waste rock environment is negligible. In addition the leach tests and geochemical model, which was developed to evaluate the leach tests, shows that the risk of leaching of contaminants from the waste rock is negligible (Noa, 2019).

GeoDyn Systems recommended that the waste rock be treated as a Type 4 waste, which is generally inert and does not require complex engineered barrier systems. The temporary WRDs will therefore have a Class D barrier, which entails topsoil stripping and 150 mm base preparation. No significant or poor-quality leachate is expected from the temporary WRDs.

The groundwater report provides mapping showing the predicted movement of groundwater based on the physical characteristics of the waste rock material for each temporary WRD and open pit which will be concurrently backfilled and rehabilitated (refer to Appendix H). The simulations showed that a potential plume would migrate a maximum of 150 m from the temporary WRDs, at a concentration of less than 20 % of the source concentration. No third-party groundwater users were identified within the predicted zone. No decanting is expected after mine closure (Noa, 2019).

The severity has therefore been rated as low in both the unmitigated and mitigated scenarios.

<u>Duration</u>

Groundwater contamination is long-term in nature, occurring for periods longer than the life of proposed project.

<u>Spatial scale / extent</u>

The potential contamination plume would extend beyond the project footprint but remain localised in both the unmitigated and mitigated scenarios.

<u>Probability</u>

The probability of the impact occurring relies on a causal chain that comprises three main elements:

- Does contamination reach groundwater resources?
- Will people and animals utilise this contaminated water?
- Is the contamination level harmful?

The first element is that contamination reaches the groundwater resources underneath or adjacent to the proposed project area. Due to the proximity of the sources to groundwater in the shallow aquifer, contaminants could reach groundwater resources. It should be noted that the open pits and underground mine voids are not expected to decant.

The second element is that third parties and/or livestock use this contaminated water for drinking purposes. No known third-party groundwater users are located within the contamination plume zones, however it is possible that contamination could reach the baseflow of the Klipspruit as described above.

The third element is whether contamination is at concentrations which are harmful to users. Based on the geochemical assessment, no significant or poor quality leachate is expected to be associated with the temporary WRDs or backfilled open pits. As a combination, the unmitigated and mitigated probability is low.

Significance

The significance is low in both the unmitigated and mitigated scenarios.

Summary of the rated contamination of groundwater impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	L	H	L	M	L	L
Mitigated	L	H	L	M	L	L

Management objectives

Prevent and minimise further water quality impacts in the catchment from the proposed project.

Management measures

The following management measures will be implemented during all phases of the project:

- Prior to mining, an updated hydrocensus will be conducted in a 500 m radius around each opencast pit and the underground mining areas. The data recorded will be used to finalise the monitoring protocol and the groundwater flow model and associated management scenarios;
- All potentially affected third-party groundwater users identified in the updated hydrocensus will be included in the mines' groundwater monitoring program to ensure that changes in water quality can be identified;
- Although this is not expected, should the West Wits mining activities cause a loss of water supply through decreased water quality to third parties, alternative water supply of equivalent or better quantity and quality will be provided to the affected user, or appropriate compensation will be provided by West Wits, until such time as the pollution impacts cease;
- Mine infrastructure will be constructed and operated so as to comply with the National Water Act (36 of 1998) and Regulation 704 (4 June 1999);
- Concurrent rehabilitation of disturbed areas will be conducted where practical;
- Additional boreholes will be drilled at key locations to serve as monitoring boreholes. This is discussed in more detail below. These boreholes will also be subjected to aquifer testing;
- The underground mining areas will be further assessed by drilling boreholes to proposed depth of mining, intersecting known geological units, fractures and mining sequence. These boreholes will also be subjected to aquifer testing;
- The groundwater flow model will be updated once the hydrocensus, monitoring and testing data is updated. The simulations will be re-run to determine if the predictions were accurate or if any changes to the management measures are required;
- All hazardous chemicals (new and used), mineralized waste and non-mineralised waste will be handled in a manner that they do not pollute water. This will be implemented by means of the following:
    - Pollution prevention through basic infrastructure design;
    - Pollution prevention through maintenance of equipment;
    - Pollution prevention through education and training of workers (permanent and temporary);
    - Pollution prevention through appropriate management of hazardous, materials; and
    - The required steps to enable containment and remediation of pollution incidents.

Emergency situations

In case of a major discharge incident that may result in the contamination of groundwater resources the emergency response procedure in section 30.2.2 will be followed.

ISSUE 9 CHANGE IN AMBIENT AIR QUALITY

Information in this section was sourced from the air quality impact assessment undertaken by Airshed Planning Professionals (Airshed, 2019A) (refer to Appendix J).

Introduction

There are a number of activities in all phases that have the potential to contribute to the pollution of air. In the construction and decommissioning phases these activities are usually temporary in nature, usually existing for a few weeks to a few months. The operational phase will present more long-term activities and the closure phase will present final rehabilitated areas.

Air pollution related impacts on biodiversity are discussed in the biodiversity section and therefore this section focuses on the potential for human health impacts.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Impact assessment

Severity / nature

The main air contaminants associated with the proposed project include: inhalable particulate matter less than 10 microns in size (PM_{10}), larger total suspended particulates (TSP) that relate to dust fallout, sulphur dioxide (SO_{2}), nitrite (NO_{2}) and carbon monoxide (CO) emissions mainly from vehicles and generators, in addition to diesel particulates from generators. The main sources of dust emissions from the opencast mining operations are likely to be materials handling of ROM and waste rock in the pit, as well as of waste rock at the WRD; and vehicle entrainment emissions from haul trucks and other mobile equipment. The main sources of dust emissions from the underground mining operations are the ventilation shafts and the aboveground handling of ROM (Airshed, 2019A). There will be no residual landforms after mine closure as ore will be taken off site for mineral processing and all waste rock material will be removed to backfill the open pits, or if necessary waste rock material will be disposed of offsite.

Airshed conducted dispersion modelling simulations using the US EPA AERMOD atmospheric dispersion modelling suite to determine the highest hourly, highest daily and annual average ground level concentrations for each of the pollutants considered for the operational phase. A set of isopleth plots are provided in the air report (refer to Appendix J). Averaging periods were selected to facilitate the comparison of simulated pollutant concentrations to the National Ambient Air Quality Standards (NAAQS). Dustfall results were compared to the National Dust Control Regulations (NDCR) standards.

Simulated maximum concentrations for all opencast operations at receptor locations are shown in Table D 2. The simulations show:

- Inhalable dust: In the unmitigated scenario, the simulated highest daily PM_{10} concentrations exceed the NAAQS (75 µg/m³ for the 24-hour and 40 µg/m³ annual averaging period) at the closest receptor locations to the east, north and south of each of the pits, except the Mona Lisa Pit. Simulated $PM_{2.5}$ concentrations are in compliance with the SA NAAQS for all averaging periods at all receptor locations.
  With simple mitigation measures such as wet suppression of dust at material handling points and regular water sprays on haul roads, the simulated incremental PM_{10} concentrations due to the open pit mining operations fall within compliance with the NAAQS at all receptor locations, with the exception of daily PM_{10} concentrations at the buildings to the south of Rugby Club and to the east of 11-Shaft where the annual average is still exceeded.
- Dust fallout: In the unmitigated scenario, simulated highest monthly dust fallout rates comply with the NDCR residential limit at all receptor locations and comply with the NDCR non-residential limit at all off-site areas.
- Gases: Simulated NO_2, SO_2, and CO concentrations comply with the NAAQS for all averaging periods at all receptor locations.

With respect to underground operations, the highest daily and annual average PM_{10} concentrations as a result of aboveground ROM handling and ventilation shaft emissions were simulated to exceed the NAAQS in the immediate vicinity of the underground infrastructure complexes. However, the simulation shows compliance with the SA NAAQS at all receptor locations (Airshed, 2019A).

The severity rating is based on the simulated annual PM_{10} concentrations, at the receptors close to open pit operations, which exceed the NAAQS, which represents the highest potential impact area. The severity has been rated as medium in the unmitigated scenario. With mitigation, although the annual NAAQS levels will no longer be exceeded, and although the daily PM_{10} concentrations at the buildings to the south of Rugby Club and to the east of 11-Shaft will be significantly reduced, the concentrations cannot be reduced sufficiently to comply with the daily NAAQS at these receptors. The severity has therefore been rated as medium in the mitigated scenario.

TABLE D 2: DISPERSION MODELLING RESULTS – OPEN PIT OPERATIONS (AIRSHED, 2019A)

Pollutant	Scenario	Averaging Period	Limit Value (µg/m³)	Simulated Maximum Concentration at Sensitive Receptor Locations (µg/m³)				
				Roodepoort	Mona Lisa	Rugby Club	11 Shaft	Kimberley East
PM_{10}	Unmitigated	24-hour	75	***99***	54	***115***	***260***	***40***
		1-year	40	33	14	***63***	***82***	7
	Mitigated	24-hour	75	51	29	***91***	***150***	23
		1-year	40	14	6	27	35	3
$PM_{2.5}$	Mitigated	24-hour	40	5	3	10	20	1
		1-year	20	1.3	0.6	3.2	5	0.3
NO_2	Unmitigated	1-hour	200	37	21	67	110	17
		1-year	40	7.5	3.2	14.4	18.7	1.6
SO_2	Unmitigated	1-hour	350	0.1	0.1	0.2	0.4	0.1
		24-hour	125	0.1	0.0	0.1	0.2	0.0
		1-year	50	0.03	0.01	0.05	0.07	0.01
CO	Unmitigated	1-hour	30 000	19	8	36	47	4
Diesel Particulates	Unmitigated	1-hour		2.7	1.5	4.9	8.0	1.2
		24-hour		2.0	1.2	3.6	6.0	0.9
		1-year		0.6	0.2	1.1	1.4	0.1
Dust Fallout	Mitigated	1-month	600	90	50	200	250	20

Bold and *italics* text indicates exceedance of the NAAQS.

Duration

The elevated PM_{10} concentrations would be short-term due to the limited duration of opencast mining activities. With mitigation, the duration of impacts will be reduced.

Spatial scale / extent

The spatial scale of the potential impact could be beyond the immediate mining area in both the unmitigated and mitigated scenarios.

Probability

The health impact probability is linked to the probability of ambient concentrations exceeding the evaluation criteria in relation to potential receptors. In the unmitigated scenario this is high due to the elevated PM_{10} concentrations at receptors close to the opencast pits. With mitigation, the probability therefore reduces to seldom.

Significance

The significance of this impact is high in the unmitigated scenario. With mitigation, the significance of reduces to medium.

Summary of the air pollution impact rating per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and closure						
Unmitigated	M	L	M	M	H	H
Mitigated	M	L	M	M	L	M

Management objective

The objective is to prevent air pollution health impacts.

Management action

Management actions that have been identified in all phases prior to closure are provided below.

