ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE CHANGES TO INFRASTRUCTURE LAYOUT AND ACTIVITIES AT THE MAMATWAN MINE

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EXECUTIVE SUMMARY

Project background

Hotazel Manganese Mines (Pty) Ltd (HMM) is the holder of a Mining Right (MR) for the opencast manganese mine known as Mamatwan Manganese Mine (MMT). The MMT is operated by South32 Limited (South32), a globally diversified mining and metals company producing bauxite, alumina, aluminium, energy and metallurgical coal, manganese, nickel, silver, lead and zinc in Australia, Southern Africa and South America. The MMT is located approximately 25 km to the south of the town Hotazel, in the John Taolo Gaetsewe District Municipality (JTGDM) and Joe Morolong Local Municipality (JMLM) of the Northern Cape Province of South Africa. The MMT is bordered by the Tshipi Borwa Mine (operated by Tshipi é Ntle Manganese Mining (Pty) Ltd [Tshipi]) to the West and by the United Manganese of Kalahari (Pty) Ltd (UMK) Mine, to the North.
MMT is making an application to the DMRE for an integrated EA (including Waste Management License) and update of the mine's current EMPR to address a number of layout and activity changes that have already taken place at the MMT, as well as proposed layout and activity changes.

A list of layout and/or activity changes that
have already taken place include:

- Expansion of the north and south- eastern WRDs;
- Changes to the rehabilitation criteria of WRDs;
- Expansion of the product stockyard;
- Establishment of potable and process water storage facilities; and
- Expansion of an existing road.

A list of the proposed layout and/or activity changes include:

- Establishment of a top-cut stockpile and associated mobile crushing and screening plant;
- Establishment of stormwater management infrastructure including a Pollution Control Dam (PCD) and evaporation channels;
- Change in height of the WRD (this excludes rehabilitated WRD's);
- Establishment of a pipeline to transfer water abstracted from the decommissioned Middelplaats Mine to MMT;
- Upgrading the railway line and the railway loadout station;
- Sale of waste rock as aggregate; and
- Re-processing of material located in Adams Pit .

Summary of authorisation requirements

The MPRDA, NEMA and NEM: WA requires that an applicant submit the relevant environmental reports required in terms of NEMA. The Environmental Impact Assessment (EIA) Regulations, 2014 (published under Government Notice Regulation (GNR) 982 of 4 December 2014, as amended), promulgated in terms of NEMA set out the assessment process and reporting requirements where authorisation is required. For the purpose of this project, an integrated EIA process will be undertaken and will meet the requirements of:

- Regulation 31 (Part 2: substantive amendment process) to cater for changes to the approved 2005 EMPR in terms of the EIA Regulations (GNR 982 of 2014), as amended; and

- Regulation 21 and 23 (Scoping and Environmental Impact Assessment (S&EIA) process) to cater for listed activities in terms of the EIA Regulations (GNR 982 of 2014), as amended. Listed activities triggered as a result of the project are outlined in Section 4.1.

Purpose of this Environmental Impact Assessment Report

An EIA is conducted in two phases. The first is the Scoping Phase and the second is the EIA Phase. The final Scoping Report was submitted to the DMRE on 26 March 2021 and was accepted on 27th October 2021. The objectives of the Scoping Phase were in line with Chapter 4, Part 3 of the EIA Regulations (GNR 982 of 2014), as amended. The terms of reference as identified in the Scoping Report for further assessment during the EIA phase enables the meaningful assessment of all relevant biophysical and socioeconomic issues.

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.

Summary of the public participation process

The table below outlines the details of the public participation process that will be followed during the EIA phase of the project. This process is aligned with the public participation plan approved by the DMRE.

DETAILS OF THE PUBLIC PARTICIPATION PROCESS TO BE FOLLOWED DURING THE EIA PHASE

Task	Description
Review of the EIA and EMPR	
I&APs review of the EIAR and EMPR	The EIAR and EMPR has been made available for public review for 30 calendar days. I&APs have been notified that the EIA and EMPR are available for review via email and SMS notifications. Full copies of the EIA and EMPR have been uploaded onto the SLR website and data-free website. The link to this website was distributed to all I&APs via email and SMS notifications. A Non-Technical Summary of the EIAR and EMPR, available in English, Afrikaans and Setswana, was made available to all I&APs via email.
Submission of the EIAR and EMPR to the DMRE.	The EIAR and EMPR will be updated to include any comments received during the review of the report by I&APs. The updated reports will be uploaded onto SAMRAD for consideration by the DMRE.
Notify I&APs of the DMRE's decision.	Notify I&APs of the decision taken by DMRE and applicable appeals processes.

Impacts and management actions

The table below provides a summary of the key impacts and management actions identified throughout the process.

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
Loss of soil and Land Capability through physical disturbance	• Soil erosion management. • Soil compaction management. • Waste Management. • Soil Loss and Stockpile Management. • Revegetation immediate to rehabilitation of footprint.	Medium to Low	Very Low
Loss of soil and land capability through contamination	• Hazardous materials to be stored in bunded, lined areas. • Maintenance of vehicles and use of drip trays. • Waste stored on lined surface. • Spill kits available and used on site. • Awareness training. • Post rehabilitation audits.	Medium	Low
Reduced floral habitat and diversity	• Demarcation and fencing of working footprint to limit loss of indigenous vegetation. • Designs should include precautions to prevent spills/leaks. • Alien Invasives Plants Management and Control Plan. • Comprehensive rehabilitation and revegetation plan.	Medium	Low
Impact on floral species of conservation concern	• Walkdown of the green-fields areas within the project footprint and all protected species to be marked. • A rescue and relocation plan for protected floral species. • Permitting for the removal of protected species must be obtained. • Rehabilitation plan to be implemented effectively and as soon as possible. • Rehabilitation to continue for at least 5 years after decommissioning and closure.	Medium	Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
Loss of faunal habitat and diversity	• Proposed top-cut to be fenced off and clearly demarcated. • Access roads on existing roads. • Consider sensitive habitats throughout planning and execution. • Alien invasive species control plan. • Fire management and erosion plan. • NO clearing outside of the development footprint.	Medium	Low
Impact on Important faunal species of conservation concern	• Proposed top-cut to be fenced off and clearly demarcated. • Access roads on existing roads. • Consider sensitive habitats throughout planning and execution. • Rehabilitation plan should be developed for implementation throughout the development phase. • Fire management and erosion plan. • Design should precent potential leaks and spills.	Medium	Very Low
Contamination of surface water resources affecting third party use	• Drip trays should be placed under all standing machinery. • Oil recovered from any vehicle or equipment on site must be collected, stored and disposed of by accredited vendors for recycling. • A water quality monitoring plan must be formulated before construction.	Medium	Low
Erosion and Sedimentation	• Construction must be undertaken in the dry season. • Concurrent rehabilitation of disturbed land and revegetation should be carried out to minimise the period that bare soils are exposed to erosion. • A service and maintenance plan must be compiled and implemented.	Medium	Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
Alteration of natural drainage patterns affecting flow of water in downstream systems.	• Development of stormwater infrastructure for pollution control. • Clean water to be released into the environment to minimise alteration of natural drainage flow. • Reuse of water from the PCDs must be prioritised as well as use of water from Middelplaats Shaft.	Medium	Low
Contamination of groundwater affecting third part use.	• Ongoing monitoring in order to address contamination timeously.	Medium	Low
Development of the drawdown due to mining.	• Ongoing monitoring in order to identify any issues for address.	Medium	Low
Increase in ambient air concentrations.	• Limit speed of haul trucks to a maximum of 40 km/h. • Limit unnecessary travel of vehicles on unpaved roads. • Apply water sprays / dust suppressant on regularly travelled sections of roads. • Vehicles should be cleaned of all mud and material to be transported must be covered before travelling on public roads. • Access road to the sinter plant needs to be kept clean to minimise carry-on of mud to public roads. • Controlled blasting techniques to be used to minimise dust generation. • Blasting to be conducted on cloudless days only, if possible. • Chemical surfactants added to water sprays to lower water surface tension and increase binding properties. • Increase in-pit material moisture content. • Drop the height from excavator into haul trucks through water sprays.	Medium	Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
	• Water sprays at mobile crushers.		
Increase in disturbing noise levels affecting potential human receptors.	• Temporary noise barriers and use low noise equipment for construction phase. • Alternatives to audible reversing alarms or configure to maximise forward movements of mobile plant and vehicles. • Selection and management of low noise equipment and vehicles. • Maintain road surfaces. • Activities to be limited to daytime hours. • Grievance procedure should be available for receptors to report noise disturbance.	Low	Very Low
Loss or damage to heritage and/or palaeontological resources.	• Chance finds protocol to be implemented.	Low	Very Low
Disturbance to third party road users by project related traffic.	• Chance finds protocol to be implemented.	Low	Very Low
Positive socio-economic impact.	• Optimise the use of rail for the transport of materials to reduce the requirement for trucking and impact to road users. • Optimise as possible the use of local labour.	Very Low	Low
Negative Socio-economic Impact	• Influx of migrant workers should be managed as far as possible. • Impacts to sensitive receptors should be minimised through implementation of the EMPR and mitigation measures, particularly within the construction phase.	Low	Very Low
Hazardous Excavations and infrastructure that	• Excavations and infrastructure should be limited to within the working footprint.	Low	Very Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
pose a safety risk to third parties and animals.	• Access to the site should be limited as it is within the mining right area. • Fencing, or demarcation of dangerous areas should be implemented. • Monitoring of excavations should be carried out daily to ensure that no animal has become trapped within these areas.		
Sterilisation of mineral resources.	• All of the proposed activities will be taking place within the existing mine surface infrastructure area. Therefore, it is not anticipated that any additional mineral resources will be sterilized.	N/A	N/A
Change in current land use.	• The current land use is mining and this will remain the land use post authorisation of the proposed activities.	N/A	N/A

Environmental Impact Statement

The assessment of the proposed project presents the potential for negative impacts to occur (in an unmitigated scenario) on the biophysical environments both on the project footprint and in the surrounding area. With the implementation of management actions, these potential impacts can be prevented or reduced to acceptable levels.

It follows that provided the EMPR is effectively implemented, there is no biophysical, cultural heritage or socio-economic reason why the proposed project should not proceed.

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
ABA	Acid Base Accounting
AEL	Air Emissions License
AIP	Alien and Invasive Plant
AQIA	Air Quality Impact Assessment
ASTM	American Standard Testing Method
BID	Background Information Document
BIF	Banded Iron Formation
BPG	Best Practice Guidelines
Ca	Calcium
CBA	Critical Biodiversity Area
Cl	Chlorine
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRR	Comments and Response Report
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Fisheries and Forestry
DENC	Northern Cape Department of Environment and Nature Conservation
DME	Department of Minerals and Energy
DMRE	Department of Mineral Resources and Energy
DMS	Dense Medium Separator
DRDLR	Department of Rural Development and Land Reform
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Report
EMF	Environmental Management Framework
EMPR	Environmental Management Plan Report
EPCM	Engineering, Procurement and Construction Management
ESA	Early Stone Age
ESDD	Environmental and Social Due Diligence
ESIA	Environmental and Social Impact Assessment

Acronym / Abbreviation	Definition
F	Fluoride
FOE	Frequency of Exceedance
GDP	Gross Domestic Product
GNR	General Notice Regulation
HDSAs	Historically Disadvantaged South Africans
HHM	Hotazel Manganese Mines (Pty) Ltd
HIA	Heritage Impact Assessment
I&AP	Interested and Affected Party
IBA	Important Bird Area
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
IWUL	Integrated Water Use Licence
JMLM	Joe Morolong Local Municipality
JTGDM	John Taolo Gaetsewe District Municipality
KMF	Kalahari Manganese Field
LC	Leachable Concentration
LMO	Lower Manganese Ore Body
LOM	Life of Mine
LoS	Load-Out station
LSA	Late Stone Age
MECA	Manganese Export Capacity Allocation
Mg	Magnesium
MMO	Middle Manganese Ore Body
MMT	Mamatwan Manganese Mine
MPRDA	Minerals and Petroleum Resources Development Act (Act 28 of 2002, as amended)
MR	Mining Right
MSA	Middle Stone Age
Mt	Million tonnes
N	Nitrogen
Na	Sodium
NAAQS	National Ambient Air Quality Standards
NAG	Nett Acid Generation
NBA	National Biodiversity Assessment

Acronym / Abbreviation	Definition
NCPGDS	Northern Cape Provincial Growth and Development Strategy
NCNCA	Northern Cape Nature Conservation Act (Act 9 of 2009)
NCPSDF	Northern Cape Provincial Spatial Development Framework
NDCR	National Dust Control Regulations
NDP	National Development Plan
NEMA	National Environmental Management Act (Act 107 of 1998, as amended)
NEM: AQA	National Environmental Management: Air Quality Act (Act 39 of 2004, as amended)
NEM: BA	National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended)
NEM: WA	National Environmental Management: Waste Act (Act 59 of 2008, as amended)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (Act 25 of 1999)
NO_2	Nitrogen Dioxide
NO_3	Nitrate
NOx	Nitrous oxides
NPAES	National Priority Areas Expansion Strategy
NSSD	National Strategy for Sustainable Development
NWA	National Water Act (Act 36 of 1998, as amended)
O_3	Ozone
OPP	Ore Processing Plant
Pb	Lead
PCD	Pollution Control Dam
PES	Present Ecological State
PFS	Pre-Feasibility Study
PM	Particulate Matter
QDS	Quarter Degree Squared
ROM	Run of Mine
S&EIA	Scoping and Environmental Impact Assessment
SABAP2	South African Bird Atlas Project 2
SABS	South African Bureau of Standards
SACAD	South African Conservation Area Database
SAHRA	South African Heritage Resources Agency
SAMRAD	South African Mineral Resources Administration System
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAPAD	South African Protected Area Database

Acronym / Abbreviation	Definition
SCC	Species of Conservation Concern
SCS	Soil Conservation Services
SDF	Spatial Development Framework
SLP	Social and Labour Plan
SLR	SLR Consulting (South Africa) (Pty) Ltd
SO_2	Sulphur dioxide
SO_4	Sulphate
South32	South32 Limited
SPLP	Synthetic Precipitation Leaching Procedure
T.Alk	Total Alkalinity
TC	Total Concentration
TFR	Transnet Freight Rail
THT	Training Handling Times
TPA	Tonnes per annum
Tshipi	Tshipi é Ntle Manganese Mining (Pty) Ltd
TSP	Total Suspended Parts.
TWQR	Targeted Water Quality Range
UMK	United Manganese of Kalahari (Pty) Ltd
UMO	Upper Manganese Ore Body
US EPA	United States Environmental Protection Act
WHO	World Health Organisation
WML	Waste Management Licence
WRD	Waste Rock Dump
WUL	Water Use Licence
WULAAS	Water Use License Application and Authorisation System

ENVIRONMENTAL IMPACT ASSESSMENT AND ENVIRONMENTAL MANAGEMENT PROGRAMME FOR THE CHANGES TO INFRASTRUCTURE LAYOUT AND ACTIVITIES AT THE MAMATWAN MINE

1. INTRODUCTION

1.1 PROJECT BACKGROUND

Hotazel Manganese Mines (Pty) Ltd (HMM) is the holder of a Mining Right (MR) for the opencast manganese mine known as Mamatwan Manganese Mine (MMT). The MMT is operated by South32 Limited (South32), a globally diversified mining and metals company producing bauxite, alumina, aluminium, energy and metallurgical coal, manganese, nickel, silver, lead and zinc in Australia, Southern Africa and South America. The MMT is located approximately 25 km to the south of the town Hotazel, in the John Taolo Gaetsewe District Municipality (JTGDM) and Joe Morolong Local Municipality (JMLM) of the Northern Cape Province of South Africa. The MMT is bordered by the Tshipi Borwa Mine (operated by Tshipi é Ntle Manganese Mining (Pty) Ltd [Tshipi]) to the West and by the United Manganese of Kalahari (Pty) Ltd (UMK) Mine, to the North. The regional and local settings are illustrated in Figure 3-1 and Figure 3-2, respectively. HMM holds the following environmental permits and authorisations for the MMT:

- A MR (Reference number: NC 252 MR) issued and approved by the former Department of Minerals and Energy (DME) (currently the Department of Mineral Resources and Energy [DMRE]) in May 2006;
- An Environmental Management Programme (EMPR) (Reference number: NC 6/2/2/118) issued and approved by the former DME (currently the DMRE) in November 2005;
- An Atmospheric Emissions Licence (AEL) (Licence number: NC/AEL/JTG/MAM01/2012) issued by the Northern Cape Department of Environment and Nature Conservation (DENC) in March 2020;
- An Integrated Water Use Licence (IWUL) (License number: 10/D41K/KAGJ/1537) issued by the Department of Water and Sanitation (DWS) in January 2012 and associated amendment issued in October 2017 and October 2020;
- An Environmental Authorisation (EA) (Reference number: NC/KGA/HOT3/07) for bulk fuel storage issued by former Department of Tourism, Environment and Conservation (currently DENC) in July 2007); and
- An EA (Reference number: NC 30/5/1/2/3/2 (252) MR) for the merging of the Mamatwan Sinterfontein Waste Rock Dump (WRD) with the Tshipi Eastern WRD from the DMRE in January 2020.

1.2 SCOPE OF THE PROJECT

MMT is making an application to the DMRE for an integrated EA (including Waste Management License) and update of the mine's current EMPR to address a number of layout and activity changes that have already taken place at the MMT, as well as proposed layout and activity changes.

A list of layout and/or activity changes that have already taken place include:

- Expansion of the north and south- eastern WRDs;
- Changes to the rehabilitation criteria of WRDs;
- Expansion of the product stockyard;
- Establishment of potable and process water storage facilities; and

- Expansion of an existing road.

A list of the proposed layout and/or activity changes include:

- Establishment of a top-cut stockpile and associated mobile crushing and screening plant;
- Establishment of stormwater management infrastructure including a Pollution Control Dam (PCD) and evaporation channels;
- Change in height of the WRD (this excludes rehabilitated WRD's);
- Establishment of a pipeline to transfer water abstracted from the decommissioned Middelplaats Mine to MMT;
- Upgrading the railway line and the railway loadout station;
- Sale of waste rock as aggregate; and
- Re-processing of material located in Adams Pit .

In addition to the above, MMT also proposes to amend specific management commitments in the approved EMPR which are no longer relevant to the operation.

1.3 SUMMARY OF AUTHORISATION REQUIREMENTS

The proposed layout and activity changes will require an integrated EA (including Waste Management License) and amendment of MMT's current EMPR. The project includes activities listed under the National Environmental Management Act (No. 108 of 1998) (NEMA) and waste management activities listed under the National Environmental Management: Waste Act (No. 59 of 2008) (NEM: WA). Under both NEMA and NEM: WA, listed activities are prohibited from commencing until written authorisation is obtained from the competent authority, which in this case is the Northern Cape office of the DMRE.

The project requires approval of an integrated EA (including Waste Management License) in terms of Section 24 of NEMA and Section 45 of NEM: WA from the Northern Cape DMRE. In terms of Section 102 of the Mineral and Petroleum Resources Development Act (No. 59 of 2002) (MPRDA), an EMPR may not be amended or varied without the written consent of the Minister of Mineral Resources.

The MPRDA, NEMA and NEM: WA requires that an applicant submit the relevant environmental reports required in terms of NEMA. The Environmental Impact Assessment (EIA) Regulations, 2014 (published under Government Notice Regulation (GNR) 982 of 4 December 2014, as amended), promulgated in terms of NEMA set out the assessment process and reporting requirements where authorisation is required. For the purpose of this project, an integrated EIA process will be undertaken and will meet the requirements of:

- Regulation 31 (Part 2: substantive amendment process) to cater for changes to the approved 2005 EMPR in terms of the EIA Regulations (GNR 982 of 2014), as amended; and
- Regulation 21 and 23 (Scoping and Environmental Impact Assessment (S&EIA) process) to cater for listed activities in terms of the EIA Regulations (GNR 982 of 2014), as amended. Listed activities triggered as a result of the project are outlined in Section 4.1.

Further detail on the integrated environmental process is included in Section 5.2. In addition, the project also requires authorisation from the DWS for specific water uses listed under Section 21 of the National Water Act (No. 36 of 1998) (NWA). Further detail on the water use licensing requirements is included in Section 4.1.3. This report does not address the requirements of a water use licensing process. This will be handled as part of a separate process with the DWS.

1.4 INTRODUCTION TO THE ENVIRONMENTAL ASSESSMENT PROCESS

An EIA is conducted in two phases. The first is the Scoping Phase and the second is the EIA Phase. The final Scoping Report was submitted to the DMRE on 26 March 2021 and was accepted on 27th October 2021. The objectives of the Scoping Phase were in line with Chapter 4, Part 3 of the EIA Regulations (GNR 982 of 2014), as amended. The terms of reference as identified in the Scoping Report for further assessment during the EIA phase enables the meaningful assessment of all relevant biophysical and socioeconomic issues.

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.

1.5 TERMS OF REFERENCE

SLR Consulting (South Africa) (Pty) Ltd (SLR), as the independent Environmental Assessment Practitioner (EAP), is responsible for undertaking the required environmental regulatory process and conducting the public participation process. The terms of reference for this integrated regulatory environmental process were to:

- Make an application for the EA of the proposed project in terms of NEMA and NEM; WA;
- Ensure the EIA process is undertaken in accordance with the requirements of NEMA, EIA Regulations 2014 (GNR 982 of 2014), as amended);
- Ensure the EIA process is undertaken in an open and participatory manner to ensure that all potential impacts are identified;
- Undertake a formal public participation process, which includes the distribution of information to Interested and Affected Parties (I&APs) and provides the opportunity for I&APs to raise any concerns/issues, as well as an opportunity to comment on all documentation; and
- Integrate all the information, including the findings of the specialist studies (where relevant) and other relevant information, into an EMPR report to allow an informed decision to be taken by the competent authority.

Further to this and in accordance with Appendix 3 of the EIA Regulations (GNR 982 of 2014), as amended and the DMRE reporting requirements, the key objectives of the EIA process 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.

1.6 STRUCTURE OF THE REPORT

This document has been prepared in accordance with the DMRE EIA and EMPR template format, 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 (GNR 982 of 2014), as amended. Table 1-1 provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

TABLE 1-1: STRUCTURE OF THE EIA REPORT

EMPR report requirement as per the DMRE template	EMPR report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Part A of DMRE 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 2.1
Expertise of the EAP	Details of the expertise of the EAP, including curriculum vitae	Section 2.2
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 coordinates of the boundary of the property or properties	Section 3
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 3.2
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 4
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 4.1
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 5
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 6

EMPR report requirement as per the DMRE template	EMPR report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
Motivation for the preferred development footprint within the approved site including	A motivation of the preferred development footprint within the approved site including	Section 7
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 7.1
Details of the development footprint alternatives considered	Details of all the alternatives considered	Section 7.2
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 8
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 8.3
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 9
Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree of the impacts	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 loss of resources and can be avoided, managed and mitigated	Section 9.15
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 9.16
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 9.17
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 9.18
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 9.19
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 9.20

EMPR report requirement as per the DMRE template	EMPR report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
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 10
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 11
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 12
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 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	Section 13
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 14
Final proposed alternatives	The final proposed alternatives which respond to the impact management actions, avoidance, and management actions identified through the assessment	Section 15

EMPR report requirement as per the DMRE template	EMPR report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
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 16
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 17
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 18
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 19
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 20
Financial provision	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts	Section 21
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; and a motivation for the deviation	Section 22
Other information required by the competent authority	Any specific information required by the competent authority.	Section 23
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 24
Part B of DMRE 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	Note that this is available in the amended EMPR.
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	Note that this is available in the amended EMPR.

EMPR report requirement as per the DMRE template	EMPR report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
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	Note that this is available in the amended EMPR.
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	Note that this is available in the amended EMPR.
The determination of closure objectives		Note that this is available in the amended EMPR.
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	-	Note that this is available in the amended EMPR.
Potential acid mine drainage	-	Note that this is available in the amended EMPR.
Steps taken to investigate, assess and evaluate the impact of acid mine drainage	-	Note that this is available in the amended EMPR.
Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage	-	Note that this is available in the amended EMPR.
Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage	-	Note that this is available in the amended EMPR.
Volumes and rate of water use required for the mining	-	Note that this is available in the amended EMPR.
Has a water use licence (WUL) been applied for?	-	Note that this is available in the amended EMPR.
Impacts to be mitigated in the respective phases	-	Note that this is available in the amended EMPR.
Impact management outcomes	A description and identification of impact management outcomes required for the aspects contemplated in paragraph	Note that this is available in the amended EMPR.

EMPR report requirement as per the DMRE template	EMPR report requirements as per the 2014 NEMA regulations (as amended)	Reference in the report
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	Note that this is available in the amended EMPR.
Financial provision		Section 25
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 26
	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, considering 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 the work; and risks must be dealt with in order to avoid pollution or the degradation of the environment	Section 27
Specific information required by the competent authority	Any specific information that may be required by the competent authority	Section 28
Undertaking	-	Section 29

1.7 OPPORTUNITY TO COMMENT

This EIA Report (EIAR) is available for a 30-day comment period from **22nd November 2021 to 6th January 2022** in order to provide I&APs with an opportunity to comment on any aspect of the project and the findings of the S&EIA process to date. Copies of the full report are available on the SLR website (at https://slrconsulting.com/public-documents) and the SLR data free website (at https://slrpublicdocs.datafree.co/public-documents). Electronic copies (compact disk) of the report are available from SLR, at the contact details provided below.

All comments received during the review process will be included in final EIAR.

SLR Consulting (South Africa) (Pty) Ltd
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PO Box 1596, Cramerview 2060 (if using post please call SLR to notify us of your submission)
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By providing your personal information to be registered as an I&AP for this project you consent to SLR managing your information in accordance with the Protection of Personal Information Act 4 of 2013. This includes; (1) retaining and using your Personal Information as part of a contact database for this and/or other ESIAs, (2) contacting you regarding this and/or other ESIA processes, (3) disclosing the database to other authorised parties for lawful purposes, (4) processing it for lawful purposes, and (5) including correspondence in ESIA Reports. You may request for your Personal Information to be deleted from the Project database or comments to be excluded from ESIA Reports at any time by contacting SLR.

PART A - SCOPE OF ASSESSMENT

2. DETAILS OF THE EAP

2.1 DETAILS OF THE DETAILS OF THE EAP WHO PREPARED THE REPORT

The details of the EAP project team that were involved in the preparation of this EIAR and EMPR are provided in Table 2-1 below.

TABLE 2-1: DETAILS OF THE EAP

General		
Organisation	SLR Consulting (South Africa) (Pty) Ltd	
Postal address	PO Box 1596, Cramerview, 2060	
Tel No.	(011) 467 0945	
-	**Role**	**Email**
Rob Hounsome	Reviewer – Process review, quality control	rhounsome@slrconsulting.com
Natasha Smyth	EAP and Project Manager – Management of process, specialist review, public participation process and report compilation	nsmyth@slrconsulting.com
Sharon Meyer	Report Author – Report compilation	smeyer@slrconsulting.com

SLR has no vested interest in the proposed project other than contractually agreed payment for consulting services rendered as part of the EIA process. An undertaking by SLR declaring its independence, as required by the EIA Regulations (GNR 982 of 2014), as amended, is provided in Section 20.

2.2 EXPERTISE OF THE EAP

Rob Hounsome, the Reviewer, holds an MSc. in Environmental Chemistry. Rob has undertaken more than 200 Environmental and Social Impact Assessments (ESIA) and Environmental and Social Due Diligence (ESDD) services in nearly 40 countries for the past 25 years in accordance with requirements of national governments, industry associations, and various funding agencies including all the major International Finance Institutes, Equator Principal Banks, and/or legal firms, including both Due Diligence Assessments for project financing and advisory on Lender expectations (and associated project financing negotiations).

Natasha Smyth, the Project Manager has a BSc Hons in Environmental Science and Development. Natasha has over 10 years of experience within the Minerals sector, both as a project manager and assistant to various projects in South Africa and Africa. Natasha has managed and assisted in a wide range of Environmental Impact Assessment projects for major and small-scale minerals developments throughout South Africa as well as in Namibia for many of the major operators within the minerals industry.

Curriculum vitae of the project team are attached in Appendix A.

3. LOCATION OF THE ACTIVITY

3.1 LOCATION OF THE OVERALL ACTIVITY

A description of the property on which the project activities are located is provided in Table 3-1.

TABLE 3-1: DESCRIPTION OF THE PROPERTY

Description	Detail	
Farm name	**Project component**	**Relevant farm and portion**
	Expansion of the north and south-eastern WRDs.	Portion 5 of the farm Goold 329.
	Changes to rehabilitation criteria for WRDs.	• Portion 5 of the farm Goold 329 (North, central and southeast waste rock dumps); • Remaining extent of the farm Sinterfontein 748 (Sinterfontein waste rock dump); • Portion 2 of the farm Mamatwan 331 (South waste rock dump); and • Portion 4 of the farm Adams 328 (Rehabilitated waste rock dump).
	Expansion of product stockyard.	• Remaining Extent of the farm Sinterfontein 748.
	Establishment of potable and process water facilities.	• Portion 5 of the farm Goold 329 (Aqua tanks); and • Remaining Extent of the farm Sinterfontein 748.
	Expansion of existing road.	• Portion 9 of the farm Goold 329.
	Establishment of a top-cut stockpile and associated crushing and screening facilities.	• Portions 5 and 9 of the farm Goold 329; and • Portion 4 of the farm Adams 328.
	Establishment of stormwater management infrastructure.	• Portions 5 and 9 of the farm Goold 329; • Remaining Extent of the farm Sinterfontein 748; and • Portion 4 of the farm Adams 328. • (The proposed stormwater management plan is being finalised, however likely farms on which proposed infrastructure may be located is listed above.)
	Changes to all WRD heights (excluding rehabilitated WRD).	• Portion 5 of the farm Goold 329 (North, central and southeast waste rock dumps); • Remaining extent of the farm Sinterfontein 748 (Sinterfontein waste rock dump); and

Description	Detail	
		• Portion 2 of the farm Mamatwan 331 (South waste rock dump).
	Establishment of a pipeline to transport abstracted water from the decommissioned Middelplaats Mine to MMT.	• Portion 3 of Middelplaats 332 (Decommissioned Middelplaats Mine and proposed boreholes); • Remaining extent and portions 8 and 20 of the farm Mamatwan 331; and • Portion 3 of the farm Moab 700.
	Upgrading the railway loadout station.	• Remaining extent of the farm Sinterfontein 748.
	Sale of waste rock as aggregate (excludes rehabilitated WRD).	• Portion 5 of the farm Goold 329; • Remaining extent of the farm Sinterfontein 748; and • Portion 2 of the farm Mamatwan 331.
	Re-processing of material located in Adam's pit.	Portion 4 of the farm Adams 328.
Application area (ha)	Collectively approximately 70 ha will be disturbed as part of the project.	
Magisterial district	Kuruman Magisterial District	
Distance and direction from nearest town	The proposed project site is located approximately 25 km south of Hotazel (Refer to Figure 3-1).	
21-digit Surveyor General code for each farm portion	• C04100000000032900005 • C04100000000032900009 • C04100000000032800004 • C04100000000033200003 • C04100000000033200000 • C04100000000033100000 • C04100000000033100008 • C04100000000033100020 • C04100000000070000000 • C04100000000036700001 • C04100000000033100017 • C04100000000074800000	

3.2 LOCALITY MAP

The regional and local settings of the MMT are illustrated in Figure 3-1 and Figure 3-2, respectively. The location and layout of the project components are illustrated in Figures 4-1 to 4-10 in Section 4.

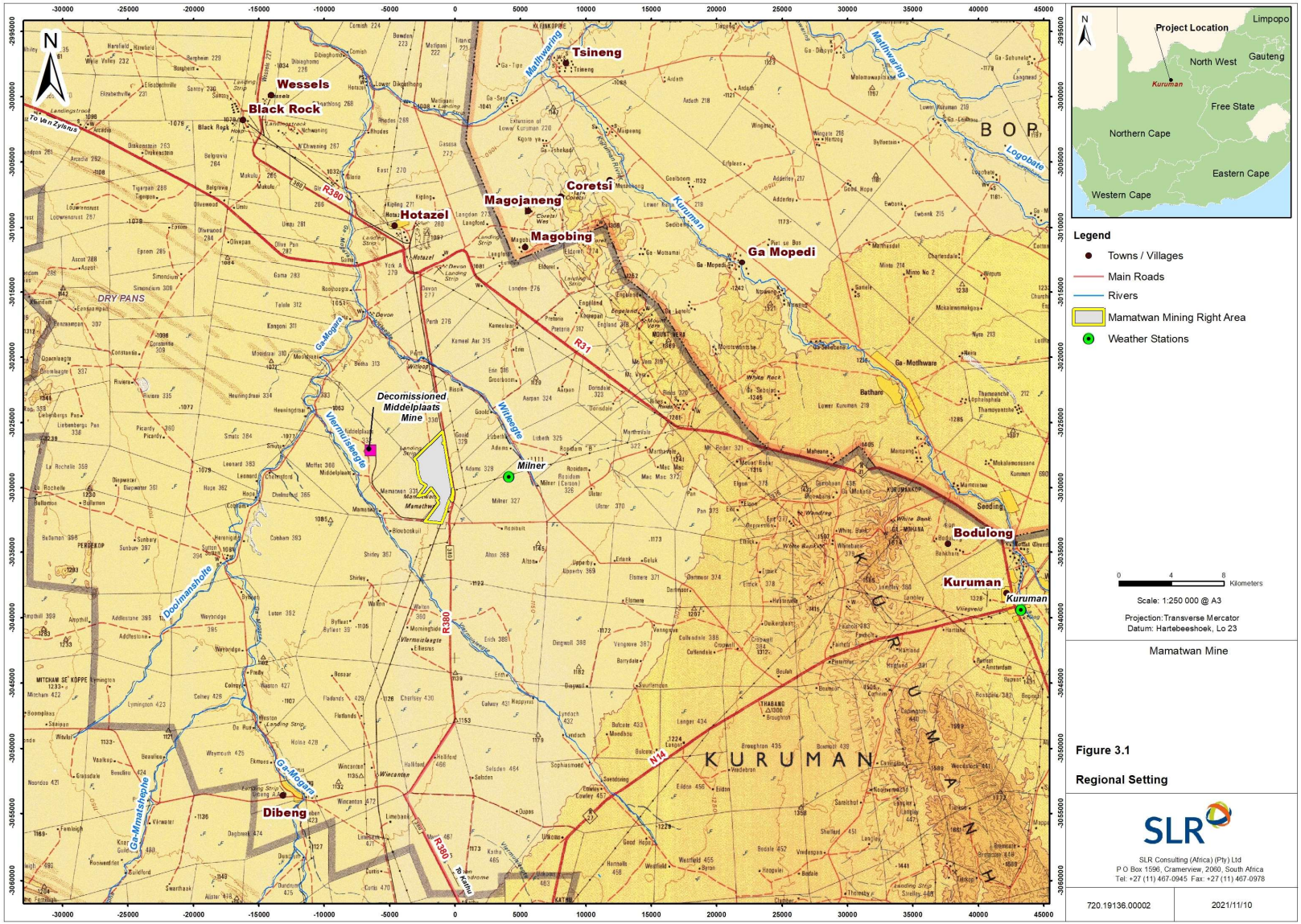


FIGURE 3-1: REGIONAL SETTING OF MAMATWAN MINE

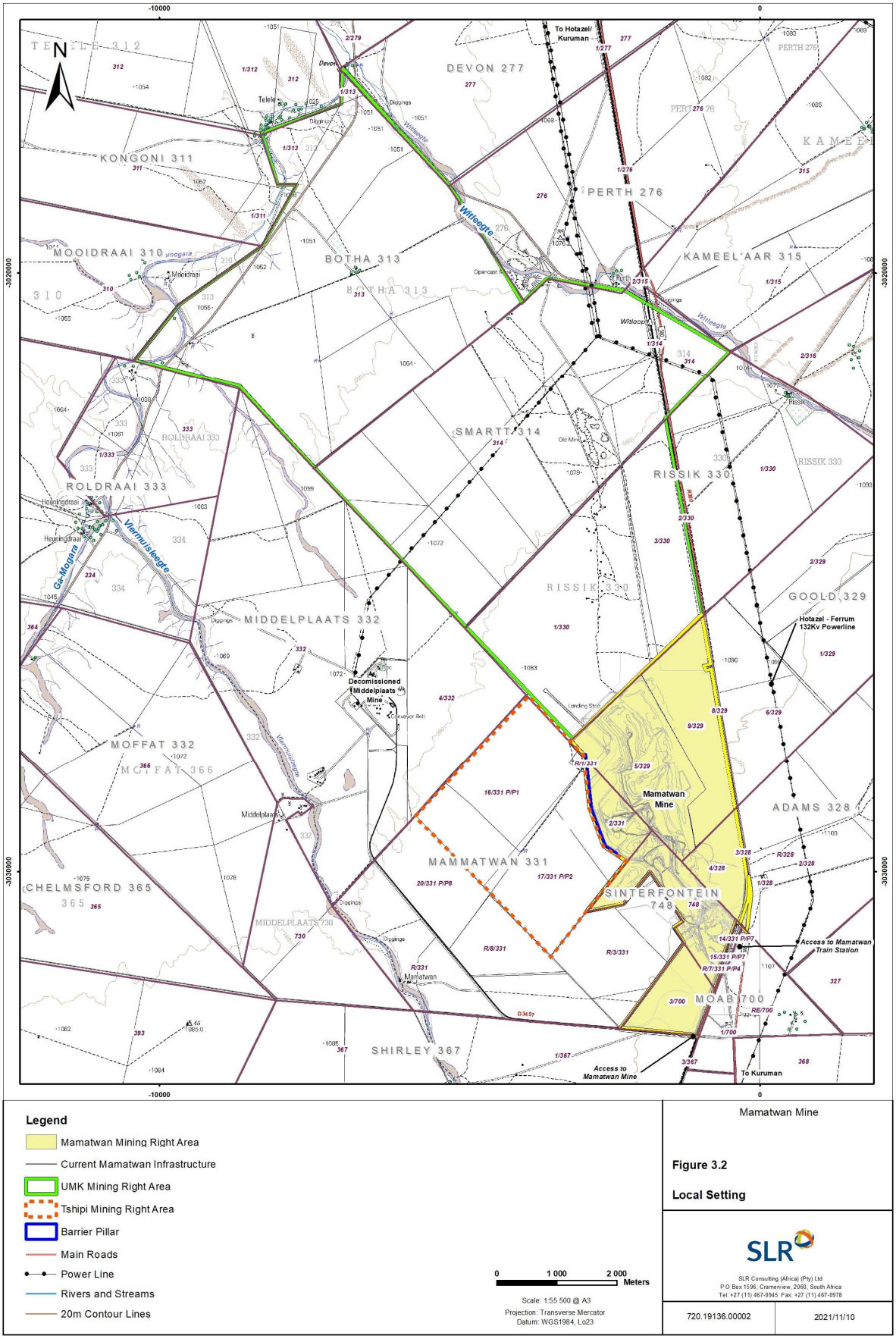


FIGURE 3-2: LOCAL SETTING OF MAMATWAN MINE

4. DESCRIPTION OF THE SCOPE OF THE ACTIVITY

Information in the following section was sourced from the approved 2005 EIA and EMPR (JAWS, 2005), the approved Basic Assessment Report for the merging of the Mamatwan Sinterfontein WRD and Tshipi Eastern WRD (SLR, 2020) and the MMT project team for the current application. A site layout showing the location of existing and proposed project activities / components is illustrated in
Figure **4-1**.

4.1 LISTED AND SPECIFIED ACTIVITIES

The proposed project triggers various activities for which authorisation is required in terms of the NEMA, NEM: WA and NWA. The associated listed or specified activities are summarised below.

4.1.1 NEMA and the EIA Regulations

The EIA Regulations (GN R 982 of 2014) as amended promulgated in terms of Chapter 5 of NEMA provides for control over certain Listed Activities. These Listed Activities are detailed in Listing Notice 1 (GN R 983 of 2014, as amended) and Listing Notice 2 (GN R 984 of 2014, as amended) as well as Listing Notice 3 (GN R 985 of 2014, as amended). The undertaking of activities specified in the Listing Notices is prohibited until EA has been obtained from the competent authority. Such EA, which may be granted subject to conditions, will only be considered once there has been compliance with the EIA Regulations (GN R 982 of 2014) as amended. Where a development triggers activities listed in Listing Notice 1 and 3, a Basic Assessment process must be applied for the application. Where a development triggers activities listed in Listing Notice 2, a S&EIA process must be applied for the application. As the proposed project would trigger activities specified in Listing Notices 1 and 2, a S&EIA process has to be conducted.

It should be noted that the project scope of work has been revised and defined during the EIA phase. The main project components identified as listed activities in terms of NEMA and the EIA Regulations (GNR 982 of 2014), as amended, are included in Table 4-1 below. This integrated EIA also includes activities that have already taken place at MMT. These activities do not trigger any Listed Activities but are included for completeness purposes.

In addition to the activities which have already taken place and those proposed, MMT also wishes to include administrative changes to the approved EMPR commitments. This will entail the removal of commitments which are no longer relevant to the MMT operations. In this regard, the EMPR provided as part of this process has been consolidated with existing commitments, as well as those recommendations concerned with the specific project components. Further detail regarding the management actions is provided in section 10.4.

TABLE 4-1: PROJECT ACTIVITIES AND ASSOCIATED LISTED ACTIVITIES

Description of the project activity	Aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
Proposed layout/activity changes		
Establishment of a top-cut stockpile and associated mobile crushing and screening plant.	34 ha	**NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, Activity 15:** The clearance of an area of 20 ha or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for: (i) The undertaking of a linear activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan. **RELEVANCE**: The clearance of 34 ha of land for the establishment of the topsoil stockpile is above the 20 ha threshold, therefore triggering this activity.
		NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent. **RELEVANCE**: Product stockpiles require a WUL in terms of the NWA. It follows that the existing IWUL, will need to be amended to cater for the top-cut stockpile.
Establishment of stormwater management infrastructure –PCD and evaporation channels	Estimated capacity exceeding 50 000 m^3 covering an area of more than 1 ha.	**NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, 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 m^3 or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014. **RELEVANCE**: Based on preliminary design it is envisaged that a PCD will be required which will exceed a combined capacity of50 000 m^3.
		NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, Activity 27: The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation, except where such clearance of indigenous vegetation is required for: (i) The undertaking of a linear activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan. **RELEVANCE**: The proposed pollution control dam may be established in areas that will require the clearance of more than 1 ha of indigenous vegetation but less than 20 ha.
		NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, Activity 16: The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 m or higher or where the highwater mark of the dam covers an area of 10 ha or more. **RELEVANCE**: Based on preliminary design it is likely that one of the proposed PCDs may by 5 m deep.
		NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent.

Description of the project activity	Aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
		RELEVANCE: The PCD requires a WUL in terms of the NWA. It follows that the existing IWUL will need to be amended to cater for the proposed PCDs if they are required.
Establishment of stormwater management infrastructure – Proposed pumping system to transfer process water from the PCD to the plant for re-use. (May be required depending on the outcome of detailed design work and alternatives assessment)*.	More than 1 000 m in length.	**NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, Activity 10:** The development and related operation of infrastructure exceeding 1 000 m in length for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes: (i) With an internal diameter of 0,36 m or more; or (ii) With a peak throughput of 120 l/s or more; excluding where: (a) Such infrastructure is for the bulk transportation of sewage, effluent, process water, wastewater, return water, industrial discharge or slimes inside a road reserve or railway line reserve; or (b) Where such development will occur within an urban area. **RELEVANCE**: Based on preliminary designs a pumping system to transfer water from the PCDs to the plant for re-use may be required. In this regard, it is envisaged that pipelines exceeding 1 000 m in length with an internal diameter of 0.36 m or more may be required.
Changes to WRD height (excludes rehabilitated WRDs).	Not applicable.	**NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018**: **Listing Notice 1, Activity 34:** The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding - (i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day. **RELEVANCE**: The change in the height of the WRDs will increase the volume of the existing dumps and as such the IWUL will need to be amended.
Establishment of a pipeline to transport abstracted water from the decommissioned Middelplaats Mine to MMT.	Approximately 4 km in length.	**NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, Activity 9:** The development of infrastructure exceeding 1 000 m in length for the bulk transportation of water or stormwater: (i) With an internal diameter of 0,36 m or more; or (ii) With a peak throughput of 120 l/s or more. excluding where: (a) Such infrastructure is for bulk transportation of water or stormwater or stormwater drainage inside a road reserve or railway line reserve; or (b) Where such development will occur within an urban area.

Description of the project activity	Aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
		RELEVANCE: A pipeline of 10 inches (0.26 m) in diameter, with a maximum pumping capacity in excess of 120 l/s exceeding 1 000 m in length will be required.
Upgrading the railway loadout station.	Approximately 5.6 ha for non-linear activities including the contractors' offices and parking, and future stockpile area.	**NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 1, Activity 27:** The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for: (i) The undertaking of a linear activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan. **RELEVANCE**: The clearance of 5.6 ha of land for the establishment of the future stockpile area and contractors' areas is above the 1 ha threshold, therefore triggering this activity.
Sale of waste rock as aggregate.	Not applicable.	**NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, 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 winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies. **RELEVANCE**: The sale of waste rock as aggregate may require crushing and screening prior to sale to third parties.
Re-processing of material located in Adams Pit.	14 ha	**NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, 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 winning, extraction, classifying, concentrating, crushing, screening or washing; but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies. **RELEVANCE**: The re-processing of material in Adams Pit requires the use of screening and is therefore considered a primary process.
Layout/activity changes that have already taken place		
Expansion of the north and south-eastern WRDs.	10 ha	HMM is committed to undertake rehabilitation concurrent with mining operations as per the approved 2005 EMPR. As part of rehabilitation the northeastern WRD and the southeastern WRD footprints were extended. The extension does not increase the capacity of the WRDs. It follows that the expansion falls within the ambit of the approved EMPR and does not trigger Listed Activities in terms of NEMA.
Changes to the rehabilitation criteria of WRDs.	Not applicable.	Changes to the rehabilitation criteria will be included in the updated EMPR, but do not trigger Listed Activities in terms of NEMA.
Expansion of the product stockyard.	13 ha	The product stockyard is catered for in the approved 2005 EMPR. The expansion takes place within the overall existing plant area and as such does not trigger Listed Activities in terms of NEMA.