Dust emissions

- Best practice mitigation measures (wind breaks, wet suppression etc.) will be implemented for both the mining and rehabilitation phases of the opencast operations. Mitigation measures will be in-line with the requirements of the City of Johannesburg Metropolitan Municipality By-Laws which requires mitigation of any air pollution, as far as reasonably possible.
- In addition, best practice mitigation measures (wind breaks, wet suppression, minimised drop heights) will be implemented on ROM handling operations during the underground phase of the West Wits Mining Project.
- Specific measures include:
  - Wet suppression techniques will be used to control dust emissions, especially in areas where dry material is handled or stockpiled;
  - Exposed soils and other erodible materials will be re-vegetated or covered promptly;
  - New areas will be cleared and opened-up only when absolutely necessary;
  - Surfaces will be re-vegetated or otherwise rendered non-dust forming when inactive;
  - Storage for dusty materials will be enclosed or operated with efficient dust suppressing measures;

- Loading, transfer, and discharge of materials will take place with a minimum height of fall, and be shielded against the wind, and the use of dust suppression spray systems should be considered;
- Strict speed limits will be imposed to reduce entrained emissions and fuel consumption rates; and
- Should PM10 concentrations exceed the NAAQS at the closest receptor locations, additional dust suppression measures will be investigated.

Gaseous emissions

- Vehicles will be fitted with catalytic converters and low sulphur fuel will be used to minimise NO_2 and SO_2 impacts;
- Vehicle idle times will be kept to a minimum to minimise CO, NO_2, SO_2, diesel particulate and greenhouse gas emissions; and
- Strict speed limits (as low as practically feasible, a maximum of 40 km/hr, but preferably 20 km/hr) will be imposed on mine vehicles to reduce fuel consumption rates.
- The vehicle fleet should be regularly serviced and maintained to minimise CO, NO2, SO2, diesel particulate and greenhouse gas emissions.
- Older vehicles in the current fleet should be replaced with newer, more fuel-efficient alternatives where feasible.

Air quality complaint register

- The mine will keep an air quality complaint register and respond immediately to complaints about air quality related problems. All such complaints will be documented and recorded as incidents and addressed as deemed appropriate. These records will be kept for the life of mine.
- Regular community liaison meetings will be held with the neighbouring communities to address air quality related concerns.

Emergency situations

None identified.

ISSUE 10 INCREASE IN GREENHOUSE GAS EMISSIONS

Information in this section was sourced from the climate change assessment undertaken by Promethium Carbon (Promethium, 2019) (refer to Appendix I).

Introduction

Anthropogenic climate change as a global phenomenon is caused by the accumulated greenhouse gas emissions from global emitting sources. The impact thereof on society is increasingly of concern. The proposed project's contribution to global climate change is determined by the greenhouse gas emissions produced by the mine and its value chain. This assessment focuses on calculating the greenhouse gas emissions and investigating the consequent climate change impacts.

The global nature of climate change impacts is such that the greenhouse gas emissions from any individual project or source cannot be connected directly to any specific environmental impacts as a consequence of climate change. The analysis presented in this report is presented in the context that, even though the individual GHG emission contribution of a project cannot be directly linked to specific localised climate change impacts, global climate change is nevertheless significant and can be quantified as such.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Support services Demolition Rehabilitation	-

Impact assessment

Severity / nature

South Africa's Nationally Determined Contribution (NDC) submitted in Paris in 2015 sets out a national emissions trajectory up to 2050. South Africa, as a developing nation, requires some allowances to increase its emissions in the short-term to foster economic growth and steadily transition towards a low carbon economy. The amount of greenhouse gas that South Africa can emit in terms of the NDC is the country's "carbon budget". This carbon budget forms one of the planetary boundaries that should not be exceeded in terms of sustainability principles.

The greenhouse gas emission impacts of the proposed project were analysed in terms of both South Africa's national greenhouse gas inventory and climate change, as well as the global inventory and climate change.

The proposed project is expected to generate approximately 802 tonnes of carbon dioxide equivalent (tCO_2e) of direct emissions over the mine's lifetime. The direct emissions are from the combustion of diesel and are considered to be within the direct control of the mine. A large percentage (99.7 %) of the mine's lifetime emissions are however categorised as indirect emissions. These emissions are as a result of electricity consumption (Scope 2 emissions) and other indirect sources specifically purchased goods and services, other fuel and energy related activities and diesel consumption for transport of goods.

The total project lifetime inventory is expected to consume approximately 0.0031 % of South Africa's carbon budget. This value is above the low-materiality threshold (0.00013 %) but below the medium-materiality threshold (0.013 %) of South Africa's carbon budget. The impact of the project's total greenhouse gas inventory within a domestic context is therefore considered to be medium-low severity (Promethium, 2019).

The specific greenhouse gas emissions from the construction and operation of the proposed West Wits mining project cannot be attributed directly to any particular climate change effects. In addition, greenhouse gas emissions from the proposed mine, when considered in isolation, will have a minimal impact on global climate change. However, the global atmosphere, as the receiving environment should be considered.

Duration

The impacts of anthropogenic climate change are permanent and cannot be reversed. The duration is high in both the unmitigated and mitigated scenarios.

Spatial scale / extent

The spatial scale of the potential impact will extend beyond the project area in both the unmitigated and mitigated scenarios. The spatial scale is high in both the unmitigated and mitigated scenarios.

Probability

The probability that GHG emissions will impact on global climate change is definite, regardless of the mitigation.

Significance

The significance of this impact is high in the unmitigated. With mitigation the significance can reduce to medium. It must be noted however that the duration that the project-related GHG are assumed to remain in the atmosphere renders the impacts (limited as they may be) effectively irreversible with the impacts of anthropogenic climate change, in many cases resulting in the irreversible loss of resources. There are options to mitigate the GHG emissions from the operation phases of the mining project. However, these options are not able to alter the impact that the GHG emissions will have on climate change in terms of their extent, duration or probability. It is only the magnitude of the GHG emissions impact that can be reduced by reducing the quantity of emissions (Promethium, 2019).

Summary of the increase in greenhouse gas emission impact rating per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operations and decommissioning						
Unmitigated	M-L	H	H	H-M	H	H
Mitigated	L	H	H	M	H	M

Management objective

To limit greenhouse gas emissions from the project.

Management action

A greenhouse reduction strategy will be implemented during all mine phases as described below.

Plan	• Quantify greenhouse gas emissions through a documented inventory • Identify activities associated with greenhouse gas emissions • Set short, medium and life of mine emission reduction targets.
Do	• Identify continuous greenhouse gas emission reduction initiatives • Manage risks associated with greenhouse gas emissions • Ensure compliance with relevant policy and legislation, including greenhouse gas reporting requirements.
Check	• Measure and track performance towards achievement of emission reduction targets • Measure and track energy use to continuously consider energy efficiency options • Report on greenhouse gas emissions to stakeholders.
Act	• Continuously improve energy performance and the carbon management system • Re-assess the impacts of existing and future policies and regulations • Ensure that the mine’s overall strategic goals are in line with the mine’s climate change policy • Adjust the mine’s policies and indicators if the objectives are not being met.

Emergency situations

None identified.

ISSUE 11 RADIATION IMPACT

Information in this section was sourced from the radiological safety assessment undertaken by SciRAD (SciRAD, 2019) (refer to Appendix K).

Introduction

In the context of a mine, radiation typically originates from mineralised substances (ore, product and tailings dam), through inhalation (of radon gas and particulate matter), ingestion (of water or contaminated foodstuffs) and exposure to gamma radiation pathways. The operational and decommissioning phase will present long term activities and the closure phase will present backfilled opencast pits and rehabilitated areas that may have the potential to impact surrounding third parties.

It should be noted that potential occupational radiation exposure is not included in this EIA and is instead addressed as an occupational health and safety issue elsewhere.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
N/A			
-	Underground mining Opencast mining Mineralised waste	Mineralised waste	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity

As discussed in the baseline section (Section 6.4.1.9), the radionuclide activity concentrations for all the rock and soil samples are well below the regulatory limit of 500 Bg/kg (or 0.5 Bq/g). Based on this fact, a radiological assessment was in fact not deemed necessary by the radiation specialist but was conducted in order to address offer stakeholders concerns.

SciRAD determined the external exposure doses from dust deposition, dust and radon gas inhalation, as well as the total dose (the sum of external exposure and inhalation doses) from the potential radiation sources i.e. opencast pits, temporary waste rock dumps, dust etc. The doses were then compared to relevant regulatory limits as described below.

The NNR specifies an individual dose limit from all controllable radiation sources to which an individual may be exposed, and this is an additional dose over and above the background dose a person is normally exposed to. For a member of the public this dose limit is set at 1 000 µSv/a (or 1 mSv/a). To ensure that the dose limit is not exceeded, a dose constraint (a value lower than the limit) is introduced on individual sources of radiation. For South Africa a dose constraint of 250 µSv/a (i.e. 0.25 mSv/a) is specified in the regulations, which also serves as a public dose limit for a single radiation source or operation (SciRAD, 2019). The individual doses have been determined to be trivial (less than 10 µSv/a) or insignificant (less than 1 µSv/a) for the project. The maximum total incremental dose, with the uncertainty considered, is not expected to exceed 11 µSv/a (that is 7 ± 4 µSv/a). These doses are therefore well below the dose constraint of 250 µSv/a.

Radon doses are normally not added to the total dose as the NNR Act Regulations do not particularly address Radon exposure to members of the public. However, the calculated Radon concentration is compared to the latest International Commission on Radiation Protection (ICRP) recommendation of 300 Bq/m^3 (ICRP, 2010). This criterion requires action to be taken when the level is exceeded. According to SciRAD, the Radon concentrations at public areas are likely to be well below the action level of 300 Bq/m^3 with values determined to be less than 0.2 Bq/m^3 for the project.

According to SciRAD, based on the radionuclide activity concentrations for all the rock and soil samples falling well below the regulatory limit of 500 Bg/kg (or 0.5 Bq/g), and the calculated doses falling well below all relevant regulatory limits or levels where health impacts could occur, the proposed project does not warrant any concern regarding the radiological impacts to the public and no mitigation measures are deemed necessary. The severity is therefore rated as low.

Duration

Any health-related impacts can extend beyond closure; therefore, the duration is high.

Spatial scale

The potential impact zone is close to the source but potentially extending off site.

Probability

The probability of any health-related impacts occurring is low.

Significance

The impact significance is low.

Summary of the rated radiation impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Operation, decommissioning and closure						
Unmitigated	L	H	M	M	L	L

As indicated above, the proposed project does not warrant any concern regarding the radiological impacts to the public and no mitigation measures are deemed necessary.

ISSUE 12 INCREASE IN AMBIENT NOISE LEVELS

Information in this section was sourced from the noise impact assessment undertaken by Airshed Planning Professionals (Airshed, 2019B) (refer to Appendix L).

Introduction

Two types of noise are distinguished: noise disturbance and noise nuisance. The former is noise that can be registered as a discernible reading on a sound level meter and the latter, although it may not register as a discernible reading on a sound level meter, may cause nuisance because of its tonal character (egg. distant humming noises).

Mine activities have the potential to generate both noise disturbances and noise nuisance in all phases, prior to closure. Refer to the biodiversity section in this appendix for the potential noise impacts on biodiversity. This section will only focus on the potential human related noise impacts.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure

Construction	Operational	Decommissioning	Closure
			N/A
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	-

Rating of impact

Severity / nature

Noise pollution can create nuisance that will have different impacts on different receptors because some are very sensitive to noise and others are not. The closest potential receptors are located in various surrounding communities as described in Section 6.4.1.10 and shown in Figure 6-14. Baseline noise levels are generally typical for suburban and urban districts, although one noise measurement location experienced higher noise levels due to heavy traffic on the R41 road.

The predicted change in ambient noise levels was modelled using CadnaA software and the set of isopleth figures are provided in the noise report (refer to Appendix L). Table D 3 indicates the predicted increase in noise levels at potential receptors. The noise modelling predicted that an increase of between 5 dB and 15 dB extends over potential receptors situated close to the 11 Shaft Main Reef Pit, Rugby Club Main Reef Pit, Mona Lisa Bird Reef Pit, Roodepoort Main Reef Pit and at the Vent Shafts. A more detailed table is provided in the noise report (refer to Appendix L) and provides the increase in noise levels outside of potential receptor areas as well.

The community reaction due to day-time noise levels from the project operations are expected to result in varying reactions and complaints based on distance from the project activities. The expected community reaction according to the South African National Standard (SANS) 1013 is also provided in is provided in Table D 3. Airshed has noted that the expected community reaction will overlap as not all individuals are equally sensitive to noise. An increase in noise of 10 dB is subjectively perceived as a doubling in the loudness of the noise according to Airshed (Airshed, 2019b).

The severity of the noise impacts was based on the Gauteng Noise Control Regulation level of 60 dBA at potential receptors for continuous day/night time noise levels, as advised by the noise specialists. For the open pit mining operations the severity is rated as medium, except for the Kimberly Reef East Pit where levels remain below 60 dBA and therefore the severity of the noise impact from this pit is rated as low. For underground mining operations, the severity rating is low. With mitigation focussed on controlling noise at source and establishing noise barriers, the severity can be reduced for all operations.

Duration

In both the unmitigated and mitigated scenarios, for the open mining operations, the noise pollution impacts will generally occur for the life of the specific pit which is a low duration. Some pits will be mined out in as little as three months. For the underground mining, in both the unmitigated and mitigated scenarios, the noise pollution impacts will generally occur until the closure phase of the mine when the noise generating activities are stopped. The ventilation shafts will be operated for 20 years to support underground mining. This is a medium duration.

Spatial scale / extent

The noise impacts are predicted to extend beyond the project area to potential receptors. This is a medium spatial scale for the open pit mining operations. With mitigation measures, the spatial scale should be reduced to low.

TABLE D 3: INCREASE IN NOISE LEVELS AT POTENTIAL RECEPTORS DUE TO MINING OPERATIONS AND EXPECTED COMMUNITY REACTION (SUMMARISED FROM AIRSHED, 2019B)

Mining area	Distance to closest potential receptor	Increase in noise level above the baseline (for the duration of the relevant operation)			
		0 - 10 dB	5 dB - 15 dB	10 dB - 20 dB	> 15 dB
		Expected community reaction according to SANS 10103			
		Little reaction with sporadic complaints	Medium reaction with widespread complaints	Strong reaction with threats of community action	Very strong reaction with vigorous community action
Day/night time					
Kimberly Reef East Pit	~590m	Up to ~80m	From ~30m to ~250m	Up to ~80m	Up to ~30m
11 Shaft Main Reef Pit	~100m	Up to ~60m	**Up to ~180m**	Up to ~60m	0 m
Rugby Club Main Reef Pit	~120m	**Up to ~180m**	**From ~100m to ~350m**	**From ~40m to ~180m**	Up to ~100m
Mona Lisa Bird Reef Pit	~60m	**Up to ~200m**	**From ~60m to ~450m**	**From ~20m to ~200m**	**Up to ~60m**
Roodepoort Main Reef Pit	~20m	**Up to ~210m**	**From ~110m to ~400m**	**From ~50m to ~210m**	**Up to ~110m**
Vent Shafts	~550m	Up to ~440m	From ~260m to ~700m	From ~120m to ~440m	Up to ~260m

Values have been **bolded** where potential noise sensitive receptors within the study area are affected.

Probability

The probability of the predicted noise increases causing a noise related disturbance at the potential receptors surrounding the open pit mining operations is medium. The probability associated with the vent shafts is considered to be low due to the absence of receptors within the predicted impact zone. With mitigation the probability can be reduced to low.

Significance

The unmitigated significance is medium for the open pit mining operations and low for the ventilation shafts. This can be reduced / maintained at low with mitigation.

Summary of the rated increase in disturbing noise levels due to open pit mining per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	M	L	M	M	M	M
Mitigated	L	L	L	L	L	L

Summary of the rated increase in disturbing noise levels due to underground mining per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	L	M	L	L	L	L
Mitigated	L	L	L	L	L	L

Management objective

To prevent public exposure to disturbing noise.

Management actions

Management actions that have been identified in all phases prior to closure are outlined below:

Engineering and operational practices

- All diesel-powered equipment and plant vehicles will be properly maintained so as not to produce unnecessary noise. This will particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers.
- Any change in the noise emission characteristics of equipment will serve as trigger for withdrawing it for maintenance.
- When new equipment is required, equipment with specifications with lower sound power levels must be selected. Vendors will be required to guarantee optimised equipment design noise levels.
- Ventilation shaft outlet face away from any residential area.
- Noise will be managed when using equipment as follows:
  - Machines used intermittently will be shut down between work periods or throttled down to a minimum and not left running unnecessarily. This will reduce noise and conserve energy.
  - Plants or equipment from which noise generated is known to be particularly directional (i.e. the vent shaft), will be orientated so that the noise is directed away from potential receptors where feasible;
  - Construction materials such as beams will be lowered and not dropped.
- In managing noise specifically related to truck and vehicle traffic, efforts will be directed at:
  - Minimising individual vehicle engine, transmission, and body noise/vibration. This is achieved through the implementation of an equipment maintenance program.

- Maintaining road surfaces regularly to avoid corrugations, potholes etc.
- Avoiding unnecessary idling times.
- Use of alternatives to the traditional reverse 'beeper' alarm such as a 'self-adjusting' or 'smart' alarm. Such alarms include a mechanism to detect the local noise level and automatically adjust the output of the alarm so that it is 5 to 10 dB above the noise level near the moving equipment.
- Limiting traffic to between 06:00 and 18:00.

- Where possible, other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, will be limited to day-time hours.

<u>Enclosure of nose sources</u>

- Sources of significant noise will be enclosed where feasible. The extent of enclosure will depend on the nature of the machine and their ventilation requirements.

<u>Noise barriers</u>

- Earth berms can be built to provide screening for large scale earth moving operations a. Care should be taken when constructing earth berms since it may become a significant source of dust.
- The waste rock dumps would be developed in such a manner as to limit noise from the dumping of waste rock on top of the berm.

<u>Speed control</u>

- Limit vehicle speeds on mine access and internal roads to limit noise.

<u>Noise complaints register</u>

- The mine will provide an effective method of communication whereby community members can lodge any noise complaints. This may take the form of a help line.
- The mine will keep a noise complaints register and respond immediately to complaints about disturbing noise. All such complaints will be documented and recorded as incidents. The measures taken to address these complaints will be included in the documentation. This may include ad hoc noise monitoring at the location of the complainant. Where necessary additional management actions will be implemented to avoid repeat occurrences. These records will be kept for the life of mine.

<u>Communication with potential receptor</u>

- Surrounding noise receptors will be informed about the sound generated by proposed project operations on a factual basis through a stakeholder engagement process to be implemented for the mine.

Emergency situations

None identified.

ISSUE 13 CHANGE IN LANDSCAPE AND RELATED VISUAL IMPACTS

Information in this section was sourced from visual assessment undertaken by Scientific Terrestrial Services (STS, 2019B) (refer to Appendix N).

Introduction

Visual impacts on this receiving environment may be caused by activities and infrastructure in all mine phases. The more significant visual impacts relate to the larger infrastructure components (such as the shafts, opencast pits and mineralised waste). The opencast pits will be fully backfilled and all surface infrastructure will be removed upon closure, therefore there should be no visual impacts after post closure.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The severity of visual impacts is determined by assessing the change to the visual landscape as a result of mine related infrastructure and activities. As indicated in the baseline section, the project area has already been impacted upon by historic and current mining and agricultural activities, as well as urban development. Sensitive visual receptors have been determined to primarily consist residential areas, motorists on the roads within and around the MRA, scholars at schools in the residential areas, users of outdoor recreational facilities such as the Durban Deep Golf Course, parks, sportsgrounds, Orlando Soccer Stadium, and people at their place of work in the industrial and commercial areas.

In the unmitigated scenario, the proposed project may impact on the existing landscape character and sense of place associated with the project area and its immediate surroundings as described below (STS, 2019B):

- Roodepoort Main Reef Pit and Rugby Club Main Reef Pit: Current mining activities take place in the greater area; however, the opencast pits are situated directly north of the main road (Randfontein Road) and directly south of businesses and houses. The landscape character and sense of place for road users, people at their place of work and residents, although already influenced by existing land uses, would be altered further;
- Mona Lisa Bird Reef Pit: The area currently provides a source of relative calmness and tranquillity, irrespective of the mining activities taking place to the northwest of the pit area, since it comprises grassland with limited anthropogenic structures in the footprint area. The proposed mining activities in this area will therefore have a negative visual impact on the landscape character and sense of place, especially for people residing in Solplaatje situated south of the pit.
- 11 Shaft Main Reef Pit, Kimberley Reef East Pit and Kimberley Reef Infrastructure Complex: The landscape character and sense of place associated with these areas have already been negatively impacted by the surrounding historic and ongoing mining activities, thus the negative visual impact of the proposed mining activities in these areas is low to negligible.
- Bird Reef Central Infrastructure Complex: The historic shaft lies within this area, which will be refurbished, therefore the visual impact on the landscape character and sense of place is already present and receptors in the area are accustomed to the presence of the shaft.

Direct visual exposure and intrusion will take place as a result of the loss of vegetation and excavation activities at the opencast pits and infrastructure complexes being visible to residents, people at their place of work and motorists traveling on the roads in the immediate vicinity thereof. Indirect visual exposure includes fugitive dust and lighting (at the infrastructure complexes only) which will alter the visual environment.