Description of the project activity	Aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
Establishment of potable and process water storage facilities.	0.66 ha (total area) Capacities: Process water tank: 564 m^3 Catchment tank: 300 m^3 Overflow tank: 300 m^3 Aqua tanks: 5 000 m^3 Potable water tank: 164 m^3	Potable and process water facilities are generally approved in the approved EMPR. Updating the EMPR to provide specific information pertaining to the number of facilities, location and capacities does not trigger Listed Activities in terms of NEMA.
Expansion of an existing road.	Widened by 4 to 5 m.	The expansion of the existing road located to the east of the open pit is below NEMA Listed Activity thresholds and as such does not trigger Listed Activities in terms of NEMA.

4.1.2 NEM: WA

Waste management activities that have, or are likely to have, a detrimental effect on the environment are listed in GNR 921 (as amended). Activities above certain thresholds are subject to a process of impact assessment and licensing. NEM: WA also provides for the setting of norms and standards for the storage and disposal of waste. Where a development triggers activities listed in Category A, a Basic Assessment process must be applied for. Where a development triggers activities listed in Category B, a S&EIA process must be applied for the application. As the proposed project would trigger activities specified in Category A and B, a S&EIA process has to be conducted. The waste management activities in Category A and Category B triggered by the proposed project are shown in Table 4-2.

TABLE 4-2: WASTE MANAGEMENT ACTIVITIES IN TERMS OF THE NEM: WA

Description of project activity	Aerial extent of the activity (ha)	Listed activity number, applicable listing notice and activity description
Changes to WRD height (excludes rehabilitated WRDs).	Not applicable.	**NEM: WA (GNR 921 of 2013) as amended by GNR.332 of 2014 (G.G. 37604 of 02/05/2014), GNR.633 of 2015 (G.G. 39020 of 24/07/2015) and GNR.1094 of 2017 (G.G. 41175 of 11/10/2017): Category A, Activity 13:** The expansion of a waste management activity listed in Category A or B of this Schedule which does not trigger an additional waste management activity in terms of this Schedule. **RELEVANCE:** The definition of 'expansion' includes modifications or alterations which result in increases to the capacity of a facility. Increasing the height of the WRDs above what is provided for in the approved 2005 EMPR will provide for greater capacity.
Sale of waste rock as aggregate.	Not applicable.	**NEM: WA (GNR 921 of 2013) as amended by GNR.332 of 2014 (G.G. 37604 of 02/05/2014), GNR.633 of 2015 (G.G. 39020 of 24/07/2015) and GNR.1094 of 2017 (G.G. 41175 of 11/10/2017): Category B, Activity 11:** The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the MPRDA. **RELEVANCE:** The sale of waste rock as aggregate is considered to be reclamation of a residue stockpile.

4.1.3 NWA

A WUL is required for any new water use that is not listed in Schedule 1 of NWA or that is not covered by a General Authorisation. The proposed project triggers a water use activity listed in Section 21 of the NWA. The MMT holds an IWUL (License number: 10/D41K/KAGJ/1537) issued by DWS in January 2012 and associated amendment issued in October 2017 and October 2020. As part of the proposed project the existing IWUL will need to be updated to cater for the following changes:

- Updating approved water uses to primarily cater for capacity and terminology changes that have taken place since the licence was issued;

- Applying for water uses currently undertaken at the MMT that are currently not included in the existing IWUL; and
- Applying for proposed new water uses as part of future planned projects.

Table 4-3 provides an overview of the IWUL amendment process which will be undertaken due to the proposed project activities; However, it is important to note that this is being handled as part of a separate process with the DWS.

TABLE 4-3: LISTED WATER USE ACTIVITIES IN TERMS OF THE NWA

Description of project activity	Aerial extent of the activity (ha)	Water use number and description
Changes to WRD heights (excludes rehabilitated WRDs).	North WRD Central WRD Southeast WRD Sinterfontein WRD	**Section 21 g:** The current capacities of the WRDs will need to be amended to cater for the increase in height.
Establishment of stormwater management infrastructure – Proposed PCD and evaporation channels	To be finalised with the detailed design of the PCD. The extent is anticipated to be greater than 10 000 m^2	**Section 21 g:** Based on preliminary design it is envisaged that a PCD will be required and will exceed 50 000 m^3.
Establishment of a top-cut stockpile and associated crushing and screening plant.	34 ha	**Section 21 g:** A topcut stockpile will be utilised to store low grade topcut material. This material will be crushed and sold to prospective buyers as aggregate.
Abstraction of Water from Middelplaats underground mine works.	N/A	**Section 21 a:** Water abstraction to supplement make-up water. MMT license allows for 164 m^3/day. Abstraction from Middelplaats will accommodate any additional water supply requirements.
Re-processing of material located in Adams Pit.	14 ha	**Section 21 g:** The re-processing of material in has the potential to contaminate water resources.
Establishment of potable and process water storage facilities.	0.66 ha (total area) Capacities: Process water tank: 564 m^3 Catchment tank: 300 m^3 Overflow tank: 300 m^3 Aqua tanks: 5 000 m^3 Potable water tank: 164 m^3	**Section 21 b and Section 21 g:** Storage of potable water and water containing waste.

4.2 DESCRIPTION OF THE PROPOSED ACTIVITIES

See Table 4-10 on page 47 for a summary of the proposed activities. The subsections below provide some detail around the existing operations and the proposed activities as applied for through this environmental authorisation process.

4.2.1 Overview of Existing Operations

The MMT is an approved open cast mine which commenced operations in 1963. The mining operations target local manganese orebodies. The current Run of Mine (RoM) for MMT is in the order of 3 million tons per annum (TPA). MMT has an estimated remaining life of mine (LOM) of 17 years. A description of approved open cast and mineral processing activities is provided in Table 4-4 and Table 4-5, respectively. A layout map detailing the approved layout is provided in
Figure **4-1** and a process flow diagram is provided in Figure 4-3.

4.2.1.1Surface Infrastructure

An overview of infrastructure currently located at the MMT is illustrated in

Figure 4-1 and includes the following:

- Open pit and Adams open pit;
- WRDs (North WRD, Central WRD, Southeast WRD, South WRD, Sinterfontein WRD, Dense Medium Separator (DMS) discard dump and rehabilitated WRDs)
- Processing infrastructure comprising:
  - Crushing and screening (in-pit crusher, Kawasaki crushers, ROM cone crusher);
  - DMS plant;
  - Sinter plant;
  - Coke; and
  - Ore processing plant.
- Stockpiles including:
  - Topsoil stockpiles; and
  - Product stockpile area.
- Tailings dam (rehabilitated);
- Transport infrastructure (conveyors, haul roads, loadout station and weighbridge, railway siding);
- Sewage treatment plant;
- Water storage (water tanks, water reservoirs and pump house);
- Waste management areas (general and hazardous waste yard);
- Soil remediation facility;
- Diesel refuelling and storage facilities (fuel bay);
- Washbays and tyre bay;
- Explosive magazine; and
- Support infrastructure including:
  - Substation and MMC (loadout station, in-pit crusher, sinter plant, ore processing plant, ROM)
  - Office buildings, ore processing plant office, main office, sinter offices, tearoom, clinic, walkways, stores, laboratory, change house and parking areas (north pit parking and parking);
  - Workshops, Barloworld workshop, sinter workshops, Ore processing plant workshop; and
  - Main gate with security and access control.

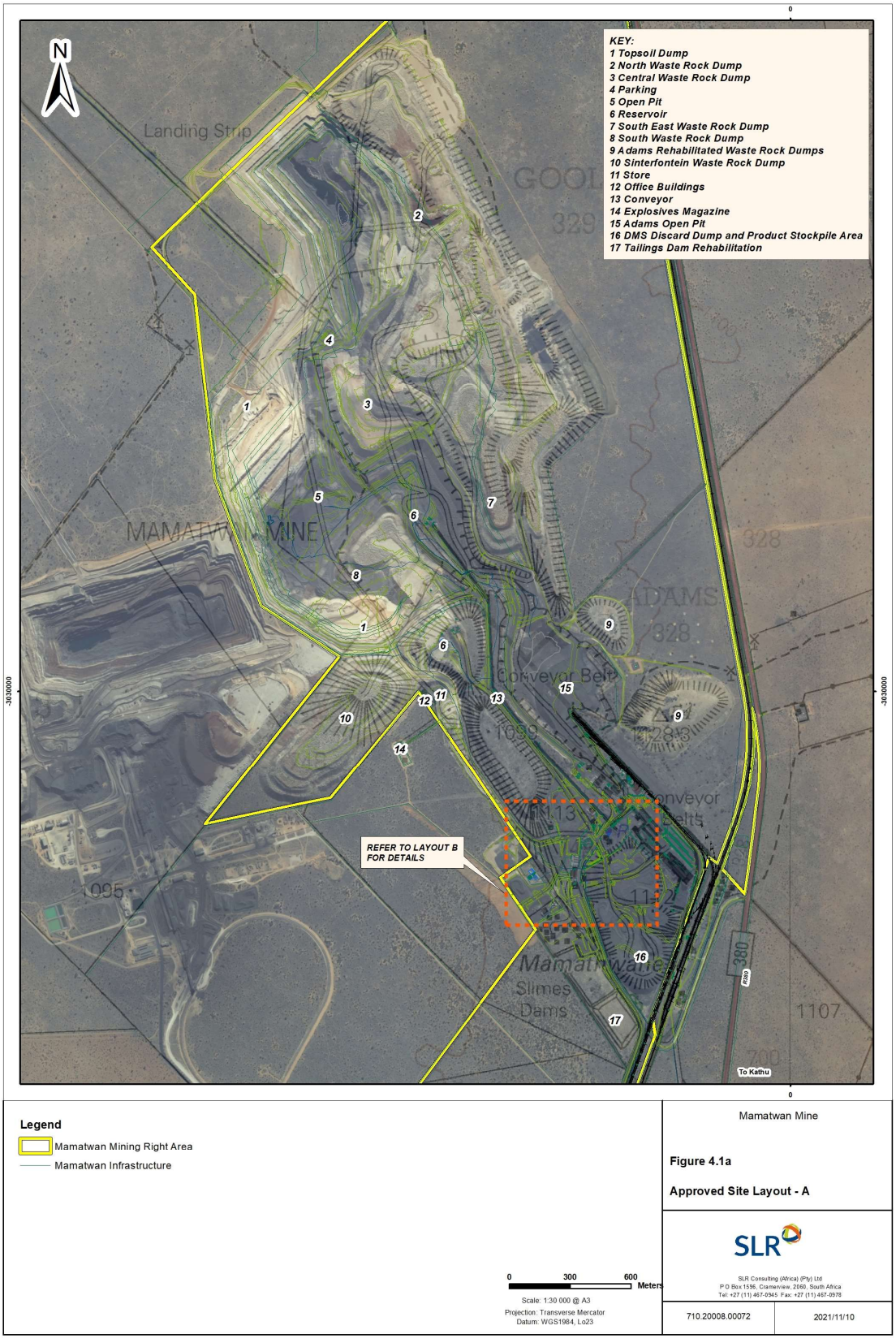


FIGURE 4-1A: APPROVED SITE LAYOUT OF MAMATWAN MANGANESE MINE

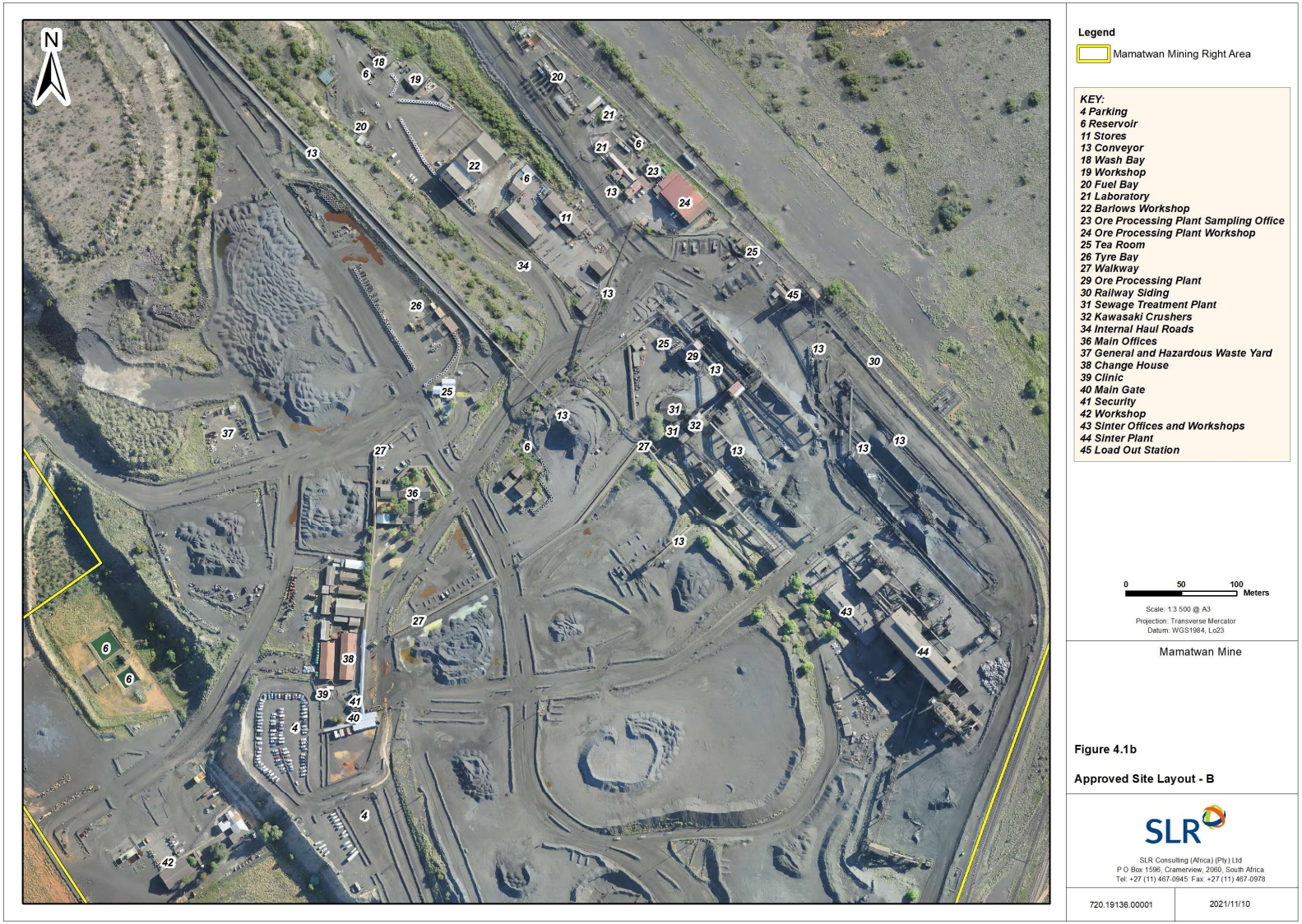


FIGURE 4-2B: APPROVED SITE LAYOUT OF MAMATWAN MANGANESE MINE

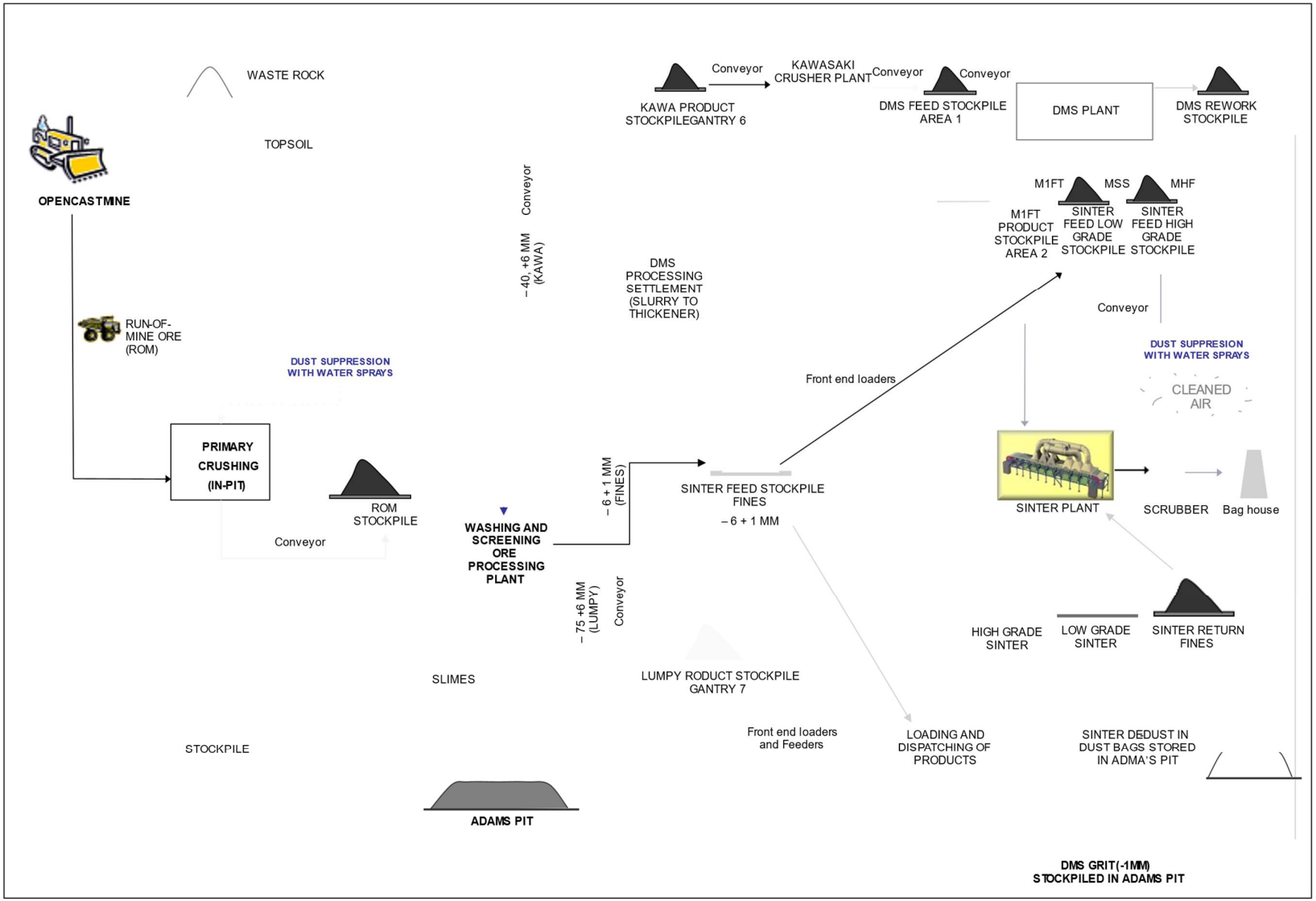


FIGURE 4-3: PROCESS FLOW DIAGRAM OF MAMATWAN MANGANESE MINE OPERATIONS

4.2.1.2 Open Pit Mining Method

MMT is approved for conventional opencast mining methods. Topsoil is stripped and waste rock is blasted and removed to uncover the manganese ore body. This is done using traditional truck and shovel methods. Table 4-4 provides an overview of the open cast mining methods employed at MMT.

TABLE 4-4: SUMMARY OF OPEN CAST ACTIVITIES

Activity	Description
Open Pit	Mining activities are currently being undertaken in the open pit as indicated in Figure 4-1. This pit is currently being extended to the north and west in compliance with the existing EMPR.
Mining of the barrier pillar between MMT and Tshipi Borwa Mine	MMT has received approval from the Northern Cape DMRE (Reference number: NC 30/5/1/2/3/2 (252) MR) in January 2020, to mine the barrier pillar between their operation and the Tshipi Borwa Mine. The approved barrier boundary is 18 m wide. The approved activities designate Tshipi Borwa Mine with responsibility for stripping waste, drilling and blasting the ore on behalf of both parties. Waste rock would be deposited onto each party's WRD. Ore would be loaded by each party and delivered to their respective stockpile areas.
Removal of overburden and topsoil stripping	The removal of overburden is undertaken in stages. First, soft overburden (primarily sand) is stripped and stockpiled or replaced on to backfilled spoils. The exposed rock is then drilled and blasted, generally in two cuts (for the limestone) and further cuts for the banded ironstone where this is present. When necessary, three cuts may be employed for safety reasons. Topsoil is transported via truck to designated topsoil stockpile areas for later use as part of rehabilitation.
Drilling and blasting	Ore faces are drilled at 70° to the vertical by truck mounted percussion drills, with ammonium nitrate explosives being used for blasting.
Removal of ore	Mining of the ore body is done in three cuts (top, middle and bottom) with thickness of approximately 0 – 25 m (soft overburden), 11 m (rock) and 3 - 15 m (ore), respectively. The stratigraphy of the orebody is; however, variable.
Removal of waste Rock	Waste rock is stripped and transported to one of the designated WRDs at the MMT. Waste rock is either backfilled into the open pit or used to flatten the slopes of existing dumps.
Access to opencast workings	Ore is drilled and blasted and hauled using front end loaders and shovels to the "in-pit" primary crusher, forming part of the mineral processing operations (see Table 4-5 below).

4.2.1.3Mineral Processing Method

A summary of the mining and mineral processing activities that take place at the MMT is provided in Table 4-5.

TABLE 4-5: OVERVIEW OF APPROVED MINERAL PROCESSING ACTIVITIES

Activity	Detail
In-pit crushing and screening	Ore is crushed using a "in-pit" jaw crusher to reduce the size of the ore for further downstream processes. Crushed ore is conveyed to a ROM stockpile near the mineral processing plant. Excess ore is stored and crushed as required.
Conveying, washing, and screening	Ore from the ROM stockpile is conveyed along a 2 km belt to the primary stockpile. Two parallel circuits comprising scalping screens, cone crushers and double-deck sizing screens and a horizontal dewatering screen at the Ore Processing Plant (OPP). Lumpy material (– 75 +6 mm) from the OPP is stockpiled in marked allocated lumpy product stockpile area (Gantry 7) prior to being sent to the load out station using front end loaders. The product is conveyed to railway trucks via the load out section for sale to third parties.
DMS Plant and Sintering	The natural Mamatwan ore ideally lends itself to upgrading by technologically advanced beneficiation processes. In this regard, the -40 +6 mm feed from the OPP is stockpiled (KAWA product stockpile Gantry 6) and is subjected to crushing prior to being sent to the DMS via conveyer. The DMS plant can be used to beneficiate the ore prior to sintering by recovering the upgradeable portion of the ore body. The product (low grade and high grade) from the DMS is stored on the sinter feed stockpiles prior to being subjected to the sinter plant process. Correctly graded material and sized from the DMS is stockpiled prior to be sent to the loading and dispatch. The DMS grit (low grade product), that is currently not sold is currently stored in. Plant spillages occurs within the plant area. Fines (-6+1 mm) from the OPP is stockpiled at the Fines Sinter Feed stockpile prior to being conveyed directly to the sinter plant. Some of this material is sold directly to third parties and is not sent to the sinter plant. Material that is not sent to the sinter plant from the DMS plant is stockpiled for rework. During the sintering process calcium carbonate and other impurities are driven off resulting in an increase in the grade. In this regard, the sinter plant generates a high and standard grade sinter product which is conveyed to loading and dispatching of MMT products. Fugitive dust is extracted from the process through a series of extraction ducts with the particulate matter being captured in bag houses. Dust from the baghouses is either recycled back into the sinter process or captured in

Activity	Detail
	bulk bags which is currently stored in . Off gas and particulate matter (PM) is extracted and scrubbed.
Disposal	Slimes material from the OPP is sent to Adams Pit for disposal. The DMS grit (low grade product), that is currently not sold is currently stored in Adams Pit. Dust from the baghouses is either recycled back into the sinter process or captured in bulk bags which is currently stored in Adams Pit .
Load - out station and rail	The material is conveyed to railway trucks via the load out section (refer to Figure 4-1 for the location of the approved load-out station).
Sale of product	The processing plant has been designed to generate saleable manganese ore product which meets certain grades and size specifications. Manganese ore is sold to both local and international markets. Further processing occurs by third parties involved with furnace smelting production of the ferroalloy or direct sale of manganese ore to the market.
	Prior to being sent to the load out station using front end loaders, the product is conveyed to railway trucks via the load out section for sale to third parties.

4.2.1.4 Mineralised Waste Management

Details of the waste management is discussed in the sections below. Table 4-6 provides a summary of the features of the WRDs.

TABLE 4-6: DESIGN FEATURES OF THE WRDS

Feature	Detail
Physical dimensions	<table><tr><td></td><td>East</td><td>West</td><td>North</td><td>Total</td></tr><tr><td>Area (ha)</td><td>54 (49)</td><td>215.76 (41)</td><td>94.75 (118)</td><td>364,51</td></tr><tr><td>Height (m)</td><td>80</td><td>86</td><td>86</td><td></td></tr><tr><td>Capacity (Mm^3)</td><td>24 (17)</td><td>117.15 (41)</td><td>47 (59)</td><td>188.15</td></tr><tr><td></td><td colspan="4">(values in parenthesis are those approved in 2017 EMPR)</td></tr></table>
Physical characteristics	The material comprises rock including sand, calcrete, clay and (uneconomic) banded iron. The water content is expected to be about 5%. The void ratio is approximately 0.5.
Management, transport, placement	Waste rock will be loaded into mining dump trucks and hauled to the Sinterfontein WRD where it is tipped and dozed into final position.
Diversion of clean water and containment of dirty water	Water management infrastructure such as berms around the existing WRD would be adapted as required to manage run-off from the WRD.
Topsoil stripping	Topsoil in the WRD void will be stripped and stockpiled at existing stockpile areas at the mine in accordance with existing approved soil conservation procedures. Stripping and stockpiling of topsoil is done immediately in advance

		of dumping. Topsoil will be stripped to a depth of at least 0.2 m. The first 0.15 m of topsoil should be stripped separately and not mixed with the deeper horizons.
Lining		The foundations will be designed taking cognisance of the geotechnical conditions and the base preparation will be in accordance with the required barrier system determined by a waste classification in accordance with regulations R632 and R634, promulgated in terms of NEM: WA. In this regard, the WRD will need to conform to a Class D liner specification (Rip and Re-Compact).
Side slopes		The slopes of the WRDs will include 20 m lifts with wide platforms, the benches are 30 m wide, which reduces the overall side slopes. A bench face angle of 35 degrees will be ensured.
Under drains		No under drainage has been provided. Surface runoff is directed around the WRD and dump surfaces provide positive drainage to prevent ponding and infiltration.
Access and access control		Access to the Sinterfontein WRD will be via existing haul roads within the MMT surface use area. A perimeter fence has been installed around the perimeter of the MMT preventing unauthorised access.
Dust control		During operation roads are watered using water and/or chemical solutions for dust suppression. During the post operational phase, no measures are necessary due to the rehabilitation of the WRDs. Monitoring forms part of the overall site monitoring.
Closure		The WRD should be shaped to ensure the area is free draining (i.e. no ponding of water on the top surface post closure. The WRD side slopes to be confirmed through on-going field trails. The WRD should be capped with a minimum of 300 mm soil/growth medium material. The capping thickness should be confirmed through on-going field trails. No active groundwater protection measures are envisaged during closure given the relatively low pollution potential of the residual waste rock material. In the event that water quality monitoring around any WRD indicates that the WRDs are causing pollution, additional management measures will be investigated in consultation with a qualified specialist.
Rehabilitation	Revegetation	WRD to be revegetated using a mix of indigenous grasses (i.e. dry seeding) and trees/shrubs (i.e. hand planting of seedlings). Vegetation species to be confirmed through ongoing field trials.
	Erosion control	Erosion management measures and/or mitigation measures to be confirmed through ongoing field trials.
	Maintenance and aftercare	Maintenance and aftercare period to be confirmed through ongoing field trials.
	Rehabilitation success criteria	Rehabilitation success will be determined by monitoring trends in soil nutrient levels, soil microbial levels, vegetation cover and vegetation biodiversity levels and comparing data and temporal trends in the data to numerical targets.

Safety classification of waste rock dumps

The safety classification for the approved WRDs was determined in accordance with the South African Code of Practice for Mine Residue Deposits (South African National Standards (SANS) 10286:1998) and the requirements of the MPRDA. The summarised classifications are included in Table 4-7 below.

TABLE 4-7: SAFETY CLASSIFICATION CRITERIA FOR WASTE ROCK DUMPS

Criteria No.	Criteria		Comment	Safety Classification
1	No. of Residents in Zone of Influence	0 (Low hazard)	There are no farmhouses or other structures within the zone of influence.	Low Hazard
		1 -10 (Medium hazard		
		>10 (High hazard)		
2	No. of Workers in Zone of Influence	<10 (Low hazard)	The waste rock dumps are located near the open pit and as such mine workers may be located in the zone of influence, however majority of the main activities will take place in the pit area.	Medium Hazard
		11 – 100 (Medium hazard)		
		>100 (High hazard)		
3	Value of third party property in zone of influence	0 – R 2 million (Low hazard)	No formal assessment of the value of property has been done in the zone of influence. The characteristics of the WRDs are such that catastrophic failures will be localised and no extended flow will be experienced.	Low Hazard
		R2 – R 20 million (Medium hazard)		
		>R 20 million (High hazard)		
4	Depth to underground mine workings	>200 m (Low hazard)	There are no known underground mine workings beneath the tailings dam site. Any future workings would be more than 270 m below surface.	Low Hazard
		50 – 200 m (Medium hazard)		
		<50 m (High hazard)		

4.2.1.5Non-Mineralised Waste Management

Domestic and industrial waste

Waste will be disposed of at appropriate permitted waste disposal facilities. For general waste the closest permitted site is in Kuruman. For hazardous waste, the closest permitted site is at Holfontein.

Sewage

The MMT has an established sewage system. As part of the proposed project, no mobile toilets will be on-site as existing contractors will continue to utilise existing mine facilities.

4.2.1.6 Transport System

Transport System – Site Access and Roads

The proposed project will require the establishment of a new access road from the regional R380 road. A new site entrance and security checkpoint will be built to allow access to the client and the Engineering, Procurement and construction Management (EPCM) project office and parking, the rail, civil and other contractor site office and laydown areas, and the future stockpile area (see
FIGURE 4-4). This will include two level crossings to allow vehicles to cross the proposed new rail loop.

Existing internal haul roads will be utilised. In addition to this, existing contractors will be utilised for the stockpiling of waste rock material and as such the proposed project will not result in any changes to the existing internal transport system.

Railway siding

A proposed new railway siding will be constructed immediately west of the R380 and will contain the client and EPCM project office and parking, the rail, civil and other contractor site office and laydown areas, and the future stockpile area within the contained loop area (see Figure 4-4). This is discussed further in section 4.2.3.5.

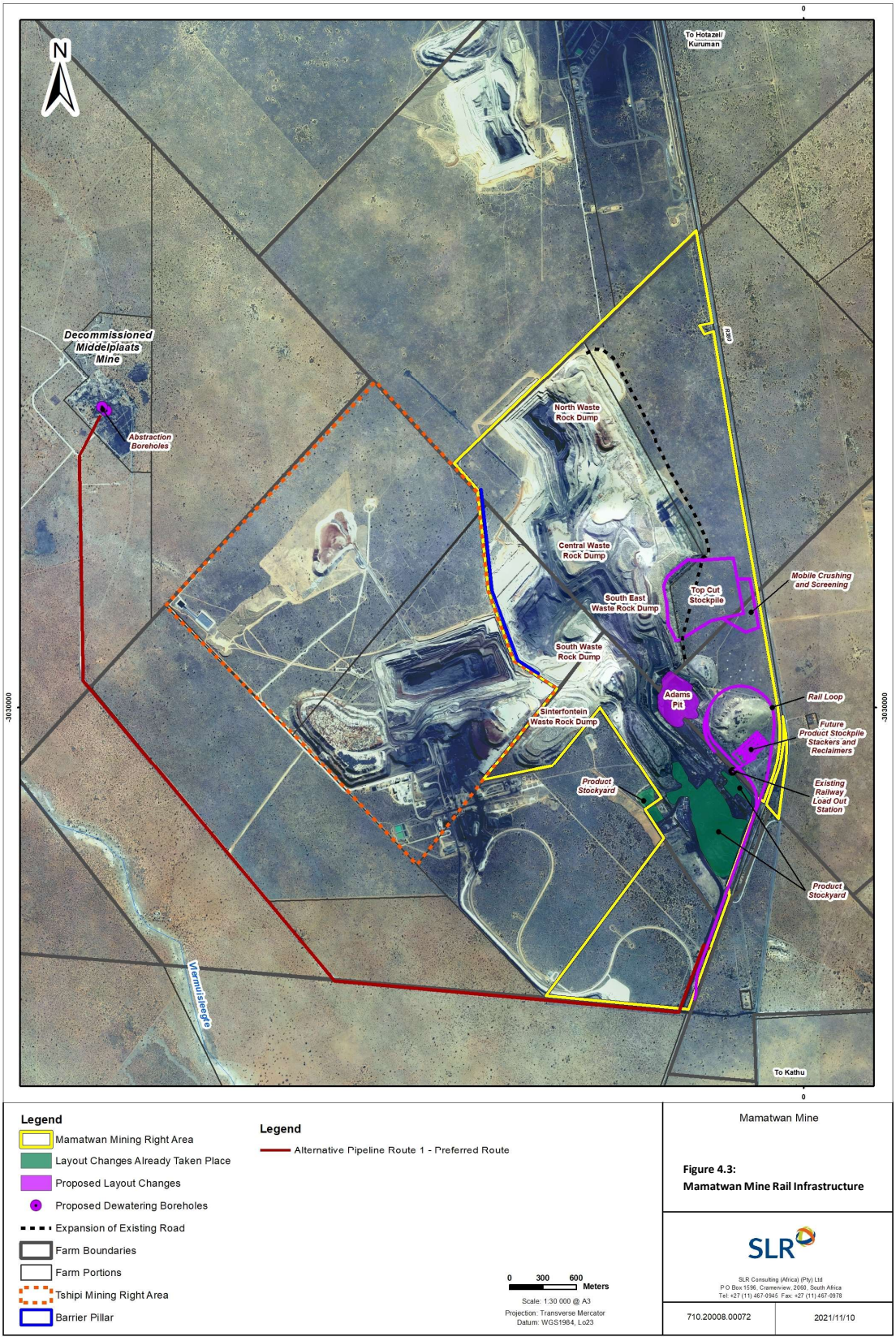


FIGURE 4-4: MAMATWAN MANGANESE MINE RAIL INFRASTRUCTURE

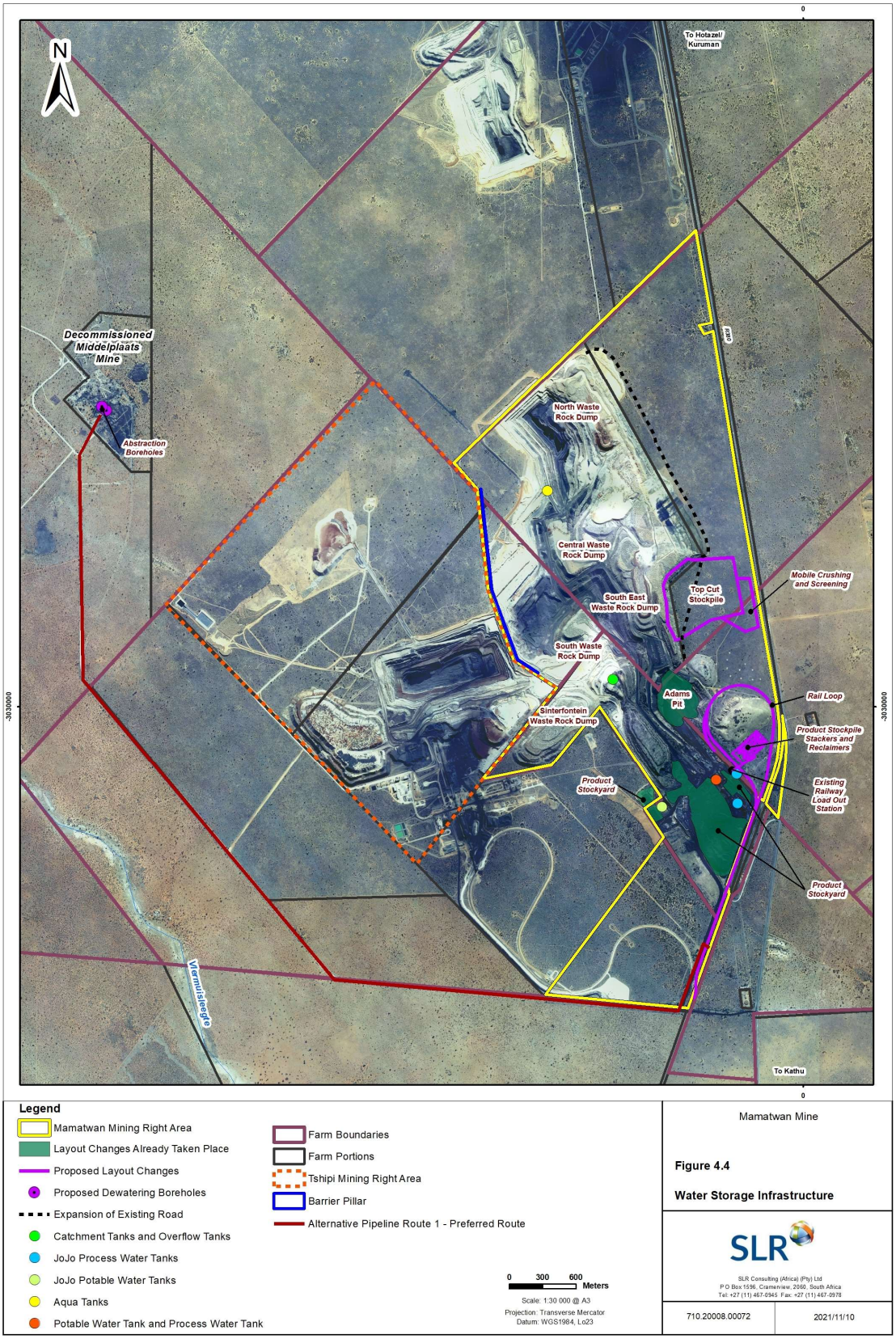


FIGURE 4-5: WATER STORAGE INFRASTRUCTURE

4.2.1.7 Water Supply and Management

Potable water

Drinking water is obtained from the Vaal Gamagara pipeline. It is anticipated that potable water use will not increase significantly and will be related only to the construction workforce on site.

Process water

Process water will be required during the operational phase for dust suppression and maintenance (e.g. cleaning). This will be sourced from the mine's existing process water supply system and will be piped to the respective areas or supplied by means of water bowsers. The proposed height increases to the existing WRDs will not require any additional potable water supply.

Water storage facilities

MMT has the following water storage facilities in place (see
FIGURE 4-5):

- Catchment tanks and overflow tanks;
- JoJo process and potable water tanks;
- Aqua Tanks; and
- Potable water tank and process water tank.

4.2.1.8 Storm Water Management

Formal stormwater infrastructure exists in the southern-central portion of the site (plant area) and this area is shown in Figure 4-6. Currently the dirty runoff generated from this portion of the site is conveyed via concrete channels, concrete pipe culverts and an unlined earthen channel to discharge into Adams Pit. It is an unlined and informal facility.

The existing storm water management system will be upgraded to allow the dirty runoff, within the mine area, to flow across the site as surface flow before discharging into lined storage facilities. Earthen cut-off channels and berms are proposed for construction towards the toe of the upstream catchment to contain and direct clean runoff away from the site.

Pollution Control Dam

A PCD is proposed as the alternative storage facility to Adams Pit . As the topography currently facilitates flow of dirty runoff from the site towards Adams Pit, the proposed position of the PCD is in the same area (see Figure 4-6). Three PCD sizing options are proposed for the PCD, which will be addressed as part of the IWUL application (e-WULAAS ref: WU21230). Details of the three PCD options are described in Table 4-8.

TABLE 4-8: SIZING OPTIONS FOR THE PCD - VOLUMES AND REQUIRED DAILY ABSTRACTION RATES

PCD (5m deep)					
Option A – 50 000 m³ Dam		Option B – 60 000 m³ Dam		Option C – 70 000 m³ Dam	
Abstraction (m³/day)	% Annual Spill	Abstraction (m³/day)	% Annual Spill	Abstraction (m³/day)	% Annual Spill
620	4.52	350	4.52	210	4.52
720	3.39	460	3.39	260	3.39
1070	2.26	590	2.26	350	2.26
2240	1.13	1320	1.13	470	1.13

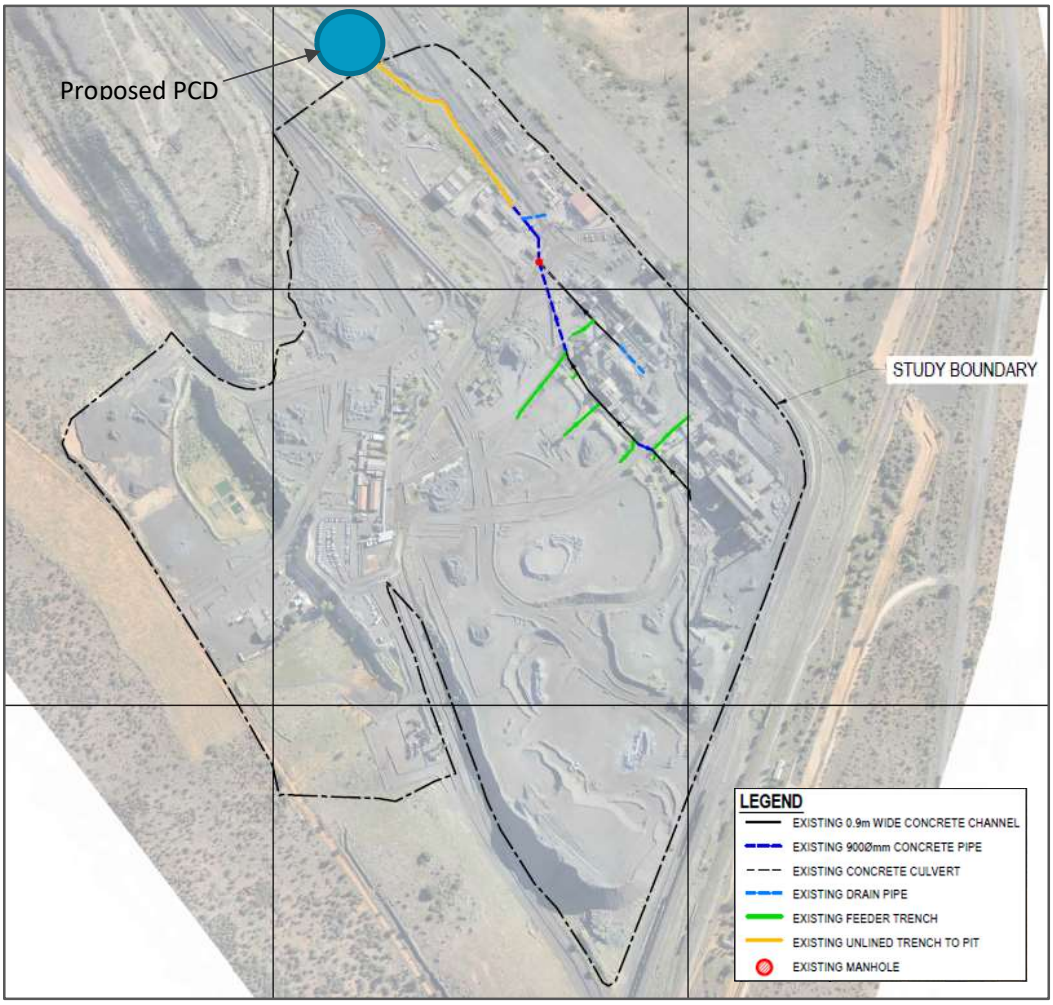


FIGURE 4-6: EXISTING STORM WATER INFRASTRUCTURE AND PROPOSED PCD LOCATION

Conveyance Infrastructure

The existing concrete infrastructure is adequately for a sized 1:50 year-(24 hour) peak flow event, however the channel that directs flow from Areas 1, 2 and 4 is unlined and will need to be lined and realigned to direct the dirty runoff into the proposed PCD (see Figure 4-7). New conveyance infrastructure will be required in Areas 3

and 5 as there is no existing infrastructure to contain the dirty runoff from these areas. Lined channels are recommended for construction around the perimeter of Areas 3 and 5 (see Figure 4-8). A wide channel/evaporation paddock structure that facilitates evaporation of this runoff, may be needed to attenuate flows from Area 3. As the expected runoff volume from Area 5 are comparatively small, dirty water that collects in the proposed lined channels are expected to evaporate.