The visual intrusion impacts are described below (STS, 2019B):

- Roodepoort Main Reef Pit, Rugby Club Main Reef Pit and Mona Lisa Bird Reef Pit: The altered visual environment will lead to undesirable levels of visual intrusion, with moderate levels of incompatibility with surrounding land uses as well as visual contrast and discord between the opencast pit areas and their surroundings;
- 11 Shaft Main Reef Pit, Kimberley Reef East Pit and Kimberley Reef Infrastructure Complex: Given that these areas have a high visual adsorption capacity due to vegetation and remnant mine dumps screening these areas, the visual impact of the proposed mining activities have a low to negligible visual intrusion on surrounding receptors; and
- Bird Reef Central Infrastructure Complex: The visual impacts are considered to be moderately intrusive to the receiving environment, especially to people playing golf at the Durban Deep Golf Course northeast of the proposed infrastructure area. The surrounding environment has a moderate visual adsorption capacity due to the dense vegetation, therefore the proposed mining infrastructure will not be significantly visually intrusive to the surrounding environment.

Lighting associated with the proposed project may be visible during both day and night, but lighting is obviously more likely to have a visual impact during the night time. No lighting will be used for the open pit mining operations as no activities will take place at night in these areas. The areas surrounding the proposed operations are already heavily impacted by night-time lighting, therefore the addition of lighting at the proposed infrastructure areas will not be significant.

Taking the above discussions into consideration, the severity has been rated as high depending on the operations activities relative to the baseline environment and surrounding receptors. With mitigation, the severity prior to closure could reduce to medium. After decommissioning the severity would reduce to low with the removal of surface infrastructure, complete backfill of the opencast pits and general site rehabilitation.

Duration

In the unmitigated scenario the duration is high because the impacts could extend beyond closure. With mitigation, the duration of impacts would be medium reducing to low at closure.

Spatial scale / extent

In all phases visual impacts are likely to extend beyond the proposed project area. This is a medium spatial scale.

Probability

In the unmitigated scenario the probability of visual impacts occurring as a result of the proposed project is definite. In the mitigated scenario the probability would reduce to medium prior to closure and low at closure.

Significance

The unmitigated significance is high and reduces to medium with mitigation prior to closure. The mitigated significance reduces to low at closure.

Summary of the rated negative visual views impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All Phases						
Unmitigated	H	H	M	H	H	H
Construction, operation and decommissioning						
Mitigated	M	M	M	M	M	M
Closure						
Mitigated	L	L	M	L	L	L

Management objectives

To minimise any further visual impacts on receptors.

Management measures

Mitigation measures to be implemented during all project phases include the following:

- The areas of disturbance will be limited to what is absolutely necessary as defined for infrastructure in this EIA;
- As little vegetation as possible will be removed to act as visual screens from surrounding receptor sites, and wherever possible, all existing natural vegetation will be retained and incorporated into the project site rehabilitation. In particular natural vegetation will be retained in the vicinity of the Bird Reef Central Infrastructure Complex due to the presence of sensitive receptors;
- As far as possible, natural contours will be followed during infrastructure placement;
- The height of structures will be a low as possible, where this can be achieved without increasing the infrastructure footprint;
- Consideration will be given to placing stockpiles where they could screen mining activities from the potential viewers;
- Visually cluttered material storage yards and laydown areas will be screened with the use of material fencing;
- Natural colours will be used and the use of highly reflective material should be avoided. Any metal surfaces will be painted to fit in with the natural environment in a colour that blends in effectively with the background. The identification of appropriate colours and textures for facility materials will take into account both summer and winter appearance;
- The use of permanent signs and project construction signs will be minimised;
- Construction activities will be restricted to daylight hours as far as possible, in order to limit the need to bright floodlighting and the potential for skyglow;
- Open pit mining activities will take place during the daylight hours, in order to limit the use of bright floodlighting at night;
- Outdoor lighting will be strictly controlled:
    - All lights used for illumination (except for lighting associated with security) will be faced inwards and shielded to avoid light escaping above the horizon;
    - The use of high light masts and high pole top security lighting will be avoided along the periphery of the operations. Any high lighting masts will be covered to reduce sky glow;
    - Up-lighting of structures will be avoided, with lighting installed at downward angles that provide precisely directed illumination beyond the immediate surrounding of the mining infrastructure, thereby minimising the light spill and trespass;

- Care will be taken when selecting luminaries to ensure that appropriate units are chosen and that their location will reduce spill light and glare to a minimum. Only “full cut-off” light fixtures that direct light only below the horizontal will be used on the buildings;
- Censored and motion lighting will be installed at office areas, workshops and other buildings to prevent use of lights when not needed;
- Minimum wattage light fixtures will be used, with the minimum intensity necessary to accomplish the light's purpose;
- Vehicle-mounted lights or portable light towers are preferred over permanently mounted lighting for night-time maintenance activities. If possible, such lighting will be equipped with hoods or louvers and be aimed toward the ground to avoid causing glare and skyglow;
- The use of low-pressure sodium lamps, yellow LED lighting, or an equivalent will reduce skyglow and wildlife impacts.

- Erosion, which may lead to high levels of visual contrast and further detract from the visual environment, will be managed with the use of soil stabilisation measures and concurrent rehabilitation;
- Topsoil stockpiles will be properly managed in terms of slope angles and will be vegetated to minimise visual contrast and prevent soil losses;
- Dust will be managed to minimise visual impacts;
- Rubble will be removed from site on a regular basis;
- Litter and dust management measures will be implemented;
- The opencast will be backfilled, surface infrastructure removed and the overall project area rehabilitated as per the decommissioning and rehabilitation plan described in section 3.2.16.

Emergency situations

None identified.

B) IMPACT ON SOCIO-ECONOMIC ENVIRONMENT

ISSUE 14 ECONOMIC IMPACT (POSITIVE AND NEGATIVE)

Information provided in this section was sourced from the socio-economic assessment (Mercury, 2019) (refer to Appendix Q).

The development of a mine of this nature has the potential to impact on the economy both positively through potential growth in the mining sector and negatively through the potential loss of existing economic activities. This section focuses on the potential positive and negative economic impacts associated with the project and assesses these collectively.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Overall development of the mine	Operation of the mine Rehabilitation of the open pit areas	Overall decommissioning of the mine and rehabilitation	-

Rating of impact

Severity / nature

There is predicted to be a positive economic impact on the local, regional and national economies in both the construction and operational phases. Direct benefits would be derived from wages, taxes and profits. Indirect benefits would be derived through the procurement of goods and services, and the increased spending power of employees.

Positive economic impacts would include (Mercury, 2019):

- Direct employment: The opencast mining operations would require approximately 40 to 50 employees. During the construction phase for the underground mining operations it is expected that a contractor would require up to a maximum of 50 staff. The operational phase would require approximately 1 105 full-time employees (at peak production). The total value of the employment potential for the first 10 years life of mine, which includes the two years of construction work associated with the refurbishment of the underground operations, equates to R772.3 million in present value. This value could potentially increase to R1.48 billion in present value should the underground operational employment opportunities be maintained for the anticipated life of mine. In addition, the proposed mining development could stimulate current industries, manufacturing and distribution facilities, which could create additional employment opportunities. At closure, employment opportunities would be limited. With mitigation, the mine could create opportunities beyond the life of its operations.
- Direct contribution to the economy: The economic contribution as a result of the proposed mining development will have a positive impact through money spent to pay for salaries, supplies, raw materials, operating expenses and taxes, on the local, regional and national economy. The short-term nature of the open pit project will have less significant impacts on direct economic impacts than the potential long-term mining project, which may have a duration of 25 years. In this regard the project will provide a capital injection over the first 10 years of R613 million in present value and a potential revenue generation of R3.3 billion in present value for the life of mine. The revenue potential for the first 10 years is R2.5 billion in present value.

  Without mitigation, the local and regional economy may not fully benefit from the proposed project. With mitigation through local economic development plans, it will be possible to enhance the contribution the mine will have on a local and regional economic scale, and some initiatives will be able to be sustained post closure.
- Indirect and induced benefits to the economy: Current industries, manufacturing and distribution facilities surrounding the proposed mining rights area is not expected to be influenced by the establishment of an active mining operation in the area. Instead, depending on the nature of the services and products provided, the proposed mining development could potentially stimulate the growth of these businesses. The proposed project will furthermore potentially create additional revenue and employment opportunities.

  Induced effects are the results of increased personal income as a result of the proposed project, including indirect effects. Businesses experiencing increased revenue from the direct and indirect effects will subsequently increase payroll expenditures (by hiring more employees, increasing payroll hours, raising salaries, etc.). Households will in turn, increase spending at local businesses. The induced effect is therefore a measure of this increase in household-to-business activity.

  In the unmitigated scenario, some of these positive impacts may not take place or may happen to a lesser extent. In the mitigated scenario the economic impacts could reach the maximum potential.

- Contribution towards socio-economic development: The proposed project will contribute towards the local economic development in the area through the company's corporate social investments and Social and Labour Plan projects and initiatives. This includes the following positive socio-economic benefits to its employees and surrounding communities:
  - Development of skills through the company's skills development plan;
  - Learnership programs to provide learners with an occupational qualification; and
  - Investment in infrastructure development through local economic development and integrated development programmes.

Although illegal mining does generate a certain degree of income for individuals involved in the illegal activities and the downstream value chain, the health, safety and environmental risks associated with this type of mining also contribute negatively to the local economy. The proposed development will assist towards the eradication of illegal mining in the area. Mined and rehabilitated land holds opportunity for spatial integration by improving fragmentation and unlocking development potential in large areas, which should contribute more positively to the economy (Mercury, 2019).

In the unmitigated scenario it is possible that land surrounding the project will experience some degree of additional negative social and environmental impacts, which could impact on current businesses and land values. The proposed open cast activities however span a relatively short life (months) and will involve the rehabilitation of areas mined by West Wits. With mitigation, this will have a positive impact on land value. Degraded land will be restored and illegal mining activities in the immediate area should come to a halt.

Underground mining activities may influence the desirability of planned housing developments, which could potentially affect the value of these properties. Impacts such as vibration, air, noise, traffic and water quality arising from the proposed mining activities could have a negative impact on housing developments and property values. In the scenario where the project successfully implements the stipulated environmental and social management measures, these impacts can be managed to acceptable levels which should not reduce surrounding land value. The area will however be rehabilitated in the decommissioning and closure phase in the mitigated scenario, which will enable alternative land uses to continue.

When considering alternative feasible land uses for the project site, housing and mix-use housing and commercial development are regarded as the only feasible alternative. These are however already approved and/or in progress. The fact that mineral resources are still present may make it difficult to obtain permission to establish the housing development in the area as it could result in sterilisation of these minerals. Where property developers are required to first remove mineral reserves and rehabilitate this will come at a cost to the developer and will require the necessary authorisations from the DMR. Where the project aligns its timeline to support post-closure development within an agreed timeline with the developer, the economic benefits of both the mining and alternative land use can be realised. The open cast activities will have a minimal impact on the programme of these projects. Should the proposed mining development not proceed, the potential opportunity to develop and grow existing industries, manufacturing and distribution facilities surrounding the proposed mining rights area may not take place (Mercury, 2019). Potential impacts on land uses and land values are assessed under Issue 23.

When considering the above, the overall severity is rated positive low in the unmitigated scenario. With mitigation, it is possible to enhance the positive economic contribution of the mine on a local and regional economic scale as well as support the post-closure land use objectives as agreed with relevant landowners.

Duration

In the normal course, the direct positive and negative economic impacts associated with the proposed mine will occur for the life of mine. Post closure, in the unmitigated scenario, the scale of the impacts will be reduced. However, the proposed mine would have contributed to income creation, and a better skilled workforce is expected to continue beyond the life of mine in the mitigated scenario.

Spatial scale / extent

In both the unmitigated scenario, the spatial scale of the impact is medium. With mitigation the benefits of the project can extend beyond the proposed project area on a regional and national scale.

Probability

The probability of local and regional economies and communities benefiting from the mine is medium. With mitigation the probability of enhancing positive economic impacts is definite.

Significance

In the unmitigated scenario, the significance of this potential impact is medium. In the mitigated scenario, the significance is further increased.

Unmitigated – summary of the rated economic impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	L+	M	M	L+	M	M+
Mitigated	H+	H	H	H+	H	H+

Management objectives

To enhance the positive economic impacts of the project and support post-closure land development.

Management measures

The following management measures will be implemented:

- Develop recruitment and procurement policies and procedures that:
    - prioritise local employment, with a focus on semi-skilled and skilled positions being made available to local people as far as possible;
    - source contractors and service providers from within the local community, where possible;
    - provide training and skills development to the youth, prospective employees and local businesses;
    - establish a procurement mentorship programme for local and black owned businesses including youth and women owned businesses.
- Facilitate local involvement in indirect business and service opportunities.
- Implement the Social and Labour Plan and relevant initiatives in line with legislation requirements.
- Develop and implement local corporate social investment strategies in consultation with the relevant authorities.
- Develop and implement a policy and plan for influx management that allows for collaboration with government authorities and landowners.
- Develop and implement a formal bursary and skills development programme in the closest communities to increase the number of local skilled people and thereby increase the potential local employee base.

- Identify and develop sustainable business opportunities and skills, independent from the project for members of the local communities to ensure continued economic prosperity beyond the life of the project.
- Develop and rehabilitate the open pit operations in line with the rehabilitation and closure plan and in consultation with relevant landowners.
- In consultation with landowners, ensure rehabilitation is such that the post-closure land use can be achieved.

Emergency situations:
None identified.

ISSUE 15 LOSS AND STERILISATION OF MINERAL RESOURCES

Introduction

Mineral resources can be sterilised and/or lost through the placement of infrastructure and activities in close proximity to mineral resources, by preventing access to potential mining areas, and through the disposal of mineral resources onto mineralised waste facilities (temporary waste rock dumps).

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
N/A		N/A	N/A
-	Underground mining Opencast mining Mineralised waste	-	-

Discussion

No geological impacts such as sterilization of mineral resources are expected as the proposed project is being planned in a manner that allows for the maximum extraction of the targeted commodities within the project area. This impact is therefore considered to be insignificant and has not been assessed further. As part of normal operations West Wits will prevent mineral sterilization through:

- Incorporating cross discipline planning structures for all mining and infrastructure to avoid mineral sterilization. The mine resource manager will play a key role;
- Mine workings will be developed and designed so as not to limit the potential to exploit deeper or adjacent minerals deposits.

ISSUE 16 INWARD MIGRATION AND SOCIAL ILLS

Information provided in this section was sourced from the socio-economic assessment (Mercury, 2019) (refer to Appendix Q).

Introduction

Mining projects tend to bring with them an expectation of employment in all project phases prior to closure. This expectation can lead to the influx of job seekers to an area which in turn increases pressure on existing communities, housing, basic service delivery and raises concerns around safety and security. This section focuses on the potential for the inward migration and associated social issues.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The effects of inward migration can be significant. These effects could include, but not be limited to:

- Potential establishment or expansion of informal settlements;
- Increased pressure on housing, water supply infrastructure, sanitation and waste management systems and infrastructure, health care and community services and infrastructure;
- Potential for increased pressure on natural resources such as water, fauna, flora and soils;
- Increase in trespassing and crime;
- Spread of disease, most notably HIV/Aids and tuberculosis.

It is not possible to predict how significant the inward migration may be; however, this impact severity has been rated as high using the precautionary approach. It may be possible to mitigate this impact by managing expectations with regard to employment.

Duration

Negative social issues associated with inward migration can continue beyond the closure of the mine, particularly in the unmitigated scenario.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impacts of inward migration could extend beyond the proposed project area and into surrounding communities.

Probability

In the unmitigated scenario the impact is considered to be possible. With mitigation, the probability can be reduced to low.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation this may reduce to low.

Summary of the rated inward migration impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation, decommissioning						
Unmitigated	H	H	M	H	M	H
Mitigated	L	L	M	L	L	L

Management objectives

To minimise negative socio-economic impacts associated with the mine.

Management measures

Key mitigation aspects include the implementation of good recruitment, procurement and training procedures during all mine phases as follows:

- Good communication with all job and procurement opportunity seekers will be maintained throughout the recruitment process. The process must be seen and understood to be fair and impartial by all involved. The personnel in charge of resolving recruitment and procurement concerns must be clearly identified and accessible to potential applicants;
- The precise number of new job opportunities (permanent and temporary) and procurement opportunities will be made public together with the required skills and qualifications. The duration of temporary work will be clearly indicated and the relevant employees/contractors provided with regular reminders and revisions throughout the temporary period;
- People will be hired from the closest communities as far as is practically possible;
- A vendor database will be developed and maintained including an assessment of business aptitude and skill;
- Procurement opportunities will be identified that can be ring-fenced for local businesses;
- Goods and services will be procured from the closest communities as far as is practically possible;
- A formal bursary and skills development programme will be developed and implemented in the closest communities to increase the number of local skilled people and thereby increase the potential local employee base;
- There will be no recruitment or procurement at the gates of the mine. All recruitment will take place off site at designated locations. All procurement will be through existing, established procurement and tendering processes that will include mechanisms for empowering service providers from the closest communities.

In addition to the above aspects, the following management measures will be implemented:

- The mine will develop and implement an Influx and Land use Management Plan in collaboration with CoJ;
- A social monitoring and evaluation strategy will be developed and implemented to monitor, review and adapt social implementation strategies if and when required;
- A grievance mechanism will be developed and implemented and communicated to surrounding communities;
- The mine will work with neighbouring mines and industries, local authorities and law enforcement officials to monitor and prevent the development of informal settlements near the mine and to assist where possible with crime prevention within the proposed project area;
- Local communities will be permitted to gather natural resources from specific areas that is earmarked for vegetation clearance (such as firewood);
- A Code of Conduct will form part of induction of new workers with a clear statement and procedure regarding access, conduct and identification;
- Workers will be urged to recognize and report suspicious activity and signs of burglary and be informed of crime prevention measures that they themselves can take;
- The mine will liaise with existing community policing forums to properly secure the project area and surrounding area;

- A health policy on HIV/AIDS and tuberculosis will be implemented. This policy will promote education, awareness and disease management both in the workplace and in the home so that the initiatives of the workplace have a positive impact on the communities from which employees are recruited. Partnerships will be formed with local and provincial authorities to maximize the off-site benefits of the policy;
- The mine will develop and implement a community health and welfare strategy to ensure that community health and welfare issues are addressed in an integrated and coordinated manned with existing health and welfare facilities and infrastructure;
- The mine will work closely with the local and regional authorities and other mines and industries in the areas to be part of the problem-solving process that needs to address social service constraints;
- The mine will develop agreements with developers to schedule implementation of mining and availability of land for development;
- The EMP commitments with regard to managing pollution, traffic and noise will be implemented; and
- Regular stakeholder engagement will be conducted to report on EMP compliance performance and give stakeholders an opportunity to raise issues or concerns regarding the operations.

Emergency situations:
In case of development of informal settlements the emergency response procedure in Section 30.2.2 will be followed.

ISSUE 17 LOSS OF LIVELIHOOD FOR ILLEGAL MINERS

Introduction

The illegal miners currently operating within the project area and accessing the relevant ore bodies will lose their livelihood once the project activities commence.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
N/A			
-	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

Severity / nature

The loss of livelihood will directly affect the illegal miners and the families they support. In addition, the illegal mining value chain will no longer benefit from the illegal mining activities.

It is not possible to predict how significant the loss of livelihood will be to the illegal miners and the associated value chain; however, this impact severity has been rated as high in line with the precautionary approach. It may be possible to mitigate this impact by collaborating with the DMR, City of Joburg and Civil Rights Organisations to find solutions.

Duration

Where solutions are possible, loss of livelihood would be temporary and for less than the life of the project.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, the impact is likely to extend beyond the proposed project area and into surrounding communities.

Probability

In the unmitigated scenario the impact is definite. With mitigation, the probability can be reduced.

Significance

In the unmitigated scenario, the significance of this potential impact is high. With mitigation the significance reduces to medium.

Summary of the rated Loss of livelihood for illegal miners impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation, decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	M	M	M	M	M	M

Management objectives

To mitigate the loss of livelihood by illegal miners and the associated value chain.

Management measures

The following management measures will be implemented:

- The mine will collaborate with the DMR, City of Joburg and Civil Rights Organisations to find solutions to the illegal miner dilemma.
- Where possible, and where candidates are suitable, the mine will consider further development and employment of the illegal miners.

ISSUE 18 SOCIAL BENEFITS ASSOCIATED WITH EMPLOYMENT AND ECONOMIC DEVELOPMENT

Information provided in this section was sourced from the socio-economic assessment (Mercury, 2019) (refer to Appendix Q).

Introduction

Employment and economic development has the potential to improve livelihoods of individuals living in the local area through increased disposable income for individuals and households and the flow of revenue into local services and support sectors.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use	Underground and Opencast Transport system Power supply and use Water supply and use	Maintenance and aftercare of rehabilitated areas

Construction	Operational	Decommissioning	Closure
	Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	

Rating of impact

Severity/nature

Unemployment is a key issue for the area. There are a high number of job seekers and discouraged workers, in part due to due to general economic downturn in South Africa. New employment opportunities are likely to be of direct economic benefit at the local and regional level. Contractors may make use of existing staff during construction, which could limit the real number of new skilled, semi-skilled and unskilled opportunities. Despite this, there is likely to be an increase in employment locally, as the high number of opportunities during the underground mining operations (1100 at peak production) is likely to have a notable impact on the employment sector.

The direct impact of employment opportunities and indirect local economic improvement as well as local economic investment and development could contribute towards improving the quality of life for local communities. This may include increased disposable income for individuals and households. A potential positive local social impact could occur in the construction and operational phases.

The investment of capital into a new mining project and the operation of the mine, would likely have a trickle-down effect in terms of supporting local industries and the flow of revenue into local services and sectors. This in turn supports the development of the local economy through enabling businesses to grow or maintain their economic contribution. Where economic benefits are spread out over municipal or regional economies, the economic impact on local communities would likely be diluted.