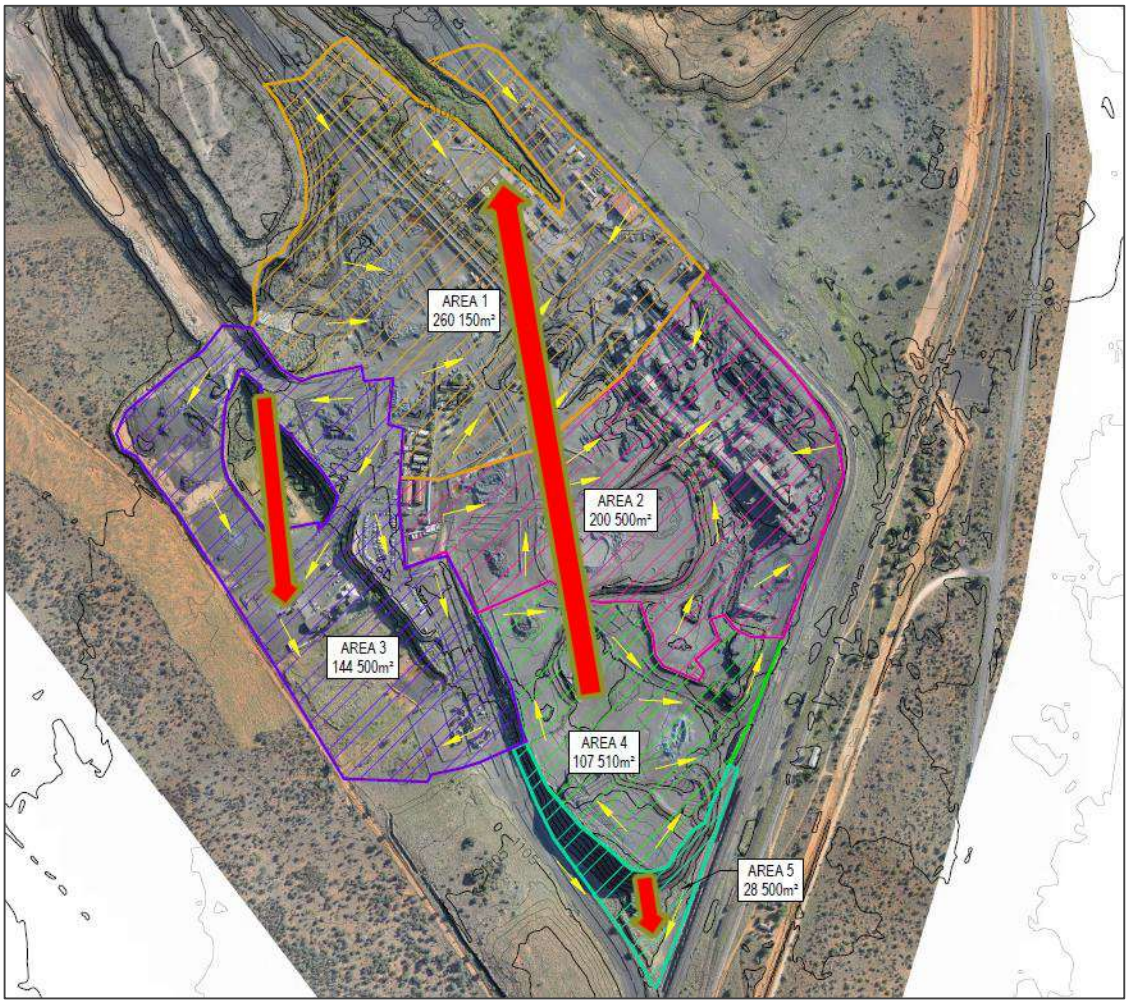


FIGURE 4-7: DIRTY CATCHMENT AREAS WITHIN THE PLANT AREA AND THE DIRECTION OF FLOW

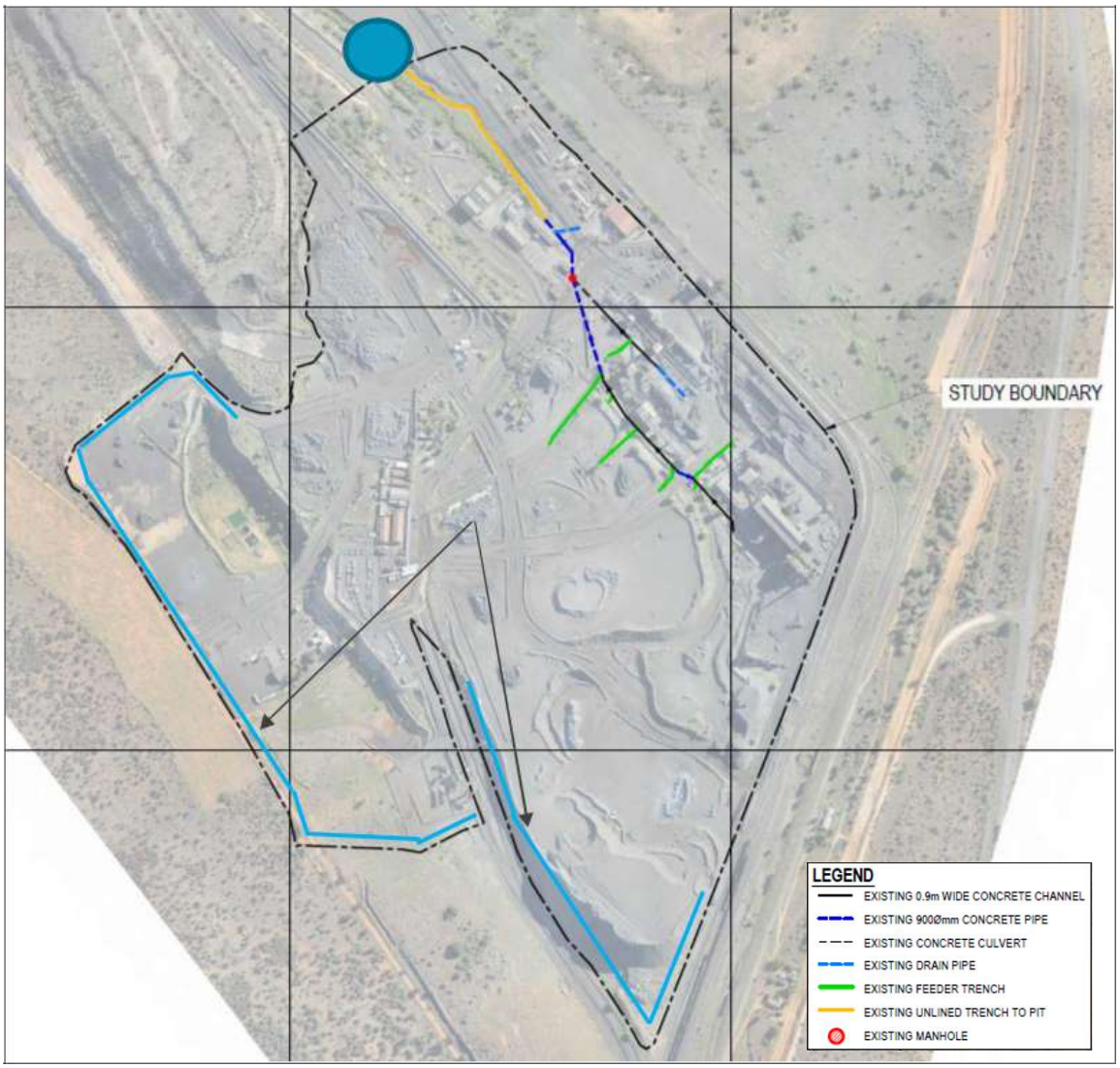


FIGURE 4-8: PROPOSED LINED CHANNELS

Earth Cut-Off Channels

The design and construction of earthen cut-off channels and berms are proposed to prevent dirty water from leaving the northern portion of the site (see Figure 4-9). A low volume of water is expected to collect in these channels and so will be allowed to evaporate. No storage facilities are deemed necessary for areas north of the plant. These channels will be constructed using a simple cut to fill operation and can be maintained regularly.

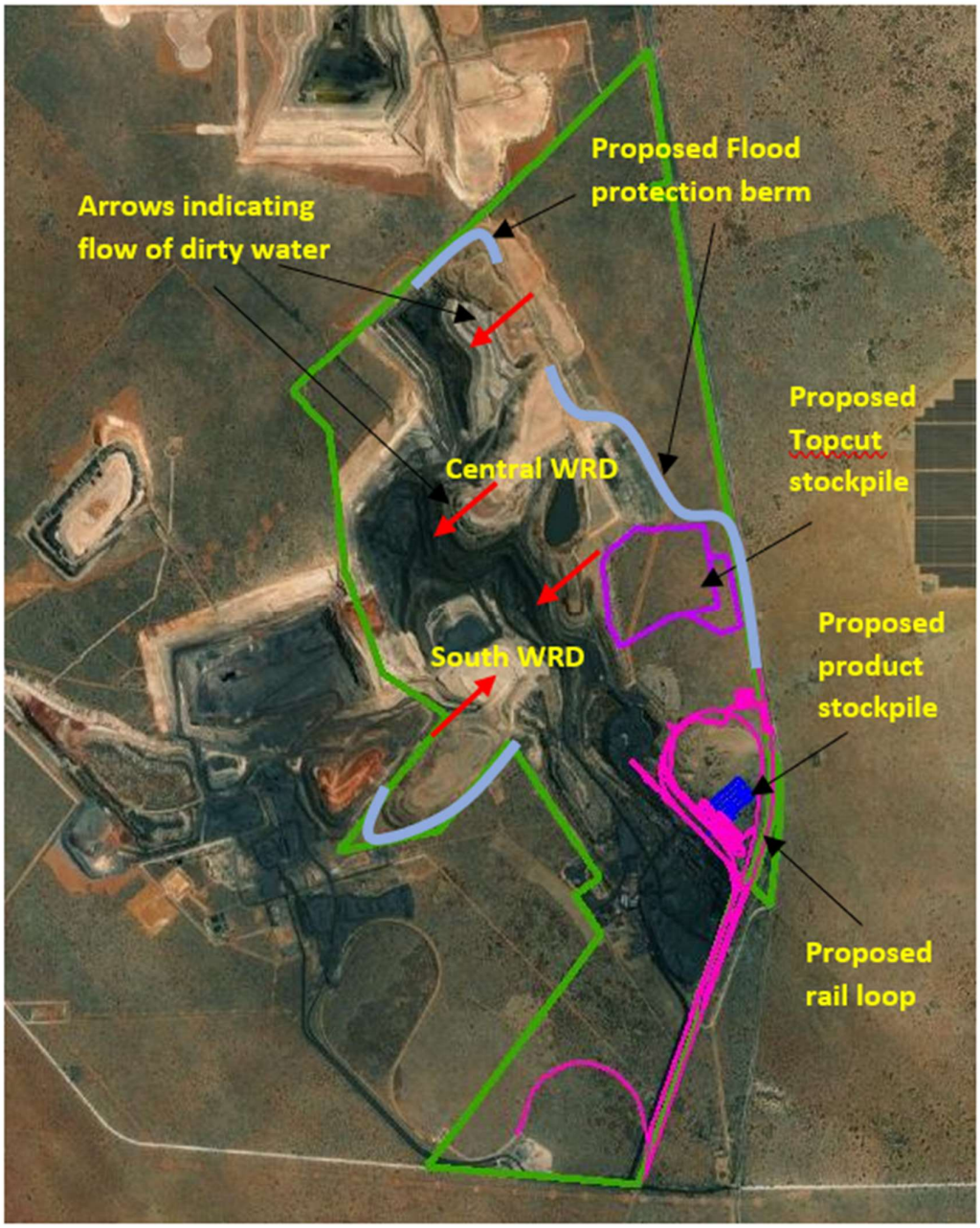


FIGURE 4-9: EXPECTED DIRECTION OF FLOW OF DIRTY WATER IN THE NORTHERN PORTION OF THE SITE

The clean water will be kept out of the dirty water catchments through the construction of berms and cut-off channels, constructed at the toe of the upstream clean catchments (see Figure 4-10). The dirty water collection channels will have a 0.8 m freeboard height, in line with the GN704 regulation. These channels and berms will be constructed using a simple cut to fill operation and can be maintained regularly.

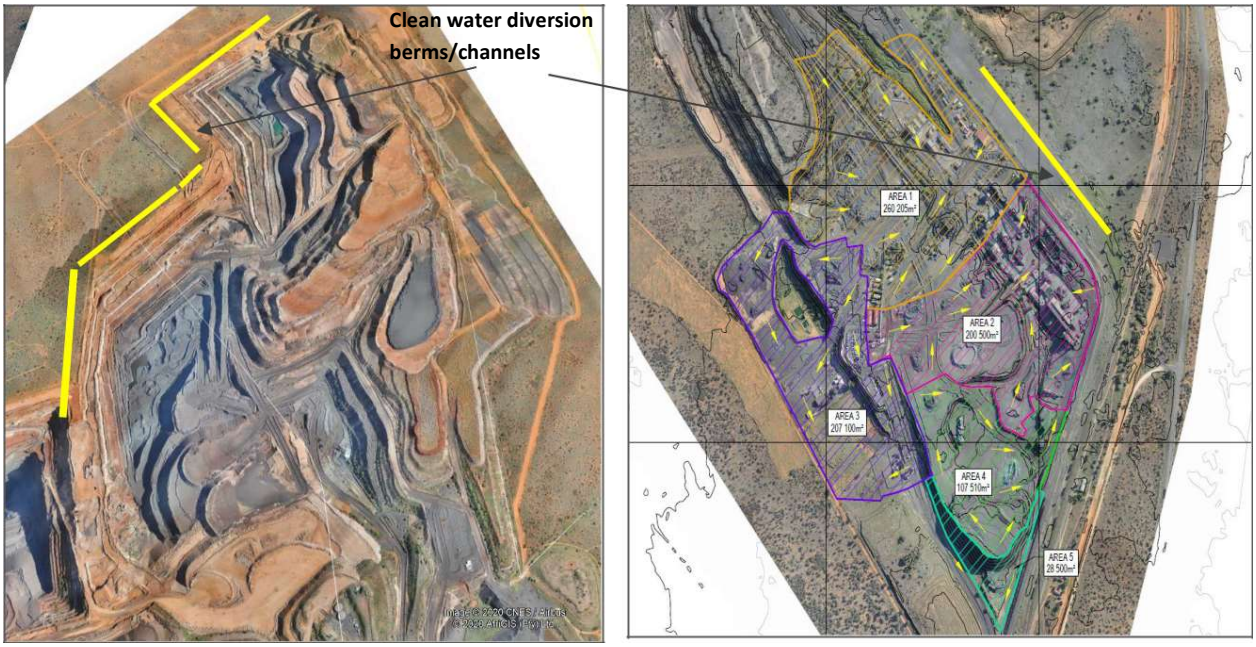


FIGURE 4-10: PROPOSED POSITIONS OF CLEAN WATER DIVERSION BERMS/CHANNELS

4.2.1.9 Water Balance

A daily time step rainfall-runoff model for the dirty stormwater catchments was coupled with a daily time step water balance model for the PCD. The rainfall-runoff model is based on the Soil Conservation Services (SCS) method and is used to estimate the portion of the rainfall which infiltrates or runs off from each catchment, for each day of the simulation. The PCD water balance model considers stormwater inflows, the direct rainfall reaching the dam, the evaporation losses and the return water pumping policy and calculates the volume of water in the PCD for each day of the simulation.

The results of the PCD simulations show three potential dam sizes and related daily abstraction volumes. Three options were considered to allow the mine to choose whether a smaller dam, with a higher abstraction rate suited them or conversely whether a larger dam with a lower abstraction rate suited the MMT Mine more. A 70 000 m^3 dam size is recommended for the PCD. Table 4-8**page20**shows the three potential dam volumes and the required daily abstraction amounts. The option that has been recommended is based on the current dirty water reuse practice. Should the mine adopt a practice of utilising (reusing) more dirty water moving forward, then the three options give the mine the flexibility to suit a range of future water management possibilities. The mine will have to abstract and reuse the amount of water that is shown in Table 4-8. Refer to Appendix J for the Storm Water Management Plan (SLR, 2021) for more information on the stormwater management.

4.2.1.10 Electricity

The proposed project will not result in an increase in power supply at the MMT. This will form part of existing services and capacities at the MMT.

4.2.1.11 Support Services

The activities and infrastructure that is being applied for constitutes supporting services to the current mining operation.

4.2.1.12 Operating Hours and LOM

MMT operates continuously (24 hours per day, 7 days a week). MMT has a remaining Life of Mine (LOM) of 17 years.

4.2.2 Layout Changes / Activities That Have Already Taken Place

4.2.2.1 Expansion of the northeastern and southeastern WRDs

MMT is committed to undertake rehabilitation concurrent with mining operations as per the approved 2005 EMPR. As part of rehabilitation, the north-eastern WRD and the south-eastern WRD footprints were extended in order to enable a reduction in the steepness of the side wall slope. The approved north-eastern and south-eastern WRDs, as well as the expansion areas, are depicted in
Figure 4-1.

4.2.2.2 Change in WRD rehabilitation criteria

The approved 2005 EMPR committed MMT to rehabilitate the WRDs to a 1:3 slope. As part of rehabilitation trials, the north-eastern WRD was shaped to a 1:5 slope with 2 m high stormwater interception bench drains constructed at approximately 40 m intervals along the slopes. Significantly less erosion was associated with the change in rehabilitation strategy and this approach is proposed to be implemented for all future WRD rehabilitation. It follows that as part of the proposed project it is proposed to change the rehabilitation criteria detailed in the EMPR.

4.2.2.3 Expansion of the product stock yard

The approved 2005 EMPR makes provision for a product stockyard. Within this approved stockyard area various materials such as coal, coke, ROM, DMS discard, sinter and product (varying in grades) can be stockpiled. As output has increased there has been a need for additional space to store larger volumes of material. The project stockyard area has been extended within the overall existing plant area (refer to
Figure 4-1 for the extended stockyard area).

4.2.3 Proposed Layout and/or Activity Changes

4.2.3.1 Establishment of top-cut stockpile and mobile crushing and screening plant

Top-cut material has historically been discarded onto a current WRD (Central WRD) because of its lower manganese content. A 2015 Opportunity Assessment highlighted the need for a top-cut viability study. Following investigations done by MMT, the viability of selling top-cut material (also referred to as low- grade product) was realised. It follows that additional storage space is required to stockpile the top-cut material. The top-cut material will need to be subjected to crushing and screening prior to being sent to the sinter plant. The proposal includes the establishment of a mobile crushing and screening plant adjacent to the stockpile area. After processing at the sinter plant, the low-grade product will be sold to local and/or international markets.

The required stockpile area capacity is estimated at approximately 43Mt, would be up to 34 ha in extent and would be located to the east of the eastern WRD, extending to the property boundary adjacent to the R380 (refer to Figure 4-1).

A prefeasibility study is in progress validating trade-off studies for value in the remaining top-cut ore. The value will be unlocked by stockpiling top-cut, crushing and processing through DMS and sinter plants. This will increase MMT's resource utilisation, reduce stripping ratio and add ability to react to manganese price fluctuation.

4.2.3.2 Stormwater infrastructure

Please refer to section 4.2.1.8.

4.2.3.3 WRD height increase

The approved 2005 EMPR specifies the height of the MMT WRDs to be 50 m above natural ground level. MMT is proposing to increase this to 80 m in order to provide additional capacity for the disposal of waste rock. The height increase would not be applied to rehabilitated WRDs.

4.2.3.4 Water supply pipeline from Middelplaats Mine

MMT utilises groundwater for the washing and screening processes in the OPP, as well as for the beneficiation process through cyclones at the DMS plant. MMT currently sources this water from ingress in the open pit for use in the processing and beneficiation plants. This groundwater is currently obtained by pumping it from the south pit of Mamatwan mine into various water storage dams and then into the plants. This source of water is unreliable as water is not always available within the open pit and as such MMT has started to source water from the Sedibeng Vaal Gamagara Water Supply Scheme. The Sedibeng Vaal Gamagara Water Supply Scheme is known for challenges associated with water shortage and as such this is not deemed a sustainable long-term solution for MMT.

MMT is proposing to source water from the decommissioned Middelplaats Mine for back-up purposes in the event of process water shortages at the mine. The underground workings of the decommissioned Middelplaats mine are flooded and as such MMT is proposing on abstracting this water via two boreholes that still need to be drilled. A pipeline to transfer the water from the decommissioned Middelplaats Mine to the MMT will need to be established. It is anticipated that the pipeline will be an HDPE pipe with a diameter of 260 mm and will be located above ground.

It is unknown if the current water at Middelplaats will be sustainable water supplementary to the process water, or a once off dewatering of the shaft and underground workings. The flow level will be determined once pumping can start to evaluate the water level drop vs. quantity pumped out.

4.2.3.5 Upgrading the railway loadout station

South32 has a Manganese Export Corridor Allocation on the Transnet Freight Rail (TFR) manganese line between Hotazel, in the Northern Cape, and Coega, in the Eastern Cape. The allocation is underutilised due to train loading inefficiencies at MMT. This results in TFR liability payments and increased road haulage costs. There is therefore a need to improve the loading rate of trains at the MMT. Additionally, the TFR has initiated a manganese expansion programme which will increase manganese export capacity by upgrading the rail network. TFR plans to increase capacity of the manganese rail line beyond the current 4-million TPA to 16 million TPA.

In order to meet the TFR's expanded capacity requirements, the loading rate of trains at the MMT needs to be increased. It currently takes MMT an average of 14 hours to load a train consisting of 104 wagons. South32 is

therefore proposing on upgrading the existing load out station and conveyor to improve the loading capacity and time. Increasing global demands of manganese ore creates opportunities for resources in South Africa to expand current facilities in order produce increased volumes and sell more products.

TFR's has initiated a manganese expansion programme which will increase manganese export capacity allocation (MECA) by upgrading the rail network between Hotazel, in the Northern Cape, and Coega, in the Eastern Cape. The project will include a new bulk terminal at the Port of Ngqura. The target completion date is in year 2023, subject to approvals.

TFR has distributed technical requirements to its manganese customers and outlined the new requirements for Train Handling Times (THT), locomotive requirements, wagons to be loaded of at a time, loading rates and locomotive requirements.

These requirements translate to increased loading rates that result in increased train handling times: -

- MECA 3 Loading rate of 3500 TPA loaded on 104 wagons which translates to a two-four-hour train turnaround time;
- MECA 2 requires 104 trains be completely loaded and ready for departure in 12 hours from train arrival at the compilation yard;
- The current rail wagon train size is 104 units. The basic engineering design study for the upgrade will include a train size of 125 units to meet possible future TFR train size configurations; and
- Consideration will be made to achieve a four-hour loading period to fully exploit the opportunity of the Raptor Project and maximize the benefit for the business.

The current train loading infrastructure at MMT and Wessels Mine, also a South32 HMM owned Mine in Northern Cape, is not capable of achieving this loading rate. The reduced loading periods as outlined by TFR, has necessitated the need for a pre-feasibility study (PFS) which will investigate and identify the most cost-effective way to upgrade the loading infrastructure for Mamatwan Mine and Wessels Mine to comply with the changing requirements from TFR. These changes are triggered by TFR through the MECA3 contract and Saldanah capacity increase readiness requirements.

The constraint will be where improvements to the current system are required to maintain a 100% strike rate to MECA 2 train handling conditions of 12 hours, as effort must be able to provide this improvement with minimal interruption and outages to the current operation and daily shipment of ore. It is also necessary to constantly take into consideration how the community and environmental permitting risks can be mitigated while developing the project. An integrated approach will be followed throughout the study of the investment alternatives as well as with the development of the preferred investment alternative to incorporate environmental considerations (wetlands, closure strategy, water use license amendments environmental permitting timelines) and community risks (community unrest, exposure to dust, noise and vibration).

Possible consequences if the project does not proceed:

- Penalties due to loading a training in more than the required 12 hour THT;
- The possibility of loss of access to reliable export lines (Saldanha);

- Possible misalignment between marketing and the mine about what the purpose of the project is (marketing view is that the project will address the requirement for increased volumes in the future whilst the Mine's view is that the project needs to match current market demand);
- Penalties due to non-adherence to profile requirements – Existing Load-out Station (LoS) does not consider change in profile. It is envisioned that settings will be optimised to ensure that the required profile is achieved as closely as possible; and
- Loss of loading spot due to competition with peer.

Criticality of project including Inputs and Outputs

The critical aspects of the rail loop and loadout station are discussed in TABLE 4-9.

TABLE 4-9:CRITICALITY OF THE PROJECT

Criticality of the project	Description
Fit with Business strategy	Manganese through existing logistics, and maximising South32's exposure to export markets
Lowering of logistics cost	Lower the logistics cost as the envisaged transportation will mean that trucking of ore to port are no longer used
Reduced train loading times	By reducing the train loading time, South32 will now have a time buffer available which can be utilised to service for increased volumes of manganese exports
Increased train loading cycles	South32 can increase the train loading cycle and have more trains loaded per day. This opportunity will see increased earnings
Reduce stockyard inventory	Rapid loading will reduce ore inventory in the stockyard and allow space for newly mined ore to be stored. Large product containment has a risk of miscellaneous charges which will be reduced when ore stock is moved quickly.
Improve regional job prospects	The rapid loading project will increase the job prospect of people around Hotazel and create a chance for South32 to improve its BBBEE scoring. Furthermore, if ore is loaded at a rapid rate, the overall mining activities will improve and create more opportunities for good business.
Improve the socio-economies	Where possible, the rail loading upgrading project will seek to address the socio-economic development and create mini-projects that would uplift the local community and local entrepreneurs.
Modernise load-out Station to date with current technology	The overall out-of-date infrastructure, resource and operating procedures slows the sequential rail loading and is disposed to high recapitalisation costs.
Compliance to TFR standard and terms & conditions	System upgrades, compliance to TFR's new MECA3 contract and avoid possible penalties.

Proven technology	The project will use proven technology.
Maintain market share	The load-out station upgrade allows South32 to meet its criteria of TFR and to its customers, it will also maximize value from the South32 export allocation at Saldanha port.

The rail loop and LoS will be located immediately west of the R380 on the remaining extent of the farm Sinterfontein 748 (refer to Figure 4-4).

Approval of the EIA will determine the initiation of the construction phase, but expectations are that construction would commence by end of first quarter 2022.

4.2.3.6 Sale of waste rock as aggregate

The approved 2005 EMPR makes provision for the storage of waste rock along the eastern and southern side of the open pit. WRDs established on site include the north-eastern WRD, the central WRD, the south-eastern WRD, the south WRD,s; the Adams rehabilitated WRDs and the Sinterfontein WRD. MMT is committed to partially backfilling the open pit with waste rock and concurrently rehabilitating WRDs that will remain on surface in perpetuity.

MMT is proposing on selling some of the waste rock that would have remained on surface in perpetuity as aggregate to third parties. Doing so could reduce the size of the WRDs remaining on surface at closure.

4.2.3.7 Re-processing of material located in Adams Pit

Adams Pit contains numerous materials that have been stockpiled or disposed in the pit since the Adams Pit was decommissioned in the 1980s. The materials include tailings, slimes, general waste, sinter de-dust, plant spillages and DMS grit.

MMT is proposing on re-processing the tailings, DMS grit, sinter de-dust and plant spillages currently stockpiled within Adams Pit as part of rehabilitation of the pit. Market depending, it is anticipated that a maximum of 40 000 tons of material could be sold to third parties per month. The re-processing of the material stored in Adams Pit would include:

- The use of an excavator to remove the material within the Pit;
- The use of a new temporary mobile screen to remove unwanted material (general waste and sinter de-dust bags) and screen the material into different size fractions;
- The material would be transported by truck to dispatch using road or rail, for sale to third parties;
- Unwanted material (general waste and sinter de-dust bags) will be deposited at the designated MMT waste disposal site; and
- Waste rock will be used to backfill the open pit as part of rehabilitation.

TABLE 4-10: LIST OF PROPOSED PROJECT ACTIONS / ACTIVITIES / PROCESSES

Main activity/ process	Sub-activities	Construction Phase	Operation Phase	Decommissioning Phase	Closure Phase
Site preparation	Selective vegetation clearance (in line with the sites existing EMPR commitments and DAFF guidelines) .				
	Removal of existing minor structures such as fencing (if present).				
	Demarcation of temporary working corridors such as access routes and pathways where required.				
	Establishment of construction material and equipment laydown area within existing disturbed areas.				
Earthworks	Earth moving activities for stripping of topsoil and sub-soil in line with the soil management procedure in the EMPR.				
	Cleaning, grubbing and bulldozing activities.				
	Temporary stockpiling of topsoil and sub-soil.				
	Excavation of trenches and foundations and compaction of soils.				
Civil works	Mixing of concrete and concrete work (such as laying of foundations).				
	Erection, use and removal of scaffolding and cranes.				
	General building activities and erection of equipment and structures.				
	Steel work(including installing re-enforcement steel, grinding and welding).				
	Installation and lay down of water pipelines .				
Waste rock (Mineralised waste) management	Hauling, tipping and dozing of waste rock.				
	Concurrent backfilling of the pit (in-pit dumping).				
	Rehabilitation of WRDs (on-site, on surface).				

Main activity/ process	Sub-activities	Construction Phase	Operation Phase	Decommissioning Phase	Closure Phase
Storm water management **continue until infrastructure can be removed or successfully rehabilitated*	Diversion of clean water from dirty areas.				
	Containment of dirty water collected from dirty areas.				
Transport systems	Construction and maintenance of on-mine private (gravel) haul, access and service roads.				
	Movement of construction vehicles/machinery within the site boundary (via on-mine private roads).				
	Movement of waste rock with dozers, excavators, loaders and/or haul-trucks.				
Continued use of existing services Non-mineralised (general and industrial hazardous) waste management	Railway loop				
	Collection of general and hazardous waste on mine site.				
	Disposal and/or treatment of contaminated soils.				
	Removal of waste by contractor for recycling, re-use and/or final disposal at permitted waste disposal facilities.				
Site management	Site management (monitoring, inspections, maintenance of facilities, security, access control).				
	Environmental awareness training and emergency response.				
	On-going rehabilitation of facilities/disturbed areas (where possible).				
	Implementing and maintaining management plans.				
Continued use of existing services Transport systems	Vehicle and plant equipment servicing and maintenance workshops, spray painting and wash bays.				
	Use of parking, loading and off-loading areas for trucks, busses, and other vehicles.				
	Transportation of staff to and from site (using private cars and busses via surfaced roads).				

Main activity/ process	Sub-activities	Construction Phase	Operation Phase	Decommissioning Phase	Closure Phase
	Transport of input materials, supplies, services, and waste removal (using trucks and vans via surfaced roads).				
Continued use of existing services	Waste management: • Handling and storage and removal of general waste on site (domestic waste; cleared vegetation; building rubble) (as per waste management procedures). • Handling and storage of hazardous waste on site (fuel; lubricants; cement; explosive packaging; solvents). Separation of oil and water at wash bays Continued use of sewage facilities				
	Water supply for domestic use.				
	Use of existing process water supply from the Plant Dam.				
	Recycling and re-use of water within the operations via pipelines.				
	Use of established roads and access roads.				
	Use of existing security and access infrastructure.				
Demolition	Dismantling and demolition of fixed infrastructure and removal of equipment.				
	Demolition of ramps, haul, service and access roads (no longer needed).				
	Replacing soil resources.				
Rehabilitation, maintenance and aftercare	Slope stabilisation, erosion control and landscaping.				
	Re-vegetation of landscaped areas.				
	Removal of alien invasive species from rehabilitated sites.				
	Restoration of natural drainage patterns as far as practically possible.				
	Erosion control and landscaping.				

Main activity/ process	Sub-activities	Construction Phase	Operation Phase	Decommissioning Phase	Closure Phase
	Re-vegetation of disturbed areas and where infrastructure is removed.				
	Removal of alien invasive species from disturbed and rehabilitated sites.				
	Restoration of natural drainage patterns as far as practically possible.				
	Maintenance and repair of post closure landforms, facilities, and rehabilitated areas.				
	Erosion control and landscaping.				
Site support services	Access control and roaming security activities at mine entrance and on MR and surface right areas.				

5. POLICY AND LEGISLATIVE CONTEXT

5.1 LEGAL FRAMEWORK

5.1.1 Mineral and Petroleum Resources Development (No. 28 of 2002) (MPRDA), as amended

The MPRDA , as amended, governs the acquisition, use and disposal of mineral and petroleum resources in South Africa. The MRPDA promotes equitable access to the nation's mineral and petroleum resources. The objectives of the Act, amongst others, are to promote economic growth and mineral and petroleum resources development in the Republic, particularly development of downstream industries through provision of feedstock and development of mining and petroleum inputs industries and also to promote employment and advance the social and economic welfare of all South Africans.

Chapter 4 of the Mineral and Environmental Regulation provides a framework to regulate the application for mining, prospecting and closure rights. In addition, Section 102 of the MPRDA governs the amendment of rights, permits, mine work programmes, EAs and management programmes, and ministerial consent is required.

With the establishment of the “One Environmental System” in 2014, the DMRE must apply the range of environmental principles included in Section 2 of NEMA when taking decisions that significantly affect the environment. To give effect to the general objectives of Integrated Environmental Management (IEM), the potential impacts on the environment of listed or specified activities must be considered, investigated, assessed and reported on to the competent authority. Section 24(4) of NEMA provides the minimum requirements for procedures for the investigation, assessment, management, and communication of the potential impacts.

The proposed project will require an amendment to the approved 2005 EMPR and associated update of the current mine work programme. It follows that a Section 102 Amendment will be applied for in terms of the MPRDA.

5.1.1.1MPRDA Regulations, 2004

The MPRDA Regulations, 2004 (as amended by GN No. 420 of 27 March 2020), promulgated in terms of Section 107 of the MPRDA, provide for a range of matters relating to the administration of the Act. Part 1 details regulations for the lodging of applications, Part 2 deals with Social and Labour Plans (SLP) while Part 3 set out environmental regulations for mineral development. The recent amendment in March 2020 removed the great majority of the environmental provisions from the Regulations. These Regulations had not been practicably implementable since the December 2014 introduction of the “One Environmental System” and the amendment of the overriding legislation (MPRDA and NEMA).

5.1.2 National Environmental Management Act (No. 107 of 1998) (NEMA), as amended

NEMA establishes principles and provides a regulatory framework for decision-making on matters affecting the environment. All organs of state must apply the range of environmental principles included in Section 2 of NEMA when taking decisions that significantly affect the environment. Included amongst the key principles is that all development must be socially, economically and environmentally sustainable and that 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. The participation of I&APs is stipulated, as is that decisions must consider the interests, needs and values of all I&APs.

Chapter 5 of NEMA provides a framework for the integration of environmental issues into the planning, design, decision-making and implementation of plans and development proposals. Section 24 provides a framework for granting of environmental authorisations. To give effect to the general objectives of IEM, the potential impacts on the environment of listed or specified activities must be considered, investigated, assessed and reported on to the competent authority. Section 24(4) provides the minimum requirements for procedures for the investigation, assessment, management and communication of the potential impacts. In terms of the management of impacts on the environment, Section 24N details the requirements for an EMPR.

5.1.2.1EIA Regulations, 2014 (as amended by GN No. 326 of 7 April 2017)

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 EA has been obtained from the competent authority. Such EA, which may be granted subject to conditions, will only be considered once there has been compliance with the EIA Regulations (GNR 982 of 2014), as amended.

The EIA Regulations (GNR 982 of 2014), as amended)set out the procedures and documentation that need to be complied with when applying for EA. A Basic Assessment process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in Listing Notices 1 and/or 3 and a S&EIA process must be applied to an application if the authorisation applied for is in respect of an activity or activities listed in Listing Notice 2.

The proposed project will trigger activities specified in Listing Notice 2 (refer to section 1.3) and therefore a S&EIA process is required in order for the DMRE to consider the application in terms of NEMA. As the DMRE are the competent authority for the NEMA and NEM: WA activities, HMM will apply for an integrated EA, as provided for in section 24L of the NEMA.

5.1.2.2Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations, 2015

The purpose of the Regulations pertaining to the Financial Provision for Prospecting, Exploration, Mining or Production Operations (GN R 1147 of 2015) is to regulate the determination and making of financial provision as contemplated in the Act for the costs associated with the undertaking of management, rehabilitation and remediation of environmental impacts from prospecting, exploration, mining or production operations through the lifespan of such operations and latent or residual environmental impacts that may become known in the future.

The compilation of a financial provision report in support of the proposed project is outlined in Section 25.

5.1.2.3National Guideline on minimum information requirements for preparing Environmental Impact Assessments for mining activities that require environmental authorisation, 2018

The Minister of Environmental Affairs gave a notice (GN 86 of 2018) of intent to publish National Guideline on minimum information requirements for preparing EIAs for mining activities that require EA. The purpose of the guideline is to allow for a more standardised approach during the compilation of EIAs for mining activities. This guideline remains in draft format.

5.1.3 National Environmental Management: Waste Act (No. 59 of 2008) (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. A waste management activity identified in terms of the NEM: WA may not commence, be undertaken or conducted except in accordance with published standards or a Waste Management Licence.

5.1.3.1Listed waste management activities

Listed waste management activities are included in GN R 921 of November 2013, as amended. Category A and Category B listed waste management activities above certain thresholds are subject to a process of impact assessment and licensing. Category C listed waste management activities do not require a waste management license but are subject to the provisions of National Norms and Standards (GN R 926, November 2013). The assessment and reporting process in support of a WML application must be undertaken in accordance with the EIA Regulations (GNR 982 of 2014), as amended. These Regulations define the requirements for the submission, processing, consideration and decision of applications authorisation of listed activities. Activities listed in Category A require a Basic Assessment process, while activities listed in Category B require a S&EIA process in order for authorities to consider an application in terms of NEM: WA.

The MMT project activities will trigger waste management activities under Category A (refer to Table 4-2), requiring a WML. As the DMRE is the competent authority for the NEMA and NEM: WA activities, HMM will apply for an integrated EA, as provided for in section 24L of the NEMA.

5.1.3.2Waste Classification and Management Regulations, 2013

The purpose of the Waste Classification and Management Regulations (GNR 634 of 23 August 2013) is to ensure adequate and safe storage and handling of hazardous waste, and to inform the consideration of suitable waste management options. These regulate the classification of waste in terms of SANS 10234; prescribe requirements for the assessment of waste destined for disposal (GN R 635); require that disposal of waste to landfill take place in terms of GN R 636; prescribe requirements and timeframes for the management of certain wastes and prescribe the general duties of waste generators, transporters and managers. They also include communication elements for labelling and information required for Safety Data Sheets.

Although the Norms and Standards primarily refer to landfills, the definition of waste in South Africa includes mine residues such as waste rock and therefore the Norms and Standards apply to mine residue classification.

5.1.3.3Regulations regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015

The purpose of these Regulations (GN R 632) is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation. The management of residue stockpiles and deposits must be undertaken in accordance with the Regulations, as well as the complimentary Norms and Standards and other Regulations published under the NEM: WA.

5.1.3.4National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013 and National Norms and Standards for Disposal of Waste to Landfill, 2013

The GN R 635 prescribes the requirements for the assessment of waste prior to disposal to landfill. Waste generators must ensure their waste is assessed in terms of the standard prior to disposal. The assessment is

based on the total concentration (TC) and leachable concentration (LC) of certain elements and chemical substances in the waste compared against concentrations specified in the standard. Following laboratory analysis, the TC and LC are compared with specific TC and LC threshold values in the standard, which then determines the particular type of waste (Type 0, 1, 2, 3 and 4) for disposal.

The GN R 636 determines the requirements for the disposal of waste to landfill; define landfill classification and containment barrier designs, waste acceptance criteria for landfills and certain restrictions on waste disposal. Four classes of landfill (Class A, B, C or D) are prescribed in the standard, each with a particular barrier (liner) design. The new landfill classes do not make a distinction between sites for the disposal of general or hazardous waste. The standard stipulates which types of waste are allowed to be disposed at a particular class of landfill. Waste disposal prohibitions, aimed at eliminating the disposal of certain wastes within set periods of time include certain hazardous wastes, recoverable materials such as used oils and solvents, liquid wastes and brines, as well as high calorific value wastes.

5.1.4 National Water Act (No. 36 of 1998) (NWA)

The NWA provides a legal framework for the effective and sustainable management of water resources in South Africa. It serves to protect, use, develop, conserve, manage and control water resources as a whole, promoting the integrated management of water resources with the participation of all stakeholders. This Act also provides national norms and standards, and the requirement for authorisation (either a WUL or General Authorisation) of water uses listed in Section 21 of the Act. The competent authority is the DWS. This Report does not address the requirements of a WUL process. This will be handled as part of a separate process with the DWS.

5.1.4.1Regulations on the use of Water for Mining and Related Activities, 1999

GNR. 704 of June 1999, was established to provide regulations on the use of water for mining and related activities aimed at the protection of water resources. The principal conditions of GNR. 704 of June 1999 applicable to this project are:

- Condition 5 which indicates that no residue or substance which causes or is likely to cause pollution of a water resource may be used in the construction of any dams, impoundments or embankments or any other infrastructure which may cause pollution of a water resource;
- Condition 6 which describes the capacity requirements of clean and dirty water systems. Clean and dirty water systems must be kept separate and must be designed, constructed, maintained and operated to ensure conveyance of flows of a 1:50 year recurrence event. Clean and dirty water systems should not spill into each other more frequently than once in 50 years. Any dirty water dams should have a minimum freeboard of 0.8m above full supply level; and
- Condition 7 which describes the measures which must be taken to protect water resources. All dirty water or substances which may cause pollution should be prevented from entering a water resource (by spillage, seepage, erosion etc.) and ensure that water used in any process is recycled as far as practicable.

5.1.4.2Regulations Regarding the Procedural Requirements for WUL Applications and Appeals, 2017

These Regulations, published in terms of the NWA (GN R 267), prescribe the procedure and requirements for WUL applications as contemplated in sections 41 of the NWA; as well as an appeal in terms of section 41(6) of the NWA. The WUL application process requires:

- A pre-application enquiry meeting with the responsible authority;
- The making of an application in the prescribed form, with documents relevant to a particular water use application;

- Conducting a site inspection;
- A public participation process; and
- Assessment and consideration of the technical documents by the responsible authority.

A separate WUL application process will be undertaken in consultation with the DHSWS and will be undertaken in accordance with these Regulations.

5.1.5 National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM: AQA)

The NEM: AQA regulates all aspects of air quality, including prevention of pollution and environmental degradation; providing for national norms and standards (through a National Framework for Air Quality Management) regulating air quality monitoring, management and control; and licencing of activities that result in atmospheric emissions and have or may have a significant detrimental effect on the environment.

5.1.5.1Listed activities and Minimum Emission Standards

In terms of Section 22 of NEM: AQA no person may conduct an activity releasing emissions (GN No. 893, 22 November 2013) without an AEL. MMT holds an AEL for their operations. The proposed activity and layout changes do not trigger any activity set out in the notice and thus there is no requirement for an amendment to the AEL.

5.1.5.2National Ambient Air Quality Standards, 2009

National Ambient Air Quality Standards (NAAQS) (GN 1210) were determined in for South Africa, based on international best practice for inhalable PM ($PM_{2.5}$), thoracic PM (PM_{10}), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, lead and benzene. The NAAQS permit a frequency of exceedance (FOE) of 1% per year (88 hours or 4 days per year for 1-hour and 24-hour average concentrations) for some pollutants. The NAAQS is presented in the Air Quality Study (see Appendix H).

5.1.5.3National Dust Control Regulations, 2013

The National Dust Control Regulations (NDCR) (GN 827) were gazetted on 1 November 2013. The purpose of the regulations is to prescribe general measures for the control of dust in all areas including residential and light commercial areas. The Regulations provide a guideline for monitoring and measuring dust fall. Dust fall is assessed for nuisance impact and not an inhalation health impact. The acceptable dust fall rates is presented in the Air Quality Study (see Appendix H). Potential dust fall from the project will be assessed against the NDCR.

5.1.5.4National Atmospheric Emission Reporting Regulations, 2015

MMT is required by the AEL to report in terms of the National Atmospheric Emission Reporting Regulations (GN 283).

5.1.5.5Greenhouse Gas Reporting Regulations, 2017

MMT is required by the AEL to report annually in terms of the Greenhouse Gas Reporting Regulations (GN 275)

5.1.6 National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM: BA)

The NEM: BA provides for the management and conservation of South Africa's biodiversity and the protection of species and ecosystems that warrant national protection. NEM: BA regulates the carrying out of restricted activities, without a permit, that may harm listed threatened or protected species or activities that encourage the spread of alien or invasive species and makes provision for the publication of bioregional plans and the listing

of ecosystems and species that are threatened or in need of protection. Bioregional plans should be considered by competent authorities in their decision-making regarding an application for EA.

Where protected species may be located within the proposed development footprint, these will need to be removed. Prior to removal NEM: BA, as well as the Northern Cape Nature Conservation Act (Act 9 of 2009) requires that these species be identified and that a permit be obtained for damage or removal of these species.

5.1.6.1Alien and Invasive Species Regulations, 2014 and Lists

Alien and Invasive Species Regulations (GN R 598 of 2014) as well as the Alien and Invasive Species List (GN R 864 of 2016) have been published to regulate the monitoring, control and eradication of listed invasive species. All landowners on whose land alien and invasive species occur must make the necessary arrangements to be compliant with these Regulations. These will guide the EMPR for the project.

5.1.7 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The NHRA provides for the identification, assessment and management of the heritage resources of South Africa. The Act lists development activities that would require authorisation by the responsible heritage resources authority. The Act requires that a person who intends to undertake a listed activity notify the relevant provincial heritage authority at the earliest stages of initiating such a development. The relevant provincial heritage authority would then in turn, notify the person whether a Heritage Impact Assessment (HIA) should be submitted. However, according to Section 38(8) of the NHRA, a separate report would not be necessary if an evaluation of the impact of such development on heritage resources is required in terms of the Environment Conservation Act (No. 73 of 1989) (now replaced by NEMA) or any other applicable legislation. The decision-making authority should, however, ensure that the heritage evaluation fulfils the requirements of the NHRA and consider in its decision-making any comments and recommendations made by the relevant heritage resources authority.

Where new land is disturbed by the project, the provisions of the NHRA will be considered. The BID was uploaded to the South African Heritage Resources Agency (SAHRA) website (SAHRA Case No. 14 985).

5.2 LEGISLATION CONSIDERED IN THE PREPARATION OF THE EIA REPORT

A summary of the applicable legal framework that has been considered in the assessment process is provided in Table 5-1.