The degree to which this impact would benefit local people and communities depends on a number of factors. This includes, the number of new opportunities realised locally (i.e. not through existing contractors who have staff or people brought in from outside the local area), and the manner in which income is used to benefit households and individuals (that is, spending on positive aspects such as education and food versus on negative social behaviour such as drug and alcohol abuse). The latter aspects are outside of the control of this project, but the former can be improved through specific internal policy development and implementation.

Social benefits during the open pit mining operations would be temporary and would likely be diluted due to the very large local urban population. Greater benefits, however, could be secured where local labour and procurement are prioritised. The promotion of employment in South Africa is always supported and is seen as a direct positive benefit of the project. Permanent employment of local people would help in improving the livelihoods of individuals living in the local area.

Duration

Positive social benefits would be for the life of the project, particularly in the unmitigated scenario. With mitigation these benefits could extend beyond closure.

Spatial scale / extent

In both the unmitigated and mitigated scenarios, social benefits would extend beyond the proposed project area and into surrounding communities.

Probability

In the unmitigated scenario the impact is considered to be possible. With mitigation, the probability can be increased to definite.

Significance

In the unmitigated scenario, the significance of this potential impact is medium positive. With mitigation this increases to high positive.

Summary of road disturbance and traffic safety impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	L+	M	M	L+	M	M+
Mitigated	M+	H	M	H+	H	H+

Management objectives

To enhance social benefits.

Management measures

Apply the management measures outlined under Issue 16 above.

ISSUE 19 ROAD DISTURBANCE AND TRAFFIC SAFETY

Information provided in this section was sourced from the traffic impact assessment (Siyazi, 2019) (refer to Appendix O).

Introduction

Traffic impacts are expected from construction through to the end of the decommissioning phases when trucks, buses, and private vehicles make use of the private and public transport network in and adjacent to the proposed project area. The key potential traffic related impacts are on road capacity and public safety.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Transport system	Transport system	Transport system	-

Rating of impact

Severity / nature

The R41 is a provincial road and is already heavily congested during peak traffic times. The proposed project will generate additional volumes of traffic along the R41 and various smaller roads which intersect the R41 as a result of the transportation of ore, people and materials. The calculated trips to be generated by the project, which includes worker transport, transport of ore off-site for processing using heavy vehicles and the delivery of consumables using heavy vehicles, is provided in Section 3.2.13.

Due to the current congestion on the R41, Siyazi has indicated that upgrades are required at intersections D to K (refer to Figure 6-15) to increase the capacity and improve road safety for pedestrians and road users by the relevant roads department, prior to the development of the proposed project. Once these upgrades are completed, the proposed project and the anticipated traffic should not impact significantly on the road network or require further upgrades.

The following safety risks apply when additional traffic associated with the proposed project is added to the transport network:

- Pedestrian accidents
- Vehicle accidents.

In the unmitigated scenario the severity is high. In the mitigated scenario the severity reduces to medium because the frequency of potential accidents is expected to reduce.

Duration

Any serious injury or death is a long-term impact in both the unmitigated and mitigated scenarios.

Spatial scale / extent

Possible accident sites could be located within or outside the proposed project area given that both private and public roads are and will continue to be used for the transport of ore, materials and personnel. Any indirect impacts associated with any injuries or fatalities will extend to the communities to which the injured people/animals belong. This is a medium spatial scale both with and without mitigation.

Probability

In the unmitigated scenario, the probability of accidents occurring as a result of the proposed project is medium because although there is a possibility that traffic accidents could occur these are not expected to occur on a continuous basis or in the normal course of operations. With mitigation this reduces to low.

Significance

Without mitigation, the significance is high. With mitigation, this reduces to medium.

Summary of road disturbance and traffic safety impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	H	H	M	H	M	H
Mitigated	M	H	M	H	L	M

Management objectives

To minimise the risk of increased traffic on public roads due to the proposed project.

Management measures

Due to the current congestion on the R41, Siyazi has indicated that upgrades are required by the relevant roads department at intersections D to K (refer to Figure 6-15) to increase the capacity, prior to the development of the proposed project. Siyazi has also noted that the following upgrades are required by the relevant roads department to ensure road safety, prior to the development of the proposed project (Siyazi, 2019):

- Pedestrian walkways and crossings should be provided at all intersections where not currently provided to ensure a split between vehicle traffic and pedestrians moving around the intersections; and
- Road markings, reflective road studs (LED), road signs and overhead lights should be provided and maintained at all the relevant intersections to ensure visibility during night time, proper visibility of intersection lane geometry and sufficient information to road users.

Once these upgrades are completed, the proposed project and the anticipated traffic should not require any further upgrades from a road capacity or safety perspective.

The following management measures will be implemented by the mine:

- Further investigations and collaboration with the relevant road authority will be conducted to finalise the access routes during the detailed design phase for the project;
- The Mona Lisa Pit new access road will be designed and constructed with the required approvals;
- The Roodepoort Pit access intersection on Gustaf Street will be designed and constructed according to the specialist recommendations (Siyazi, 2019) and with the required approvals. This will include dedicated turning lanes as shown in the specialist report;
- The mine will avoid peak traffic periods when transporting ore in heavy vehicles off-site for mineral processing;
- A transport safety programme will be implemented to achieve the mitigation objectives during the construction, operational and decommissioning phases. Key components of the programme include:
  - Education and awareness training;
  - Speed limit enforcement;
  - Maintenance of the transport system where appropriate; and
  - Use of dedicated loading and off-loading areas on site.
- Detailed investigations will be conducted in conjunction with the relevant road authority in terms of the existing quality and potential life span of the existing road surface layers of the roads where consumables, ROM ore and workers will be transported; and
- A road maintenance plan will be prepared in conjunction with the relevant road authority on public roads where trucks will operate as soon as the project has been approved in order to ensure that the consumables, ROM ore and workers can be transported at all times.
- A road safety awareness campaign and traffic monitoring strategy will be developed and implemented.

Due to the close proximity of Westlake Road that intersects with Main Reef Road (Point J), the traffic specialist is recommending that Point I be closed off permanently in the long-term by the Department of Roads. In the short-term the mine will limit the use of Point I by mining related vehicle trips in the following manner:

- By only making left-turns from the west into Reid Road to the proposed mine site (Inbound vehicle trips);
- Inbound mine vehicle trips from the east will travel via Point J and Westlake Road; and
- Outbound mine vehicle trips should gain access to Main Reef Road at Point J.

The proposed Roodepoort Main Reef Pit Access is expected to experience delays for mine related vehicles exiting the proposed mine site during the morning peak traffic period. Due to the short duration of the proposed mining at this site, outbound mine related vehicle trips during the morning peak traffic period will be limited to left-out movements only.

Emergency situations

In case of a person or animal being injured by transport activities the emergency response procedure in Section 30.2.2 will be followed.

ISSUE 20 SAFETY RISKS TO THIRD PARTIES

Introduction

The development and operation of a mine includes a number of activities and facilities that could present safety risks to third parties. Safety risks as a result of project-related traffic are assessed under Issue 19 above.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Non-mineralised waste Rehabilitation	Underground mining Opencast mining Transport system Demolition Rehabilitation	-

Rating of impact

<u>Severity / nature</u>

There will be a change in nature of the site during mining, although the sites have already been disturbed by historical anthropogenic activities.

The introduction of large machinery and vehicles, open pit mining activities and the presence of workers could negatively affect public safety. Berms would be established at the open pits to prevent access to the mining area. Once mining is complete, the open pit would be completely backfilled and rehabilitated in line with the post closure land use for the respective pit.

At the infrastructure complexes, the introduction of construction activities, large machinery and vehicles, and the presence of construction workers could negatively affect public safety. The infrastructure complexes however would be fenced to prevent accidental or deliberate access to the site. The fencing would remain for the life of the project. Thereafter decommissioning and closure of the complexes would be done taking into account post closure safety requirements.

Also present in the area are illegal mining activities where existing underground shafts are accessed. This is often done in an unsafe manner. Blasting, used as a mining method by the illegal miners, currently presents the potential for damage to infrastructure and fuel/gas pipelines located in the area. Where open pits are planned, these holings will be removed and the area made safe resulting in a positive impact.

An influx of people to the site or area in search of employment opportunities could pose safety risks to local businesses, land users and residents if unrest occurs.

In the absence of mitigation, any potential injury to third parties, infrastructure or animals could be severe. With mitigation that prevents access to mining areas, takes into account the safety of third parties and removes existing risks due to illegal mining, the severity reduces to low. At closure, the risk associated with illegal mining activities would be removed. This is considered a positive impact.

Duration

In the context of this assessment, death or permanent injury to humans and animals is considered a long term, permanent impact, regardless of the project phase or the mitigation measures implemented.

Spatial scale / extent

For the most part, direct impacts (injury and/or death) will be limited to within the mining or infrastructure boundary, but indirect impacts will extend to the communities to which the people / animals belong. This is applicable to all project phases.

Probability

In the case of third parties, in the unmitigated scenario, there is a high possibility that mining activities and facilities will present a risk to third parties and free-roaming animals during all project phases. With mitigation that prevents access to mining areas, takes into account the safety of third parties and removes existing risks due to illegal mining, the probability reduces to low. At closure, with mitigation, the probability of positive impacts occurring increases.

Significance

In the unmitigated scenario, the significance of this potential impact is high. In this regard, the significance of the mitigated impact will reduce to low for all phases prior to closure due to a reduced severity and likelihood of the impact occurring.

Summary of safety risks to third parties per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation, decommissioning						
Unmitigated	H	H	M	H	H	H
Mitigated	L	H	M	M	L	L
Closure						
Unmitigated	H	H	M	H	H	H
Mitigated	L+	H	M	M+	H	M+

Management objectives

To prevent physical harm to third parties and animals.

Management measures

The following measures are recommended:

- Use security control measures in the form of manned access points, fencing, barriers and/or warning signs (in appropriate languages or illustrations) to keep people and animals away from mining and infrastructure areas.
- Undertake regular patrols of the mining area to ensure no breach of security measures has taken place. Where required, maintenance of facilities will be done to re-instate the integrity of the security measures.
- Rehabilitate the site in line with the closure and rehabilitation plan included in this report.
- Educate and train all workers (temporary and permanent) on the risks associated with hazardous excavations.

- Undertake community awareness programmes to educate the community on project-related safety risks.

Emergency situations

In case of injury or death due to hazardous excavations, the mine will implement its emergency response procedure, Section 30.2.2.

ISSUE 21 INCREASE IN HEALTH RISKS TO RECEPTORS

Information provided in this section was sourced from the human health risk assessment conducted by EnviroSim Consulting (EnviroSim) (EnviroSim, 2019) (see Appendix R).

Introduction

Mining activities generally cause environmental disturbance, which has the potential to release hazardous substances into the environment. By moving hazardous substances from inaccessible locations underground to locations in the surface environment, the potential for human exposure to these substances is enhanced.