TABLE 5-1: LEGAL FRAMEWORK

Applicable legislation	Reference where applied	How does this development comply with and respond to the policy and legislative context?
The South African Constitution, 1996.	All	The MMT and proposed activity/layout changes must comply with South African constitutional and common law by conducting its construction and operational activities with due diligence and care for the rights of others. Section 24 (a) of the South African Constitution states that everyone has the right to an environment that is not harmful to their health and well-being. This provision supersedes all other legislation.
MPRDA as amended and associated regulations.	All	A section 102 application was prepared by HMM and was submitted to the DMRE on 17 March 2021 via the DMRE

Applicable legislation	Reference where applied	How does this development comply with and respond to the policy and legislative context?
		South African Mineral Resources Administration System (SAMRAD).
NEMA and associated regulations.	All	An integrated EA and WML application was prepared by SLR and was submitted to the DMRE on 17 March 2021 via the DMRE SAMRAD.
NEM: WA and associated regulations.	All waste related activities and infrastructure	
NWA and water use licensing regulations.	All new water uses and amended water uses.	This report acknowledges that an IWUL Application process is required for the proposed project which will be handled as part of a separate process with the DWS.
NEM: AQA	All emissions that may impact on the environment	Air emissions were considered as part of project planning and an Air Quality Study has been compiled for the proposed project.
NEM: BA	All	Biodiversity was considered as part of project planning and a Biodiversity Study has been compiled for the proposed project.
Conservation of Agricultural Resources Act (No. 43 of 1983)		
Northern Cape Nature Conservation Act, 2009 (No. 9 of 2009)		
NHRA	All new areas that will be cleared for development.	A Heritage/cultural and Palaeontological Study has been compiled for the project.

5.3 GUIDELINES, POLICIES, PLANS AND FRAMEWORKS

The guidelines and policy framework listed in Table 5-2 have been considered during the EIA phase of project.

TABLE 5-2: GUIDELINE AND POLICY FRAMEWORK

Guideline	Governing body	Relevance
Public participation guideline in terms of NEMA (2012, updated in 2017)	Department of Environmental Affairs (DEA) now the Department of Forestry, Fisheries and Environment (DFFE)	The purpose of this guideline is to ensure that an adequate public participation process is undertaken during the S&EIA process.
Guideline on need and desirability (2014, updated in 2017)	DEA now the DFFE	This guideline informs the consideration of the need and desirability aspects of the proposed project.
National Development Plan (NDP) 2030	National Planning Commission	The NDP (2030) is the overarching development planning policy for the country, to which all other development planning, in particular spatial planning,

Guideline	Governing body	Relevance
		must be aligned. The NDP outline South Africa's Vision and provides the Framework for eliminating poverty and reducing inequality by 2030.
Northern Cape Provincial Spatial Development Framework (NCPSPF, 2012)	Department of Rural Development and Land Reform (DRDLR)	The NCPSDF is needed for coherent prioritisation of projects within a spatial economic framework that takes cognises of environmental realities and the imperative to create a developmental state. The NCPSDF was designed as an integrated planning and management tool to facilitate on-going sustainable development through the province. The NCPSDF recognises the importance of the mining sector in the province's economic growth. However, it also aims to manage any direct detrimental impacts of resource use and promote positive socio-economic conditions once the resource use has reached its productive life cycle.
Joe Morolong Local Municipal Integrated Development Plan (IDP) 2016	JMLM	The JMLM IDP is the principle strategic instrument guiding all planning, management, investment and development within the province in order to provide best solutions towards sustainable development.
Best Practicable Guidelines (BPGs) for the mining industry including: BPG G1: Stormwater Management. BPG A4: PCDs. BPG G2: Water and Salt Balances.	DWS	These local and international standards provide best practice for the prediction, prevention and management of water in mining. These standards have been considered during the Surface Water Study.
SANS Drinking water standard SANS 241: 2015	South African Bureau of Standards (SABS)	
Targeted Water Quality Range (TWQR) (DWA, 1996)	DWS	
Water Quality Resource Objectives for Catchment D41K as specified in the MMT WUL (DWA, 2012).	DWS	
SANS 10103 (2008)	SABS	These local and international standards provide best practice for the prediction, prevention and management of mine drainage. These standards have been considered during the Geochemical study.
World Health Organisation (WHO) Standard for drinking water	WHO	
International Finance Corporation (IFC) Mining Effluent (2007)	IFC	
SANS 241 (2015) (Operational, Aesthetic, Acute health and Chronic	SABS	These local and international standards provide best practice for the prediction of noise related impacts to third parties. These standards have been considered during the preparation of the Noise Study.
WHO guidelines for community noise, health	WHO	
IFC General Environmental, Health and Safety (EHS) Guidelines on noise	IFC	

Guideline	Governing body	Relevance
Quality of Domestic Water Supplies Volume 1: Assessment Guide, Second Edition, (1998)	DSWS	Groundwater quality at MMT is compared against these guidelines and standards.
South African Water Quality Guidelines – Volume 1 Domestic Use (1993 and 1996)	DWS	
SANS for drinking water (SANS 241:2015)	SABS	
NAAQS for PM_{10}, SO_2, NO_2, ozone (O_3), CO, lead (Pb) and benzene (2009). $PM_{2.5}$ in 2012	DEA now the DFFE	These local and international standards provide best practice for the measurement and prediction of dust related impacts to third parties. These standards will be considered during the preparation of the Air Quality Study.
National Freshwater Ecosystem Priority Areas 2011 (NFEPA)	DWS	Biodiversity was considered as part of project planning and in the assessment of potential impacts. Reference was made to various national and provincial databases to determine potential presence and conservation sensitivity.
Northern Cape Critical Biodiversity Areas (CAN) (2016)	South African National Botanical Institute (SANBI)	
South Africa Conservation Areas Database (SACAD, 2017)		
South Africa Protected Area Database (SAPAD, 2017)		
Mining and Biodiversity Guideline (2013)		
Important Bird and Biodiversity Areas (IBAs)	Birdlife International	
National Biodiversity Assessment (NBA) 2018	DEA now the DFFE	
National Protected Areas Expansion Strategy 2008 (NPAES)		
National Threatened Ecosystems (2011)		

6. NEEDS AND DESIRABILITY

6.1 BACKGROUND

The DFFE (formerly DEA) guideline on need and desirability (GN R891, 20 October 2014) 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. In 2017, the DFFE published an updated guideline on project need and desirability, although this is yet to be formally gazetted. The 2017 guideline on need and desirability provides that addressing the need and desirability of a development is a way of ensuring sustainability – in other words, that a development is ecologically sound and socially and economically justifiable.

When considering how the development may affect or promote justifiable economic and social development, the relevant spatial plans must be considered, including Municipal IDPs Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF). The assessment reports need to provide information as to how the development will address the socio-economic impacts of the development, and whether there would be any socio-economic impact resulting from the development on people's environmental rights. Considering the need and desirability of a development entails the balancing of these factors. Consistent with the aim and purpose of the EIA, the concept of "need and desirability" relates to, amongst others, the nature, scale and location of the development being proposed, as well as the wise use of land and natural resources.

The National Strategy for Sustainable Development and Action Plan 2011 - 2014 (NSSD 1) (2011) states the following:

- In the first instance, it recognises that the maintenance of healthy ecosystems and natural resources are preconditions for human wellbeing. In the second instance, it recognises that there are limits to the goods and services that can be provided. In other words, ecological sustainability acknowledges that human beings are part of nature and not a separate entity.
- What is needed and desired for a specific area should primarily be strategically and democratically determined beyond the spatial extent of individual EIAs. The strategic context for informing need and desirability may therefore firstly be addressed and determined during the formulation of the sustainable development vision, goals and objectives of Municipal IDPs and SDFs during which collaborative and participative processes play an integral part, and are given effect to, in the democratic processes at local government level.
- When formulating project proposals and when evaluating project specific applications, the strategic context of such applications and the broader societal needs and the public interest should be considered. In an effort to better address these considerations and their associated cumulative impacts, the NEMA also provides for the compilation of information and maps that specify the attributes of the environment in particular geographical areas, including the sensitivity, extent, interrelationship and significance of such attributes which must be considered. Whether a proposed activity will be in line with or deviate from the plan, framework or strategy per se is not the issue, but rather the ecological, social and economic impacts that will result because of the alignment or deviation. As such, the EIA must specifically provide information on these impacts in order to be able to consider the merits of the specific application. Where a proposed activity deviates from a plan, framework or strategy, the burden of proof falls on the applicant (and the EAP) to show why the impacts associated with the deviation might be justifiable. The need and desirability of the development must be measured against the abovementioned contents of the IDP, SDF and EMF for the area, and the sustainable development vision, goals and

objectives formulated in, and the desired spatial form and pattern of land use reflected in, the area's IDP and SDF. While project-level EIA decision-making therefore must help us stay on course by finding the alternative that will take us closer to the desired aim/goal, it is through Integrated Development Planning (and the SDF process) that the desired destination is firstly to be considered and the map drawn of how to get there.

6.2 NATIONAL AND REGIONAL 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 Northern Cape.

6.2.1 National Development Plan 2030 (NDP)

The 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.

6.2.2 New Growth Path 2010

South Africa has embarked on a new economic growth path in a bid to create 5 million jobs and reduce unemployment from 25% to 15% over the next ten 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; and
- Agro-processing;
    - Mining value chains;
    - Manufacturing and industrial development;
    - Knowledge and green economy;
    - Tourism and services; and
    - Informal sector of economy.

The New Growth Path reflects the commitment of government to prioritise employment creation in all economic policies and sets out the key drivers and sectors for employment which will be the focus of government. Mining is identified as a key sector for prioritisation in order to drive economic growth and create jobs.

6.2.3 Northern Cape Provincial Spatial Development Framework 2018

The reviewed Northern Cape PSDF 2018 identifies the PSDF as an enabling mechanism to comply with the National Spatial Development framework. The PSDF functions as an innovate strategy that will apply sustainability principles to all spheres of land use management throughout the Northern Cape and which is to facilitate practical results, as it relates to the eradication of poverty and inequality and the protection of the integrity of the environment. In short, the PSDF is to serve as a mechanism towards enhancing the future of the Northern Cape and its people.

Five growth and development strategies are proposed to assist the province and municipalities in managing future growth of settlements. These strategies are listed below:

- Strategy 1: A Diversification and Maintenance Strategy for settlements with a Low Social Need and High Development Potential (60% of the provincial population);
- Strategy 2: A Growth Management Strategy for settlements with a High Social Need and High Development Potential. (20% of the provincial population);
- Strategy 3: A Migration and Maintenance Strategy for settlements with a High Social Need and Low Development Potential. (10% of the provincial population);
- Strategy 4: A Sustainable Livelihood Strategy for settlements with Low Social Need and Low Development Potential (10% of the provincial population); and
- Strategy 5: Mining development management strategy.

In addition, the PSDF identifies five zones of development in the province, these zones are listed below:

- Manufacturing;
- Agriculture;
- Administrative;
- Transportation; and
- Logistics.

The project will optimise mining-related activities at the site and provide economic opportunities derived from wages, taxes, and profits. Indirect economic benefits associated with the project are derived from the procurement of goods and services and the spending power of employees.

6.2.4 The Northern Cape Provincial Growth and Development Strategy 2009 – 2014

The primary purpose of the Northern Cape Provincial Growth and Development Strategy (NCPGDS) is to provide a collaborative framework within which to drive and ensure effective and coordinated delivery and implementation in the Province. It provides the public and private sector and parastatals, as well as labour and civil society, with a strategic focus derived through consensus, to harness their collective efforts in promoting economic growth and social development. The vision of the NCPGDS is to build a prosperous, sustainable growing provincial economy to reduce poverty and improve social development for a caring society by promoting growth, diversification, and diversification of local economy as well as eradication of poverty through social development. The project will continue to contribute to poverty eradication by providing economic opportunities in the broader area.

6.3 ENSURING ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES

Mining is a necessary activity in order to extract natural resources for manufacturing and development. Manganese is primarily used by the steel industry in deoxidizing and desulfurizing additives and as an alloying constituent. As such it is in high demand. Due to the nature of mining projects, impacts on biodiversity and the role that it plays in the ecosystem are inevitable.

MMT has been in operation since the 1960s and biodiversity across the site has been substantially transformed. Previous studies have identified habitats of intermediate importance for floral communities around the perimeter of MMT. Species of conservation concern (SCC) may occur within these habitats. The proposed layout and activity changes at the MMT largely fall within the current, ongoing operations and would likely not constitute a significant, new disturbance to biodiversity. The project has the potential to directly disturb soils, vegetation and fauna. The disturbances also have the potential to allow proliferation of alien and invasive plants (AIP). In addition, the changes may further disrupt the ecological functions and ecosystem services derived from the site.

Biodiversity and soil studies would be necessary to determine the sensitivity of the project area and potential impacts of the proposed changes. The biophysical impacts of the proposed project have been investigated as part of the EIA phase. Measures to enhance the benefits and mitigate the impacts to these resources are included in this EIAR.

6.4 PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT

According to DMRE (2011) *"South Africa has been a resource economy in excess of a century. An independent evaluation of South Africa's non-energy in-situ mineral wealth is estimated at US$2.5 trillion (Citibank report, May 2010), making the country the wealthiest mining jurisdiction. However, a considerable amount of South Africa' s mineral resources is exported as raw ores or only partially processed. Although South Africa has steadily improved its ratio of beneficiated to primary products exported since the 1970s, these ratios are still well below the potential suggested by the quality and quantity of its mineral resource's endowment. The Government's industrialisation policy calls for a paradigm shift in mineral development, strategic investment in assets to maximise long-term growth beneficiation projects, enhance value of exports, increase sources for consumption of local content, and create opportunities for sustainable jobs. Minerals are a vital input to an industrialisation programme, which is intended to accelerate manufacturing in South Africa (for local consumption and export). Competitive access to minerals for local beneficiation is one of the key success factors for the country's industrialisation initiative."*

The Kalahari Manganese Field (KMF) contains approximately 80% of the world's known high-grade manganese ore reserves. Mining of the manganese results in the production of ore for sale, creates sustainable jobs and supports economic activity. The export of ore generates foreign income. Direct economic benefits from MMT are derived from wages, taxes and profits. Indirect economic benefits are derived from the procurement of goods and services and the spending power of employees. Further to this, through employment, employees of the mine are afforded the opportunity to further their education through the skills development plan of the mine's SLP. The skills development plan is not the extent of human resources development at the mine. Supplementary plans to enhance the socio-economic benefits of the project are also in place, and these include a career progression plan, a mentorship plan and internships and bursaries. In addition to these social development plans, the mine also has in place an Employment Equity Plan and targets relating to historically disadvantaged South Africans (HDSAs). The benefits not only contribute to the country's Gross Domestic Product (GDP) but result in significant contributions to the economies and people of the Northern Cape, and specifically the JTGDM.

Community/society priorities are officially expressed through public documents including the provincial growth and development strategy and spatial development framework documents. In this regard, the priorities of the JMLM's IDP and the JTGDM's SDF are mainly focused on the reduction of unemployment and halving poverty, as well as establishing affordable accommodation in towns experiencing rapid expansion by investing in key sectors and developing and upgrading basic service delivery and infrastructure. In order to achieve this, development must be channelled into specific nodes and corridors (JTGDM, 2016). One of the Key Focus Areas for economic growth is the Gamagara Development Corridor, within which the MMT is located (see Figure **6-1**).

Taking the above into consideration the project will support and enable continuation of current operations of the MMT, which will in turn sustain economic and social development. The MMT contributes to the national South African economy at macro level by exporting its product that leverages foreign income into the country. Direct economic benefits are derived from wages, taxes and profits. Indirect economic benefits will be derived from the procurement of goods and services and the spending power of employees. Further to this, through employment, employees of the mine are afforded the opportunity to further their education through the skills development plan of the mine's SLP. Supplementary plans to enhance the socio-economic benefits of the MMT are also in place, and these include a career progression plan, a mentorship plan and internships and bursaries. In addition to these social development plans, the mine also has in place an Employment Equity Plan and targets relating to HDSAs. The SLP is in line with the IDP of the JTGDM and the JMLM.

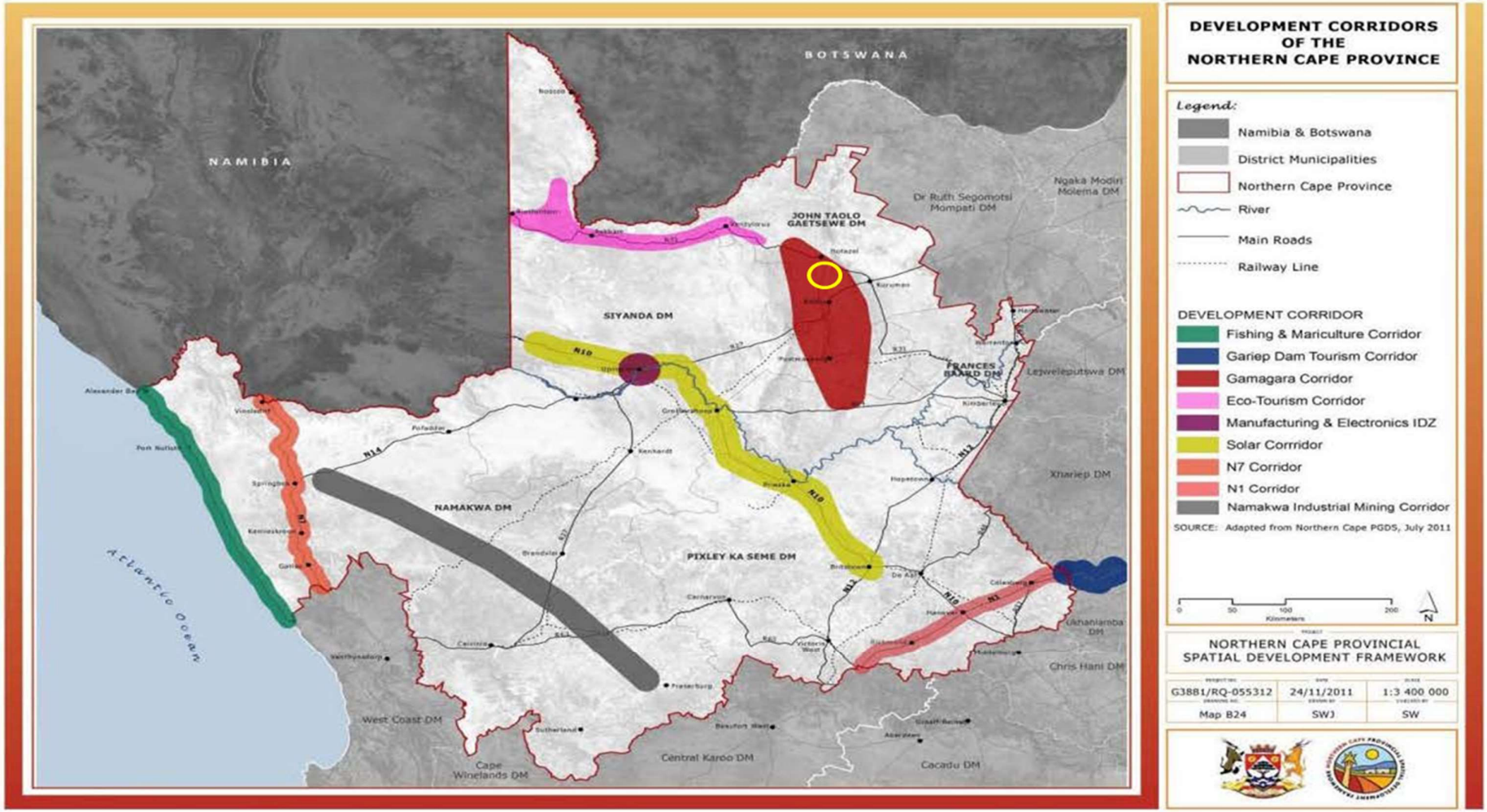


FIGURE 6-1: DEVELOPMENT CORRIDORS OF THE NORTHERN CAPE SOURCE: NPSDF, 2012 (MMT LOCATION SHOWN BY YELLOW CIRCLE

7. MOTIVATION FOR THE PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVES

The alternatives identified and preferred for this project are strongly dependent on the existing surface infrastructure locations as the new infrastructure must link at specific points. For this reason, the routes of the linear infrastructure were assessed in terms of alternatives. The project is located within the MR Area which has been disturbed and impacted by the construction and operation of the mining infrastructure. Furthermore, the link points to existing infrastructure are fixed and therefore the new infrastructure must take this into consideration in alignment of linear infrastructure.

7.1 PROCESS FOLLOWED TO REACH THE PREFERRED ALTERNATIVES WITHIN THE SITE

The identification of alternatives was carried out through the assessment of the site by the engineering and EAP project team. The engineering team identified potential alternatives for the pipeline route and the railway loop. These alternatives were feasible in terms of the terrain and engineering requirements for the linear infrastructure. The engineers focused on the use of existing servitudes for the railway loop and pipeline route in order to minimise additional footprints that would need to be cleared, levelled and prepared for this linear infrastructure.

Once engineering alternatives had been identified, the EAP project team analysed and selected the alternatives that posed the least risk to the environment. These alternatives are discussed below. The alternatives were analysed against environmental and social criteria to select the preferred alignment or route.

7.2 DETAILS OF THE ALTERNATIVES CONSIDERED

7.2.1 The "No-Go" Alternative

The No-Go alternative would be to not undertake any of the below activities:

- Establishment of a top-cut stockpile and associated mobile crushing and screening plant;
- Establishment of stormwater management infrastructure ;
- Change in height of WRD (this excludes rehabilitated WRDs);
- Establishment of a pipeline to transfer water abstracted from the decommissioned Middelplaats Mine to MMT;
- Upgrading the railway line and railway loadout station;
- Sale of waste rock as aggregate; and
- Re-processing of material located in Adams Pit.

The No-Go option would mean that the efficacy of the mine would not be optimised, and the LOM may be reduced. Furthermore, many of the activities applied for are focused on improving environmental management on site.

- The establishment of the pipeline to transfer abstracted water from Middelplaats mine to MMT is optimising the water available at Middelplaats for use at MMT. Should this not be possible, additional water would need to be sourced at MMT, and the Middelplaats water would be managed independently;
- The upgrade and extension of the railway line is allowing for the continued rail transport of product and supply, avoiding the requirement for trucking, which has an impact on roads, road users and road safety; and

- The sale of waste rock as aggregate negates the requirement for expanded or additional waste rock dumps for long term disposal of this material; and
- Reprocessing of material in Adams Pit is optimising resources within an existing impacted footprint. This is the best method to rehabilitate Adams Pit without the requirement for disposal of waste at a new facility.

7.2.2 Location Alternatives

The activities applied for within this application are supporting facilities to the existing MMT. Therefore, the activities and infrastructure need to be located within the existing mine layout in order to best accommodate the current mining infrastructure, access roads and conducts. The alternatives for this project focus on the linear infrastructure. All of the activities that are being applied for will be carried out within the existing MR area and within the mine footprint.

The route for the water pipeline included three options. Figure 7-1 below provides the alignment of the alternatives and the preferred layout.

The alternatives were assessed to minimise watercourse and road crossings and disturbance of any other surface environmental sensitivities or infrastructure. For this reason, Option 3 was selected as this route is in alignment with, and within the reserve of, an existing access road. While option 3 is the longer route, it will generate a lesser impact to the receiving environment.

One alternative, in additional to the preferred alternative, was considered for the rail loop route. Figure 7-2 below provides the alignment of these alternatives. Option 1 required a longer loop which extended past both stockpiles to the east of Adams Pit. This alignment was then optimised to produce Option 1 which provides a smaller loop around only one stockpile and supports the existing railway LOS and includes future product stockpile stackers and reclaimers.

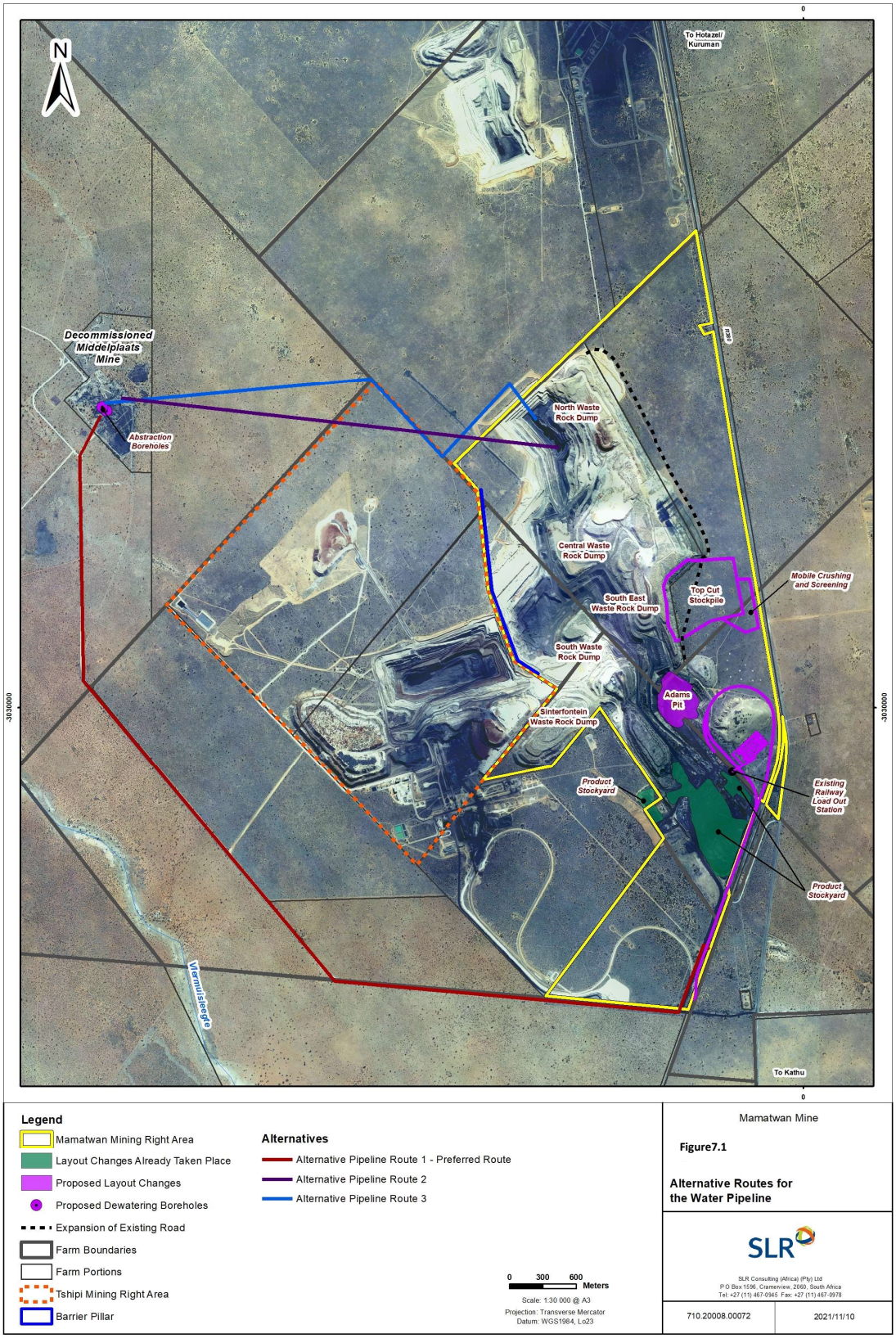


Figure 7-1: Alternative routes for the water pipeline

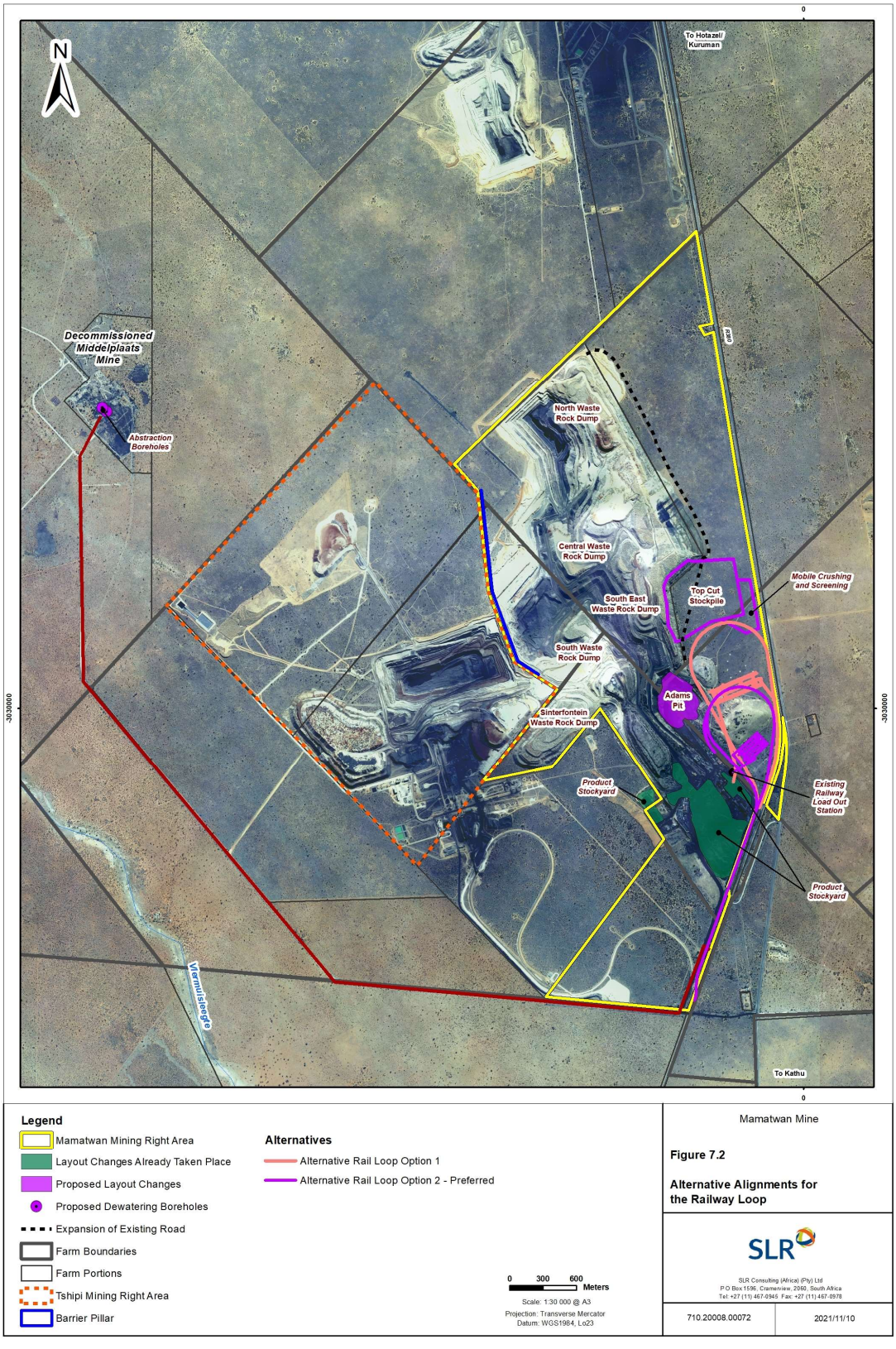


Figure 7-2: Alternative alignments for the railway loop

8. DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

This section describes the public participation process undertaken in line with Chapter 6 of the EIA Regulations (GNR 982 of 2014), as amended. The aim of the public consultation process is to co-ordinate a process through which I&Aps are informed of the proposed project and EIA process. I&Aps broadly refers to landowners, land users, , surrounding landowners and land users, commenting authorities, the competent authority, surrounding mines, industries, parastatals and any other I&Aps who may have interested in the project. I&Aps are provided with an opportunity to provide input into the project plan, the assessment and proposed mitigation measures. An overview of the public participation process undertaken to date is outlined in Table 8-1 below.

8.1 SCOPING PHASE PUBLIC PARTICIPATION

Due to the COVID-19 Lockdown, the public participation process for the Scoping phase (in support of the proposed project) was put on hold on 27 March 2020. On 5 June 2020, the DFFE issued GN 650, which provided direction on how to proceed with licensing processes and public participation processes. In this regard, the following is noted in GN 650:

- Reports may not be made available at any public places or premises closed to the public; and
- Hard copies or electronic versions of reports may be made accessible through websites, zero-data portals, and provided at identified public places.

Taking the above into consideration, the planned public participation plan for the project was adjusted and submitted to the DMRE for consideration. The public participation plan was approved by the DMRE on 13 July 2020. The distribution of the Scoping Report, as outlined in Table 8-1, was aligned with the approved public participation plan.

TABLE 8-1: OVERVIEW OF THE SCOPING PHASE PUBLIC PARTICIPATION PROCESS

Task		Description
Notification – I&Aps		
Public participation undertaken to date	DMRE application	Submission of the application form to the DMRE via the SAMRAD system.
	Land claims commissioner consultation	The Land Claims Commissioner was consulted to verify if any land claims have been lodged on the farms within the MMT MR area and on the portion 4 of the farm Middelplaats 332. See Appendix C1 for a copy of the correspondence received from the Land Claims Commissioner in November 2019 and August 2020.
	A desktop social scan	A desktop social scan was undertaken as part of the EA process to verify details of the existing I&AP database for MMT. The desktop social scan therefore included the following: • The verification of the relevant surrounding landowners, land occupiers, relevant ward councillor, municipalities, organs of state, commenting authorities and other I&Aps; • Verification of contact details for I&Aps on the existing database; and • Verification of appropriate communication structures. A copy of the project database is included in Appendix C4. This database has been updated on an on-going basis throughout the EA process.

Task		Description
Public participation undertaken to date	BID	A BID has been compiled by SLR and was distributed to I&Aps and commenting authorities registered on the project database. The BID provided: • Information about the proposed project and ED process; • Information about the baseline environment of the proposed project area; • Information pertaining to project alternatives that will be considered as part of the EA process; • Information regarding possible biophysical, heritage/cultural and social impacts associated with the proposed project activities; • Details pertaining to the public participation process; and • Information on how I&Aps can have input into the S&EIA process. A registration and response form was attached to the BID, which provided I&Aps with an opportunity to submit comments on the proposed project. The BID was made available in English, Afrikaans and Setswana. A copy of the BID including the proof of distribution is included in Appendix C3.
	Site notices	SLR placed laminated A2 site notices (in English, Afrikaans and Setswana) at key conspicuous positions in and around MMT, the decommissioned Middelplaats Mine as well as nearby towns in March 2020. Given the time that passed since the initial I&AP notifications, re-engagement site notices were placed at key conspicuous positions in and around the MMT, the decommissioned Middelplaats Mine as well as nearby towns in March 2021. Copies of the site notices, photographic proof and a map illustrating the location of the site notice placements (those placed in 2020 and 2021) are provided in Appendix C. Copies of the site notices, photographic proof and a map illustrating the location of the site notice placement are also provided in Appendix C2.
	Newspaper advertisements	Block advertisements were placed in two local newspapers. In this regard, advertisements were placed in the Kathu Gazette on 7 March 2020 and in the Kalahari Bulletin on 5 March 2020. Given the time that has past since the publication of the initial advertisements, re-engagement advertisements were published in the Kathu Gazette on 26 March 2021 and the Noordkaap Bulletin on 25 March 2021. See Appendix C2 for a copy of the advertisements placed in 2020 and 2021.
	Public and commenting authorities meeting	A public and commenting authorities meeting was held as part of the public participation process at the Hotazel Recreational Club on 12 March 2020. The purpose of the meeting was to provide: • Information about the proposed project; • Information about the baseline environment of the proposed project area; • Information about the environmental authorisation process; • Information pertaining to project alternatives that will be considered as part of the environmental authorisation process; • Information regarding possible biophysical, heritage/cultural and social impacts associated with the proposed project activities;

Task		Description
		• Details pertaining to the public participation process; and • Information on how I&APs and commenting authorities can have input into the environmental assessment process. No I&APs attended the meeting.
Public participation undertaken to date	Review of the Scoping Report	The Scoping Report was made available for public review for 30 calendar days. I&APs were notified when the Scoping Report was available for review via email and SMS notifications. Full copies of the Scoping Report were uploaded onto the SLR website and the SLR data-free website. The link to this website was distributed to all I&APs via email and SMS notifications. A Non-Technical Summary of the Scoping Report, available in English, Afrikaans and Setswana, was also made available to all I&APs via email. A copy of the Non-Technical Summary is included in Appendix C3 together with the proof of distribution.
	Submission of the Scoping Report to the DMRE	The Scoping Report was updated to include any comments received by I&APs during the public review period. This updated Scoping Report was uploaded onto SAMRAD for DMRE decision-making purposes and subsequently approved on 27th October 2021. Approval is provided in Appendix XXX,
	Notification of DMRE decision of the Scoping Report	All I&APs were notified via email and SMS notifications of the DMRE's decision of the Scoping Report. Once the Scoping Report was accepted, the EIA phase was initiated.

8.2 EIA PUBLIC PARTICIPATION

8.2.1 Notification of I&APS

All registered I&APs included on the project database were involved in the EIA process of the project. Notifications were in the form of emails and bulk SMS notifications. The relevant I&APs identified for the project are listed below:

- Competent authority:
  - DMRE
- Commenting authorities:
  - DWS;
  - DENC;
  - SAHRA;
  - Department of Agriculture and Land Affairs ;
  - DFFE;
  - The Northern Cape DRDRL ;
  - Department of Public Works, Roads and Transport;
  - JTGDM;

  - JMLM; and
  - Ward councillor (Ward 4).
- Parastatals:
  - Telkom;
  - Transnet; and
  - Eskom.
- Non-government organisation
  - Kalagadi Water User Forum.
- Others:
  - Landowners and land users; and
  - Surrounding mines and industries.

8.2.2 Details of the Public Participation Process to be Followed for the EIA Phase

The table below outlines the details of the public participation process that will be followed during the EIA phase of the project. This process is aligned with the public participation plan approved by the DMRE.

TABLE 8-2: DETAILS OF THE PUBLIC PARTICIPATION PROCESS TO BE FOLLOWED DURING THE EIA PHASE

Task	Description
Review of the EIA and EMPR	
I&APs review of the EIAR and EMPR	The EIAR and EMPR has been made available for public review for 30 calendar days. I&APs have been notified that the EIA and EMPR are available for review via email and SMS notifications. Full copies of the EIA and EMPR have been uploaded onto the SLR website and data-free website. The link to this website was distributed to all I&APs via email and SMS notifications. A Non-Technical Summary of the EIAR and EMPR, available in English, Afrikaans and Setswana, was made available to all I&APs via email.
Submission of the EIAR and EMPR to the DMRE.	The EIAR and EMPR will be updated to include any comments received during the review of the report by I&APs. The updated reports will be uploaded onto SAMRAD for consideration by the DMRE.
Notify I&APs of the DMRE's decision.	Notify I&APs of the decision taken by DMRE and applicable appeals processes.

8.3 SUMMARY OF ISSUES RAISED BY I&APS

A summary of the issues and concerns raised by I&APs to date as part of the Scoping Phase public participation process are tabulated below.

TABLE 8-3: SUMMARY OF ISSUES RAISED BY I&APS AND COMMENTING AUTHORITIES DURING THE SCOPING PHASE

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
Initial public participation				
Other I&APs				
Khahliso Makale	Eskom, email correspondence received on 17 March 2020	This notice affects the existing Eskom Distribution's power lines, Adams/Umtu 1 132 kV Overhead Line, Adams/Umtu 1 132 kV Overhead Line, Umk/Milner 1 132 kV Overhead Line, Adams/Umtu 1 132 kV Overhead Line, Adams/Kalbas 1 132 kV Overhead Line, Riries/Dougnor 1 11 kV Overhead Line, Milner/Dougnor 1 132 kV Overhead Line, Dougnor Substation and Hotazel/Middelplaats 1 66 kV Overhead Line which traverses the proposed mining area. The approximate positions of these services are indicated on the attached locality Map. Eskom Distribution will raise no objection to the proposed Mining operations on the above mentioned properties provided Eskom's rights and services are acknowledged and respected at all times. Eskom's rights are protected by Wayleave Agreements and Servitudes. The approximate positions of these services are indicated on the attached.	The numerous powerlines located to east of the MMT Mining Right boundary will not be influenced by the proposed project. The powerlines located near the decommissioned Middelplaats Mine which follow a portion of the D3457 to the South of the MM,T will be in close proximity to the proposed dewatering pipeline from the decommissioned Middelplaats Mine to the MMT (option 1 – refer to Section 43). South32 is aware of the requirements of Eskom, which	See Figure 3-2 for the location of the Eskom lines. Section 9.14– Land use baseline

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		Further to the above the following conditions must be adhered to and accepted in writing before any development and or construction: **A.1 Access and egress** Eskom shall at all times retain unobstructed access to and egress from its servitudes and services. **A.2 Approvals** A.2.1 Eskom's consent doesn't relieve the applicant from obtaining the necessary statutory, landowner or municipal approvals. A.2.2 The applicant will adhere to all relevant environmental legislation. Any cost incurred by Eskom as a result of non-compliance will be charged to the applicant. **A.3 Eskom Cables** Eskom's underground cables affected must be placed in sleeves encased in concrete across the width of the servitude, at the applicant's expense. Materials to be used and relevant dimensions shall be determined as required. **A.4 Dimensions** No construction or excavation work shall be executed within 11 metres from any Eskom power line structure, and/or within 11 metres from any stay wire.	will be adhered to prior to any construction related activities.	

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		A.5 Earthing All work within Eskom's servitude areas shall comply with the relevant Eskom standards in force at the time. **A.6 Expenditure** If Eskom has to incur any expenditure in order to comply with statutory clearances or other regulations as a result of the applicant's activities or because of the presence of his equipment or installation within the servitude or wayleave area, the applicant shall pay such costs to Eskom on demand. **A.7 Ground level variations** Changes in ground level may not infringe statutory ground to conductor clearances or statutory visibility clearances. After any changes in ground level, the surface shall be rehabilitated and stabilised so as to prevent erosion. The measures taken shall be to Eskom's requirements. **A.8 Indemnity** Eskom shall not be liable for the death of or injury to any person or for the loss of or damage to any property whether as a result of the encroachment or of the use of the servitude area by the applicant, his/her agent, contractors, employees, successors in title, and assigns. The applicant indemnifies Eskom against loss, claims or damages including claims pertaining to consequential damages by third parties		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		and whether as a result of damage to or interruption of or interference with Eskom's services or apparatus or otherwise. Eskom will not be held responsible for damage to the applicant's equipment. The applicant's attention is drawn to the Electricity Act, 1987, (Act 41 of 1987, as amended in 1994), Section 27(3), which stipulates that the applicant can be fined and/or imprisoned as a result of damage to Eskom's apparatus. **A.9 Machinery** No mechanical equipment, including mechanical excavators or high lifting machinery, shall be used in the vicinity of Eskom's apparatus and/or services, without prior written permission having been granted by Eskom. If such permission is granted the applicant must give at least seven working days prior notice of the commencement of work The Eskom's authorised area representative for the Kathu CNC: Victor Andreas 053 723 6902/083 789 0770, email address: AndreVC@eskom.co.za. This allows time for arrangements to be made for supervision and/or precautionary instructions to be issued. **A.10 Permission to do work** A.10.1 No work shall commence unless Eskom has received the applicant's written acceptance of the conditions specified in the letter of consent and/or permit.		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		A.10.2 Eskom's rights and duties in the servitude shall be accepted as having prior right at all times and shall not be obstructed or interfered with. Note: Where an electrical outage is required, at least fourteen workdays is required to arrange same. A.11 Remedial action Under no circumstances shall rubble, earth or other material be dumped within the servitude or Way Leave restriction area. The applicant shall maintain the area concerned to Eskom's satisfaction. The applicant shall be liable to Eskom for the cost of any remedial action which has to be carried out by Eskom. **A.12 Safety** A.12.1 The clearances between Eskom's live electrical equipment and the proposed construction work shall be observed as stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993). A.12.2 Equipment shall be regarded electrically live and therefore dangerous at all times. A. 12.3 In spite of the restrictions stipulated by Regulation 15 of the Electrical Machinery Regulations of the Occupational Health and Safety Act, 1993 (Act 85 of 1993), as additional safety precaution, Eskom will not approve the erection of Houses, or structures occupied or		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		frequented by human beings under the power lines and only after consideration of all alternatives, within the servitude area. A. 12.4 Eskom may stipulate any additional requirements to illuminate any possible exposure to Customers or Public to coming into contact or be exposed to any dangers of Eskom plant. A. 12.5 It is required of the applicant to familiarize him/herself with all safety hazards related to Electrical plant. **B.1 Blasting, opencast mining and undermining** B.1.1 A specific document of permission in respect of the blasting or mining activity as issued by the Inspector of Mines must be submitted to Eskom before commencement of operations. [refer to the Minerals Act, 1991 (Act 50 of 1991) Regulation 9.33.5 – Permission to fire more than one shot hole at a time within 500m from surface structures] B.1.2 Blasting in close proximity to Eskom's overhead power lines or substations is prohibited unless the following precautions are met [refer to the Mine Health and Safety Act, 1996 (Act 29 of 1996) Regulation 17.6(a) - 100m and above • a blasting plan submitted with the document of permission referred to in B.1.1 above, • a Peak Particle Velocity (PPV) to be kept below 75 mm/s, for lines and 50 mm/s for buildings,		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		• a seismic control device is set up to record the readings, ensure fly rock and air blast control by means of adequate matting, in the interest of air blast control, only single shot blasting shall be allowed. • Permission for blasting will be strictly as stipulated in the Blasting Design by the Blasting Consultants and blasting should be done away from the power lines. B.1.3 The applicant will be held liable for damage to Eskom's towers or substation equipment, as a result of blasting activities. B.1.4 Costs incurred by Eskom to comply with statutory requirements in terms of an applicant's (or his contractors) works, equipment or plant in the servitude area, shall be paid to Eskom on demand. B.1.5 Eskom may charge the applicant appropriately for time on site during blasting operations. B.1.6 Eskom reserves the right to withdraw its consent if the blasting process becomes hazardous and likely to result in power interruptions. B.1.7 If and whenever the applicant applies and if permission for the blasting process is granted the applicant must give at least fourteen workdays prior notice of the commencement of blasting to The Eskom's authorised area representative for Kathu CNC: Victor Andreas 053 723 6902/083 789 0770, email address: AndreVC@eskom.co.za. This allows		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		time for arrangements to be made for supervision of and/or precautionary instructions to be issued in terms of the blasting operation. **B.1.8 General Conditions** B.1.8.1 Firing near the power lines should be along a free face, facing away from the power lines, as the Mine has suggested. B.1.8.2 The Mine should prepare a proper analysis of the rock structure and any geological anomalies prior to blasting. B.1.8.3 The "safe distance of 25m" from Eskom pylons should be indicated on the blasting plan. Existing geological faults, decomposed zones and fractured rock structures could have destabilising effects on founding material as a result of the firing, especially when developing an open face next foundations and below founding level. These conditions should be considered when deciding on the method and plan of blasting near the Eskom power line pylons. B.1.8.4 Eskom retains the right to appoint any specialist at any time on behalf of the Mine, to inspect Eskom structures for deformation. B.1.8.5 The mining depth near Eskom pylons should carefully be controlled for stability and adjustments being made when so instructed by Eskom.		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		B.1.8.6 Upon receiving the letter of consent from the inspector of the mine to blast below 100m, the applicant must present to Eskom Technical Evaluation Forum L3 the blasting philosophy for final approval. Should the applicant or his contractor damage any of Eskom services during commencement of any work whatsoever, then Eskom's 24 hour Contact Centre Tel: 08600 37566 must be dialled immediately to report the incident. Any relocation of Eskom's services, due to this undermining, will be for the account of the Applicant. The Applicant will also be responsible for granting Eskom an alternative route for the power line. The Eskom Customer Contact Centre at 08600 37566 must be contacted in connection with any line deviation and costs.		
Comments received during the review of the Scoping Report				
SAHRA - Commenting authority				
Natasha Higgit	23 April 2021 – Interim comments (Case ID: 16265)	SLR Consulting has been appointed by Hotazel Manganese Mines (Pty) Ltd to conduct an Environmental Authorisation (EA) Amendment Application for proposed changes to the infrastructure layout and activities at the Mamatwan Mine, near Hotazel, Northern Cape Province (NC-00198-MR/102).	Heritage/cultural and Palaeontological Studies will be compiled for the project. Refer to Appendix D and Appendix E respectively.	Section 9.12– baseline environment

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		A draft Scoping Report (DSR) has been submitted in terms of the National Environmental Management Act, 1998 (NEMA) and the 2017 EIA Regulations for activities that trigger the Mineral and Petroleum Resources Development Act, 2002 (MPRDA)(As amended). The proposed change in layout and activities includes the following: establishment of top-cut stockpile and associated mobile crushing and screening plant, establishment of stormwater management infrastructure, establishment of pipelines, and upgrading the railway and railway loadout station. The DSR notes that a Heritage and Palaeontological Study will be compiled for the project as part of the EIA phase. The SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit notes the pending Heritage Impact Assessment and Palaeontological Impact Assessment. The HIA must comply with section 38(3) of the National Heritage Resources Act, Act 25 of 1999 (NHRA). The archaeological component of the HIA must comply with the 2007 Minimum Standards: Archaeological and Palaeontological Components		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		for Impact Assessments. Additionally, as the proposed development application area is located in an area of moderate sensitivity for palaeontological resources as per the SAHRIS Palaeo Sensitivity map, a desktop Palaeontological Impact Assessment (PIA) must be required to be undertaken by a qualified palaeontologist. (See https://www.palaeosa.org/heritage-practitioners.html for a list of qualified palaeontologists). The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Further comments will be issued upon receipt of the above requested reports and the Draft EIA documents. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.		
Other I&APs				
Judy Behr	Allmar Engineering, email received on 25 March 2021	Our company would like to enquire more information regarding the published advertisement in the Noordkaap Bulletin 25 March 2021. We are an active vendor on Mamatwan mine. Proposed Layouts – Establishment of pipeline to transfer water from the decommissioned Middelplaats Mine to MMT. Would you be so kind as to let us know the way forward regarding the above mentioned?	Vendor related aspects have been submitted to South32 for consideration.	Not applicable

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
Moses	I&AP, email received on 03 May 2021	I hereby request to register as an interested party in Mamatwan new expansion and other related developments. Feel free to update me with any developments which are taking place in Mamatwan, especially from an environmental point of view in the mine.	This email serves to confirm that you have been included onto the project database. We will keep you appraised of the project throughout the environmental authorisation process.	Appendix C– Stakeholder Database
BB Andrews	Harambee Social Justice, powered by Allen and Ovary Project 03 May 2021, received via email	Thank you for the opportunity to comment on CHANGES TO THE INFRASTRUCTURE LAYOUT AND ACTIVITIES AT THE MAMATWAN MINE. We are The Harambee Social Justice Project. We would like to bring to the agency's attention to alternative options that are highly relevant for the decision-making process regarding the proposed activity changes for the Mamatwan Mine (MMT) with specific reference to the re-processing of material located in Adams Pit. The alternative option proposed suggest that the actual socio-economic impact of the regulatory actions will empower social justice and socio-economic upliftment in local communities. This resource would develop BBEEE suppliers to the mine, provide additional educational and training opportunities and go a long way to addressing some of the Mine's Social and Labour plan commitments.	The proposed project is in the initial stages of the public participation process and as such all I&APs will be provided with an additional opportunity to review the EIA and EMPR. The re-processing of material within is under investigation and as such further information will be provided in the EIA and EMPR. With reference to Section 7 it is important to note that the re-processing of material within also forms part of rehabilitation	Section 7

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		Please consider what this proposed alternative approach implies regarding the effectiveness of this project in achieving its stated purpose. We are grateful for the opportunity to review the subject documentation. As an interested and/or affected party (I&AP) we would like to be informed about the proposed project and have input into the IRP processes and reports. We also welcome the opportunity to provide input at the public meeting and to review and comment on any further reports. As such, we offer the following comments for consideration and incorporation in the IRP. **Reprocessing of material located in** Mamatwan Mine (MMT) is making an application to the DMRE for an integrated Environmental Authorisation and to update of the mine's EMPR to address a number of proposed layout and activity changes. Within this list of activity changes is the proposed re-processing of material located in . We understand the DMRE to have issued HMM with a Notice of Intention (September 2019) specifying that the storage of sinter de-dust	activities, which is in line with the mine's commitments. The removal of materials from for re-processing should also reduce the risk to groundwater contamination, as a potential contamination source will be removed (refer to Section 7). The re-processing of the material within is considered the preferred method of management. Consideration will however be given to how the re-processing of the material is undertaken, with the aim to identify means that possibly lead to supplier development and/or community related projects. It should be further noted that the re-processing of material within is not the only project component	

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		bags in could not continue. We acknowledge that the re-processing of the material located in is the only feasible operational option given that identifying a new storage area is constrained by existing infrastructure and activities at the mine and would require the disturbance of additional undisturbed areas. We note that MMT did not consider any alternative options for the re-processing of the material in which would provide for industrialisation, supplier development or community impact projects. We would like to bring to the agency's attention alternative options for the re-processing of the material located in for the implementation of community benefit projects. **Project Social Impact** We believe that mining entities play a significant role in improving the socio-economic conditions of the communities in which they operate. However, there is often a disconnect between the good intentions of the social and labour plans and the poor socio-economic development levels that exist in the mining communities. In this respect we would like to echo Minister Gwede Mantashe's remarks in that while *"…. there is a*	that could provide procurement opportunities. The establishment of the top cut stockpile, the establishment of stormwater management infrastructure, establishing dewatering infrastructure from Middelplaats and upgrading the existing railway line all present procurement opportunities. This has been identified as a potential positive socio-economic impact for the proposed project (refer to Section 7). Further information pertaining to the procurement opportunities will be provided in the EIA and EMPR.	

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		noticeable improvement in the levels of compliance. However, overall transformation of the mining industry remains unacceptably low; *- The spirit of the Mining Charter was not fully embraced, and compliance was generally thought of as means to protect the "social license to operate";* *- The majority of mining communities continue to live in abject poverty despite the State, being the custodian of the Country's mineral wealth on behalf of the nation."* As a result, every opportunity should be made to establish real partnerships between the mining companies and the surrounding communities. We understand that while the project will support and enable continuation of current operations of the MMT, which will in turn sustain economic and social development, we wish to enhance the transformative socio-economic benefits of the MMT project by addressing: 1. Skills Development 2. Local Procurement 3. Supplier Development		

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this report where the issues and or responses were incorporated
		4. Enterprise Development 5. Social Economic Development At the local level, the host community is increasingly resistant to project development because they feel the costs of mining activities on their livelihoods and environment are higher than the benefits they derive from those activities. In addition to receiving direct revenues and employment, there is increasing demand to access procurement opportunities. Core to Harambee approach is their belief that the Minerals Industry can play a leading role in advancing government development outcomes by supporting strategic solutions from the private sector regarding resource recovery and social impact management.		

9. ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE SITE

The baseline information provided in the following section is aimed at giving the reader perspective of the biophysical, cultural/heritage and socio-economic context and sensitivity prior to the commencement of the project activities. This is important in understanding the potential impacts of the project. This section provides a description of these attributes in the receiving environment of the project footprint.

The information provided within this section is based on the specialist reports compiled for this project. Each section will reference the applicable specialist report.

9.1 GEOLOGY

9.1.1 Introduction

Geology and associated structural features provide a basis from which to understand:

- The potential for sterilisation of mineral reserves;
- The geochemistry and related potential for the pollution of water from mineralised waste facilities and stockpiles (tailings dam and waste rock dumps); and
- The potential for geological lineaments such as faults and dykes. Faults, dykes and other lineaments can act as preferential flow paths of groundwater, which can influence both the dispersion of potential pollution plumes and the inflow of water into mine workings.

9.1.2 Data sources

The information in this section was sourced from the Waste Assessment and Geochemical Characterisation Report (SLR, 2020) and the Geohydrological report for MMT (GHT, 2018).

9.1.3 Description

Regional geology

The MMT is located on the southwestern outer rim of the Kalahari Manganese Field (KMF). The general stratigraphic column of the KMF is presented in the table below.

TABLE 9-1: GEOLOGICAL DESCRIPTION

Supergroup / Group / Subgroup / Formation		Geological Description
Kalahari Group		Kalahari sands, calcrete, clays & gravel beds
Kalahari unconformity		
Karoo Supergroup		Dwyka tillite
Dwyka unconformity		
Olifantshoek Supergroup	Lucknow Formation	White ortho-quartzite
	Mapedi Formation	Green, maroon and black shales and quartzites
Olifantshoek unconformity		

Transvaal Supergroup	Postmansburg Group	Voelwater Subgroup	Mooidraai Formation	Dolomite, Chert
			Hotazel Formation	Banded ironstone (upper)
				Upper Manganese Ore Body
				Banded Ironstone (middle)
				Middle Manganese Ore Body
				Banded Ironstone (middle)
				Lower Manganese Ore Body
				Banded Ironstone (lower)
		Ongeluk Formation		Andesitic Lava

Three beds of manganese ore are interbedded with the Banded Iron Formation (BIF) of the Hotazel Formation (Transvaal Supergroup). The BIF of the Hotazel Formation typically consists of repeated thin layers of black iron oxides (magnetite or hematite) alternating with bands of iron-poor shales and cherts.

Local and operational geology

MMT mines the manganese ore from the Hotazel Formation (within the Transvaal Supergroup), which is underlain by basaltic lava of the Ongeluk Formation (Transvaal Supergroup) and directly overlain by dolomite of the Mooidraai Formation (Transvaal Supergroup). The Transvaal Supergroup is overlain unconformably by the Olifantshoek Supergroup which consists of arenaceous sediments, typically interbedded shale, quartzite and lavas overlain by coarser quartzite and shale. The different formations present in the project area include the Mapedi and Lucknow units. The whole Supergroup has been deformed into a succession with an east-verging dip.

The Olifantshoek Supergroup is overlain by Dwyka Formation which forms the basal part of the Karoo Supergroup. At the mine, this consists of tillite (diamictite) which is covered by sands, claystone and calcrete of the Kalahari Group.

According to the GHT report (2018) the Hotazel formation is structurally confined within the Dimoten Syncline, a north-westerly plunging basin containing more than 80% of global land-based manganese reserves within an area of approximately 525 km^2. It is this basin that defines the extent of the KMF.

The Hotazel Formation includes a Banded Iron Formation (BIF). The ore is contained within a 30 to 40-meter-thick mineralised zone which occurs along the entire area and is made up of three manganese-rich zones:

- Upper Manganese Ore Body (UMO);
- Middle Manganese Ore Body (MMO); and
- Lower Manganese Ore Body (LMO).

The UMO is 10cm to 15cm thick and comprises moderate deposits of manganese. The poorly mineralised MMO is approximately 1m thick and not economically efficient. The LMO is a highly mineralised unit consisting of six important mineralised zones (X, Y, Z, M. C and N).

According to the GHT report (2018), the manganese ore dips in a south to south-westerly direction at approximately six degrees, has a lower grade at MMT, and is characterised by laminated, carbonate bearing,

braunite rich mudstone. Exposed ore is typically massive in character, with minor vertical fracturing and bedding parting observed.

Faults and dykes

The GHT report (2018) reports a sill on the Smartt-Rissik prospect adjacent to the MMT. The full extent of this sill is apparently unknown at this stage and would require further exploration drilling, however GHT notes that this sill is known to also sub-crop, presumably continuously and with relative constant thickness, on the MMT and Middelplaats mine properties. According to the GHT report (2018), sill material appears to have similar characteristics to the older Ongeluk Formation, although it can sometimes be distinguished on the basis of colour, feldspar shape, and the apparent absence of augite. When drilled using rotary air percussion equipment, the sill was generally found to be resistant to drilling, and in most instances, fresh throughout. Observed core obtained from diamond drilling was typically un-fractured, with those rare fractures typically filled with secondary minerals.

The GHT report (2018) reports a second sill during mining at the Hotazel Pit further to the north and was easily distinguished from adjacent sub-crops of sub-vertical to vertical dykes and Ongeluk Lavas due to its fibrous appearance, a consequence of the predominance of plagioclase lathes.

Various intrusive structures are close to and around MMT. These include doleritic dykes. It is expected that vertical displacement of the Hotazel Formation and the sill that intrudes it has occurred along the trend of many of these structures. It is further noted that many of the permeable voids that developed in response to faulting would have been filled during a later magmatic phase (GHT, 2018).

Geochemistry analysis – Acid base accounting (ABA)

Introduction

Acid Base Accounting (ABA) is an internationally accepted analytical procedure that screens the acid-producing and acid-neutralizing potential of a sample. Net Acid Generation (NAG) tests directly determine the acid generating potential of sulphur minerals in a rock sample. The final NAG pH after complete oxidation of the sample is used as a screening criterion for the acid generation potential.

Synthetic Precipitation Leaching Procedure (SPLP) leach tests are a laboratory extraction method designed to provide an indication of the metals and salt that could be leached from the waste products. The procedure makes an assessment where rainfall is the only external factor influencing leachate generation. The pH value of the extraction value can be altered to allow the evaluation of the leachate quality under potential acid rock (pH 3) or neutral (pH 7) conditions. Leach test results are not a direct indicator of drainage quality as the conditions of the test, especially the liquid-to-solid ratio, do not represent actual field conditions. Therefore, leachate concentrations are not representative of seepage or run-off that could emanate from site.

Analysis

The rock samples taken from the waste rock / discard dumps and slimes / tailings facilities of Mamatwan Mine and were submitted to the Institute for Groundwater Studies for Acid-Base Accounting (ABA) and leaching tests. The following conclusions can be made regarding the ABA results and calculations:

- Constituents are not readily soluble in water, even when completely oxidized. Nevertheless, testing did suggest that trace to minor amounts of crushed ore derived Ca, K, B, Mg, Na and SO4 could dissolve under ideal conditions, which suggests that these parameters also have potential for application as pollution indicators during routine monitoring.
- With regards to acid generation potential, all tested slimes, and discards samples of Mamatwan were classified “very low risk” when test results were analysed. This is due to the relative abundance of contained neutralising minerals (i.e. calcite and dolomite).
- According to the pH values, the discards pose a low acid risk. The pH tests are, however, the least determinative and only serve as a first indication of the acid generation potential. The final pH values for the samples were between 7.19 and 11.25 (Final pH > 5.5, sample is considered to be non-acid-generating).
- The NNP (Net Neutralising Potential) values for both open and closed systems indicate that the discards contain an excess of neutralising minerals.
- The Neutralising Potential Ratio values further indicate that there is no acid potential for both open and closed systems.
- The verdict of the comparative interpretation of the ABA results is that the waste rock discards of Mamatwan Mine pose a very low risk of acidification or Acid Mine Drainage.

Geochemistry analysis – Leachate

The monitoring report (GHT Global, 2018 [as cited in GHT,2018]) indicated that the most important impacts on the surface water and especially the groundwater at the Mamatwan mine site were nitrate, manganese and boron, with some other parameters such as calcium and magnesium being elevated. Emphasis is placed on groundwater, as the surface water structures are part of a closed mine reticulation system. The geochemical models have indicated that the geological waste is the source of calcium, magnesium and bicarbonate together with the manganese, boron and fluoride. Due to the extreme evaporative conditions of the regional climate of the HMM sites as well as the mine reticulations systems which are closed systems, dissolved salts can build up in the system with time, which is in part the reason for the elevated major ions, such as calcium and magnesium. The models have also indicated that small amounts of manganese as well as boron can be leached from the waste rock and tailings and potentially impact groundwater.

9.1.4 Conclusion

A sill is reported to sub crop on the MMT Mine property, while a second one was reported during mining at the Hotazel Pit further to the north. There are other various intrusive structures close to and around MMT, including doleritic dykes. With regards to geochemistry, it was concluded that the waste rock discards of Mamatwan Mine pose a very low risk of acidification or Acid Mine Drainage. Furthermore, small amounts of manganese as well as boron can be leached from the waste rock and tailings and potentially impact groundwater. It follows that pollutions control measures must be considered for the waste rock and tailings.

9.2 TOPOGRAPHY

Introduction and link to impact

The presence of project infrastructure and mining activities has the potential to change the natural topography. A change in topography has the potential to impact on visual amenity (Section 9.10) and surface water drainage

(Section 9.6) and may be harmful to third parties and animals. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

9.2.1 Data sources

Information in this section was sourced from site visits undertaken by the SLR project team and the review of topographical data and satellite imagery.

9.2.2 Description

In general, the area surrounding the MMT is relatively flat with a gentle slope towards the north and north-west. The elevation varies from 1 087 m to 1 107 m above mean sea level (mamsl). The majority of the natural topography within the project area has been disturbed as a result of the existing mining infrastructure and mining activities associated with the Tshipi Borwa Mine, the decommissioned Middelplaats Mine, the United Manganese of Kalahari (UMK) Mine and the Adams Solar Farm. The mine pits and WRDs at the MMT have had the most influence on topography. The highest topographical features surrounding the MMT are the UMK and Tshipi Borwa Mine WRDs (see Figure 3-2).

9.2.3 Conclusion

The natural topography has been altered as a result of the establishment of the NE topsoil stockpile area. Prior to the establishment of the NE topsoil stockpile the topography of the project site would have resembled similar characteristics to that of the surrounding general area (i.e. relatively flat areas with gentle slopes). Given that Adams Pit was mined out by 1980, the natural topography was already altered prior to the use of Adams Pit for the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust. The project activities present infrastructure that may pose a significant risk to third parties and have impacts on the visual character, water resources, and the surrounding land users. It is therefore vital that the design of the infrastructure should be such that any changes to topography results in stable topographic features which do not have a detrimental impact. This also needs to be considered within the context of the existing altered natural topography due to MMT's infrastructure and mining activities.

9.3 CLIMATE

9.3.1 Introduction and link to impact

Climate can influence the potential for environmental impacts and related mine design. Specific issues include:

- Rainfall could influence erosion, evaporation, vegetation growth, rehabilitation planning, dust suppression and surface water management planning;
- Temperature could influence air dispersion through impacts on atmospheric stability and mixing layers, vegetation growth, and evaporation which could influence rehabilitation planning; and
- Wind could influence erosion, the dispersion of potential atmospheric pollutants and rehabilitation planning.

To understand the basis of these potential impacts, a baseline situational analysis is described below.

9.3.2 Data sources

Information in this section was sourced from previous studies undertaken for MMT (SLR, 2019) as well as the Air Quality Study undertaken by Airshed (2019) in support of the MMT Section 24G Environmental Impact Assessment Report (SLR, 2020).

Rainfall data, rainfall depths and evaporation data were sourced from the nearest weather station (Milner weather station located 7 km east from the MMT). Temperature and wind data were sourced from the Kuruman weather station, located 42 km from the MMT. Wind speed, wind direction and temperature are not recorded at the Milner weather station and as such the Kuruman weather station is the closest weather station to the MMT that provides this data. The locations of the weather stations are illustrated in Figure 3-1.

9.3.3 Description

Regional climate

The project area falls within the Northern Steppe Climatic Zone, as defined by the South African Weather Bureau. This is a semi-arid region characterised by seasonal rainfall, hot temperatures in summer, and colder temperatures in winter (SLR, 2019).

Rainfall, evaporation and rainfall depths

Monthly rainfall and evaporation data for the Milner weather station is summarised in Table 9-2 below. Rainfall depth frequency data is summarised in the table below. The average rainfall at the Milner weather station is 372 mm per annum. Given that the Milner weather station is only 7 km from the MMT, similar rainfall levels can be expected at the mine. The average evaporation rates recorded at the Milner weather station are 2 351 mm per annum for S-Pan and 1 972 mm per annum for open water (see Table 9-2).

TABLE 9-2: SUMMARY OF AVERAGE MONTHLY AND ANNUAL RAINFALL AND EVAPORATION DATA (SLR, JUNE 2019)

Month	Rainfall (mm) Milner (393083 W)	WR2005 S-Pan Evaporation	WR2005 Open Water Evaporation
January	59.8	276.9	232.6
February	63.0	209.9	184.8
March	72.3	193.3	170.1
April	39.9	144.1	126.8
May	19.2	114.7	99.8
June	9.1	91.0	77.3
July	1.3	106.0	88.0
August	5.4	153.8	124.5
September	6.4	213.0	172.5
October	19.2	269.7	218.4
November	31.5	248.0	232.9
December	44.5	294.6	244.5

Month	Rainfall (mm) Milner (393083 W)	WR2005 S-Pan Evaporation	WR2005 Open Water Evaporation
Annual	372.0	2351.0	1972.0

TABLE 9-3: RAINFALL DEPTH FREQUENCY (SLR, JUNE 2019)

Storm Duration (m/h/d)	Return Period (years)						
	2	5	10	20	50	100	200
15 m	15.0	21.3	25.7	30.2	36.3	41.2	46.2
30 m	19.8	28.1	34.0	40.0	48.0	54.4	61.1
45 m	23.3	33.1	40.1	47.1	56.6	64.1	71.9
1 hr	26.1	37.2	45.0	52.8	63.5	72.0	80.7
1.5 hr	30.8	43.8	53.0	62.2	74.8	84.7	95.1
2 hr	34.6	49.2	59.5	69.9	84.0	95.2	106.8
4 hr	40.0	56.9	68.8	80.7	97.0	110.0	123.4
6 hr	43.5	61.9	74.9	87.9	105.6	119.7	134.3
8 hr	46.2	65.7	79.5	93.3	112.1	127.1	142.6
10 hr	48.4	68.8	83.3	97.8	117.5	133.1	149.4
12 hr	50.3	71.5	86.5	101.5	122.0	138.3	155.2
16 hr	53.4	75.9	91.9	107.8	129.6	146.9	164.8
20 hr	55.9	79.6	96.2	113.0	135.8	153.9	172.6
24 hr	58.1	82.6	100.0	117.3	141.0	159.8	179.3
1 d	46.7	66.5	80.5	94.5	113.5	128.6	144.3
2 d	56.8	80.8	97.7	114.7	137.9	156.2	175.3
3 d	63.6	90.5	109.5	128.5	154.4	175.0	196.3
4 d	68.2	97.1	117.4	137.8	165.7	187.7	210.6
5 d	72.0	102.5	124.0	145.5	174.9	198.2	222.4
6 d	75.3	107.2	129.6	152.1	182.9	207.2	232.5
7 d	78.2	111.3	134.6	158.0	189.9	215.1	241.4

Temperature

The area experiences hot temperatures during summer, with the highest record of 42.6°C during the month of January. Winter temperatures are relatively low especially in the months of June to August. Daily maximum temperatures range between 43°C in January to 25°C in June, with daily minimum temperatures between -4.2°C in August to 10°C in January. Table 9-4 below provides the minimum, average and maximum temperature obtained from the Kumaran South African Weather Station for the period 2015 to 2017.

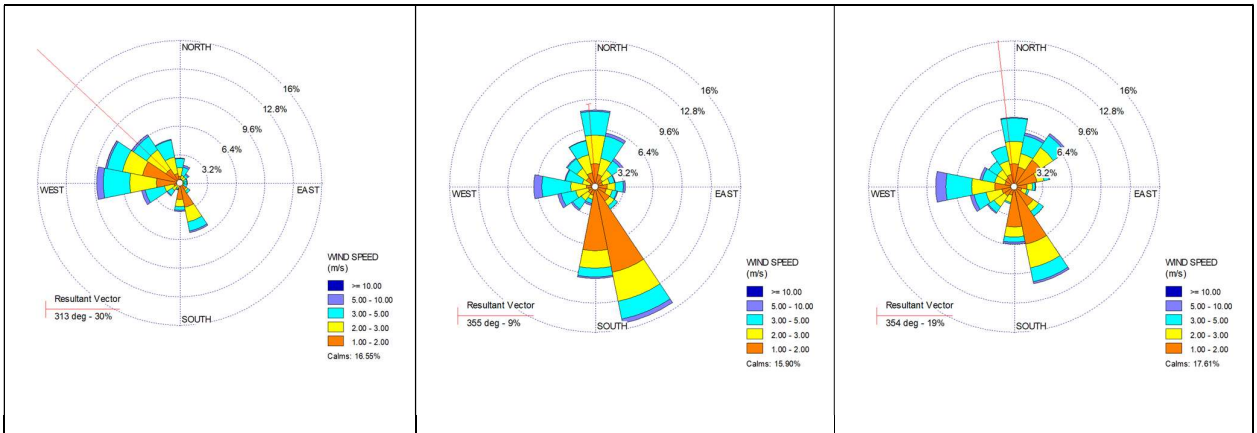
TABLE 9-4: MINIMUM, AVERAGE AND MAXIMUM TEMPERATURES (AIRSHED, 2019)

	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Min	10.1	10	6.4	3.3	2	-3.2	-3.9	-4.2	2.2	2.7	4.3	9.6
Ave	25.1	24.3	22.2	17.9	14.0	10.7	10.8	13.8	18.5	21.7	23.5	26.4
Max	42.6	38.8	35.6	35.3	28.8	25.3	27.1	31.3	34.7	38.5	39.5	39.9

Wind

The annual average wind roses for the Kuruman Weather Station (located approximately 43 km to the west of MMT) for the years 2015, 2016 and 2017 are shown in Figure 9-1 with the period average wind field (2015-2017) and diurnal variability in the wind field provided in Figure 9-2. The predominant wind direction is from the south-south-east and south with most of strong winds from the west. Frequent winds also occur from the north. Over the three-year period (2015 – 2017), the frequency of occurrence of south-south-easterly wind was between 12% and 17%, with winds with a westerly component occurring approximately 15% of the time. Winds occur less frequently from the easterly sector. During the day winds are more frequent from the westerly and the northerly sectors, with the strongest winds directly from the west. The wind shifts during the night-time to dominantly south-south-easterly and southerly winds. Day-time calms occurred for 9% of the time, with night-time calms for 24% of the time.

According to the Beaufort wind force scale, wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 14-17 m/s near gale force winds. Based on the three years of SAWS data (2015-2017), wind speeds exceeding 6 m/s occurred for only 1% of the time, with a maximum wind speed of 10 m/s. The average wind speed over the three years was 2.06 m/s. Calm conditions (wind speeds < 1 m/s) occurred for 17% of the time. The United States Environmental Protection Agency (US EPA) indicates a friction velocity of 5.4 m/s to initiate erosion from a coal storage piles (US EPA, 2006). Thus, the likelihood exists for wind erosion to occur from open and exposed surfaces, with loose fine material, when the wind speed exceeds at least 5.4 m/s. Wind speeds exceeding 5.4 m/s occurred only for 2% over the three years (2015 -2017).



Annual Wind Rose 2015 | Annual Wind Rose 2016 | Period Wind Rose 2015-2017

FIGURE 9-1: PERIOD AND ANNUAL WIND ROSES (AIRSHED, 2019)

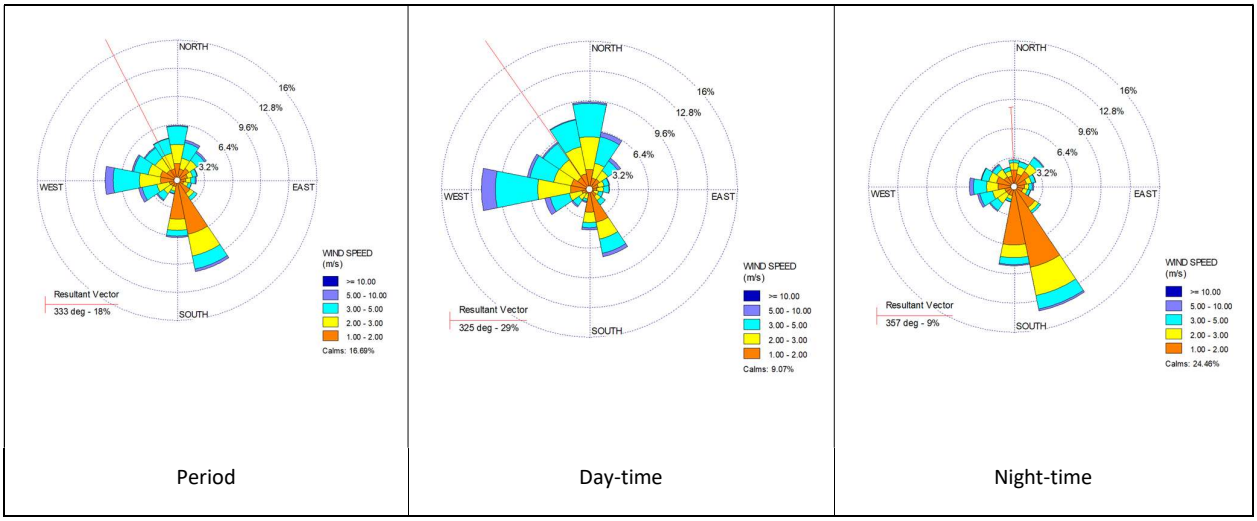


FIGURE 9-2: PERIOD, DAY-TIME AND NIGH-TIME WIND ROSES (AIRSHED, 2019)

Atmospheric Stability

During the daytime, the atmospheric boundary layer is characterised by thermal turbulence due to the heating of the earth's surface and the predominance of an unstable layer. During unstable conditions, ground level pollution is readily dispersed thereby reducing ground level concentrations. 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 (which causes sound scattering in the presence of mechanical turbulence).

For low level releases, such as activities associated with mining operations, the highest ground level concentrations would occur during weak wind speeds and stable (night-time) atmospheric conditions. However, windblown dust is likely to occur under high winds (neutral conditions).

9.3.4 Conclusion

The MMT is characterised by hot to very hot summers and cool to warm winters with rain generally occurring in the form of localised thunderstorms that last for short periods at a time during rainy periods. High evaporation rates reduce infiltration, while rainfall events can increase the erosion potential and the formation of erosion gullies. The presence of vegetation does, however, reduce the effects of erosion. The mixing of layers resulting in the formation of temperature inversions, and the presence of cloud cover limits the dispersion of pollutants. Wind significantly affects the amount of material that is suspended from exposed surface and wind speed determines the distance of downward transport as well as the rate of dilution of pollutants in the atmosphere. The likelihood exists for wind erosion to occur from open and exposed surfaces, with loose fine material, when the wind speed exceeds at least 5.4 m/s. These climatic aspects need to be taken into consideration during operational planning.

9.4 SOILS AND LAND CAPABILITY

This section is based on the specialist study that was completed by Scientific Aquatic Services, dated 2019 and updated in October 2021.

9.4.1 Introduction

Based on observations during the site assessment and local knowledge (Mamatwan Mine Management), the dominant land uses within the focus areas are wildlife/wilderness and grazing land uses. It should be noted that no cultivated commercial agricultural activities were observed within 3km radius of the focus study area. The focus areas resemble Oxidic and Anthropic catena topo sequences Oxidic soils are characterised by strong pigmenting effects of iron in the form of hematite and geothite. These soils drain freely and are well aerated. These attributes make soils ideal for cultivation. Oxidic soils constitute approximately 66% of the total investigation area and these soils include Ermelo and Hutton soil forms.

Some areas were previously subjected to extensive disturbance due to historic mining support infrastructure such as roads and an old waste rock dump. Areas along the existing roads and within the zone of influence showed evidence of disturbance where proposed pipeline route (preferred alignment) with traverse the landscape. These areas are largely dominated by the Anthropic soils which include Witbank soil form. Anthropic soils include all soils which have been subjected to the alteration from their natural state by human-related interventions such that no recognizable diagnostic soil morphological characteristics could be identified. The Witbank and Cullinan soil forms constitute about 32% of the total surveyed area.

9.4.2 Data Source

The soils and land capability study was carried out as a desktop and field investigation. The desktop assessment took the following data sources into account and reviewed these in terms of the study area:

- The Mean Annual Precipitation (MAP) ranges between 201 and 400mm per annum, which means that the MAP of the surrounding area is not ideal for crop growth under rainfed conditions due to high risk of crop failure;
- According to the Geology 2001 and the 1:250 000 geological map of South Africa, the majority of the focus areas is underlain by clastic sedimentary rock formations (i.e. Tillite) while the remaining portions are underlain by Eolean rock formations, of the Kalahari geological groups;
- The desktop assessment indicates that the focus areas have a very low land capability. The entire focus area is considered only suitable for livestock grazing (Class VII);
- According to the AGIS database, the livestock grazing capacity potential is estimated to be approximately 11 hectares per large animal unit (Morgenthal et al., 2005). This area is therefore not considered ideal for commercial livestock farming due to sparsity of vegetation, extreme temperatures and scarcity of water sources which might cause harm to livestock and subsequent loss of profit;
- The natural soil pH is estimated to range between 6.5 and 7.4, indicating that the soils are slightly acidic to neutral, as interpolated from topsoil pH values obtained from the National Soil Profile Database (AGIS database);
- According to the Soils 2001 Layer the focus areas is situated within an area where the soils are classified as red-yellow apedal freely drained soils with a high base status and < 15% clay; and
- The soils within the focus areas have a low to moderate water or wind erosion hazard/potential, and the area is generally level to gently sloping land. The soils therefore have low to very high erodibility due to the sandy soil texture of the dominant soils within the focus areas.

The field assessment included sampling of soils to assess the profile of the soil and confirm the soil form.

9.4.3 Conclusion

The land capability of the proposed development sites is Arable Class I with a Moderate land potential. The overall impact of the proposed mining support infrastructure on the land capability and land potential of these soils is anticipated to be very low and be effectively managed by implementing effective house-keeping and management measures throughout construction, operation and decommissioning.

9.5 BIODIVERSITY

As a baseline, this section provides an outline of the biodiversity occurring on site and the status of the fauna and flora, 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.

9.5.1 Data source

Desktop vegetation type information and the associated conservational status were extracted from the South African National Vegetation Map. Information on plant and animal species recorded for the Quarter Degree Squares (QDS), was extracted from the SABIF/SIBIS database hosted by SANBI. Numerous national and provincial databases were utilised to determine the conservational sensitivity of the project areas. These databases included: The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM: BA) list of threatened ecosystems (2011):

- Important catchments and protected expansion areas in terms of the NPAES;
- The South Africa Conservation Areas Database (SACAD, 2017);
- The South Africa Protected Area Database (SAPAD, 2017);
- The Mining and Biodiversity Guidelines (2013);
- The Northern Cape critical biodiversity areas (CBAs) (2016); and
- IBAs (2015).

In order to determine the Present Ecological State (PES) of the study area, the following methodology was employed:

- Maps and digital satellite images were consulted prior to the field investigation in order to determine broad habitats, vegetation types and potentially sensitive sites. An initial visual on -site assessment of the study area was made in order to confirm assumptions made from the maps;
- A literature review was conducted for habitats, vegetation types and species distribution;
- Relevant databases were considered during the assessment of the footprint area including:
    - The Important Bird and Biodiversity Areas (IBA, 2015);
    - South African Bird Atlas Project 2 (SABAP2);
    - International Union for Conservation of Nature (IUCN); and
    - The Northern cape Critical Biodiversity Areas (2016).

9.5.2 Description

<u>Terrestrial characteristics</u>

The terrestrial characteristics of the project area, derived from desktop information, is summarised in Table 9-5 below. The table also provides information on the sensitivity of the project areas in accordance with existing national and provincial databases. It is important to note, that although all data sources used provide useful and often verifiable, high quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics. This information is however considered to be useful as background information.

The project areas do not fall within any protected or priority areas and the Kathu Bushveld vegetation is considered a Least Threatened Vegetation type, per the National Biodiversity Assessment (2020). The project areas do however fall within the Griqualand West Centre of Endemism. A centre of plant endemism is an area with high concentrations of plant species with very restricted distributions, known as endemics. Centres of endemism are important because it is these areas, which if conserved, would safeguard the greatest number of plant species. The Griqualand West Centre of Endemism is considered a priority in the Northern Cape, as the number of threats to the area is increasing rapidly and it is poorly understood. Furthermore, this centre of endemism is extremely poorly conserved, and is a national conservation priority.

TABLE 9-5: CONSERVATION CHARACTERISTICS OF THE MMT

Details in terms of Mucina and Rutherford (2006)		Description of the vegetation type(s) (Mucina and Rutherford 2006)	
Biome	The project activities are located within the Savanna Biome.	**Vegetation Type**	Kathu Bushveld
		Climate	Summer and autumn rainfall, very dry winters
Bioregion	The project activities are situated within the Eastern Kalahari Bushveld Bioregion.	**Distribution**	Northern Cape Province
		Conservation	Least threatened. Target 16%. Not conserved in statutory parks
Vegetation Type	The project activities fall within the Kathu Bushveld vegetation type.	**Vegetation and landscape features**	Medium-tall tree layer with *Acacia erioloba* in places, but mostly open and including *Boscia albitrunca* as the prominent trees. Shrub layer generally most important with, for example, *A. mellifera, Diospyros lycioides* and *Lycium hirsutum*. Grass layer is variable in cover. **Biogeographically Important Taxa (Kalahari endemics)** Small Tree: *Vachellia luederitzii* var. *luederitzii*. Graminoids: *Anthephora argentea*, *Megaloprotachne albescens*, *Panicum kalaharense*. Herb: *Neuradopsis bechuanensis*.
Conservation details pertaining to the study area (Various databases)			
National Biodiversity Assessment (2011)	Ecosystem types are categorised as "not protected", "poorly protected", "moderately protected" and "well protected" based on the proportion of each ecosystem type that occurs within a protected area recognised in the Protected Areas Act, 2003 (Act 57 of 2003), and compared with the biodiversity target for that ecosystem type. The project activities are located within an area that is currently not protected.		
National Threatened Ecosystems (2011)	The project activities are not located in an ecosystem that is listed as threatened.	**Northern Cape Critical Biodiversity Areas (2016)**	
NPAES (2009), SACAD (2017) and SAPAD (2017)	According to the NPAES database, the SAPAD, 2019 and the SACAD, the project activities do not fall within a protected or conservation area or nature reserve, nor is it situated within 10km of a formal protected area.	The Northern Cape CBA Map identifies biodiversity priority areas, called CBAs and Ecological Support Areas, which, together with protected areas, are important for the persistence of a viable representative sample of all ecosystem types and species as well as the long-term ecological functioning of the landscape as a whole. According to the Northern Cape CBA database, the project activities fall outside of any CBAs. The immediate surrounding area includes natural areas with an Ecological Support Area situated within 5 km to the north-east and the south-west of the project activities.	

Details in terms of Mucina and Rutherford (2006)		Description of the vegetation type(s) (Mucina and Rutherford 2006)
IBA (2015)	The project activities do not fall within an Important Bird and Biodiversity Area (IBA, 2015), nor is located within 10 km of an IBA.	
In terms of the Mining and Biodiversity Guidelines (2013) the project activities do not fall into any biodiversity priority areas and is therefore not deemed a risk for mining.		The project activities are situated within the Griqualand West Centre of Endemism.

Terrestrial habitat units associated with the project areas

TABLE 9-6: HABITAT UNITS WITHIN THE PROJECT AREAS

Habitat Unit	Relevant project areas	Description of vegetation community and sensitivity
Kathu Bushveld Habitat Unit	*Senegalia mellifera - Vachellia haematoxylon – Grewia flava Kathu Bushveld* Largely associated with the top-cut stockpile, crushing and screening plant, and all of the proposed pipeline alternatives.	The Kathu Bushveld habitat unit is considered an open savanna and has well-developed tree/shrub layer with dominant trees such as *Senegalia (Acacia) mellifera*, scattered Terminalia sericea and *Acacia haematoxylon.* The shrub layer is developed and is dominated by species such as *Senegalia mellifera, Tarchonanthus camphoratus, Grewia flava*, and A. hebeclada. The grass layer is variable in cover, with bare soil patches notable throughout the habitat unit. In some areas denser bush clumps occur either consisting of the Protected Tree *Acacia (Vachellia) erioloba* or dense stands of Acacia mellifera. The Kathu Bushveld Habitat Unit is sub-divided into the *Senegalia mellifera - Vachellia haematoxylon – Grewia* flava Kathu Bushveld vegetation community and the *Senegalia mellifera – Stipagrostis Open* Kathu Bushveld vegetation community. See Figure **9-3** for the distribution of the vegetation communities within the project areas.
	Senegalia mellifera – Stipagrostis Open Kathu Bushveld Largely associated with the railway loop.	
Transformed Habitat Unit	Largely associated with , the expansion of an existing road and the existing product stockyard, stormwater management infrastructure, the existing loadout station, potable and process water storage facilities.	The Transformed Habitat Unit refers to areas that have been transformed as a result of historic and ongoing mining activities and infrastructure. These areas contain very little to no vegetation and where present it consists mainly of alien invasive species.
Degraded Bushveld Habitat Unit	Largely associated with the existing WRDs.	The Degraded Bushveld Habitat Unit refers to areas that have been partially or largely transformed. The Degraded Bushveld was severely altered from the reference Kathu Bushveld as a result of mining activities and infrastructure. Also included are all mining areas associated with vegetated areas, such as the rehabilitated historic mine dumps, as well as the outer slopes of currently utilised dumps, where vegetation has managed to re-establish. These areas contain very little natural vegetation and consist mainly of alien invasive species.

Alien and invasive floral species

Alien and invasive floral species are floral species of exotic origin which are invading previously pristine areas or ecological niches. Disturbances of the ground through trampling, excavations or landscaping often leads to the dominance of exotic species that rapidly dominate the area. Under natural conditions, these exotic species are overtaken by sub-climax and climax species through natural veld succession. This process, however, takes many years to occur, with the natural vegetation never reaching the balanced, pristine species composition prior to the disturbance. Alien vegetation invasion causes degradation of the ecological integrity of an area, causing a decline in species diversity, local extinction of indigenous species and ecological imbalance.

Alien invasive species were mainly recorded in the Transformed Habitat Unit. See Table 9-7 for a list of AIS associated with the Transformed Habitat Unit in terms of the NEM: BA List of Alien and Invasive Species (2016). Limited AIS are associated with the *Acacia* Thornveld Habitat Unit.

TABLE 9-7: ALIEN AND INVASIVE SPECIES IN THE PROJECT AREA

Scientific name	Common name	Category*
Trees/ shrubs		
Nicotiana glauca	Wild tobacco	NEMBA: Category 1b
Prosopis glandulosa var. glandulosa	Honey mesquite	NEMBA: Category 3 in Northern Cape.
Forbs		
Argemone ochroleuca subsp. ochroleuca	White-flowered Mexican poppy	NEMBA: Category 1b
Graminoid		
Pennisetum setaceum	Fountain grass	NEMBA: Category 1b

Category 1b – Invasive species that require control by means of an invasive species management programme.

Category 3 – Ornamentally used plants that may no longer be planted; existing plants may remain, except within the flood line of watercourses and wetlands, as long as all reasonable steps are taken to prevent their spread.

9.5.3 Floral Species of Conservational Concern

A number of protected floral species were observed, particularly in the Kathu Bushveld Habitat and include the National Forest Act, (Act 84 of 1998) (NFA) (amended in September 2011) protected trees *Vachellia erioloba* and *Vachellia haematoxylon*. Also observed were a number of Northern Cape Nature Conservation Act (Act 9 of 2009) (NCNCA) protected species, namely *Boophone disticha, Harpagophytum procumbens*, and *Tridentea sp. H. procumbens* is also considered a protected species in terms of NEM: BA Threatened or Protected Species (TOPS). It was observed that individuals of the V. *erioloba* and *V. haematoxylon*, as well as a single individual of the *B. disticha* were observed in the degraded Bushveld habitat unit.

In terms of the NCNCA, Schedule 2 protected species may not be picked, imported, exported, transported, cultivated or traded without a permit. It follows that the removal of any protected species in terms of the NCNCA requires a permit from the DENC. In terms of the NFA, protected tree species may not be cut, disturbed, damaged

or destroyed and their products may not be possessed, collected, removed, transported, exported, donated, purchased or sold - except under licence granted by the DAFF.

9.5.4 Faunal habitat and Species

Mammals

The project activities are unlikely to have a significant impact of mammal habitat or diversity since these areas are located directly adjacent to existing mining areas and these areas were noted to be predominantly occupied by commonly occurring species which do not have restricted ranges or habitat requirement. Furthermore, constant disturbances from current mining have likely ensured that any SCC refrain from entering the study area, remaining in the surrounding more suitable habitat available around the active mining areas.

Birds

The avifaunal habitat sensitivity for the project area is considered to be intermediate. Although a large contingent of SCC are considered likely to utilise areas at the project areas for foraging, only one SCC was deemed to potentially utilise the site for breeding: the African Rock Pipit – utilising the available rocky and grassy hillslopes created by the mining activities. The large contingent of raptors, (all known to have wide ranging) are considered unlikely to breed within the study area due to the lack of tall trees which would be required to build their nests.