According to SciRAD, based on the radionuclide activity concentrations for all the rock and soil samples tested falling well below the regulatory limit of 500 Bg/kg (or 0.5 Bq/g), and the calculated doses falling well below all relevant regulatory limits or levels where health impacts could occur, the proposed project does not warrant any concern regarding the radiological impacts to the public (SciRAD, 2019) (see Issue 11). This human health risk is therefore regarded as insignificant and will not be assessed further.

The geochemistry and groundwater specialist studies indicate that the development of acid mine drainage conditions or the leaching of contaminants from the waste rock is unlikely; concentrations of constituents that may leach from the waste rock are all within accepted drinking water criteria (see Issue 8). A human health risk is therefore not predicted to occur and will not be assessed further.

This section therefore focusses on potential health risks from the atmospheric pathway, as a result of the proposed open pit mining operations. The assessment relies on the findings of the air quality study to identify pathways of exposure and assess the potential human health risks.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Opencast mining Transport system Mineralised waste Support services Rehabilitation	Opencast mining Transport system Mineralised waste Support services Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

<u>Severity / nature</u>

Inhalable particulates, sulphur dioxide (SO_2), oxides of nitrogen (NO_x), and carbon dioxide (CO) are considered to be criteria pollutants that is, air pollutants that are regulated and used as indicators of air quality. Inhalable particulates exert a range of adverse health effects such as elevated total, cardiovascular, and infant mortality; respiratory symptoms and effects on lung growth and immune system function. SO_2, NO_x, and CO are also known to cause respiratory effects and cardiovascular effects. Using the predicted results of the air quality study (see Issue 9), short-term (daily) and long-term (annual) risks were determined for exposure to inhalable particulates. Diesel particulate matter (DPM) from exhaust emissions can be carcinogenic and result in inflammatory changes in the airways. Using the elemental analysis of waste rock samples provided by Geodyn (see Appendix H) and the air quality assessment results, it is estimated that airborne concentrations of arsenic may exceed health screening criteria (EnviroSim, 2019).

Based on the source-pathway-receptor analysis, the human health specialist has considered inhalation health risks, systemic (non-cancer) health effects and increased cancer risk. Potential human health impacts for each of these are discussed below (EnviroSim, 2019).

- ***Human health impact from inhalation exposure to criteria pollutants***

  Within the context of the estimated health risks, although severe health effects were shown to be low compared to baseline values, even under unmitigated conditions, less severe health effects such as sore throat, common cold, cough, wheeze and shortness of breath could still occur where persons are exposed to airborne pollutants.

  The health risks calculated as part of the specialist's assessment show (for exposure to the criteria pollutants) a measurable increase in the short-term and long-term health effects, especially when unmitigated concentrations of airborne particulates are considered. This is based on the maximum predicted concentration of air pollutants at receptor points. With mitigation potential receptors would be exposed to lower concentrations however the calculated risks still show a measurable increase from baseline values. The severity of exposure to criteria pollutants is therefore rated medium for both mitigated and unmitigated conditions.

- ***Non-cancer (systemic) health effects from inhalation exposure to DPM and particle associated arsenic***

  Exposure to DPM and particle associated arsenic was evaluated using a set of conservative assumptions with regard to the quantities that can enter the atmosphere. The estimated airborne concentrations were evaluated assuming long-term chronic exposure and hazard quotients.

  Although the levels of exposure to DPM and particle associated arsenic will be similar to that of criteria pollutants the risk of health effects developing is low as all hazard quotients calculated are below 1. No measurable change in the health of persons exposed to the DPM or particulates from the project is therefore expected. The rated severity is low as the affected environment (human health) will not be altered.

- ***Increased cancer incidence from inhalation exposure to particle associated arsenic***

  The risk of cancer developing in individuals exposed to arsenic present in the airborne particulates is low. However, given the seriousness of a health effect such as cancer and potential presence of sensitive individuals, the severity is rated medium for unmitigated conditions.

  However, as the waste rock is the only source of dust that includes arsenic, dust mitigation measures directed specifically at the waste rock stockpiles would significantly reduce the concentration of airborne particulates from this source. Cancer risks will therefore be reduced far below one in a million rendering it a change that cannot be measured. The related mitigated severity is low.

<u>Duration</u>

Although exposure to airborne particulates would occur for the duration of the mining and rehabilitation of each pit, health effects caused by the exposure to emissions may extend beyond this period depending on the seriousness of the illness. The related duration is rated as medium-term for both unmitigated and mitigated conditions for inhalation and systemic health risks. Although the cancer risk is predicted to be negligible, the duration is rated as long-term for both unmitigated and mitigated conditions, as should it occur (however unlikely the occurrence may be) the effects will last beyond the life of the project.

Spatial scale / extent

The dispersion modelling results presented indicate that air pollutants, specifically particulates, are predicted to disperse beyond the boundary of the mining pits. With mitigation, the spatial scale of predicted impacts would reduce, however due to the proximity of residential areas to the open pit operations exposure to airborne particulates is still expected. This is rated as a medium spatial scale for both mitigated and unmitigated conditions.

Probability

The inhalation human health risks calculated for the various receptors are small but show an increase when compared to baseline incidence estimates, at all the receptors. This result implies that the probability is expected to be low given the number of people exposed. However, given the uncertainty in the health status (baseline conditions) of the receptors and the possibility that airborne concentrations may reach high concentrations on some days, the probability is medium, in the unmitigated scenario. With mitigation the concentrations of particulates would be reduced at all the proposed mining operations, reducing the probability of health impacts to low.

The specialist has indicated that the probability of non-cancer or cancer health impacts occurring is unlikely given the low health risks.

Significance

In the unmitigated scenario the significance of human health impacts is rated medium as the potential for exposure exists, although it would be for a short period of time (between five and nine months per pit). With mitigation, the significance reduces to low as the severity and probability of impacts occurring is reduced.

Summary of inhalation health impacts rating per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	M	M	M	M	M
Mitigated	M	M	M	M	L	L

Summary of the systemic (non-cancer) health impacts rating per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	L	M	M	L	L	L
Mitigated	L	M	M	L	L	L

Summary of the cancer health risk impacts rating per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	M	H	M	H	L	M
Mitigated	L	H	M	M	L	L

Management objective

To prevent human health effects due to the proposed project.

Management action

The dust mitigation measures identified above will be implemented at all open pit mining operations associated with the proposed project to prevent possible health effects associated with particulates.

Airborne particulates concentrations will be monitored at potential receptors for the duration of the mining and rehabilitation phases of all open pit mining areas.

The surface and groundwater quality management and mitigation measures will be implemented to manage any contaminated runoff from the site, detect any changes in water quality and identify any third-party water users who could be negatively affected by the project.

The mine will develop and implement a Community Health and Welfare Strategy and Community health awareness workshops.

Emergency situations:

None identified.

ISSUE 22 BLASTING AND VIBRATION IMPACTS

Information provided in this section was sourced from the blasting assessment (Cambrian CC, 2019) (refer to Appendix M).

Introduction

Blasting activities have the potential to impact on people, animals and structures located in the vicinity of the blasting operations.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
N/A		N/A	N/A
-	Underground mining Opencast mining	-	-

Discussion

No blasting will take place for the open pit operations and therefore no blasting impacts will occur.

For the underground mining operations, blasting will take place at depths greater than 50 m. Airblast will therefore have no effect on surface infrastructure as it will be confined to the underground workings. In addition, the predicted airblast levels will be well below the threshold for human irritation.

The highest predicted vibration levels occur at points closest to the blast site but remain well below the USBM threshold at around 2 mm/s or less. The specialist predictions are considered to be conservative and actual vibration levels may well be lower than predicted. The disturbance levels attenuate or reduce rapidly with an increase in distance. Given the increasing depth of the mining activity and the small charge masses being fired at one time, it is highly unlikely that any disturbances will be felt on the surface of the ground. If any vibrations are felt on surface, the levels will be far too low to cause damage to structures. Vibrations may be perceptible to people, but should remain below the disturbing levels of 2.54 mm/s to 7.62 mm/s.

Vibration will also be generated from the Xcentric ripper. As explained in Table 3-4, an Xcentric ripper will be used to break the ground in the opencast pits. This equipment replaces the need to conduct blasting on surface. This is both for safety reasons and to minimise impacts on the surrounding environment. The ground vibration and noise disturbance levels associated with the use of the rippers were measured in May 2018 at various distances from an operating ripper. The measurements showed that the disturbance levels were highest close to the Xcentric ripper's area of operation and that these levels attenuated (decreased) rapidly with increase in distance. At distances greater than 100 m the disturbance levels will be of no consequence and insignificant.

ISSUE 23 LAND USE IMPACT

Information provided in this section was sourced from the socio-economic assessment (Mercury, 2019) (refer to Appendix Q).

Introduction

Mining activities have the potential to affect land uses both within the mine area and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	Maintenance and aftercare of rehabilitated areas

Rating of impact

<u>Severity / nature</u>

The area has been impacted by historic and current mining activities, with various mining remnant such as mine dumps in the project area. One of the opportunities identified in the Gauteng Spatial Development Framework 2030 is the rehabilitation of the mining belt. Mined and rehabilitated land being freed up for housing developments will improve fragmentation, thereby unlocking development potential in large areas that can be used for future urban development and infill. This is considered a positive impact.

The current illegal mining in the project area is a risk to the safety, security and environment of surrounding communities.

The proposed project will allow formal mining within the legal framework of the country and rehabilitation of affected project areas. Degraded land within the open pit mining areas will be restored and illegal mining activities in the immediate area should cease once the open cast areas have been completely rehabilitated. The opencast pits will be mined for a short duration and the land will then be made available for housing and industrial developments earmarked for the area.

Although the project area is primarily utilised for residential and associated development, there are, however, open areas with limited vegetation that may be utilised for firewood collection; hunting small animals; gathering plants; and subsistence gardening or grazing. The use is likely very limited but due to the poverty in the area could have an impact on land users.

In the unmanaged scenario it is possible that land surrounding the project will experience some degree of additional negative social and environmental impacts, which could impact on current land use values. In the scenario where the project successfully implements the stipulated environmental and social management measures, these impacts can be managed to acceptable levels which should not reduce surrounding land value. In the mitigated scenario the duration of the open cast mining activities will be kept to a minimum and rehabilitation objectives will be achieved and post rehabilitation land value will be enhanced.

The proposed project does, however, have the potential to impact on planned housing developments as described in section 6.4.1.14. Settlement deadlines have been agreed to with the various housing developers. The open cast activities will therefore have a minimal impact on the programme of these projects.

Underground mining activities may influence the desirability of planned housing developments, which could potentially affect the value of these properties. Impacts such as vibration, air, noise, health, traffic, social and water arising from the proposed mining activities could have a negative impact on housing developments and property values. It is possible that some buyers may disinvest from these developments due to the mine being in close proximity. In the mitigated scenario, the environmental impacts could be mitigated to a more acceptable level.