Herpetofauna

The Kalahari Tree Skinks and Common Barking Geckos have been recorded at the MMT (NSS, October 2018). Additional reptile species known to occur in the project areas include the Spotted Bush Snake, Cape Cobra, Cape Gecko, Yellow-throated Plated Lizard, Bushveld Lizard, Spotted Sand Lizard, Mole Snake and Puff Adder. Suitable habitat for Common Flap-neck Chameleon and African Rock Python was observed and these species could occur within the study area.

Amphibians

No amphibians were observed within the study area during the field assessment. Moreover, no pans or ephemeral streams transverse the study area making it unlikely that locations of standing or running surface water necessary for most amphibian species survival and breeding occur on the site. The amphibian habitat sensitivity within the study area is considered moderately low. The freshwater habitats which suit the amphibian lifestyle are absent from the study area and the habitat that is available is completely artificial and formed/created from mining processes.

Terrestrial macro invertebrates

Butterfly species that have been recorded at the project areas (NSS, October 2018) included the Wandering Donkey Acraea, African Monarch, Painted Lady, Pea Blue, Broad-bordered Grass Yellow, African Migrant and Common Sandman. None of these butterfly species has a threatened or protected status.

The exoskeleton of the *Uroplectes carinatus* scorpion was recorded at the MMT. The highly venomous *Parabuthus raudus*, and *Opistophthalmus carinatus*, are highly likely to also occur in the project areas. Other potentially occurring scorpion species include *Parabuthus granulatus*, *Opistophthalmus wahlbergii* and *Parabuthus mossambicensis*. All Opistophthalmus and Opistacanthus scorpion species are Protected Species in the Northern Cape. Remaining patches of natural vegetation at the MMT are dotted with the tangled bulbous nests of Community Nest Spiders (*Stegodyphus sp*.) and Banded Garden Spiders (*Argiope australis*).

The insect habitat sensitivity is considered moderately low to intermediate. The floral characteristics of the surrounding habitat types do not support a wide diversity of insect species yet offer suitable habitat for an abundant number of insects.

Faunal Species of Conservational Concern

Only one SCC listed species, *Orycteropus afer* (Aardvark), was observed within the study area and its immediate surroundings. The Kathu Bushveld habitat unit is expected to support a number of faunal SCC. The following faunal SCC are considered to have a POC of 60% or higher and may occur within the study area, namely *Atelerix frontalis* (Southern African Hedgehog), *Felis nigripes* (Black-footed Cat), *Otocyon megalotis* (Bat-eared Fox), *Vulpes chama* (Cape Fox), *Mellivora capensis* (Honey Badger), Aquila verreauxii (Verreaux's eagle), *Anthus crenatus* (African Rock Pipit), *Ardeotis kori* (Kori Bustard) and *Sagittarius serpentarius* (Secretary bird. Three burrowing Scorpions (*Opistophthalmus ater* (CR), *Opistophthalmus carinatus* (NYBA) and *Opistophthalmus wahlbergii* (NYBA)) all have suitable habitat located within the study area and have distributions which overlap the study area. Suitable habitat for *Chamaeleo dilepis* (Common flap-neck chameleon) and *Python sebae* (African rock python) was observed and these species could occur within the study area.

Due to the highly degraded nature of the Transformed Habitat Unit resulting from mining activities, sufficient suitable habitat is not available to support faunal SCC.

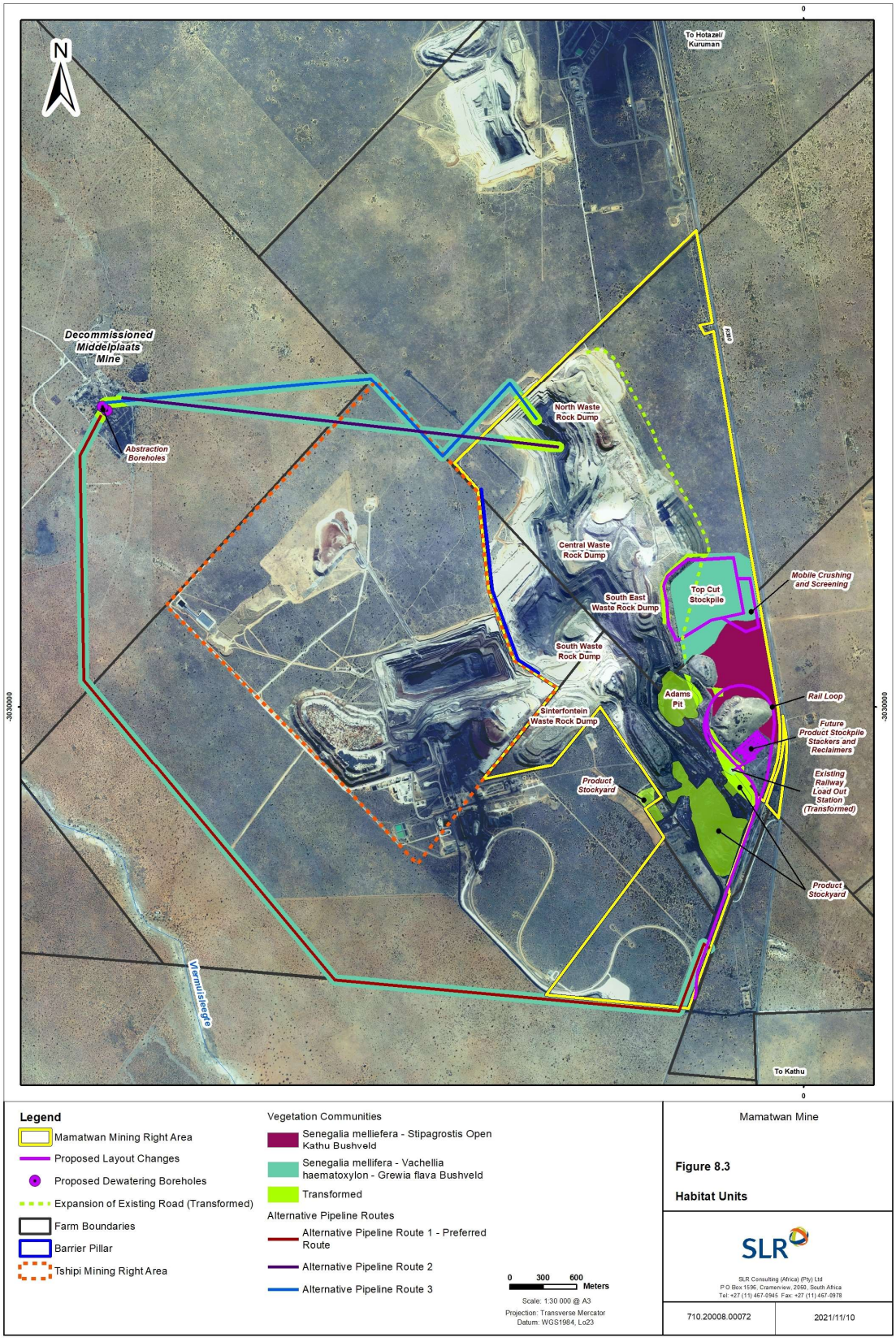


FIGURE 9-3: HABITAT UNITS

9.6 SURFACE WATER

9.6.1 Introduction and link to impact

Surface water resources include drainage patterns and paths of preferential flow of storm water runoff. The establishment of mining infrastructure and activities have the potential to alter the drainage of surface water and/or result in the contamination of the surface water resources through runoff. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

9.6.2 Data sources

Information in this section was sourced from previous studies undertaken for MMT (SLR, June 2019).

Information pertaining to catchments, mean annual runoff (MAR) and water management areas was sourced from the Water Resources of South Africa Manual WR2012 (WR 2012). Information regarding the relevant rivers surrounding MMT was sourced from the review of topographical data and on-site observations.

9.6.3 Catchments within the context of South Africa

The MMT is located within the Lower Vaal Water Management Area. The major rivers associated with this water management area include the Molopo River, Harts River and the Vaal River, which ultimately drain into the Orange River.

9.6.4 Regional hydrology

The MMT falls within the quaternary catchment D41K which has a gross total catchment area of 4 216 km^2, with a net MAR of 6.53 million cubic meters.

The major river within quaternary catchment D41K is the Ga-Mogara drainage channel, which is located approximately 8 km north-west of MMT (see Figure 3-1). The Ga-Mogara drainage channel forms a tributary of the Kuruman River. The Kuruman River flows west joining the Molopo River approximately 250 km from the confluence of the Ga-Mogara drainage channel and Kuruman River. The Molopo River drains in a southerly direction eventually joining the Orange River.

9.6.5 Local hydrology

The nearest watercourses to the MMT are the Vlermuisleegte River (located approximately 3 km west of MMT) and the Witleegte River (located approximately 4 km northeast of MMT). These rivers are ephemeral in nature and as such only flow after significant rainfall events for a short period of time. The last record flow in the Witleegte and Vlermuisleegte Rivers were in 1988. No watercourses are located at the MMT. Both the Vlermuisleegte and the Witleegte Rivers are tributaries of the Ga-Mogara River. The catchment characteristics of the Witleegte and the Vlermuisleegte Rivers are provided in TABLE 9-8 below. Any natural runoff from the MMT will drain in a north and northwest direction towards the Ga-Mogara River.

TABLE 9-8: CATCHMENT CHARACTERISTICS

Catchment	Catchment area (km^2)	MAR (nett) (million m^3/annum)	Watercourse length (km)	Drainage density (km/km^2)
Witleegte catchment	661	0.73	70 350	106.4
Vlermuisleegte catchment	487	0.54	47 250	97

9.6.6 Surface water quality

No water sampling has been conducted at MMT because there are no natural permanent surface water features at the MMT. It follows that, no surface water quality data is available.

9.6.7 Surface water use

Due to the ephemeral nature of Witleegte and Vlermuisleegte Rivers, there is no third-party reliance on surface water.

9.6.8 Floodlines

No floodlines were determined, as no watercourses are located at the MMT.

9.6.9 Wetlands

No wetlands are located at the MMT. However, the site is within the Eastern Kalahari Bushveld Group 1 wetland vegetation group which is considered Least Threatened.

9.6.10 Conclusion

The project presents infrastructure that has the potential to influence contributions of runoff to the catchment and related natural drainage patterns. The project activities also present a potential for the contamination of surface water resources. These potential impacts however need to be considered within the context of the distance of the project activities to watercourses, the sheet flow drainage patterns, the ephemeral nature of the catchment and that natural drainage patterns have already been disturbed as a result of the existing MMT infrastructure.

9.7 HYDROGEOLOGY

9.7.1 Introduction and link to impact

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. Geology and associated structural features provide a basis from which to understand:

- The geochemistry and related potential for the pollution of water from facilities that are likely to result from seepage of chemicals of concern; and
- The potential for geological lineaments such as faults and dykes. Faults, dykes and other lineaments can act as preferential flow paths of groundwater, which can influence both the dispersion of potential pollution plumes.

Mining activities and infrastructure has the potential to result in the loss of groundwater resources, both to the environment and third-party users, through contamination and, potentially, abstraction. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

9.7.2 Data sources

Information in this section was sourced from previous studies undertaken for MMT including the Section 24G EIA (SLR, September 2020), the Geochemistry Study (SLR, April 2020) (included in Appendix F) and the Groundwater Study (SLR, April 2021) compiled for the project (included in Appendix G).

Regional geology, local geology and lineament information was sourced from the review of available literature (SLR, April 2020b). For the geochemical assessment, samples were sourced from the sinter de-dust located in . Information pertaining to the regional aquifer characterisation, intrusions, groundwater flow and use in support of the Groundwater Study (SLR, April 2020b) was extrapolated from the Groundwater Study prepared for MMT by GHT Consulting in August 2018. Groundwater monitoring data was sourced from the 4th quarter monitoring report compiled by GHT in January 2020 (GHT, January 2020). Hydrocensus data was sourced from the hydrocensus undertaken by GHT in 2020 (GHT, 202).

9.7.3 Description

9.7.3.1Regional geology

The world's largest land based sedimentary manganese deposit is contained in the Kalahari Manganese Field, situated 47 km north-west of Kuruman in the Northern Cape. The general stratigraphic column of the Kalahari Manganese Field is included in TABLE 9-9 below. The Kalahari Manganese Field comprises five erosional, or structurally preserved, relics of the manganese bearing Hotazel Formation of the Paleoproterozoic Transvaal Supergroup. These include the Mamatwan-Wessels deposit (also known as the main Kalahari Basin), the Avontuur and Leinster deposits, and the Hotazel and Langdon Annex/Devon deposits. The MMT is located in the Hotazel Formation (Transvaal Supergroup) towards the southern end of the Kalahari Basin. The Hotazel Formation typically consists of repeated thin layers of black iron oxides (magnetite or hematite) alternating with bands of iron-poor shales and cherts – the so-called banded iron formations (SLR, September 2020).

TABLE 9-9: GENERAL STRATIGRAPHIC COLUMN FOR THE KALAHARI MANGANESE FIELD (SLR, SEPTEMBER 2020)

Supergroup / Group / Subgroup / Formation				Geological Description
Kalahari Group				Kalahari sands, calcrete, clays & gravel beds
Kalahari unconformity				
Karoo Supergroup				Dwyka tillite
Dwyka unconformity				
Olifantshoek Supergroup			Lucknow Formation	White ortho-quartzite
			Mapedi Formation	Green, maroon and black shales and quartzites
Olifantshoek unconformity				
Transvaal Supergroup	Postmasburg Group	Voelwater Subgroup	Mooidraai Formation	Dolomite, Chert
			Hotazel Formation	Banded ironstone (upper)
				Upper Manganese Ore Body
				Banded Ironstone (middle)
				Middle Manganese Ore Body
				Banded Ironstone (middle)
				Lower Manganese Ore Body
				Banded Ironstone (lower)
		Ongeluk Formation		Andesitic Lava

9.7.3.2Local and operational geology

The Hotazel Formation is underlain by basaltic lava of the Ongeluk Formation (Transvaal Supergroup) and directly overlain by dolomite of the Mooidraai Formation (Transvaal Supergroup) as shown in TABLE 9-9.

The Transvaal Supergroup is overlain unconformably by the Olifantshoek Supergroup, which consists of arenaceous sediments, typically interbedded shale, quartzite and lavas overlain by coarser quartzite and shale. The different formations include the Mapedi and Lucknow units. The whole Supergroup has been deformed into a succession with an east-verging dip.

The Olifantshoek Supergroup is overlain by Dwyka Formation, which forms the basal part of the Karoo Supergroup. This consists of tillite (diamictite), which is covered by sands, claystone and calcrete of the Kalahari Group.

MMT is exploiting the manganese from the banded iron stones of the Hotazel Formation. The ore is contained within a 30 to 45 m thick mineralised zone which occurs along the entire extent of MMT and is made up of three manganese rich zones, namely the Upper Manganese Ore Body (UMO), the Middle Manganese Ore Body (MMO)

and the Lower Manganese Ore Body (LMO) (see TABLE 9-9). The UMO is 10 cm to 15 cm thick and comprises moderate deposits of manganese. The poorly mineralised MMO is approximately 1 m thick and not economically viable. The LMO is highly mineralised and makes up the bulk of the ore body. The ore layer dips gradually to the north-west at approximately five degrees.

9.7.3.3Aquifer characterisation

Four aquifer units occur in the region, namely the Ongeluk, Hotazel, Mooidraai, and Kalahari Formations. These formations are described as follows:

- **The Ongeluk Formation**: Older geological formation, the aquifer is primarily associated with weathered horizons and zones adjacent to regional scale structures, although the aquifer is generally not favoured as a potential water supply source because of its low yield characteristics;
- **Hotazel Formation:** Typically have higher yields with the groundwater stored in voids that developed following bed separation, within faults and periphery fractures, and along the dolerite dykes that have partially filled regional faults. The high number of dykes and fractures interpreted for the site suggest vertical hydraulic connection throughout much of the formation above an intrusive sill, with horizontal interconnection provided along bedding planes. The higher aquifer yields are associated with the preferentially fractured, brittle Banded Iron Formation adjacent to regional faults. With increasing depth, however, the Hotazel Formation aquifer can be confined, particularly when the overlying Kalahari Formation contains thick inter-beds of highly plastic red clay as observed along the southern edge of the MMT property;
- **Mooidraai Formation:** A dolomitic aquifer occurring in the southwest of the MMT in the vicinity of the now-derelict Middelplaats Mine. This aquifer is of significance locally due to its high yielding characteristics (>10 L/s); and
- **Kalahari Formation:** On a regional scale the Kalahari Formation behaves as a semi-confined aquifer, which is hydraulically connected with aquifers in underlying formations at those sites where extensive red clay or clay-bearing Dwyka Formation beds are absent. While the aquifer is generally more porous than other site aquifers, characteristics of the aquifer vary from site to site. Yields vary significantly spatially. A paleochannel deposit has been identified to the north of the MMT pit, containing significant quantities of groundwater, however this aquifer contains high nitrate concentrations and therefore it cannot be classed as an important groundwater resource.

With reference to the above list, aquifers underlying the MMT include the Hotazel and Kalahari formations. The Aquifer Classification Map of South Africa (DWS, 1999) indicates that the local aquifer at MMT is classified as minor (poor). A minor aquifer is described as a moderately-yielding aquifer system of variable water quality.

9.7.3.4Regional recharge

MMT lies within a semi-arid climate and has a relatively thick unsaturated zone (>25m deep on average) which is not conducive to active recharge. GHT (GHT, August 2018) therefore calculated regional recharge to be between 1% and 4% of the average annual rainfall. Groundwater is estimated to be up to 25,000 years old in deeper, confined aquifers, although surficial unconfined/semi-confined aquifers have been recharged in recent time. The aquifers at the MMT are believed to be recharged directly from rainfall, through the relatively permeable Kalahari Formation.

9.7.3.5Geological lineaments

Geological lineaments such as faults and dykes can act as preferential flow paths of groundwater. Various intrusive dolerite sills and dykes have intruded the Hotazel Formation which are relatively impermeable and create groundwater compartments regionally.

9.7.3.6Groundwater flow

The direction of groundwater flow is towards the north-west.

9.7.3.7Geochemistry analysis

As part of the project a geochemical investigation (SLR, April 2020a), as included in Appendix F, was undertaken on the sinter de-dust. In this regard Acid Base Accounting (ABA) was undertaken in order to assess the potential of the sinter de-dust to generate acid or acid neutralisation potential. Leach tests are undertaken to provide an indication of the chemicals of concern that are likely to seep from the sinter de-dust. SLR collected a sample of the sinter de-dust from in August 2019. The ABA results for sinter de-dust (MMT-AP01) are shown in TABLE 9-10 below. In this regard, due to the low sulphide and high neutralisation potential sinter de-dust is classified as non-potential acid generating. The total sulphur concentration in the sinter de-dust material is above the 0.3% threshold, however the sulphur is in sulphate form and does not pose a risk of acid production.

TABLE 9-10: ACID BASE ACCOUNDING RESULTS (SLR, APRIL 2020)

Sample ID	Sulphate	Paste pH	Total Sulphur	Sulphide	Acid Potential	Neutralisation Potential	Nett Neutralisation Potential	Neutralising Potential Ratio	Total Carbon	Organic Carbon	Inorganic Carbon
Non-PAG		>5.5	<0.3	<0.3	-	-	>20	>4			
Inconclusive		3.5-5.5	-	-	-	-	-20 to 20	1-4			
PAG		<3.5	>0.3	>0.3	-	-	<-20	<1			
Unit	%	%	%	%	kg CaCO3/t	kg CaCO3/t	kg CaCO3/t	NP:AP	%	%	%
MMT-AP01	0.761	12.37	0.779	0.006	24.34	335	311	13.8	3.5	2.2245	1.28
MMT-AP01*	0.757	12.36	0.77	0.006	24.06	337	312	14.0	3.5	2.3745	1.13

* Duplicate sample prepared at the laboratory for quality control purposes

Leach tests were undertaken using distilled water (pH7) to represent neutral drainage conditions on site. This was done as a preliminary screening to identify potential chemicals of concerns. TABLE 9-11 below summarised the results of the leach tests. With reference to the tabulated results below, the main chemicals of concern include:

- Boron (B) exceeds the South African National Standards (SANS) 241 (2015) Chronic Health and World Health Organisation (WHO) Standard for Drinking Water (2017) guidelines;
- pH exceeds the SANS 241 (2015) Operational and International Finance Corporation (IFC) Mining Effluent (2007) guideline;
- Total dissolved solids (TDS) exceed the SANS 241 (2015) Aesthetic guideline;
- Electrical conductivity (EC) exceeds the SANS 241 (2015) Aesthetic guideline;
- Chloride (Cl) exceeds the WHO Standard for Drinking Water (2017) guideline; and
- Sulphate (SO_4) exceeds the SANS 241 (2015) Acute Health guideline.

TABLE 9-11: LEACH RESULTS (SLR, APRIL 2020)

Lab ID	Sample ID	Ag	Al	As	Au	B	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	Hg	Ho	Ir	K
Unit		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SANS 241 (2015) Operational		N/A	0.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Aesthetic		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Acute Health		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Chronic Health		N/A	N/A	0.01	N/A	2.4	0.7	N/A	N/A	N/A	0.003	N/A	N/A	0.1	N/A	2.0	2.0	N/A	N/A	N/A	0.006	N/A	N/A	N/A
WHO Standard for Drinking Water (2017)		N/A	N/A	0.01	N/A	2.4	0.7	N/A	N/A	N/A	0.003	N/A	N/A	0.1	N/A	2.0	N/A	N/A	N/A	N/A	0.006	N/A	N/A	N/A
IFC Mining Effluent (2007)		N/A	N/A	0.1	N/A	N/A	N/A	N/A	N/A	N/A	0.05	N/A	N/A	N/A	N/A	0.3	2.0	N/A	N/A	N/A	0.002	N/A	N/A	N/A
658,086	MMT-AP01	<0.001	0.054	<0.001	<0.001	3.853	0.216	<0.001	<0.001	577	<0.0001	<0.001	0.001	0.007	<0.001	0.001	0.004	<0.001	<0.001	<0.001	0.0002	<0.001	<0.001	11.9
658086 QC	MMT-AP01	<0.001	0.054	<0.001	<0.001	3.824	0.221	<0.001	<0.001	575	<0.0001	<0.001	0.001	0.007	<0.001	<0.001	0.009	<0.001	<0.001	<0.001	0.0002	<0.001	<0.001	11.8

Lab ID	Sample ID	La	Li	Mg	Mn	Mo	Na	Nb	Nd	Ni	Pb	Pt	Rb	Sb	Sc	Se	Si	Sn	Sr	Ta	Te	Th	Ti	Tl
Unit		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SANS 241 (2015) Operational		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Aesthetic		N/A	N/A	N/A	0.1	N/A	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Acute Health		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Chronic Health		N/A	N/A	N/A	0.4	N/A	N/A	N/A	N/A	0.07	0.01	N/A	N/A	0.02	N/A	0.04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WHO Standard for Drinking Water (2017)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.07	0.01	N/A	N/A	0.02	N/A	0.04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
IFC Mining Effluent (2007)		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.5	0.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
658,086	MMT-AP01	<0.001	0.002	0.05	0.002	0.007	5.23	<0.001	<0.001	0.020	0.006	<0.001	0.029	<0.001	<0.001	0.001	1.52	<0.001	1.192	<0.001	<0.001	<0.0001	0.005	<0.001
658086 QC	MMT-AP01	<0.001	0.001	0.05	0.001	0.007	5.28	<0.001	<0.001	0.020	0.006	<0.001	0.028	<0.001	<0.001	0.001	1.54	<0.001	1.125	<0.001	<0.001	<0.0001	0.004	<0.001

Lab ID	Sample ID	U	V	W	Y	Zn	Zr	pH	pH Temp	TDS	EC	TDS by Sum	TDS by EC	P Alk.	M Alk.	F	Cl	NO_2	NO_3	NO_3 as N	SO_4	CN (Total)	Cr^{6+}	TSS
Unit		mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	-	Deg C	mg/l	mS/m	mg/l	mg/l	mg/l CaCO3	mg/l CaCO3	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
SANS 241 (2015) Operational		N/A	N/A	N/A	N/A	N/A	N/A	5 - 9.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SANS 241 (2015) Aesthetic		N/A	N/A	N/A	N/A	5.0	N/A	N/A	N/A	1200	170	N/A	N/A	N/A	N/A	N/A	300	N/A	N/A	N/A	250	N/A	N/A	N/A
SANS 241 (2015) Acute Health		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.9	N/A	11	500	N/A	N/A	N/A
SANS 241 (2015) Chronic Health		0.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
WHO Standard for Drinking Water (2017)		0.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.5	5	N/A	N/A	50	N/A	N/A	N/A	N/A
IFC Mining Effluent (2007)		N/A	N/A	N/A	N/A	0.5	N/A	6 - 9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.0	0.1	50
658,086	MMT-AP01	<0.0001	<0.001	0.004	<0.001	0.010	<0.001	12.18	22.5	1530	243	1641	1699	788	817	0.29	10.94	<0.2	1.37	0.31	534	<0.01	<0.05	24.0
658086 QC	MMT-AP01	<0.0001	<0.001	0.004	<0.001	0.011	<0.001	12.18	22.7	1538	241	1646	1688	788	820	0.28	10.88	<0.2	1.35	0.30	540	<0.01	<0.05	24.0

9.7.3.8Groundwater use and levels

GHT undertook a hydrocensus of privately-owned or third-party boreholes on three separate occasions, and the most recent hydrocensus was carried out in the broader area in 2018. A total of 41 third-party boreholes were identified. The 2018 hydrocensus of third-party boreholes included boreholes located between a 1 km and 15 km radius from the MMT. Results of the hydrocensus indicate that water levels ranged between 18 and 74 metres below ground level and are used for domestic use and livestock watering. This however applies to a radius of 15 km from the MMT. Third parties known to reside in close proximity to the MMT primarily utilise groundwater for livestock watering purposes only. Third-party drinking water is obtained from the Vaal Gamagara Pipeline.

9.7.3.9Background groundwater quality

The results, tabulated in TABLE 9-12 and TABLE 9-13, of the 2018 hydrocensus (GHT, August 2018) as documented by GHT includes:

- 25 of the boreholes sampled were unsuitable for lifetime human consumption in terms of SANS 241:2015 due to elevated concentrations of EC, Na, Cl, nitrite (NO_3-N) and NO_3-N, iron (Fe) and Mn;
- The 2018 water quality results exceed the Water Quality Resource Objectives (WQROs) in 32 of the 41 boreholes sampled, for the following parameters: pH, Na, Calcium Ca, Mg, Cl, SO_4, Fluoride (F), NO_3-N and T.Alk.

The 2002 and 2005 hydrocensus water quality data shows elevated concentrations of EC, Na, Cl, SO_4, and NO3-N which resulted in 48 out of 80 samples being unfit for lifetime human consumption in terms of SANS241:2015. GHT compared the background groundwater quality derived from the hydrocensus water quality sampling to that of the mine monitoring boreholes and found that EC, Na, Ca, SO_4 and NO_3-N concentrations were higher at the MMT. With regard to NO_3-N concentrations, it should be noted that naturally occurring NO_3-N levels exceed the SANS241-1:2015 standard.

The hydrocensus undertaken by GHT does not compare water quality results against livestock watering limits. Given that groundwater is utilised for livestock watering purposes, SLR compared the 2018 hydrocensus results against the Department of Water Affairs and Forestry (DWAF): Target Water Quality Guideline (TWQG) for livestock watering (TABLE 9-14). The results conclude that in general groundwater had elevated concentrations of TDS and NO_3-N above the DWS Livestock Watering limits. TDS concentrations ranging between 1 000 mg/L – 2 000 mg/L is safe for sheep, beef, and horse consumption, however dairy animals, pigs, and poultry may show a reluctance of water intake. TDS concentrations ranging between 2 000 mg/L – 3 000 mg/L is safe for sheep consumption; however, beef and horses may show a reluctance of water intake. TDS concentrations above 3 000 mg/L will show a reluctance of water intake for all livestock but are unlikely to have significant detrimental effects. Elevated concentrations of NO_3-N are likely to be tolerated by cattle, sheep and goats without significant detrimental effects if feed concentration is normal, there is adequate carbohydrate intake; and exposure is short term. The hydrocensus results compared to the mine monitoring boreholes found that TDS and NO_3-N are higher at MMT.

TABLE 9-12: HYDROCENSUS UNDERTAKEN IN 2018 WATER QUALITY RESULTS (SLR, APRIL 2020)

Borehole ID		Date	Quality	pH	EC	TDS	Na	Ca	Mg	K	Cl	SO_4	SO_4 (Ae)	F	NO_2-N	NO_3-N	NH_3-N/ NH4-N (Ae)	PO_4	T.ALK	T.Hard	Fe	Fe (Ae)	B	Mn	Mn (Ae)	Ionbal
			Class		mS/m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%
HMM Hydrocensus Study	BH01	2018/07/16	"ARS"	7.9	146.00	867	68.40	115.00	74.50	11.60	183.00	47.90	47.90	0.09	0.01	38.50	0.45	0.03	325.00	593.95	0.01	0.01	0.22	0.01	0.01	-0.27
	HF/BH02	2018/07/16	"ARS"	8.15	110.00	644	52.40	93.90	47.90	9.96	101.00	48.30	48.30	0.09	0.49	33.01	0.45	0.03	237.00	431.72	0.01	0.01	0.12	0.01	0.01	0.22
	HF/BH03	2018/07/17	"Class 1"	7.37	117.00	635	39.30	81.70	85.30	2.88	103.00	60.85	60.85	0.09	0.01	6.50	0.45	0.03	387.60	555.27	0.01	0.01	0.06	0.01	0.01	0.54
	HF/BH04	2018/07/17	"Class 1"	8.16	74.00	363	78.30	14.64	31.00	3.94	142.66	1.79	1.79	0.42	0.01	0.35	0.45	0.03	148.00	164.2	0.12	0.12	0.23	0.02	0.02	-0.29
	HF/BH05	2018/07/17	"ARS"	7.56	353.00	1891	206.59	121.23	191.17	38.90	886.00	125.00	125.00	0.09	1.83	48.67	8.88	0.03	144.00	1089.94	1.19	1.19	0.38	0.20	0.20	-1.63
	HF/BH06	2018/07/17	"Class 1"	7.84	134.00	741	70.20	96.30	78.50	11.10	139.00	73.00	73.00	0.16	0.01	5.60	0.45	0.03	412.00	563.72	0.01	0.01	0.22	0.01	0.01	0.53
	HF/BH07	2018/07/20	"Class 1"	7.71	108.00	572	42.30	50.00	85.80	4.72	88.32	13.70	13.70	0.09	0.01	0.35	5.51	0.03	465.00	478.17	0.96	0.96	0.06	0.07	0.07	-0.06
	HF/BH08	2018/07/20	"Class 1"	7.54	94.80	532	45.50	69.20	51.60	10.80	97.70	30.00	30.00	0.15	0.01	0.35	2.59	0.03	371.00	385.28	0.75	0.75	0.14	0.11	0.11	-0.61
	HF/BH10	2018/07/18	"ARS"	7.24	69.50	399	46.70	55.50	28.20	6.80	36.50	37.80	37.80	0.24	0.01	7.17	0.45	0.03	258.00	254.71	0.01	0.01	0.10	0.01	0.01	-0.19
	HF/BH11	2018/07/17	"Class 1"	7.51	86.60	503	48.70	71.70	35.90	8.47	95.90	40.30	40.30	0.09	0.01	13.00	0.45	0.03	239.00	326.87	0.05	0.05	0.13	0.01	0.01	-0.35
	HF/BH12	2018/07/17	"ARS"	8.16	292.00	1464	113.72	6.58	12.80	61.72	171.00	27.10	27.10	0.21	0.01	0.35	285.00	1.30	1160.00	69.14	1.67	1.67	0.44	0.01	0.01	-0.43
	HF/BH13	2018/07/18	"ARS"	7.55	111.00	640	55.80	90.80	48.20	11.30	163.00	48.30	48.30	0.09	0.01	11.70	3.65	0.03	274.00	425.22	1.40	1.40	0.17	0.05	0.05	-0.38
	HF/BH14	2018/07/18	"ARS"	7.54	117.00	656	66.10	88.90	48.70	11.40	193.00	47.30	47.30	0.09	0.01	9.37	0.45	0.03	263.00	422.53	0.01	0.01	0.20	0.01	0.01	-0.78
	HF/BH15	2018/07/18	"Class 1"	7.89	68.50	400	55.40	48.60	25.40	9.96	33.60	36.30	36.30	0.34	0.02	7.47	0.45	0.03	261.00	225.95	0.07	0.07	0.20	0.01	0.01	-0.29
	HF/BH16	2018/07/18	"Class 1"	7.46	120.00	758	68.70	105.00	53.70	12.40	71.60	161.00	161.00	0.09	0.01	22.30	0.45	0.03	310.00	483.32	0.01	0.01	0.18	0.01	0.01	-0.18
	HF/BH17	2018/07/19	"ARS"	7.12	1273.00	10689	128.00	1979.00	466.00	4.90	1371.00	38.00	38.00	0.09	0.24	1474.00	1.24	0.03	281.00	6860.55	0.11	0.11	0.32	0.08	0.08	-7.37
	HF/BH19	2018/07/19	"ARS"	7.65	441.00	2955	136.00	326.00	301.00	5.62	739.00	47.90	47.90	0.09	0.01	278.00	0.45	0.03	278.00	2053.54	0.02	0.02	0.36	0.01	0.01	-0.13
	HF/BH21	2018/07/19	"ARS"	7.64	232.00	1474	78.60	192.00	149.00	2.17	357.00	75.30	75.30	0.20	0.01	87.40	0.45	0.03	385.00	1093.01	0.02	0.02	0.32	0.01	0.01	-0.26
	HF/BH22	2018/07/16	"ARS"	7.57	117.00	699	42.90	111.00	63.70	2.24	96.20	48.00	48.00	0.21	0.01	18.00	0.45	0.03	424.00	539.48	0.02	0.02	0.15	0.01	0.01	-0.76
	HF/BH23	2018/07/17	"ARS"	7.53	117.00	681	43.20	112.00	64.80	2.28	96.20	32.70	32.70	0.20	0.01	17.80	0.45	0.03	417.00	546.51	0.01	0.01	0.16	0.01	0.01	-0.13
	HF/BH24	2018/07/17	"ARS"	7.48	103.00	592	60.70	85.90	57.10	0.62	67.70	63.88	63.88	0.20	0.12	5.12	0.45	0.16	384.00	449.63	0.18	0.18	0.47	0.22	0.22	0.35
	HF/BH25	2018/07/17	"ARS"	7.84	142.00	835	42.90	142.00	79.80	0.27	100.00	72.79	72.79	0.34	0.13	36.19	0.45	0.03	392.00	683.19	0.01	0.01	0.25	0.01	0.01	0.78
	HF/BH26	2018/07/17	"ARS"	7.38	166.00	972	71.40	146.00	77.50	2.37	206.96	55.50	55.50	0.29	0.01	45.62	0.45	0.46	346.00	683.71	0.01	0.01	0.25	0.01	0.01	-0.41
	HF/BH28	2018/07/18	"ARS"	8.65	204.00	1183	107.00	74.10	132.00	4.34	351.67	48.52	48.52	0.09	1.64	85.22	0.45	0.10	136.00	728.60	0.01	0.01	0.26	0.01	0.01	-0.43
	HF/BH29	2018/07/18	"ARS"	7.59	105.00	601	37.00	106.00	57.70	2.19	74.31	35.74	35.74	0.10	0.01	14.41	0.45	0.08	372.00	502.29	0.08	0.08	0.14	0.01	0.01	0.41
	HF/BH30	2018/07/19	"Class 1"	8.24	73.40	420	14.70	74.80	48.70	1.62	32.92	29.00	29.00	0.14	0.07	5.49	0.45	0.03	322.00	387.32	0.01	0.01	0.05	0.01	0.01	0.09
	HF/BH32	2018/07/19	"ARS"	7.68	405.00	2634	70.00	426.00	220.00	5.89	776.00	46.32	46.32	0.09	0.61	209.39	0.45	0.03	266.00	1969.68	0.03	0.03	0.10	0.01	0.01	-0.60
	HF/BH33	2018/07/19	"ARS"	7.57	284.00	1791	157.00	153.00	192.00	9.25	452.00	105.11	105.11	0.09	0.01	107.36	0.45	0.03	406.00	1172.70	0.01	0.01	0.80	0.01	0.01	-0.26
	HF/BH34	2018/07/18	"ARS"	7.7	141.00	795	80.30	98.00	83.00	6.54	124.07	99.71	99.71	0.35	0.01	9.81	0.45	0.03	429.00	586.5	0.01	0.01	0.44	0.01	0.01	0.51
	HF/BH35	2018/07/18	"ARS"	7.39	149.00	841	89.00	102.00	85.90	6.66	139.00	113.00	113.00	0.36	0.01	10.70	0.45	0.03	426.00	608.43	0.01	0.01	0.47	0.01	0.01	0.63
	HF/BH36	2018/07/18	"ARS"	7.54	155.00	832	303.06	3.62	4.16	3.74	180.56	62.63	62.63	0.50	0.01	11.14	0.45	0.03	371.20	26.17	0.01	0.01	0.38	0.01	0.01	-0.95
	HF/BH37	2018/07/18	"ARS"	7.34	300.00	1594	144.00	247.00	142.00	11.80	717.00	134.00	134.00	0.09	0.01	1.14	0.45	0.03	319.00	1201.52	0.02	0.02	0.38	0.01	0.01	0.97
	HF/BH38	2018/07/19	"ARS"	7.53	82.10	477	35.70	71.10	51.40	4.28	18.70	31.20	31.20	0.54	0.01	4.90	0.45	0.03	402.00	389.2	0.01	0.01	0.17	0.01	0.01	-0.12
	HF/BH39	2018/07/19	"Class 1"	7.6	110.00	629	79.60	77.00	57.40	6.50	61.10	28.50	28.50	0.29	0.01	9.56	0.45	0.03	458.00	428.64	0.01	0.01	0.40	0.01	0.01	0.03
	HF/BH40	2018/07/19	"Class 1"	8.93	98.60	504	166.52	5.94	12.51	2.21	225.31	4.67	4.67	1.40	0.01	0.35	0.45	0.03	117.40	66.33	0.23	0.23	3.66	0.01	0.01	-0.64
	HF/BH41	2018/07/19	"ARS"	7.65	81.60	469	36.70	67.20	49.30	5.22	39.00	34.30	34.30	0.60	0.01	6.34	0.45	0.03	346.00	370.82	0.12	0.12	0.23	0.01	0.01	-0.05

SABS South Africa National Standard: Drinking Water, SANS 2411:2015 Edition 2

Class 1	**Recommended standard limit**- Suitable for lifetime use
ARS	**Above recommended standard limit-** Unsuitable for lifetime human consumption

SABS South Africa National Standard: Drinking Water, SANS 241:2006 Edition 6.1

Class 1	**Recommended operational limit** - Suitable for lifetime use
Class 2	**Maximum allowable limit** - Suitable for limited duration use only
AMA	**Above maximum allowable limit** - Unsuitable for human consumption

*** (Ae) Aesthetic standards.**

TABLE 9-13: HYDROCENSUS UNDERTAKEN IN 2018 RESULTS IN TERM OF DWS WQRO (SLR, APRIL 2020)

Site Name		Date	pH	EC mS/m	Na mg/L	Ca mg/L	Mg mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_3-N mg/L	T.ALK mg/L
HMM Hydrocensus Study	HF/BH01	2018/07/16	7.90	146.00	68.40	115.00	74.50	183.00	47.90	0.09	38.50	325.00
	HF/BH02	2018/07/16	8.15	110.00	52.40	93.90	47.90	101.00	48.30	0.09	33.01	237.00
	HF/BH03	2018/07/17	7.37	117.00	39.30	81.70	85.30	103.00	60.85	0.09	6.50	387.60
	HF/BH04	2018/07/17	8.16	74.00	78.30	14.64	31.00	142.66	1.79	0.42	0.35	148.00
	HF/BH05	2018/07/17	7.56	353.00	206.59	121.23	191.17	886.00	125.00	0.09	48.67	144.00
	HF/BH06	2018/07/17	7.84	134.00	70.20	96.30	78.50	139.00	73.00	0.16	5.60	412.00
HMM Hydrocensus Study	HF/BH07	2018/07/20	7.71	108.00	42.30	50.00	85.80	88.32	13.70	0.09	0.35	465.00
	HF/BH08	2018/07/20	7.54	94.80	45.50	69.20	51.60	97.70	30.00	0.15	0.35	371.00
	HF/BH10	2018/07/18	7.24	69.50	46.70	55.50	28.20	36.50	37.80	0.24	7.17	258.00
	HF/BH11	2018/07/17	7.51	86.60	48.70	71.70	35.90	95.90	40.30	0.09	13.00	239.00
	HF/BH12	2018/07/17	8.16	292.00	113.72	6.58	12.80	171.00	27.10	0.21	0.35	1160.00
	HF/BH13	2018/07/18	7.55	111.00	55.80	90.80	48.20	163.00	48.30	0.09	11.70	274.00
	HF/BH14	2018/07/18	7.54	117.00	66.10	88.90	48.70	193.00	47.30	0.09	9.37	263.00
	HF/BH15	2018/07/18	7.89	68.50	55.40	48.60	25.40	33.60	36.30	0.34	7.47	261.00
	HF/BH16	2018/07/18	7.46	120.00	68.70	105.00	53.70	71.60	161.00	0.09	22.30	310.00
	HF/BH17	2018/07/19	7.12	1273.00	128.00	1979.00	466.00	1371.00	38.00	0.09	1474.00	281.00
	HF/BH19	2018/07/19	7.65	441.00	136.00	326.00	301.00	739.00	47.90	0.09	278.00	278.00
	HF/BH21	2018/07/19	7.64	232.00	78.60	192.00	149.00	357.00	75.30	0.20	87.40	385.00
	HF/BH22	2018/07/16	7.57	117.00	42.90	111.00	63.70	96.20	48.00	0.21	18.00	424.00
	HF/BH23	2018/07/17	7.53	117.00	43.20	112.00	64.80	96.20	32.70	0.20	17.80	417.00
	HF/BH24	2018/07/17	7.48	103.00	60.70	85.90	57.10	67.70	63.88	0.20	5.12	384.00
	HF/BH25	2018/07/17	7.84	142.00	42.90	142.00	79.80	100.00	72.79	0.34	36.19	392.00
	HF/BH26	2018/07/17	7.38	166.00	71.40	146.00	77.50	206.96	55.50	0.29	45.62	346.00
	HF/BH28	2018/07/18	8.65	204.00	107.00	74.10	132.00	351.67	48.52	0.09	85.22	136.00
	HF/BH29	2018/07/18	7.59	105.00	37.00	106.00	57.70	74.31	35.74	0.10	14.41	372.00
	HF/BH30	2018/07/19	8.24	73.40	14.70	74.80	48.70	32.92	29.00	0.14	5.49	322.00
	HF/BH32	2018/07/19	7.68	405.00	70.00	426.00	220.00	776.00	46.32	0.09	209.39	266.00
	HF/BH33	2018/07/19	7.57	284.00	157.00	153.00	192.00	452.00	105.11	0.09	107.36	406.00
	HF/BH34	2018/07/18	7.70	141.00	80.30	98.00	83.00	124.07	99.71	0.35	9.81	429.00
	HF/BH35	2018/07/18	7.39	149.00	89.00	102.00	85.90	139.00	113.00	0.36	10.70	426.00
	HF/BH36	2018/07/18	7.54	155.00	303.06	3.62	4.16	180.56	62.63	0.50	11.14	371.20
	HF/BH37	2018/07/18	7.34	300.00	144.00	247.00	142.00	717.00	134.00	0.09	1.14	319.00
	HF/BH38	2018/07/19	7.53	82.10	35.70	71.10	51.40	18.70	31.20	0.54	4.90	402.00
	HF/BH39	2018/07/19	7.60	110.00	79.60	77.00	57.40	61.10	28.50	0.29	9.56	458.00
	HF/BH40	2018/07/19	8.93	98.60	166.52	5.94	12.51	225.31	4.67	1.40	0.35	117.40
	HF/BH41	2018/07/19	7.65	81.60	36.70	67.20	49.30	39.00	34.30	0.60	6.34	346.00

DWS WRWS

Below RQO	Below Resource Quality Objective
Above RQO	Above Resource Quality Objective

TABLE 9-14: HYDROCENSUS UNDERTAKEN IN 2018 RESULTS IN TERM OF LIVESTOCK WATERING LIMITS

Borehole ID		Date	pH	EC	TDS	Na	Ca	Mg	K	Cl	SO_4	SO_4 (Ae)	F	NO_2-N	NO_3-N	NH_3-N/ NH4-N (Ae)	PO_4	T,ALK	T,Hard	Fe	Fe (Ae)	B	Mn	Mn (Ae)	Ionbal
				mS/m	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/l	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	%
Livestock Limits			-	-	1000	2000	1000	500	-	1500		1000	2		100	-	-	-	-	10	-	-	10	-	-
HMM Hydrocensus Study	HF/BH01	2018/07/16	7.9	146	867.00	68.4	115	74.5	11.6	183	47.9	47.9	0.09	0.01	38.5	0.45	0.03	325	593.95	0.01	0.01	0.22	0.01	0.01	-0.27
	HF/BH02	2018/07/16	8.15	110	644.00	52.4	93.9	47.9	9.96	101	48.3	48.3	0.09	0.49	33.01	0.45	0.03	237	431.72	0.01	0.01	0.12	0.01	0.01	0.22
	HF/BH03	2018/07/17	7.37	117	635.00	39.3	81.7	85.3	2.88	103	60.85	60.85	0.09	0.01	6.5	0.45	0.03	387.6	555.27	0.01	0.01	0.06	0.01	0.01	0.54
	HF/BH04	2018/07/17	8.16	74	363.00	78.3	14.64	31	3.94	142.66	1.79	1.79	0.42	0.01	0.35	0.45	0.03	148	164.2	0.12	0.12	0.23	0.02	0.02	-0.29
	HF/BH05	2018/07/17	7.56	353	1891.00	206.59	121.23	191.17	38.9	886	125	125	0.09	1.83	48.67	8.88	0.03	144	1089.94	1.19	1.19	0.38	0.2	0.2	-1.63
	HF/BH06	2018/07/17	7.84	134	741.00	70.2	96.3	78.5	11.1	139	73	73	0.16	0.01	5.6	0.45	0.03	412	563.72	0.01	0.01	0.22	0.01	0.01	0.53
	HF/BH07	2018/07/20	7.71	108	572.00	42.3	50	85.8	4.72	88.32	13.7	13.7	0.09	0.01	0.35	5.51	0.03	465	478.17	0.96	0.96	0.06	0.07	0.07	-0.06
	HF/BH08	2018/07/20	7.54	94.8	532.00	45.5	69.2	51.6	10.8	97.7	30	30	0.15	0.01	0.35	2.59	0.03	371	385.28	0.75	0.75	0.14	0.11	0.11	-0.61
	HF/BH10	2018/07/18	7.24	69.5	399.00	46.7	55.5	28.2	6.8	36.5	37.8	37.8	0.24	0.01	7.17	0.45	0.03	258	254.71	0.01	0.01	0.1	0.01	0.01	-0.19
	HF/BH11	2018/07/17	7.51	86.6	503.00	48.7	71.7	35.9	8.47	95.9	40.3	40.3	0.09	0.01	13	0.45	0.03	239	326.87	0.05	0.05	0.13	0.01	0.01	-0.35
	HF/BH12	2018/07/17	8.16	292	1464.00	113.72	6.58	12.8	61.72	171	27.1	27.1	0.21	0.01	0.35	285	1.3	1160	69.14	1.67	1.67	0.44	0.01	0.01	-0.43
HMM Hydrocensus Study	HF/BH13	2018/07/18	7.55	111	640.00	55.8	90.8	48.2	11.3	163	48.3	48.3	0.09	0.01	11.7	3.65	0.03	274	425.22	1.4	1.4	0.17	0.05	0.05	-0.38
	HF/BH14	2018/07/18	7.54	117	656.00	66.1	88.9	48.7	11.4	193	47.3	47.3	0.09	0.01	9.37	0.45	0.03	263	422.53	0.01	0.01	0.2	0.01	0.01	-0.78
	HF/BH15	2018/07/18	7.89	68.5	400.00	55.4	48.6	25.4	9.96	33.6	36.3	36.3	0.34	0.02	7.47	0.45	0.03	261	225.95	0.07	0.07	0.2	0.01	0.01	-0.29
	HF/BH16	2018/07/18	7.46	120	758.00	68.7	105	53.7	12.4	71.6	161	161	0.09	0.01	22.3	0.45	0.03	310	483.32	0.01	0.01	0.18	0.01	0.01	-0.18
	HF/BH17	2018/07/19	7.12	1273	10689.00	128	1979	466	4.9	1371	38	38	0.09	0.24	1474	1.24	0.03	281	6860.55	0.11	0.11	0.32	0.08	0.08	-7.37
	HF/BH19	2018/07/19	7.65	441	2955.00	136	326	301	5.62	739	47.9	47.9	0.09	0.01	278	0.45	0.03	278	2053.54	0.02	0.02	0.36	0.01	0.01	-0.13
	HF/BH21	2018/07/19	7.64	232	1474.00	78.6	192	149	2.17	357	75.3	75.3	0.2	0.01	87.4	0.45	0.03	385	1093.01	0.02	0.02	0.32	0.01	0.01	-0.26
	HF/BH22	2018/07/16	7.57	117	699.00	42.9	111	63.7	2.24	96.2	48	48	0.21	0.01	18	0.45	0.03	424	539.48	0.02	0.02	0.15	0.01	0.01	-0.76
	HF/BH23	2018/07/17	7.53	117	681.00	43.2	112	64.8	2.28	96.2	32.7	32.7	0.2	0.01	17.8	0.45	0.03	417	546.51	0.01	0.01	0.16	0.01	0.01	-0.13
	HF/BH24	2018/07/17	7.48	103	592.00	60.7	85.9	57.1	0.62	67.7	63.88	63.88	0.2	0.12	5.12	0.45	0.16	384	449.63	0.18	0.18	0.47	0.22	0.22	0.35
	HF/BH25	2018/07/17	7.84	142	835.00	42.9	142	79.8	0.27	100	72.79	72.79	0.34	0.13	36.19	0.45	0.03	392	683.19	0.01	0.01	0.25	0.01	0.01	0.78
	HF/BH26	2018/07/17	7.38	166	972.00	71.4	146	77.5	2.37	206.96	55.5	55.5	0.29	0.01	45.62	0.45	0.46	346	683.71	0.01	0.01	0.25	0.01	0.01	-0.41
	HF/BH28	2018/07/18	8.65	204	1183.00	107	74.1	132	4.34	351.67	48.52	48.52	0.09	1.64	85.22	0.45	0.1	136	728.6	0.01	0.01	0.26	0.01	0.01	-0.43
	HF/BH29	2018/07/18	7.59	105	601.00	37	106	57.7	2.19	74.31	35.74	35.74	0.1	0.01	14.41	0.45	0.08	372	502.29	0.08	0.08	0.14	0.01	0.01	0.41
	HF/BH30	2018/07/19	8.24	73.4	420.00	14.7	74.8	48.7	1.62	32.92	29	29	0.14	0.07	5.49	0.45	0.03	322	387.32	0.01	0.01	0.05	0.01	0.01	0.09
	HF/BH32	2018/07/19	7.68	405	2634.00	70	426	220	5.89	776	46.32	46.32	0.09	0.61	209.39	0.45	0.03	266	1969.68	0.03	0.03	0.1	0.01	0.01	-0.6
	HF/BH33	2018/07/19	7.57	284	1791.00	157	153	192	9.25	452	105.11	105.11	0.09	0.01	107.36	0.45	0.03	406	1172.7	0.01	0.01	0.8	0.01	0.01	-0.26
	HF/BH34	2018/07/18	7.7	141	795.00	80.3	98	83	6.54	124.07	99.71	99.71	0.35	0.01	9.81	0.45	0.03	429	586.5	0.01	0.01	0.44	0.01	0.01	0.51
	HF/BH35	2018/07/18	7.39	149	841.00	89	102	85.9	6.66	139	113	113	0.36	0.01	10.7	0.45	0.03	426	608.43	0.01	0.01	0.47	0.01	0.01	0.63
	HF/BH36	2018/07/18	7.54	155	832.00	303.06	3.62	4.16	3.74	180.56	62.63	62.63	0.5	0.01	11.14	0.45	0.03	371.2	26.17	0.01	0.01	0.38	0.01	0.01	-0.95
	HF/BH37	2018/07/18	7.34	300	1594.00	144	247	142	11.8	717	134	134	0.09	0.01	1.14	0.45	0.03	319	1201.52	0.02	0.02	0.38	0.01	0.01	0.97
	HF/BH38	2018/07/19	7.53	82.1	477.00	35.7	71.1	51.4	4.28	18.7	31.2	31.2	0.54	0.01	4.9	0.45	0.03	402	389.2	0.01	0.01	0.17	0.01	0.01	-0.12
	HF/BH39	2018/07/19	7.6	110	629.00	79.6	77	57.4	6.5	61.1	28.5	28.5	0.29	0.01	9.56	0.45	0.03	458	428.64	0.01	0.01	0.4	0.01	0.01	0.03
	HF/BH40	2018/07/19	8.93	98.6	504.00	166.52	5.94	12.51	2.21	225.31	4.67	4.67	1.4	0.01	0.35	0.45	0.03	117.4	66.33	0.23	0.23	3.66	0.01	0.01	-0.64
	HF/BH41	2018/07/19	7.65	81.6	469.00	36.7	67.2	49.3	5.22	39	34.3	34.3	0.6	0.01	6.34	0.45	0.03	346	370.82	0.12	0.12	0.23	0.01	0.01	-0.05

Note: Highlighted cells indicate which water quality standard has been exceeded

9.7.3.10Groundwater quality at MMT

Groundwater quality is monitored on a quarterly basis at the monitoring points illustrated in FIGURE 26-1. All the monitoring points are located within the MMT Mining Right area. The groundwater monitoring programme was implemented in 2004. The GHT report (GHT, January 2020) compares the water quality data against the following guidelines and standards:

- Quality of Domestic Water Supplies Volume 1: Assessment Guide, Second Edition, (1998);
- South African Water Quality Guidelines – Volume 1 Domestic Use (1993 and 1996);
- SANS for drinking water (SANS 241:2015); and
- Water Quality Resource Objectives (WQROs) for the D41K Catchment as specified in the MMT IWUL.

The average groundwater quality results for January 2020 have been summarised and are presented in, TABLE 9-15 and TABLE 9-16. The results have been classified into classes, ranging from ideal to totally unacceptable, as shown in the notes below the tables. Key conclusions drawn from the MMT water quality data include (GHT, January 2020):

- Water quality at the monitoring points at MMT has elevated concentrations of Electrical Conductivity (EC), Calcium (Ca), Magnesium (Mg), Chloride (Cl), Sulphate (SO_4) Nitrate (NO_3-N), Manganese (Mn) and Boron (B). The water is unsuitable for lifetime human consumption in terms of SANS 241:2015;
- The elevated NO_3-N concentration has been determined to be of a natural origin, and this was confirmed with two background hydrocensus sampling exercises of private properties around the MMT and further afield (GHT, August 2018). This is thought to be the result of rainfall recharge to the Kalahari Formation mobilizing soil nitrates, particularly at sites that have been overgrazed or stripped of vegetation; and
- The water quality results exceed the DWS WRQOs for the following parameters: EC, Na, Ca, Mg, Cl, SO_4, NO_3-N, Fluoride (F) and Total Alkalinity (T.Alk).

The results listed above are consistent with the groundwater monitoring data collected since 2004. In addition to the above, as noted in the GHT August 2018 report, bacteriological sampling of the groundwater underlying the sewage plant indicates that bacteriological contaminants (Total Plate Count and Total Coliform Count) from the sewage plant are impacting on the site aquifer currently (GHT, August 2018). This result is not included in the table below but is applicable to monitoring point JB(MMT)23. Hydrocarbon testing found no hydrocarbon contamination to be present in the north and south pit water or at the MMT workshops (GHT, August 2018).

TABLE 9-15: GROUNDWATER QUALITY AT MMT (2020) (SLR, APRIL 2020)

Sample ID	Site description	Date	Quality Class	pH	EC mS/m	TDS mg/L	Na mg/L	Ca mg/L	Mg mg/L	K mg/L	Cl mg/L	SO_4 mg/L	SO_4 (Ae) mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NH_3-N/ NH4-N (Ae) mg/l	PO_4 mg/L	T,ALK mg/L	Fe mg/L	Fe (Ae) mg/L	B mg/L	Mn mg/L	Mn (Ae) mg/L		Ionbal %
JB(GLD)05	North of MMT pit	2020/01/16	ARS	7.08	243.00	1466	55.70	230.00	121.00	5.31	470.91	31.20	31.20	0.09	0.01	95.40	0.45	0.09	214	0.02	0.02	0.17	0.01	0.01	0.005	-2.2
JB(MMT)17	Sinter plant	2020/01/16	ARS	7.29	210.00	1679	94.97	220.00	133.11	10.32	60.40	828.00	828.00	0.21	0.01	32.80	0.45	0.05	298	0.01	0.01	1.99	0.01	0.01	0.005	-1.84
JB(MMT)18	South of MRA	2020/01/16	ARS	7.43	62.00	368	51.80	38.50	20.20	7.79	25.39	66.47	66.47	0.18	0.12	14.59	0.47	0.1	148	0.01	0.01	0.54	1.12	1.12	0.005	-0.38
JB(MMT)19	Near fuel storage facilities	2020/01/16	ARS	8.14	308.00	2048	322.00	94.89	134.74	13.60	500.44	309.56	309.56	0.09	0.33	136.00	10.60	0.07	86	0.04	0.04	0.89	0.03	0.03	0.005	-1.89
JB(MMT)20	Near workshops	2020/01/16	ARS	7.33	249.00	1829	103.00	253.63	117.00	9.12	319.00	197.00	197.00	0.24	0.01	164.00	0.45	0.04	152	0.01	0.01	2.96	0.01	0.01	0.005	-2.03
JB(MMT)21	Explosive yard	2020/01/16	ARS	7.23	119.00	722	45.30	95.50	65.53	4.64	75.40	60.50	60.50	0.21	0.01	39.20	0.45	0.17	331	1.52	1.52	0.19	0.01	0.01	0.005	-1.87
JB(MMT)22	Between and South Pit	2020/01/16	ARS	7.07	336.00	2364	86.30	333.00	182.00	8.67	495.00	84.30	84.30	0.09	0.01	228.00	0.45	0.03	273	0.02	0.02	0.21	0.01	0.01	0.005	-2.56
JB(MMT)23	Near Sewage farm	2020/01/16	ARS	7.7	159.00	1009	236.00	53.78	34.35	8.04	160.00	114.00	114.00	0.71	0.01	47.40	0.45	0.03	316	0.03	0.03	0.61	0.01	0.01	0.005	-2.22
JB(MMT)24	Near old, rehabilitated tailings dam	2020/01/16	ARS	6.93	459.00	3214	121.00	509.00	305.00	15.40	1034.00	903.00	903.00	0.34	0.01	7.30	0.45	0.13	374	5.67	5.67	15.10	3.10	3.10	0.005	-0.74
JB(RIS)04	Northwest of MMT pit	2020/01/16	ARS	7.06	251.00	765	41.90	105.00	70.00	4.55	86.20	36.50	36.50	0.14	0.01	47.30	0.45	0.06	350	0.010	0.01	0.14	0.01	0.01	0.005	-2.28
O(MMT)01		2020/01/16	ARS	7.63	287.00	2145	106.00	227.14	187.00	6.61	354.00	280.00	280.00	0.64	2.82	197.00	4.88	0.03	112	0.010	0.01	6.974	0.6	0.6	0.005	-1.31
O(MMT)02	South Pit	2020/01/16	ARS	7.61	262	1881	92.80	215.70	161.59	4.06	329.00	268.38	268.38	0.65	0.02	156.00	0.45	0.04	155	0.010	0.010	6.120	0.010	0.010	0.005	-2.50
O(MMT)03	North Pit	2020/01/16	ARS	8.13	235	2161	85.50	254.00	205.00	6.27	568.00	112.00	112.00	0.27	0.15	193	0.45	0.05	110	0.010	0.010	3.470	0.010	0.010	0.005	-1.59

Quality of Domestic Water Supplies, DWA&F, Second Edition 1998

Class 0	**Ideal water quality**- Suitable for lifetime use
Class 1	**Good water quality**- Suitable for use, rare instances of negative effects
Class 2	Marginal water quality- Conditionally acceptable, Negative effects may occur in some sensitive groups
Class 3	Poor water quality- Unsuitable for use without treatment, Chronic effects may occur
Class 4	Dangerous water quality- Totally unsuitable for use, Acute effects may occur

SABS South Africa National Standard: Drinking Water, SANS 2411:2015 Edition 2

Class 1	**Recommended standard limit**- Suitable for lifetime use
ARS	**Above recommended standard limit-** Unsuitable for lifetime human consumption

SABS South Africa National Standard: Drinking Water, SANS 241:2006 Edition 6,1

Class 1	**Recommended operational limit** - Suitable for lifetime use
Class 2	**Maximum allowable limit** - Suitable for limited duration use only
AMA	**Above maximum allowable limit** - Unsuitable for human consumption

*** (Ae) Aesthetic standards,**

South Africa Water Quality Guidelines, Volume 1: Domestic Use, DWA&F, First Edition 1993 & Second Edition 1996

NR	**Target water quality**- range No risk
IR	Good water quality- Insignificant risk, Suitable for use, rare instances of negative effects
LR	Marginal water quality- Allowable low risk, Negative effects may occur in some sensitive groups
HR	Poor water quality- Unsuitable for use without treatment, Chronic effects may occur

TABLE 9-16: MINE BOREHOLE WATER QUALITY COMPLIANCE WITH WRQOS (2020) (SLR, APRIL 2020)

Borehole ID	Date	pH	EC mS/m	Na mg/L	Ca mg/L	Mg mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_3-N mg/L	T.Alk mg/L
JB(GLD)05	1/16/2020	7.08	243.00	55.70	230.00	121.00	470.91	31.20	0.09	95.40	214.00
JB(MMT)17	1/16/2020	7.29	210.00	94.97	220.00	133.11	60.40	828.00	0.21	32.80	298.00
JB(MMT)18	1/16/2020	7.43	62.00	51.80	38.50	20.20	25.39	66.47	0.18	14.59	148.00
JB(MMT)19	1/16/2020	8.14	308.00	322.00	94.89	134.74	500.44	309.56	0.09	136.00	86.00
JB(MMT)20	1/16/2020	7.33	249.00	103.00	253.63	117.00	319.00	197.00	0.24	164.00	152.00
JB(MMT)21	1/16/2020	7.23	119.00	45.30	95.50	65.53	75.40	60.50	0.21	39.20	331.00
JB(MMT)22	1/16/2020	7.07	336.00	86.30	333.00	182.00	495.00	84.30	0.09	228.00	273.00
JB(MMT)23	1/16/2020	7.70	159.00	236.00	53.78	34.35	160.00	114.00	0.71	47.40	316.00
JB(MMT)24	1/16/2020	6.93	459.00	121.00	509.00	305.00	1034.00	903.00	0.34	7.30	374.00
JB(RIS)04	1/16/2020	7.06	251.00	41.90	105.00	70.00	86.20	36.50	0.14	47.30	350.00

DWS WRWS

Below RQO	Below Resource Quality Objective
Above RQO	Above Resource Quality Objective

9.7.4 Conclusion

Results of the quarterly monitoring undertaken by MMT indicate that water is unsuitable for lifetime human consumption in terms of the SANS 241:2015. Results of the hydrocensus, indicate that more than half of the boreholes sampled are unfit for lifetime human consumption in terms of SANS 241:2015. Several parameters also exceed the DWS WQRO standards. The 2018 hydrocensus also concludes that certain parameters exceed the DWS Livestock Watering Limits. These are however not expected to have significant detrimental effect on livestock depending on the length of exposure and the condition of the livestock.

Monitoring results show that the concentrations of parameters that exceed the SANS 241:2015 and DWS Livestock Watering Limits are higher at the MMT than at third party boreholes. It follows that the MMT and neighbouring mines have potentially influenced the groundwater quality of the area, thereby potentially influencing third parties' access to groundwater for domestic and/or livestock watering purposes.

Sinter de-dust is a potential pollution source that has the potential to influence groundwater quality through seepage of contaminates, at elevated concentrations. The contaminants of concern include B, TDS, EC, Cl and SO_4. The significance of this impact is however linked to the possibility of chemicals of concern reaching third parties that use groundwater for domestic and/or livestock watering purposes.

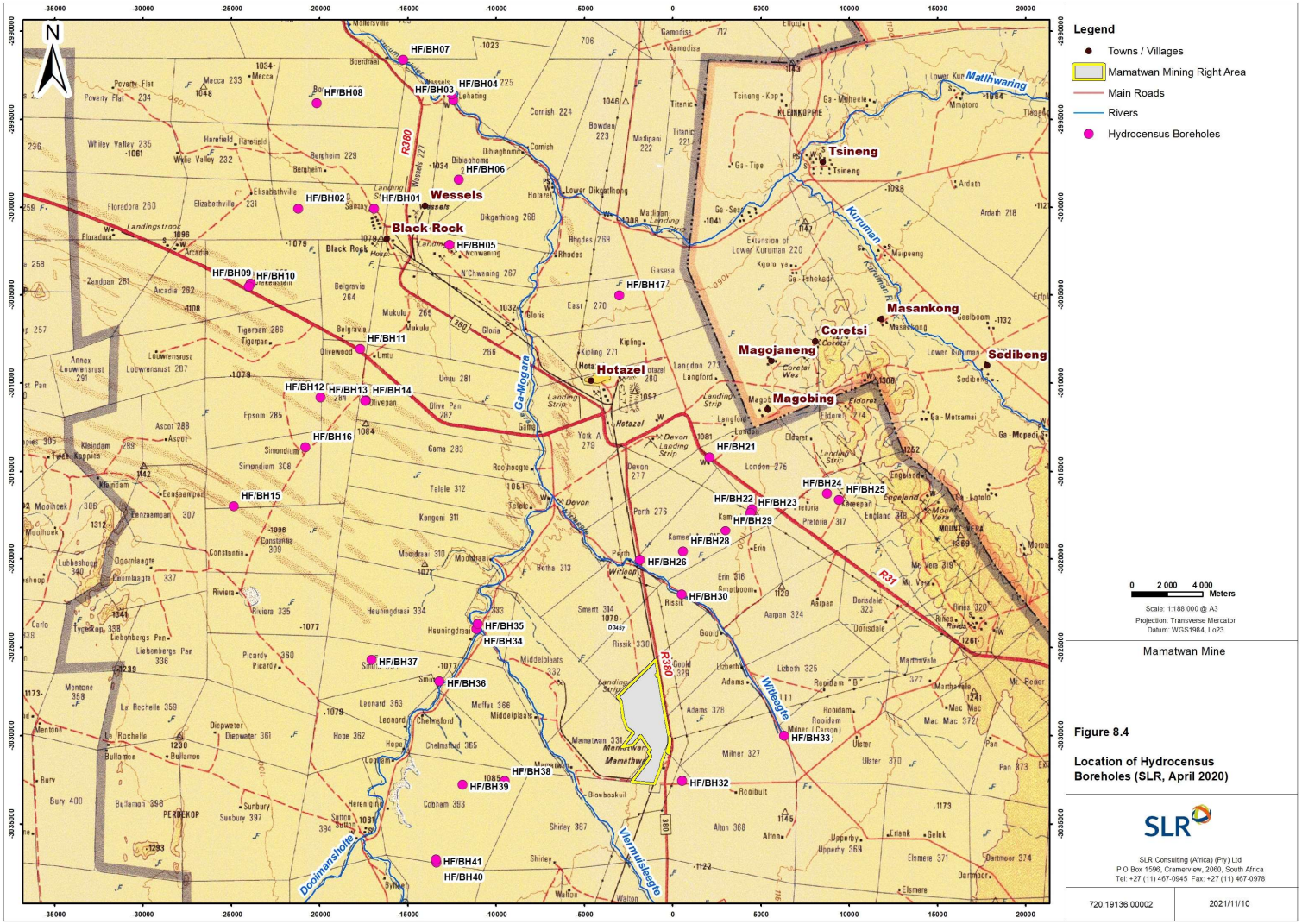


FIGURE 9-4: LOCATION OF HYDROCENSUS BOREHOLES (SLR, APRIL 2020)

9.8 AIR QUALITY

9.8.1 Introduction and link to impact

Existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. 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. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

9.8.2 Data Sources

Information in this section was sourced from the Air Quality Study compiled for the MMT (Airshed, August 2021) included in Appendix H.

Dust fallout monitoring data was sourced from the 2018 and 2019 annual dust fallout monitoring reports compiled by Skyside. Dispersion modelling data was sourced from the Golder Associates Africa (Pty) Ltd report (Golders, February 2019).

9.8.3 Description

Ambient air quality within the region

The following regional sources of emissions were identified:

- Fugitive dust: Occur as a result of vehicle entrainment of dust from local paved and unpaved roads, wind erosion from open areas and dust generated by agricultural activities. Given that the agriculture in the area is primarily restricted to livestock and game farming, agriculture is not anticipated to contribute significantly to ambient dust rates. Vehicle entrainment from the various unpaved farm and public roads is anticipated to be a significant, but localised source of dust;
- Current mining operations in the area: Particulates represent the main pollutant of concern at mining operations, whether it is underground or opencast. The amount of dust emitted by these activities depends on the physical characteristics of the material, the way in which the material is handled and the weather conditions. Current mining operations in relatively close proximity to the mining area include Kalagadi, Tshipi, Black Rock, Gloria, Wessels, Sebilo, United Manganese of Kalahari (UMK) and Kudumane;
- Biomass burning: Biomass burning emissions such as household fuel burning activities generate carbon monoxide (CO), methane (CH_4) and nitrogen dioxide (NO_2) gases;
- Veld burning: Represent significant sources of combustion-related emissions in many areas of the country;
- Rail related emissions: Emissions from diesel generated locomotives include particulates, nitrogen oxides (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO) and various volatile organic compounds including polycyclic aromatic hydrocarbons;
- Household fuel combustion: It is likely that households within the district municipality utilise coal or wood for cooking and space heating (during winter) purposes. Emissions from domestic burning include PM_{10}, nitrogen dioxide (NO_2), carbon dioxide (CO_2), carbon monoxide (CO), polycyclic aromatic hydrocarbons, particulate benzo(a)pyrene and formaldehyde; and

- Vehicle tailpipe emissions: Significant primary pollutants include carbon dioxide (CO_2), carbon monoxide (CO), hydrocarbons (HCs), sulphur dioxide (SO^2), oxides of nitrogen (mainly NO_x), and particulates. Secondary pollutants include NO^2, photochemical oxidants (ozone), sulphur acid, sulphates and nitric acid.

Emission sources associated with MMT

The activities associated with MMT that contribute to ambient air quality are listed in TABLE 9-17 below. The activities associated with the project that contribute to ambient air quality are listed in TABLE 9-18 below.

TABLE 9-17: CURRENT MMT EMISSION SOURCE ACTIVITIES (AIRSHED, AUGUST 2021)

Description	Comments
In-pit operations: drilling and blasting, excavation of ROM ore, top-cut ore, and waste rock, storage of top-cut on in-pit stockpile.	Mostly PM, gaseous emissions from mining equipment (PM, sulphur dioxide (SO2) oxides of nitrogen (NOx); carbon monoxide (CO); and carbon dioxide (CO2)).
In-pit operations: removal and stockpiling of topsoil.	Mostly PM, gaseous emissions from excavation equipment (PM, SO2; NOx; CO; CO2).
In-pit primary crushing.	Mostly PM, gaseous emissions from diesel powered machinery (PM, SO2; NOx; CO; CO2).
In-pit operations: haulage of ROM ore, top-cut ore to in-pit crusher, waste rock and topsoil to stockpiles; haulage of discard to discard dump.	PM from road surfaces, tipping, windblown dust from trucks, windblown dust from conveyors, gaseous emissions from truck exhaust (PM, SO2; NOx; CO; CO2).
ROM feed conveyor (in-pit and surface).	Mostly PM from tipping and windblown dust, gaseous emissions from machinery (PM, SO2; NOx; CO; CO2).
ROM, discard, waste rock, topsoil, and product stockpiles.	PM from tipping, windblown dust, gaseous emissions from truck exhaust (PM, SO2; NOx; CO; CO2).
Processing operations: ROM transfer point and reclaim system; primary, secondary and tertiary ROM crushing and screening; stockpiling of lumpy product and fines product and reclaiming to load to trains, stockpiling, and loadout operations, storage of sinter de-dust fines on storage area	Mostly PM, gaseous emissions from diesel powered machinery (PM, SO2; NOx; CO; CO2) Current loadout operations include a loading time of 18 hours to load to train, with underutilisation of 260 000 tpa.
DMS plant, sinter plant	PM, SO2; NOx; CO; and CO2

** Particulate matter (PM) comprises a mixture of organic and inorganic substances, ranging in size and shape and can be divided into coarse and fine particulate matter. Total Suspended Particulates (TSP) represents the coarse fraction >10 m, with particulate matter with an aerodynamic diameter of less*

than 10 m (PM10) and particulate matter with an aerodynamic diameter of less than 2.5 m (PM2.5) falling into the finer inhalable fraction. TSP is associated with dust fallout (nuisance dust) whereas PM10 and PM2.5 are considered a health concern.

TABLE 9-18: PROJECT EMISSION SOURCES (AIRSHED, OCTOBER 2021)

	Description	Sources	Comments
Proposed Layout Changes			
1	Establishment of a top-cut stockpile and associated crushing and screening plant, requiring additional storage space to stockpile top-cut material prior to processing at the sinter plant, and crushing and screening via a mobile crusher prior to being sent to the sinter plant.	Clearing of indigenous vegetation, crushing and screening, materials handling	The proposed activities are expected to result in an increase in air quality impacts at sensitive receptors to the east of the MMT mining rights boundary and are assessed in the accompanying AQIA.
2	Changes to waste rock dump height from the approved 2005 EMPR height from 50m to 80m.	Materials handling, vehicle entrained dust, bulldozing etc.	Changes in air quality impacts due to the change in waste rock dump height are expected to be minimal, and as such this source was not included in the modelling for the current assessment.
3	Upgrading the railway and railway loadout station. Transnet Freight Rail (TFR) plans to increase the capacity of the Manganese rail line, and in order to meet the TFR expansion requirements the loading rate of trains at MMT needs to be increased. This can be achieved by upgrading the existing loadout station and related railway.	Stacker, reclaimer operations, materials handling including conveyor transfer	Three proposed options were provided: Option 1: The reduction of the loading time from 18 to 12 hours to load a train with 125 wagons, requiring the reconfiguration of the train station. Option 2: The reduction of the loading time to 8 hours to load a train with 125 wagons, requiring upgrading the existing loadout station and conveyor system. Option 3: The reduction of the loading time to 4 hours to load a train with 125 wagons. This option requires the establishment of a new railway loop, new loadout station, product stockpile areas, stackers and reclaimers.
Proposed Activity Changes			
1	Sale of waste rock as aggregate: MMT is proposing selling some of the waste rock that would have remained on the surface in perpetuity.	Possible crushing of the waste rock prior to being sold, vehicle entrainment of dust in transporting waste rock to crusher and off-site.	Not enough information was made available as to this activity, and as such the source was not included in the AQIA.

	Description	Sources	Comments
2	Re-processing of material located in Adams Pit.	Materials handling at stockpiles, crushing and screening	The re-processing of material located in the Adams Pit was included in the source inventory and impact assessment.

Dust fallout

MMT is committed to monitoring dust fallout as per the approved 2005 EMPR. A dust fallout monitoring network is in place at MMT, comprising of eight (8) single dust fallout units (one has been decommissioned) and three (3) directional dust fallout units. Since the NDCRs are based on single dust fallout units following the ASTM D1739 method, the directional units cannot be compared to the NDCR limits. Dust fallout results for the period January 2018 to December 2019 for the single units are provided in TABLE 9-19 below. Refer to FIGURE 26-1 for the location of the dust fallout monitoring points.

Dust fallout collected at eight locations in and around MMT during 2018 and 2019 indicate low dust fallout rates, well below the NDCR limit for residential areas (600 mg/m²/day) and non-residential areas (1 200 mg/m²/day).

TABLE 9-19: 2018 DUST FALLOUT MONITORING RESULTS (AIRSHED, AUGUST 2021)

	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul-18[a]	Aug-18	Sep-18[a]	Oct-18[b]	Nov-18	Dec-18[a]
MMT01	180	150	26	94	111	126	196	ND	27	124	ND	108
MMT02	128	127	54	39	44	56	57	ND	45	80	80	123
MMT03	87	74	57	89	60	84	147	ND	134	118	67	207
MMT04	63	52	19	84	119	39	35	ND	50	124	33	30
MMT05	131	38	18	16	33	8	67	ND	59	81	45	32
MMT06	**Decommissioned**											
MMT07	252	241	109	97	228	147	75	ND	101	201	173	38
MMT08	153	68	47	118	212	90	49	ND	58	62	58	57
MMT09	58	97	41	51	74	24	214	ND	69	136	82	175

[a] Samples were over exposed (more than the allowable 30(±2) days). [b] Samples were under exposed (less than the allowable 30(±2) days). ND – No Data

TABLE 9-20: 2019 DUST FALLOUT MONITORING RESULTS (AIRSHED, AUGUST 2021)

	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
MMT01	98	49	205	89	248	95	271	464	162	196	339	843
MMT02	51	ND	233	102	126	87	107	223	135	166	188	144
MMT03	87	68	124	47	18	39	71	143	76	ND	119	98
MMT04	40	111	76	20	149	84	98	109	64	21	90	47
MMT05	63	137	108	29	169	76	92	164	51	61	170	76
MMT06	Decommissioned											
MMT07	86	85	119	60	119	34	83	220	38	99	122	38
MMT08	102	79	89	32	73	16	46	58	56	48	52	66
MMT09	94	80	ND	87	88	76	117	146	ND	65	124	35

Ambient PM monitoring

MMT does not undertake ambient air quality monitoring of PM_{10} concentration levels and therefore the baseline concentration levels are yet to be established for the site. MMT only undertakes dust fallout monitoring which monitors Total Suspended Particulates (TSP) in the form of nuisance dust. In support of a minimum emission standards postponement application for the Sinter plant stack emissions, Golders Associates, undertook dispersion modelling. This modelling indicates that PM concentrations at sensitive receptor locations are likely to be very low and within the NAAQS limit at sensitive receptor locations.

Potential noise sensitive receptors

The impacts of an intruding industrial air on the environment rarely extends over more than 5 km from the source. The location of the noise sensitive receptors is illustrated in Adams Pit. These sensitive receptors include a combination of neighbouring industrial sites (Adams solar farm) and isolated farmsteads.

9.8.4 Conclusion

The main pollutant of concern from all the project activities is particulate matter (PM), with PM_{10} and $PM_{2.5}$ concentrations related to health impacts and dust fallout related to nuisance impacts. The project activities present emission sources that can have a negative impact on ambient air quality and surrounding land uses. This however needs to be considered in the context of emission sources exceeding the NDCR and NAAQS limits near potential air sensitive receptors.

9.9 NOISE

Introduction and link to impact

Noise generating activities associated with mining has the potential to increase the ambient noise levels in and around the MMT that may in turn cause a disturbance to nearby sensitive receptors. Land uses surrounding MMT are described in Section 9.4. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

9.9.1 Data source

Information in this section was sourced from the Noise Study Airshed, (September; 2020) compiled for the project (included in Appendix I). The data from a baseline noise survey conducted on 18 July 2019 was studied to determine current noise levels within the area.

9.9.2 Description

Background environmental noise

Background environmental noise levels were sampled at three residential sites (Sites 1, 2 and 5) and two industrial sites (Sites 3 and 4). The locations of the noise sampling points are illustrated in Figure 9-5. With reference to TABLE 9-21 the results of the daytime noise sampling are as follows:

- Daytime L_{Aeq}'s ranged between 32.1 dBA and 62.2 dBA;
- Measured daytime L_{Aeq}'s at Sites 1, 2 and 5 were typical of the SANS 10103 noise levels for rural areas (SANS day-time limit of 45 dBA), while baseline noise levels at Sites 3 and 4 were within the industrial daytime limits (SANS day-time limit of 70 dBA). The measured daytime L_{Aeq}'s are significant higher at Site 3 than Site 4. This is to be expected given that Site 3 is located at the entrance of the MMT; and
- Measured daytime L_{Aeq} at Sites 1, 2, and 5 were below the residential limit (55 dBA IFC limit) and below the guideline for industrial receptors (70 dBA IFC limit) at sites 3 and 4.

With reference to TABLE 9-21 the results of the night-time noise sampling are as follows:

- Night-time L_{Aeq}'s ranged between 34.4 dBA and 66.3 dBA;
- Measured night-time L_{Aeq}'s at Site 1 is typical of night-time noise levels in rural areas (SANS night-time limit of 35dBA), however Sites 2 and 3 exceed the SANS limit for rural night-time noise due to insects and background mining operational noise;
- Measured night-time L_{Aeq} at Sites 3 and was below what is typical for industrial areas (SANS night-time limit of 60dBA). This limit was however exceeded at Site 4 due to the presence of background mining operations; and
- Measured night-time L_{Aeq}'s at the Sites 1, 2 and 5 were below the IFC residential guideline limit (45 dBA IFC limit) for night-time noise and were below the industrial limits (70 IFC dBA limit) for industrial noise.

TABLE 9-21: DAYTIME AND NIGHT-TIME BASELINE NOISE LEVELS (AIRSHED, SEPTEMBER 2020)

Site number	Site description	L_{Aeq} (dBA)	Observations
Daytime			
IFC Residential Limits – 55 dBA **SANS 10103 (2008) Rural District Limits – 45 dBA**			
Site 1	Residential (Near Andries van den Berg farmhouse)	32.1	Noise background from the Mamatwan and Tshipi mines operations, gusty winds, leaves on shrubs and trees rustling in the wind
Site 2	Residential (Near Nic Fourie farmhouse)	37.6	Gusty winds, leaves on shrubs and trees rustling in the wind

Site 5	Residential (Near farm workers near Decommissioned Middelplaats Mine)	44.0	Cars passing, leaves on shrubs and trees rustling in the wind, gusty winds, birds chirping
IFC Industrial Limits – 70 dBA **SANS 10103 (2008) Industrial District Limits – 70 dBA**			
Site 3	Industrial (Entrance to MMT)	62.2	Train hooting & passing, birds chirping, shrubs and trees rustling in the wind, mining operations
Site 4	Industrial (Adams Solar farm)	40.8	Leaves on shrubs and trees rustling in the wind, traffic from the road, community activities
Night-time			
IFC Residential Limits – 45 dBA **SANS 10103 (2008) Rural District Limits – 35 dBA**			
Site 1	Residential (Near Andres van den Berg farmhouse)	34.4	Sound of insects, noise background from the mining operations (hooter from the mines)
Site 2	Residential (Near Nic Fourie farmhouse)	36.3	Sound of insects and noise background from the mining operations
Site 5	Residential (Near farm workers near Decommissioned Middelplaats Mine)	38.3	Dogs barking, noise background from the mining operations, sound of insects
IFC Industrial Limits – 70 dBA **SANS 10103 (2008) Industrial District Limits – 60 dBA**			
Site 3	Industrial (Entrance to MMT)	50.5	Sounds of generator (mechanical noise), mining operations, insects, sound of insects, trucks & cars passing and hooting.
Site 4	Industrial (Adams Solar farm)	66.3	Road traffic (trucks hooting and passing), noise background from the mine operations (mechanical noise or generator)

9.9.3 Potential noise sensitive receptors

Disturbing industrial noise levels on the receiving environment rarely extends more than 5 km from the source. The location of the noise sensitive receptors is illustrated in Figure 9-5. These noise sensitive receptors include a combination of neighbouring industrial sites (Adams Solar Farm and the Eskom substation) and residential sites (isolated farm homesteads). The closest noise sensitive receptors to the project activities include the Adams Solar farm, the Eskom substation and the isolated Michael Kruger farm homestead, all located to the east of MMT.

The remaining noise sensitive receptors are likely to be influenced by the neighbouring Tshipi Borwa Mine given the proximity to the mine. Based on the prevailing wind field (Section 9.3), disturbing noise levels are expected to be more notable to the east and south of the MMT during the day and to the north and north-northwest of the MMT during the night.

9.9.4 Conclusion

The noise sampling results undertaken both near the MMT and near sensitive noise receptors indicate that SANS 10103 (2008) residential and industrial night-time noise levels were exceeded. The proposed project has the potential to contribute to ambient noise levels, as part of land clearing activities. The disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams Pit presents a source that currently contributes to the existing ambient noise levels. These contributions however need to be considered within the context of the exiting MMT mine and neighbouring mines (Tshipi Borwa Mine), that have influenced the natural ambient noise environment.

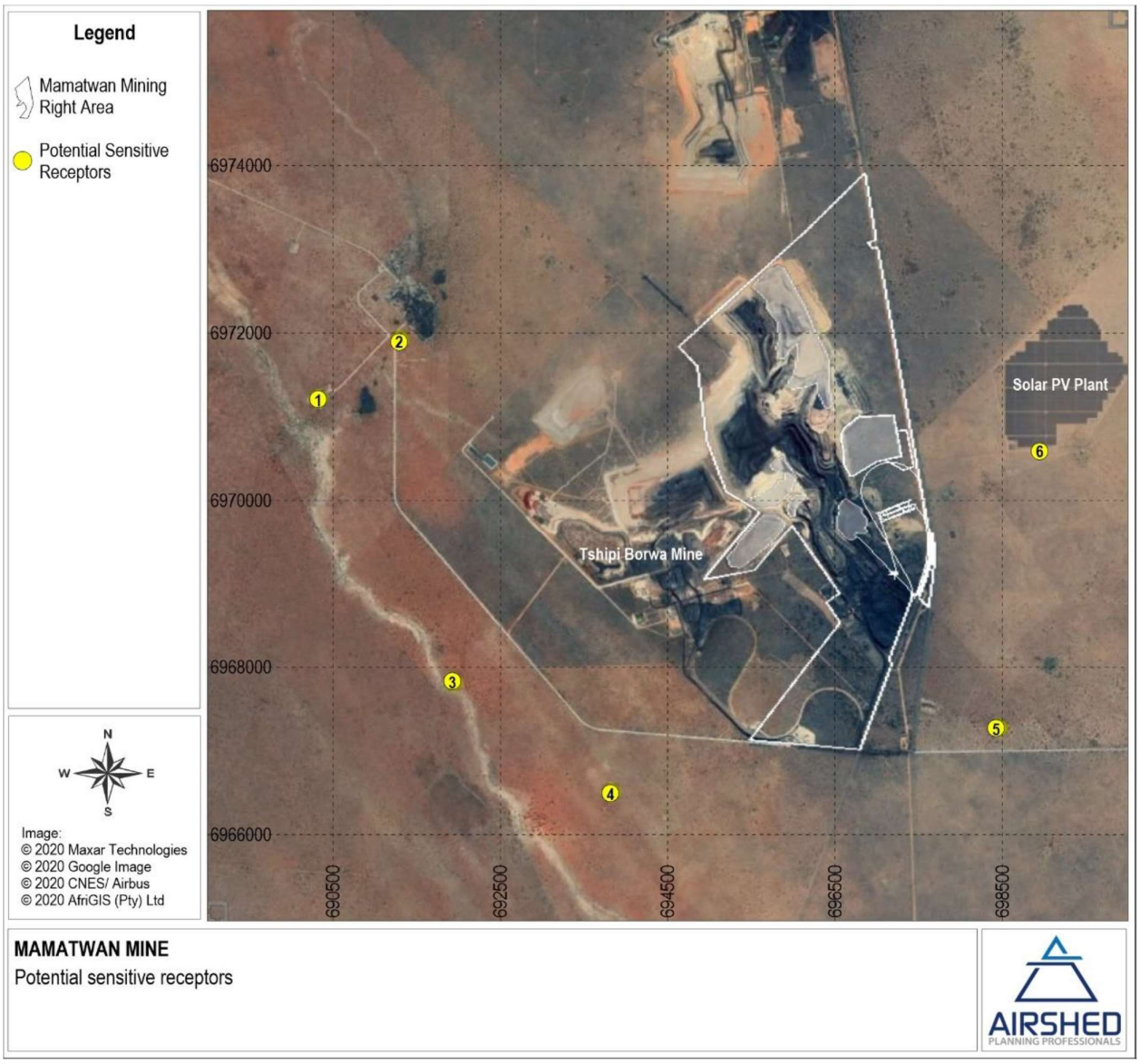


Figure 9-5: Noise Sensitive Receptors

9.10 VISUAL

9.10.1 Introduction

The visual character of an area is determined by considering landscape character, scenic quality, sensitivity of the visual resource, sense of place and visual receptors. Mining related infrastructure and activities has the potential to alter the visual aspects in a project area and surrounding area.

9.10.2 Data sources

Information in this section was sourced from aerial imagery and site visits undertaken by the specialist team. The specialist visual report was compiled by Scientific Services in November 2019.

9.10.3 Description

Landscape character

The landscape character to the immediate east and south of the current MMT and west of the decommissioned Middelplaats Mine can be described as relatively flat terrain with the bushveld vegetation composition being homogenous with the surrounding area. The landscape character associated with the undisturbed proposed project areas (proposed top-cut stockpile, and Middelplaats water pipeline routes 2 and 3), resemble characteristics similar to that of undisturbed areas to the east of the MMT and the west of the decommissioned Middelplaats Mine.

Areas to north and west of the MMT and north-east and south-east of the decommissioned Middelplaats mine are characterised by mining activities. The UMK borders the northern boundary of the MMT, while the Tshipi Borwa Mine is located along the western boundary of the MMT. WRDs form the backdrop to these areas from many viewpoints. The landscape character associated with the remaining project components is fundamentally altered due to mining characteristics.

Scenic quality

The scenic quality is linked to the type of landscapes that occurs within an area. In this regard, scenic quality can range from high to low as follows:

- High – these include the natural features such as mountains and koppies and drainage systems;
- Moderate – these include agricultural activities, smallholdings, and recreational areas; and
- Low – these include towns, communities, roads, railway line, industries and existing mines.

The landscape to the immediate east and south of MMT and west of the decommissioned Middelplaats Mine which has not been disturbed by existing and surrounding mining activities provides limited topographical variety since the terrain is relatively flat with limited distinguishing topographical features and is not considered scarce as it is representative of the greater landscape and common in the area. This scenic quality also applies to the undisturbed proposed project areas (proposed top-cut stockpile, and Middelplaats water pipeline routes 2 and 3).

The scenic quality to the west and north of the MMT, north-east and southeast of the decommissioned Middelplaats mine, including the remaining project components is fundamentally changed by mining operations. It follows that the overall scenic quality is low.

Sense of place

The sense of place results from the combined influence of landscape diversity and distinctive features. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. The project areas are located within a "mining belt". Surrounding existing mining operations and the infrastructure that supports these mines dominates the area to the west and north of the MMT and north-east and southeast of the decommissioned Middelplaats mine. It follows that the immediate area within and surrounding the project areas has a relatively weak sense of place (when the viewer is within the mining belt). However, seen in context with the site surrounded by large open spaces of arid vegetation, the harsh nature of the mining activities is "softened". When the viewer views the area from outside the "mining belt", the larger area has a stronger sense of place.

9.10.4 Conclusion

When viewed from the perspective of tourists and residents of the area, mining operations could be associated with a sense of dissatisfaction. However, the project areas are situated in a remote area where a very limited number of sensitive receptors (isolated farmsteads) are present. The great majority of traffic on the adjacent road is linked with services to the mines. Much of the project infrastructure would merge with the existing facilities and is not expected to stand out. Since the visual intrusion is already present in the area, most receptors to the east have grown accustomed to the features.