The change in land use would therefore be both positive and negative as described above. Taking these factors into consideration, the overall impact severity is rated as having a moderate overall negative impact. This can be reduced to low with mitigation that is focussed on prevention and/or controls for each environmental and social impact type. Effective rehabilitation of the open pits could result in a positive land use impact post-closure.

Duration

In the unmitigated scenario the impact on land use will extend beyond mine closure. With mitigation the majority of the land use impacts are expected to be limited to the phases prior to mine closure.

Spatial scale / extent

The spatial scale extends beyond the immediate proposed project area in both the mitigated and unmitigated scenario.

Probability

In the unmitigated scenario, where environmental and social impacts are uncontrolled, the probability that surrounding land uses will be impacted by mining is definite. With mitigation, the probability reduces to medium prior to closure. Effective rehabilitation of the open pits could possibly result in a positive land use impact post-closure.

Significance

In the unmitigated scenario, the significance of the potential negative impact is high. With mitigation the significance of the mitigated negative impact will reduce to medium for all phases prior to closure. Effective rehabilitation of the open pits is rated to have a medium positive impact at closure.

Summary of the rated land use impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Unmitigated	M	H	M	H	H	H
Mitigated	L	L	M	L	M	M
Closure						
Mitigated	L+	H	M	M+	M	M+

Management objectives

To prevent unacceptable negative impacts on surrounding land uses.

Management measures

The following management measures will be implemented:

- The EMP commitments will be implemented during construction, operation and decommissioning with a view not only to prevent and/or mitigate the various environmental and social impacts, but also to prevent negative impacts on surrounding land uses;
- Regular stakeholder engagement will be conducted to report on EMP compliance performance and give stakeholders an opportunity to raise issues or concerns regarding the operations. This will include the housing development stakeholders;
- Where relevant and in discussion with the applicable regulatory body, rezoning will be completed;
- The overall site will be rehabilitated to provide for the post closure land use in accordance with the mine Closure Plan.

Emergency situations

In case of veldt fires, the mine will implement its emergency response procedure, Section 30.2.2.

C) IMPACT ON HERITAGE RESOURCES (INCLUDING PALAEONTOLOGICAL RESOURCES)

ISSUE 24 DAMAGE TO OR DISTURBANCE OF HERITAGE (INCLUDING CULTURAL) AND PALAEONTOLOGICAL RESOURCES RESULTING IN A LOSS OF THE RESOURCE

Information in this section was sourced from the heritage study undertaken by Professional Graves Solutions (PGS, 2019) (refer to Appendix P).

Introduction

The development of infrastructure for the West Wits Project has the potential to damage heritage/cultural and palaeontological resources (if present), either directly or indirectly, and result in the loss of the resource for future generations.

Mine phase and link to project specific activities/infrastructure

Construction	Operational	Decommissioning	Closure
			N/A
Site preparation Earthworks Civil works	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Rehabilitation	Underground mining Opencast mining Transport system Power supply and use Water supply and use Mineralised waste Non-mineralised waste Support services Demolition Rehabilitation	-

Impact assessment

Severity/nature

The development of the project has the potential to impact on various heritage resources as follows:

- 18 heritage resources are located within the proposed infrastructure footprint areas and will be directly impacted, including 16 historical structures ranging from low to medium heritage significance and two living heritage cultural sites (open air religious sites) with medium significance;
- No archaeological sites were found in the project area, although there is the possibility of occasional finds as have been found in the surrounding areas;
- No paleontological resources are expected to occur in the project area, and therefore no paleontological impacts are expected;
- Two burial grounds of high heritage and cultural significance and four historical sites of medium to high heritage significance are located within the project area, but outside of proposed infrastructure footprints. These sites could be disturbed through indirect impacts if proper management measures are not put in place.

The severity rating is based on the heritage resources that have a high significance. The severity is rated as high in the unmitigated scenario due to the value of these resources that could be lost for future generations. With mitigation focussed on avoidance of all heritage resources where feasible, particularly those with a high or medium heritage significance, the severity can be reduced to low. Where avoidance is not feasible, other mitigation measures must be implemented such as documentation of the sites and obtaining relevant authorisations or permissions.

Duration

The duration is high in the unmitigated scenario during all project phases because the loss of heritage resources would be permanent. In the mitigated scenario, heritage resources will be avoided where feasible, or these resources would be documented to preserve the heritage knowledge, thereby reducing the duration of the impact.

Spatial extent/ scale

Loss of heritage (including cultural) resources will impact on communities beyond the project area, therefore the spatial scale is medium in both the unmitigated and mitigated scenarios in all project phases.

Probability

The probability is high in the unmitigated scenario but can be reduced to low with mitigation.

Significance

The unmitigated significance is high. The mitigated significance reduces to low at closure.

Summary of the rated heritage resource impacts per phase of the mine

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	H	H	M	H	H	H
Mitigated	L	L	M	L	L	L

Management objectives:

- To minimize the disturbance of heritage resources; and
- Comply with relevant legislation and recommendations from SAHRA under Section 34 and 38 of NHRA.

Management action

A heritage management plan will be implemented during construction, operations and decommissioning of the project. The basis for this management plan is provided in n Table D 4 below. Mitigation will consider avoidance of resources where feasible. In cases where resources cannot be avoided, additional management measures will need to be implemented including applying for the necessary permits.

Emergency situations

In the event of any chance finds, a chance find procedure will be implemented as described in the heritage management plan provided in Table D 4.

TABLE D 4: HERITAGE MANAGEMENT PLAN

Type	Resource No.	Heritage grading	Location	Mitigation measures	Project phase
Cultural sites within proposed infrastructure footprints.	WW002	Medium	Roodepoort Main Reef pit	Avoid these sites where feasible and apply a buffer zone of least 30m. If the sites cannot feasibly be avoided, conduct stakeholder engagement and obtain consent to relocate the sites to a suitable alternative location, to be provided by the mine.	Construction Operation Decommissioning
	WW010	Medium	Roodepoort Main Reef pit		
Historical structures within proposed infrastructure footprints.	WW001	Low	Roodepoort Main Reef pit	Avoid these sites where feasible and apply a buffer zone of least 30m. The ore trucking road alignment will be adjusted to avoid heritage resources. If the sites cannot feasibly be avoided, document the site and obtain a destruction permit from the provincial heritage resource authority (Gauteng). In this regard, structures older than 60 years will require permits for destruction. Implement a chance find procedure in cases where possible additional heritage finds are made. Contact SAHRA and appoint a qualified heritage specialist to evaluate the finds and make appropriate recommendation on mitigation.	Construction Operation Decommissioning
	WW003 and WW003-1	Low	11 Shaft Main Reef pit		
	WW004	Low			
	WW005	Low	Kimberley Reef East infrastructure		
	WW006	Low			
	WW007	Low			
	WW008	Low	11 Shaft Main Reef pit		
	WW009 and WW009-1	Low			
	WW011	Medium	Ore trucking road		
	WW012	Low	Ore trucking road		
	WW013	Medium	Ore trucking road		
	WW014	Medium	Ore Trucking road		
	WW015	Medium	Ore Trucking road		
	WW016	**Medium/High**	Ore Trucking road		
	WW017	Very Low	Mona Lisa Bird Reef pit		
	WW018	**Medium/High**	Bird Reef/ Central Circular Shaft		
Historical structures within project area, but outside infrastructure footprints.	WW019	**Medium**	South of Mona Lisa Bird Reef pit	Demarcate sites with a 30-meter buffer and avoid them. Implement a chance find procedure in cases where possible additional heritage finds are made. Contact SAHRA and appoint a qualified heritage specialist to evaluate the finds and make appropriate recommendation on mitigation.	Construction Operation Decommissioning
	WW020	**High**	North-east of Bird Reef/ Central Circular Shaft		
	WW021 and WW021-1	Low	Close to Roodepoort Main Reef Pit		
	WW023	Low/ **medium**	Between Bird Reef Central Circular Shaft and Mona Lisa Bird Reef		

Type	Resource No.	Heritage grading	Location	Mitigation measures	Project phase
Burial Grounds located within project area, but outside infrastructure footprints.	WW022-1 to WW022-3	**High**	Between Bird Reef/ Central Circular Shaft and Mona Lisa Bird Reef Pit	Demarcate sites with a 100-meter buffer and avoid them. Implement stakeholder engagement as required by the NHRA in developing practical management measures to avoid further damage to these burial grounds and allow community access. Implement a chance find procedure in cases where possible additional heritage finds are made. Contact SAHRA and appoint a qualified heritage specialist to evaluate the finds and make appropriate recommendation on mitigation.	Construction Operation Decommissioning
	WW024	**High**	North of Bird Reef/ Central Circular Shaft, close to Ore transport road		
Archaeological and paleontological material	None found on site			Implement a chance find procedure in cases where possible heritage finds are made. Contact SAHRA and appoint a qualified heritage specialist to evaluate the finds and make appropriate recommendation on mitigation.	Construction Operation Decommissioning

APPENDIX E: SOIL AND LAND CAPABILITY IMPACT ASSESSMENT REPORT

APPENDIX F: TERRESTRIAL, FRESHWATER AND AQUATIC BIODIVERSITY IMPACT ASSESSMENT REPORT

APPENDIX G: SURFACE WATER IMPACT ASSESSMENT REPORT

APPENDIX H: GROUNDWATER IMPACT ASSESSMENT REPORT

APPENDIX I: CLIMATE CHANGE IMPACT ASSESSMENT REPORT

APPENDIX J: AIR QUALITY IMPACT ASSESSMENT REPORT

APPENDIX K: RADIATION IMPACT ASSESSMENT REPORT

APPENDIX L: NOISE IMPACT ASSESSMENT REPORT

APPENDIX M: VIBRATION AND BLASTING IMPACT ASSESSMENT REPORT

APPENDIX N: VISUAL IMPACT ASSESSMENT REPORT

APPENDIX O: TRAFFIC IMPACT ASSESSMENT REPORT

APPENDIX P: HERITAGE IMPACT ASSESSMENT REPORT

APPENDIX Q: SOCIO-ECONOMIC IMPACT ASSESSMENT REPORT

APPENDIX R: HUMAN HEALTH IMPACT ASSESSMENT REPORT

APPENDIX S: CLOSURE COSTING/ FINANCIAL PROVISION REPORT

720.13087.00001
Proposed West Wits Mining Project
For DMR submission (including I&AP comments)
West Wits MLI (Proprietary) Limited

Entity	No.	Date issued	Issuer
Roodepoort Civic Centre	1	20 May 2019	M Medallie
Witpoortjie Library	2	20 May 2019	M Medallie
Braamfischerville Multipurpose Centre Library	3	20 May 2019	M Medallie
Moses Kotane Primary School	4	20 May 2019	M Medallie
Solplaatjie Hall	5	20 May 2019	M Medallie
Meadowlands Library	6	20 May 2019	M Medallie
https://slrconsulting.com/za/slr-documents	7	20 May 2019	M Medallie
Various commenting authorities for review	8	20 May 2019	M Medallie

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