9.11 TRAFFIC

Due to the fact that all of the proposed activities will be carried out within the Mamatwan Mining Right Area, there is an insignificant risk of impacts on traffic during the construction phase. During the operational phase, there is a slight positive impact to local traffic as the mine will be equipped to optimise the transport of materials via rail, which will avoid any additional road traffic that may be required for trucking of materials.

9.12 HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

A specialist study was carried out by PGS Heritage in February 2020 and was updated in October 2021.

9.12.1 Introduction

Most archaeological material in the Northern Cape is found near water sources due to the extreme water constraints within this Province. Sites usually comprise of open sites where the majority of evidence of human occupation is scatters of stone tools.

Stone Age

An important archaeological site in the region is the Wonderwerk Cave which is located about 100km from MMT. The Early Stone Age (ESA) levels at the Wonderwerk Cave date to about 780 000 years old. The site is characterised by Acheulean stone tools such as prepared cores, bifacial cleavers and refined and axes. A few [pieces of haematite were also found in the upper most Middle Stone Age (MSA) layers. Bedding material recovered indicates that the site was used as a home base by the end of the ESA.

MSA artefacts belonging to the Fauresmith industry are also found in the region. The Fauresmith is characterised by prepared cores, long, narrow flake blades, convergent points and small, broad hand axes. Layers with Fauresmith tools were dated to 276 000 – 510 000 Before Present (BP). Associated with the MSA materials were several incised stone slabs, most with curved parallel lines. Between 70 000 and 12 500 BP the site was abandoned due to significantly drier conditions, and during this time much of the region was abandoned and settlements limited to a few permanent water sources.

The earlier Later Stone Age (LSA) industry of the region forms part of the Oakhurst industry characterised by rare, retouched artefacts, mostly large oblong scrapers. The predominant raw materials are banded ironstone and dolomite. Very few adzes and blades are found, while backed artefacts and bone tools are absent. Pottery makes an appearance and there are two discrete stone tool industries associated with pottery in the Northern Cape. Prehistoric specularite mines were excavated neat Postmasburg-Doornfontein area and at Blinkklipkop. These sites show that mining started before 1 200 BP.

Rock engravings are plentiful in the Northern Cape. Most engravings were made by the San and are associated with their religious beliefs and rituals. As the wider landscape became increasingly inhabited, the San were forced to move further west and northwest, following availability of wild game.

Iron Age

The Tlharo is documented to be the first Tswana group to enter the Kuruman area. They originated to the north-east, and after splitting with the larger group, moved in a southern direction along the Molopo River. The early settlements included Khuis, Madibeng, Huiningvlei, Langeberg and Tsineng. The town of Tsineng is in the general vicinity of the MMT study area.

9.12.2 Source Data

A literature review and sensitivity analysis were carried out to understand the background to the project and the receiving environment. A physical survey was conducted by vehicle through the proposed project area by a qualified heritage specialist. The survey was conducted in July and October of 2019. The site assessment aimed at locating and documenting any relevant cultural heritage or archaeological artefacts or sites that are located within or adjacent to the proposed development footprint.

9.12.3 Conclusion

Based on the background research and desktop assessment of the previous studies undertaken for this site, only archaeological finds were considered to have a possibility of occurring in the largely disturbed study area. These archaeological finds would be protected through section 35 of the National Heritage Resources Act (NHRA). The fieldwork has however confirmed that no heritage resources as considered under Section 3 of the NHRA were found. A “chance find procedure” should be compiled and implemented during construction should any artefact be uncovered.

9.13 SOCIO-ECONOMIC BASELINE SOCIO-ECONOMIC ENVIRONMENT AFFECTED BY THE PROJECT

9.13.1 Introduction and Link to Impact

Typically mining projects have the potential to result in both positive and negative socio-economic impacts. The positive impacts are usually economic in nature with projects contributing directly towards employment, procurement, skills development and taxes on a local, regional and national scale. In addition, projects indirectly contribute to economic growth in the national, local and regional economies. The negative impacts can be both social and economic in nature and related to the influx of people seeking job opportunities (with related social ills and pressures on existing services) and a change to existing land uses (with related changes to social structures and way of life).

9.13.2 Data sources

Information in this section was sourced from the John Taolo Gaetsewe District Municipality Draft IDP 2021/22, the Joe Morolong Local Municipality Draft IDP 2020/21 as well as Statistics SA 2016.

9.13.3 Description

The MMT is located in the John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality of the Northern Cape Province. The nearest community to the mine is the town Hotazel, located approximately 25km north of the MMT. No informal or rural type settlements occur within the surrounding areas.

Population

The Hotazel community has a very low population of 1 755 people when compared to the local municipality population of 89 377, the district municipality population of 242 264 and the Northern Cape Province population of 1 145 861. This provides an indication of the remoteness of the project area.

Education

In general, statistics throughout the identified regions indicate poor educational profiles. Significant numbers of the population within the municipalities and province have received no schooling or only limited primary education. In figures, 18 569 people have no schooling in the JMLM, while 42 628 and 175 584 people have no schooling in the JTGDM and the Northern Cape province, respectively. The average number across the regions profiled of people completing high school education were relatively consistent; however, there is greater disparity when considering Grade 12 education, further education and training and tertiary education.

Employment

The majority of the population within the Northern Cape, John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality are not economically active. In 2011, the district had an unemployment rate of 30%. The Joe Morolong Municipality has the highest unemployment rate in the district at 40%, while 48% of the Hotazel population is employed.

Dwellings

The most dominant type of dwelling utilized within the Northern Cape Province, the John Taolo Gaetsewe District Municipality, the Joe Morolong Local Municipality and Hotazel is a formally constructed house or brick structure. Traditional dwellings (e.g. huts/ structures made of traditional material) are the second highest used dwelling type in the district and local municipalities with informal dwellings (e.g. shacks) being the second

highest dwelling type within the Northern Cape Province. No traditional dwellings are located within the town of Hotazel; rather the second highest used dwelling type is flats.

Basic Services

Despite the relatively formalized housing infrastructure, basic services infrastructure appears to be far less formalized when considering the province and municipalities as a whole. In general, Hotazel is well formalised in terms of basic services. This may be attributed to the Hotazel area being more urbanized having been developed and supported by surrounding mines in recent years.

9.13.4 Conclusion

In general mining related projects have the potential to influence socio-economic conditions both positively and negatively to which the approved mine already contributes. The project activities form part of existing approved operations and as such are unlikely to influence the existing socio-economic conditions of the area.

9.14 LAND USES

9.14.1 Introduction and link to impact

Mining related 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. The key related potential environmental impacts are loss of soil, loss of biodiversity, air pollution, noise pollution and visual impacts. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

9.14.2 Data source

Mining Right and land ownership details were sourced from MMT and a deed search undertaken by SLR. On-site and surrounding land use data was sourced from site observations and through the review of topographical maps and satellite imagery.

9.14.3 Description – MMT mining right

MMT through the legal entity Hotazel Manganese Mines (Pty) Ltd, holds a mining right (NC 256 MR) to mine manganese ore over portion 1, and portion 2 of the farm Mamatwan 331, the farm Sinterfontein 748, portion 3 of the farm Moab 700, portion 4 of the farm Adams 328 and portion 5 and 9 of the farm Goold 329. The mining rights boundary is illustrated in Figure 3-2.

9.14.4 Description – surrounding mining right and environmental authorisation holders

The following applies to properties directly adjacent to the MMT (refer to Figure 3-2.):

- Tshipi holds a Mining Right over on a portion of portion 1 (Currently portion 16) and a portion of portion 2 (Currently portion 17) of the farm Mamatwan 331;
- UMK holds the Mining Right over the farm Botha 313, the remaining extent of the farm Smartt 314, and portions 1 and 3 (a portion of RE) of the farm Rissik 330;
- Enel Green Power (Pty) Ltd holds an environmental authorisation over the remaining extent of the farm Adams 328; and
- Danax Energy (Pty) Ltd holds an environmental authorisation for the establishment of a new solar farm on portion 1 of the farm Shirely 367.

9.14.5 Description – landowners within and surrounding the MMT Mine

The surface right owners and corresponding title deeds numbers of the land in and adjacent to the MMT Mining Right area is listed in TABLE 9-22 and TABLE 9-23 respectively. The surface rights to all the properties within the MMT Mining Right area are held by HMM. In terms of the project areas, the NE topsoil stockpile is located on portion 9 of the farm Goold 329. Adams's pit and associated disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust takes place on portion 4 of the farm Adams 328, portion 5 of the farm Goold 329 the farm Sinterfontein 748. The project areas are all located within the MMT Mining Right area.

TABLE 9-22: LAND OWNERSHIP WITHIN THE MMT MINING RIGHT AREA

Portion	Landowner	Title deed number
Mamatwan 331		
Portion 1	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Portion 2	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Sinterfontein 748		
Portion 0	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Moab 700		
Portion 3	Hotazel Manganese Mines (Pty) Ltd	T953/2009
Adams 328		
Portion 4	Hotazel Manganese Mines (Pty) Ltd	T338/2009
Goold 329		
Portion 5	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Portion 9	Hotazel Manganese Mines (Pty) Ltd	T3211/2015

TABLE 9-23: LANDOWNERS ADJACENT TO THE MMT MINING RIGHT AREA

Portion	Landowner	Title deed number
Mamatwan 331		
Remaining extent	Andries Mathys Van Den Berg	T594/ 1987
Portions 1 and 2	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Remaining extent of portion 3		T953/2009
Portion 7	Transnet	T666/1965
Portion 8	Tshipi é Ntle Manganese Mining (Pty) Ltd	T515/1992
Portion 18 (Portion of Portion 3)	Tshipi é Ntle Manganese Mining (Pty) Ltd	T416/2014
Portion 16 (Portion of Portion 1)	Tshipi é Ntle Manganese Mining (Pty) Ltd	T416/2014
Portion 17 (Portion of Portion 2)	Tshipi é Ntle Manganese Mining (Pty) Ltd	T416/2014
Moab 700		
Portion 1	Transnet	T250/1983
Remaining extent	Machiel Andries Kruger	T594/1987
Middelplaats 332		
Remaining Extent	Saltrim Ranches (Pty) Ltd	T2297/2006
Portion 1	Terra Nominees (Samancor Manganese)	T2397/1996
Portion 4	Hotazel Manganese Mines (Pty) Ltd	T2426/2010
Middelplaats 184		
Whole farm	Abraham Johannes De Klerk	T1135/1965

Portion	Landowner	Title deed number
Adams 328		
Remaining Extent	Saltrim Ranches (Pty) Ltd	T2297/2006
Portion 1	Eskom Holdings	T347/1971
Portion 2		T1162/1982
Portion 3	Transnet	T1107/1992
Rissik 330		
Portion 0	Gideon Poolman Familie Trust	T3211/2015
Portion 1	Terra Nominees (Samancor Manganese)	T2395/1996
Portion 2	Transnet	T515/1992
Portion 3	United Manganese of Kalahari Pty Ltd	T2092/2009
Goold 329		
Portion 1	Kruger Machiel Andries	T399/1977
Portion 2	Kruger Nicolaas Philippus Fourie	T455/2010
Portion 8	Transnet	T515/1992
Portion 9	Hotazel Manganese Mines (Pty) Ltd	T2821/2011
Shirley 367		
Portion 0	Leatitia Penny Trust	T3464/1997
Portion 1	Annalien Elizabeth Fourie	T730/1984
Portion 2	Pretorius Hester Johannes	T718/1979
Portion 3	Transnet	T43/1993
Smartt 314		
Portion 0	Terra Nominees (Samancor Manganese)	T2396/1996
Portion 1	Transnet	T221/1966
Alton 368		
Portion 0	Booysen Jacomina Maria	T285/1979
Portion 1	Andries Matthys Duvenhage Testamentere	T905/2009
Milner 327		
Whole Farm	Kruger Machiel Andries	T26/1931

9.14.6 Description – land claims

The DRDLR: Land Claims Commissioner was contacted on 13 November 2019 to confirm if any land claims have been lodged on the farms on which the project activities are located. The Land Claims Commissioner has confirmed that no land claims have been lodged on the farms on which the project activities/infrastructure are located. Proof of correspondence is included in Appendix C1.

9.14.7 Description – land use within the project area

Land use at the project sites includes existing mining activities and infrastructure associated with MMT mining right area.

Description – land use surrounding the project areas (further afield)

Land uses further afield from the project areas include a mixture of agriculture, isolated residence/ residential areas, infrastructure/servitudes, mining and solar activities. More detail is provided below.

9.14.8 Agriculture

Agricultural activities currently undertaken in the areas surrounding the MMT include game farming and ad-hoc livestock grazing.

9.14.9 Isolated residence/ residential area

With reference to Figure 3-1, the nearest towns / residential areas to the MMT include:

- The Black Rock mining community located approximately 30 km north-west of the MMT;
- Hotazel situated approximately 20 km north of the MMT;
- Kuruman located approximately 45 km south-east of the MMT; and
- Kathu located approximately 40 km to the south of the MMT.

Due to the lack of available surface water resources in the area, no informal settlements are located in immediate proximity to the MMT. There are sparsely situated residences and farmhouses on the surrounding farms within an approximate radius of 5 km of the MMT. These are owned and/or occupied by farmers and farm workers and include:

- Farm workers residence located on the Farm Middelplaats 332 located approximately 5.5 km north-west from the area respectively (see Figure 3-1);
- A permanent farm homestead (A. Pyper) located on the Farm Middelplaats 332 approximately 6.3 km north-west from the project area (see Figure 3-1);
- A permanent farm homestead (Andries van den Berg) located on the Farm Mamatwan 331 approximately 4.8 km south-west from the project area (see Figure 3-1);
- Permanent farm homesteads (Nic Fourie) located on the Farm Shirley 367 approximately 5 km south from the project area (see Figure 3-1)
- A permanent farm homestead (Michael Kruger) located on the remaining extent of the farm Moab 700 approximately 2.8 km south-east from the project area (see Figure 3-2).

9.14.10 Infrastructure and servitudes

The Sedibeng Vaal-Gamagara water supply pipeline supplies the MMT with process and potable water. A pipeline connection to the Sedibeng Vaal-Gamagara reservoir is located approximately 2.5 km south from the project area (see Figure 3-1).

9.14.11 Surrounding mines

Mining operations located within a 7km radius of the MMT include the (Figure 3-1):

- The Tshipi Borwa Mine (Tshipi é Ntle Manganese Mining (Pty) Ltd is located directly west of the MMT Mining Right boundary and approximately 1.5 km west of the project areas.
- The Sebilo Mine (Sebilo Resources (Pty) Ltd) – Located approximately 7 km north from the nearest section of the MMT; and
- The dormant / temporarily closed Middelplaats Mine – Located approximately 4 km north-west from the nearest section of the MMT.

Mining operations located further afield from the project areas include the (see Figure 3-1):

- The Wessels Mine (South32) – Located approximately 28 km north from the nearest section of the MMT;
- The Nchwaning/Black Rock Mine (Assmang (Pty) Ltd) – Located approximately 26 km north from the nearest section of the MMT;
- The Gloria Mine (Assmang (Pty) Ltd) – Located approximately 21 km north from the nearest section of the MMT;
- The Kalagadi Mine (Kalagadi Manganese (Pty) Ltd) – Located approximately 17 km northwest form the nearest section of the MMT;
- The Kudumane Mine (Kudumane Manganese Resources (Pty) Ltd) – Located approximately 13 km north from the nearest section of the MMT;
- The old Hotazel Mine (dormant/closed) – Located approximately 15 km northeast from the nearest section of the MMT;
- The old Devon mine (dormant/closed) – Located approximately 14.7 km northeast from the nearest section of the MMT; and
- The old York Mine (dormant/closed) – Located approximately 12.8 km north from the nearest section of the MMT.

9.14.12 Solar plant

The Adams Solar Plant (Adams Solar PV Project Two (Pty) Ltd), owned by Enel Green Power (Pty) Ltd, is situated approximately 2 km southeast from the project area and is located on the Farm Adams 328. The Adams Solar Plant will aid the new renewable generation capacity of the national grid and contribute to the 42% share targeted by the Department of Energy for renewable energy (Integrated Resource Plan, 2010-2030). According to the strategy, 8.4 GW of new generation capacity in South Africa will be obtained from the Adams Solar Plant over the next twenty years.

Danax Energy (Pty) Ltd holds an environmental authorisation for the establishment of a new solar farm on portion 1 of the farm Shirely 367. This solar farm has not been established. It is anticipated that the new solar farm will generate a capacity 75 MW and will be connected to the Eskom grid. The NE topsoil stockpile and are located approximately 4 km and 2 km, respectively, north of the new solar farm to be established on the farm Shirley 367.

9.14.13 Conclusion

There are a number of land uses within and surrounding the project areas which may be influenced by the project activities. It should, however, be noted that land has already been significantly influenced through mining and agricultural activities and associated infrastructure and servitudes.

9.15 ENVIRONMENTAL IMPACTS AND RISKS OF THE ALTERNATIVES

In terms of this section, a list of potential impacts on the biophysical and socio-economic environment should be provided. It must be noted, however, that the alignment alternatives for the pipeline and the railway loop are insignificant. While the pipeline preferred route is along an existing road servitude, the other two alternative alignments would not have generated any significant impacts. Similarly for the railway loop, the preferred alternative is an optimisation of the second alternative, thereby requiring a smaller footprint for clearing. Neither railway loop alternative would have a significant impact on the receiving environment.

9.16 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method used for the assessment of environmental issues is set out in Table 9-24. 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.

Table 9-24: 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: DEFINITIONS AND CRITERIA*		
Definition of SIGNIFICANCE		**Significance = consequence x probability**
Definition of CONSEQUENCE		**Consequence is a function of intensity, spatial extent and duration**
Criteria for ranking of the INTENSITY of environmental impacts	**VH**	Severe change, disturbance or degradation. Associated with severe consequences. May result in severe illness, injury or death. Targets, limits and thresholds of concern continually exceeded. Substantial intervention will be required. Vigorous/widespread community mobilization against project can be expected. May result in legal action if impact occurs.
	H	Prominent change, disturbance or degradation. Associated with real and substantial consequences. May result in illness or injury. Targets, limits and thresholds of concern regularly exceeded. Will definitely require intervention. Threats of community action. Regular complaints can be expected when the impact takes place.
	M	Moderate change, disturbance or discomfort. Associated with real but not substantial consequences. Targets, limits and thresholds of concern may occasionally be exceeded. Likely to require some intervention. Occasional complaints can be expected.
	L	Minor (Slight) change, disturbance or nuisance. Associated with minor consequences or deterioration. Targets, limits and thresholds of concern rarely exceeded. Require only minor interventions or clean-up actions. Sporadic complaints could be expected.
	VL	Negligible change, disturbance or nuisance. Associated with very minor consequences or deterioration. Targets, limits and thresholds of concern never exceeded. No interventions or clean-up actions required. No complaints anticipated.
	VL+	Negligible change or improvement. Almost no benefits. Change not measurable/will remain in the current range.
	L+	Minor change or improvement. Minor benefits. Change not measurable/will remain in the current range. Few people will experience benefits.
	M+	Moderate change or improvement. Real but not substantial benefits. Will be within or marginally better than the current conditions. Small number of people will experience benefits.
	H+	Prominent change or improvement. Real and substantial benefits. Will be better than current conditions. Many people will experience benefits. General community support.

	VH+	Substantial, large-scale change or improvement. Considerable and widespread benefit. Will be much better than the current conditions. Favourable publicity and/or widespread support expected.
Criteria for ranking the DURATION of impacts	**VL**	Very short, always less than a year. Quickly reversible
	L	Short-term, occurs for more than 1 but less than 5 years. Reversible over time.
	M	Medium-term, 5 to 10 years.
	H	Long term, between 10 and 20 years. (Likely to cease at the end of the operational life of the activity)
	VH	Very long, permanent, +20 years (Irreversible. Beyond closure)
Criteria for ranking the EXTENT of impacts	**VL**	A part of the site/property.
	L	Whole site.
	M	Beyond the site boundary, affecting immediate neighbours
	H	Local area, extending far beyond site boundary.
	VH	Regional/National

PART B: DETERMINING CONSEQUENCE							
			EXTENT				
			A part of the site/property	Whole site	Beyond the site, affecting neighbours	Local area, extending far beyond site.	Regional/ National
			VL	**L**	**M**	**H**	**VH**
INTENSITY = VL							
DURATION	Very long	**VH**	**Low**	**Low**	**Medium**	**Medium**	**High**
	Long term	**H**	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Medium term	**M**	**Very Low**	**Low**	**Low**	**Low**	**Medium**
	Short term	**L**	**Very low**	**Very Low**	**Low**	**Low**	**Low**
	Very short	**VL**	**Very low**	**Very Low**	**Very Low**	**Low**	**Low**
INTENSITY = L							
DURATION	Very long	**VH**	**Medium**	**Medium**	**Medium**	**High**	**High**
	Long term	**H**	**Low**	**Medium**	**Medium**	**Medium**	**High**
	Medium term	**M**	**Low**	**Low**	**Medium**	**Medium**	**Medium**
	Short term	**L**	**Low**	**Low**	**Low**	**Medium**	**Medium**
	Very short	**VL**	**Very low**	**Low**	**Low**	**Low**	**Medium**
INTENSITY = M							
DURATION	Very long	**VH**	**Medium**	**High**	**High**	**High**	**Very High**
	Long term	**H**	**Medium**	**Medium**	**Medium**	**High**	**High**

	Medium term	M	Medium	Medium	Medium	High	High
	Short term	L	Low	Medium	Medium	Medium	High
	Very short	VL	Low	Low	Low	Medium	Medium
INTENSITY = H							
DURATION	Very long	VH	High	High	High	Very High	Very High
	Long term	H	Medium	High	High	High	Very High
	Medium term	M	Medium	Medium	High	High	High
	Short term	L	Medium	Medium	Medium	High	High
	Very short	VL	Low	Medium	Medium	Medium	High
INTENSITY = VH							
DURATION	Very long	VH	High	High	Very High	Very High	Very High
	Long term	H	High	High	High	Very High	Very High
	Medium term	M	Medium	High	High	High	Very High
	Short term	L	Medium	Medium	High	High	High
	Very short	VL	Low	Medium	Medium	High	High

PART C: DETERMINING SIGNIFICANCE							
PROBABILITY (of exposure to impacts)	Definite/ Continuous	VH	Very Low	Low	Medium	High	Very High
	Probable	H	Very Low	Low	Medium	High	Very High
	Possible/ frequent	M	Very Low	Very Low	Low	Medium	High
	Conceivable	L	Insignificant	Very Low	Low	Medium	High
	Unlikely/ improbable	VL	Insignificant	Insignificant	Very Low	Low	Medium
			VL	L	M	H	VH
			CONSEQUENCE				

PART D: INTERPRETATION OF SIGNIFICANCE	
Significance	**Decision guideline**
Very High	Potential fatal flaw unless mitigated to lower significance.
High	It must have an influence on the decision. Substantial mitigation will be required.
Medium	It should have an influence on the decision. Mitigation will be required.
Low	Unlikely that it will have a real influence on the decision. Limited mitigation is likely to be required.
Very Low	It will not have an influence on the decision. Does not require any mitigation

Insignificant	Inconsequential, not requiring any consideration.

9.17 POSITIVE AND NEGATIVE IMPACTS OF THE ACTIVITY AND ALTERNATIVES

As discussed earlier in the document, there are no expected significant impacts related to the alternatives for the pipeline and the railway loop. The preferred alternatives will be assessed in Section 9 of this report. The majority of the identified impacts are focused on elements of this application that do not have alternatives because they must support existing mining infrastructure and activities and therefore need to be within a specific location and provide a specific output to the existing process.

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

The recommended management and mitigation actions that have been identified for the potentially significant impacts have been provided in Section 13 of this report. The residual risks with mitigation are also addressed in this section. The issues identified in Table 9-25 are summarised into management actions, providing the anticipated overall residual risk before and after mitigation.

Table 9-25: Summary of possible Management Actions

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
Loss of soil and Land Capability through physical disturbance	• Soil erosion management. • Soil compaction management. • Waste Management. • Soil Loss and Stockpile Management. • Revegetation immediate to rehabilitation of footprint.	Medium to Low	Very Low
Loss of soil and land capability through contamination	• Hazardous materials to be stored in bunded, lined areas. • Maintenance of vehicles and use of drip trays. • Waste stored on lined surface. • Spill kits available and used on site. • Awareness training. • Post rehabilitation audits.	Medium	Low
Reduced floral habitat and diversity	• Demarcation and fencing of working footprint to limit loss of indigenous vegetation.	Medium	Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
	• Designs should include precautions to prevent spills/leaks. • Alien Invasives Plants Management and Control Plan. • Comprehensive rehabilitation and revegetation plan.		
Impact on floral species of conservation concern	• Walkdown of the green-fields areas within the project footprint and all protected species to be marked. • A rescue and relocation plan for protected floral species. • Permitting for the removal of protected species must be obtained. • Rehabilitation plan to be implemented effectively and as soon as possible. • Rehabilitation to continue for at least 5 years after decommissioning and closure.	Medium	Low
Loss of faunal habitat and diversity	• Proposed top-cut to be fenced off and clearly demarcated. • Access roads on existing roads. • Consider sensitive habitats throughout planning and execution. • Alien invasive species control plan. • Fire management and erosion plan. • NO clearing outside of the development footprint.	Medium	Low
Impact on Important faunal species of conservation concern	• Proposed top-cut to be fenced off and clearly demarcated. • Access roads on existing roads. • Consider sensitive habitats throughout planning and execution. • Rehabilitation plan should be developed for implementation throughout the development phase. • Fire management and erosion plan.	Medium	Very Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
	• Design should precent potential leaks and spills.		
Contamination of surface water resources affecting third party use	• Drip trays should be placed under all standing machinery. • Oil recovered from any vehicle or equipment on site must be collected, stored and disposed of by accredited vendors for recycling. • A water quality monitoring plan must be formulated before construction.	Medium	Low
Erosion and Sedimentation	• Construction must be undertaken in the dry season. • Concurrent rehabilitation of disturbed land and revegetation should be carried out to minimise the period that bare soils are exposed to erosion. • A service and maintenance plan must be compiled and implemented.	Medium	Low
Alteration of natural drainage patterns affecting flow of water in downstream systems.	• Development of stormwater infrastructure for pollution control. • Clean water to be released into the environment to minimise alteration of natural drainage flow. • Reuse of water from the PCDs must be prioritised as well as use of water from Middelplaats Shaft.	Medium	Low
Contamination of groundwater affecting third part use.	• Ongoing monitoring in order to address contamination timeously.	Medium	Low
Development of the drawdown due to mining.	• Ongoing monitoring in order to identify any issues for address.	Medium	Low
Increase in ambient air concentrations.	• Limit speed of haul trucks to a maximum of 40 km/h. • Limit unnecessary travel of vehicles on unpaved roads.	Medium	Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
	• Apply water sprays / dust suppressant on regularly travelled sections of roads. • Vehicles should be cleaned of all mud and material to be transported must be covered before travelling on public roads. • Access road to the sinter plant needs to be kept clean to minimise carry-on of mud to public roads. • Controlled blasting techniques to be used to minimise dust generation. • Blasting to be conducted on cloudless days only, if possible. • Chemical surfactants added to water sprays to lower water surface tension and increase binding properties. • Increase in-pit material moisture content. • Drop the height from excavator into haul trucks through water sprays. • Water sprays at mobile crushers.		
Increase in disturbing noise levels affecting potential human receptors.	• Temporary noise barriers and use low noise equipment for construction phase. • Alternatives to audible reversing alarms or configure to maximise forward movements of mobile plant and vehicles. • Selection and management of low noise equipment and vehicles. • Maintain road surfaces. • Activities to be limited to daytime hours. • Grievance procedure should be available for receptors to report noise disturbance.	Low	Very Low
Loss or damage to heritage and/or	• Chance finds protocol to be implemented.	Low	Very Low

Issue	Possible Management Measure	Residual Risk of the Possible Management Action	
		Without Mitigation	With Mitigation
palaeontological resources.			
Disturbance to third party road users by project related traffic.	• Chance finds protocol to be implemented.	Low	Very Low
Positive socio-economic impact.	• Optimise the use of rail for the transport of materials to reduce the requirement for trucking and impact to road users. • Optimise as possible the use of local labour.	Very Low	Low
Negative Socio-economic Impact	• Influx of migrant workers should be managed as far as possible. • Impacts to sensitive receptors should be minimised through implementation of the EMPR and mitigation measures, particularly within the construction phase.	Low	Very Low
Hazardous Excavations and infrastructure that pose a safety risk to third parties and animals.	• Excavations and infrastructure should be limited to within the working footprint. • Access to the site should be limited as it is within the mining right area. • Fencing, or demarcation of dangerous areas should be implemented. • Monitoring of excavations should be carried out daily to ensure that no animal has become trapped within these areas.	Low	Very Low
Sterilisation of mineral resources.	• All of the proposed activities will be taking place within the existing mine surface infrastructure area. Therefore, it is not anticipated that any additional mineral resources will be sterilized.	N/A	N/A
Change in current land use.	• The current land use is mining and this will remain the land use post authorisation of the proposed activities.	N/A	N/A

9.19 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

This application includes the following activities, where some activities had feasible alternatives for consideration.

9.19.1 The establishment of a top-cut stockpile and associated crushing and screening plant

The top-cut stockpile location was identified to be within the Mine Surface working area and to be accessed by existing roads. There is no alternative location for this stockpile and the stockpile location was informed by available space within the current footprint. The top-cut stockpile is located to the east of the Southeast Waste Rock Dump and north of Adams Pit in order to limit the required transport of material and to all of for the top-cut material to be accessible to the road network and to the new rail loop.

9.19.2 Establishment of stormwater management infrastructure

The stormwater infrastructure has been designed to cater to the stormwater expected for the site. The infrastructure needs to link into and optimise the existing stormwater infrastructure. The locations and designs of new infrastructure is limited by the existing infrastructure and the expected stormwater flow direction and volumes.

9.19.3 Changes to waste rock dump height

The increase in the waste rock dump height is restricted to the existing waste rock dump footprint. The value of the increase is determined by the required additional capacity. Therefore, no alternatives were assessed with this.

9.19.4 Establishment of a pipeline to transport abstracted water from the decommissioned Middelplaats Mine to Mamatwan Mine

The pipeline for the transport of water from Middelplaats Mine was assessed using three alignment options. The preferred option runs within an existing road servitude and therefore has the least potential impacts to the receiving environment. It is also technically the best route for engineering of the pipeline.

9.19.5 Upgrading the railway and railway loadout station

The railway loop alignment presented two options, the first was extended past both stockpiles to the east of Adams Pit. This option was optimised and the loop is now more conservative and runs between the two stockpiles with the future product stockpile stackers and reclaimers within the loop, in close proximity to the product stockpile.

9.19.6 Sale of waste rock as aggregate

There are no alternatives to the process of waste rock sales as aggregate. However, this process reduces the volumes of waste rock requiring long term disposal.

9.19.7 Re-processing of material located in Adams Pit.

There are no alternatives that have been identified for the reprocessing of the material at Adams Pit. The location for reprocessing is restricted to the location of the Pit and the location of the processing plant.

9.20 STATEMENT MOTIVATING THE PREFERRED ALTERNATIVE

9.20.1 Pipeline Route

The potable water pipeline route was selected from three alternatives. The preferred alternative is within an existing access road servitude and therefor limits the introduction of potential impacts to a greenfields environment. The maintenance and monitoring of the pipeline will be more easily implemented along the access road, precluding the necessity to send vehicles and equipment into undisturbed areas of the project area.

9.20.2 Railway Loop

The initial railway loop design was optimised to reduce the offprint of the railway track and maintain the loop within the Mamatwan Mining Right Area and within the disturbed footprint. The smaller loop makes the unloading of rail cars more efficient, allowing for an optimal operation.

10. 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

10.1 DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY IMPACTS

10.1.1 Desktop Assessments

The Scoping Phase of the process included the review of available reports and information of the study area. This included the following:

- Previous environmental and specialist reports for the Mamatwan Mine;
- Previous environmental and specialist reports for Tshipi Mine;
- Description of the proposed activities;
- Site layout maps of the mine and existing infrastructure; and
- Google Earth imagery of the Mining Rights area and adjacent land.

10.1.2 Engagement with Local Knowledge

Discussions with the Mine management and onsite staff provided a good understanding of the existing process and how the proposed activities and infrastructure would support and link into the existing mining facilities. Engagement with key stakeholders such as representatives of adjacent mines and landowners provided further understanding of the potential impact of the proposed activities to the region.

10.1.3 Site investigations

Site investigations were carried out by the environmental and social project team as well as by the specialist team to confirm the desktop findings. Samples were taken of the receiving environmental aspects of concern and sensitive receptors were identified and mapped. Sensitive habitats, communities and water bodies were identified and delineated.

10.1.4 Impact Assessment

An impact assessment methodology was provided for use by the entire SLR project team in order to ensure that rankings would be comparable and would be reported on in a similar manner. Workshops were held with the specialist team in order to discuss and adjust impact ratings where appropriate or to obtain clarity on the ratings in the context of the project.

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

The method used for the assessment of environmental issues is set out inTable 9-24. 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.

The 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.

10.3 POSITIVE AND NEGATIVE IMPACTS OF THE PROPOSED ACTIVITY AND ALTERNATIVES

The proposed activity was assessed to potentially generate the impacts as summarised in Table 8-3.

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

The proposed management actions that could be applied and the level or residual risk per potential impact is provided in Table 8-3.

10.5 DESCRIPTION OF THE IMPACTS AND RISKS IDENTIFIED DURING THE ENVIRONMENTAL ASSESSMENT PROCESS

Descriptions of the biophysical, cultural heritage and socio-economic impacts in respect of each of the main project activities and phases are provided in Table 10-1 below.

Table 10-1: List of Potential Impacts in respect in each of Activity and Phase

Potential Impact	Activity	Phase
Loss and sterilisation of mineral resources	N/A	N/A
Altering topography	• Site preparation • Civil works • Earthworks • Rehabilitation • Maintenance and aftercare	• Construction • Decommissioning • Closure
Hazardous excavations and infrastructure resulting in safety risks to third parties and animals	• Site preparation • Civil works • Earthworks	• Construction

Potential Impact	Activity	Phase
Soil erosion	• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	• Construction • Operation • Decommissioning • Closure
Disturbance of original soil profiles	• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	• Construction • Operation • Decommissioning • Closure
Chemical pollution of soil	• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	• Construction • Operation • Decommissioning • Closure
Physical destruction and disturbance of floral species	• Site preparation • Civil works • Earthworks • Transport systems • General site maintenance • Demolition • Rehabilitation • Maintenance and aftercare	• Construction • Decommissioning • Closure
Physical destruction and disturbance of faunal species	• Site preparation	• Construction

Potential Impact	Activity	Phase
	• Civil works • Earthworks • Transport systems • General site maintenance • Demolition • Rehabilitation • Maintenance and aftercare	• Decommissioning • Closure
Alteration of natural drainage patterns	• Site preparation • Civil works • Earthworks • Transport system • Site maintenance • Stormwater diversion and management • Rehabilitation	• Construction • Operation • Decommissioning • Closure
Contamination of surface water resources	• Site preparation • Civil works • Earthworks • Transport systems • General site maintenance • Demolition • Rehabilitation Maintenance and aftercare	• Construction • Operation • Decommissioning • Closure
Contamination of groundwater resources	• Site preparation • Civil works • Earthworks • Transport systems • General site maintenance • Demolition • Rehabilitation • Maintenance and aftercare	• Construction • Operation • Decommissioning • Closure
Air pollution	• Site preparation • Civil works • Earthworks • Transport systems	• Construction • Operation • Decommissioning • Closure

Potential Impact	Activity	Phase
	• General site maintenance • Demolition • Rehabilitation	
Increase in disturbing noise levels	• Site preparation • Civil works • Earthworks	• Construction • Decommissioning
Negative visual views	• N/A	• N/A
Road disturbance and traffic safety	• N/A	• N/A
Loss of cultural/heritage and palaeontological resources	• Site preparation • Civil works • Earthworks	• Construction • Decommissioning
Inward migration and economic impact	• Site Preparation • Civil works • Earth works	• Construction
Change in land use	• N/A	• N/A

10.6 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 biophysical, cultural/heritage and socio-economic impacts, including the extent to which impacts can be avoided or mitigated, is included in Chapter 11 and Appendix R.

11.ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

A summary of the assessment of the identified potentially significant biophysical, cultural heritage and socio-economic impacts associated with the proposed project is provided in Table 11-1 . A full description of the assessment is included in Appendix C.

TABLE 11-1: ASSESSMENT OF SIGNIFICANT IMPACTS AND RISKS

Activity	Potential impact	Aspects affected	Phase	Significance (Unmitigated)	Management actions type	Significance (Mitigated)	Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated
• Site preparation • Civil works • Earthworks • Rehabilitation • Maintenance and aftercare	Altering topography	Topography	• Construction • Decommissioning • Closure	**Insignificant**	• Minimise the area of disturbance by designing and constructing the most compact infrastructure practically possible; and • Rehabilitate in accordance with the approved mine closure plan that ensure a suitable post-closure land use is achieved.	**INSIGNIFICANT**	
• Site preparation • Civil works • Earthworks	Hazardous excavations and infrastructure resulting in safety risks to third parties and animals		• Construction	**Medium**	• The project area will be fenced off to prevent inadvertent access by third parties and animals; • Access control will be implemented to ensure access is only granted to those who have authorisation; • Barriers will be erected around all hazardous excavations; • Warning signage will be erected at all hazardous excavations; and • Where the proposed project has caused injury to third parties or animals, appropriate compensation will be provided; • Care must be taken to ensure that third-party infrastructure, such as telephone lines, etc. are not damaged during the construction phase.	**Low**	• Highly likely to be mitigated. • Highly unlikely to be reversed in the case of injury or death. • Highly likely to be avoided with mitigation. • Highly likely to cause irreplaceable loss in the case of injury or death.
• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	Soil erosion	Soil and Land Capability	• Construction • Operation • Decommissioning • Closure	**Medium**	• Implement the soil conservation procedure as per the EMPR. • Establish short term perennial vegetation that will stabilise the site but allow the indigenous vegetation to establish over the site; • Use existing established roads; • Ensure vegetation clearing is undertaken in phases; • Limit vegetation clearance to only the areas where the infrastructure will be constructed; • Avoid parking of vehicles and equipment outside of designated parking areas; • Plan vegetation clearance for dry seasons (late autumn, winter and early spring); and • Re-establish vegetation along the railway infrastructure to reduce the impact of run-off from the compacted surface of the railway area. •	**Low**	• Highly likely to be mitigated. • Unlikely to be reversed where vegetation has been removed, highly likely to be reversed beyond the project footprint. • Unlikely to be avoided where vegetation has been removed, highly likely to be avoided beyond the project footprint. • Highly unlikely to result in irreplaceable loss.
• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	Disturbance of original soil profiles		• Construction • Operation • Decommissioning • Closure	**Medium**	• Land clearance must only be undertaken immediately prior to construction activities within the development footprint; and • Level any remaining topsoil that was removed from the railway area and that remained on the surface instead of allowing small stockpiled of soil to remain on the surface.	**Low**	• Highly likely to be mitigated. • Unlikely to be reversed where vegetation has been removed, highly likely to be reversed beyond the project footprint. • Unlikely to be avoided where vegetation has been removed, highly likely to be avoided beyond the project footprint. • Highly unlikely to result in irreplaceable loss.
• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	Chemical pollution of soil		• Construction • Operation • Decommissioning • Closure	**Medium**	• Conduct potentially polluting activities (i.e., loading, hauling, tipping, transportation, handling and storage) in a manner that pollutants are contained at source and do not pollute soils. In this regard: • Service all vehicles and mobile equipment regularly in workshops, service bays and wash bays with contained impermeable, floors, dirty water collection facilities and oil traps; • Design and operate all new and used chemical, fuel and oil storage and handling facilities in a manner that all spillages are contained in impermeable areas and cannot be released into the environment; • Report ad hoc spills of potentially polluting substances (whether in dirty areas or in the environment) to the environmental manager immediately and clean up and/or remediate immediately; • Implement and maintain a dirty water management system; • Implement the waste management practices, as per the IWWMP and EMPR. • Educate and train all employees (temporary and permanent) and contractors in pollution prevention; and • Implement formalised action plans to enable fast and efficient reaction to contain and remediate pollution incidents. • Take into account the requirements for long term soil pollution prevention, land function and confirmatory monitoring in the design of any permanent and potentially polluting structures; and • Implement the emergency response procedure in the event any major spillage incident.	**Low**	• Highly likely to be mitigated. • Highly likely to be reversed with remediation. • Highly likely to be avoided with mitigation. • Highly unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks	Physical destruction and disturbance of floral species	Biodiversity	• Construction • Operation • Decommissioning	**Medium**	• A biodiversity specialist shall do a walkdown of the project footprint prior to land clearing activities to identify protected floral species and floral SCC that may have been lying dormant during initial field observations;	**LOW**	• Very highly likely to be mitigated. • Medium likeliness to be reversed.

Activity	Potential impact	Aspects affected	Phase	Significance (Unmitigated)	Management actions type	Significance (Mitigated)	Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated
• Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare			• Closure •		○ Should any protected floral species and floral SCC be located on site, the necessary permits need to be obtained from DENC and/or DFFE prior to removal. They are to be relocated and the relocation success of such species should be monitored for three years post-construction. Immediate actions are to be taken if it becomes evident that relocation is not successful; ○ Ensure the removal of indigenous vegetation is restricted to what is absolutely necessary; ○ No collection of floral species and floral SCC is allowed; • Limit edge effects to the surrounding environment by: ○ Demarcating all footprint areas during construction; ○ Preventing construction rubble or cleared alien vegetation and invasive species to be disposed outside of demarcated areas; ○ Ensuring that construction rubble and cleared alien and invasive species are taken to a registered waste disposal facility; and ○ Managing the spread of alien and invasive species. • Provide appropriate sanitary facilities and ensure the disposal thereof at a registered licenced facility; • Ensure no temporary dump sites are created on site; • No fires are allowed on site; • Compile an alien invasive species management or control plan for implementation with the following recommendations: • A buffer area of 30 m surrounding the railway balloon should be regularly checked for alien invasive species; • Remove alien invasive species throughout the construction, operation and maintenance phases; • Ensure alien vegetation is removed prior to the removal of indigenous vegetation; • Ensure only trained personnel are involved in the chemical control of alien invasive species; • Edge effects arising from the proposed project which may affect adjacent areas must be strictly managed; • Ongoing alien invasive species monitoring must be undertaken throughout all phases; and • Removed alien invasive species must not be placed on unprotected ground as seeds may disperse upon it. All cleared alien invasive species must be disposed of at a licenced waste facility.		• Medium likeliness to be avoided with mitigation. • Unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation • Maintenance and aftercare	Physical destruction and disturbance of faunal species	Biodiversity	• Construction • Operation • Decommissioning • Closure	**High**	• A biodiversity specialist shall do a walkdown of the project footprint prior to land clearing activities to identify faunal species on site and to assist with the relocation thereof; • It is recommended that culverts of sufficient size be places beneath the railway line so as to allow for the movement of small faunal species between the remaining habitat inside the railway loop and that of the larger habitat outside. Culverts must be regularly inspected for infilling and blockages, ensuring they are kept clear of debris; • No collection, trapping and harming of faunal species and faunal SCC is allowed; • Construction personnel are to undergo environmental awareness training pertaining to the potential faunal species located on site; • While no protected faunal species were identified on site, if any species are encountered on site, the necessary permits need to be obtained from DENC and/or DFFE prior to removal/relocation; • Perimeter fencing installed as part of the proposed project must allow for the movement of small animals (e.g., palisade fencing or cattle fencing). Should impermeable fencing be installed, small openings must be created to allow for the continuous movement of small animals. Such openings must be continuously monitored and cleared of debris; and • Smaller species that are not readily able to move out of an area ahead of vegetation and ground clearing activities (such as scorpions and reptiles), will be less mobile during rainfall events and cold days. As such, care must be taken to look for these species prior to these activities and should these species be encountered, they are to be carefully and safely moved to an area of similar habitat outside of the project footprint. A suitably trained specialist shall be instructed to carry out the removal of venomous snake species.	**Medium**	• Very highly likely to be mitigated. • Medium likeliness to be reversed. • Medium likeliness to be avoided with mitigation. • Unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks • General site management • Rehabilitation	Alteration of natural drainage patterns	Surface water resources	• Construction • Operation • Decommissioning • Closure	**Medium**	• Stormwater management plan has been designed to channel runoff and separate dirty water from clean water, aligning with the GN704.	**Low**	• Very highly likely to be mitigated. • Medium likeliness to be reversed. • Medium likeliness to be avoided with mitigation. • Unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks • General site management • Rehabilitation	Contamination of surface water resources			**Medium**	• Drip trays to be placed under all standing machinery and equipment. • Water quality monitoring plan and implementation. • Stormwater management plan to minimise the potential to contaminate surface water and separates dirty and clean water. • Optimise the reuse of mine water to minimise disposal / treatment / storage of dirty water.	**Low**	• Very highly likely to be mitigated. • Medium likeliness to be reversed. • Medium likeliness to be avoided with mitigation. • Unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks • Transport systems • General site management • Demolition • Rehabilitation	Contamination of groundwater resources	Groundwater resources	• Construction • Operation • Decommissioning • Closure	**Medium**	• Implement approved management actions pertaining to the containment of dirty water in accordance with Regulation 704 (June 1999); • Any sheet runoff from compacted areas must be slowed down by the strategic placement of berms; and • Control stormwater through the implementation of HMM's existing Stormwater Management Plan.	**Low**	

Activity	Potential impact	Aspects affected	Phase	Significance (Unmitigated)	Management actions type	Significance (Mitigated)	Extent to which the impact can be reversed, avoided or cause irreplaceable loss and the degree to which the impact and risk can be mitigated
• Maintenance and aftercare							
• Site preparation • Civil works • Earthworks • Demolition	Air pollution	Air Quality	• Construction • Decommissioning	**Low**	• Continue the implementation of HMM's dust fallout monitoring programme; • Reduce vehicle exhaust emissions through the use of better-quality diesel; • Implement inspection and maintenance programmes; • Implement dust suppression measures (wet and dry) to limit dust impacts.	**Very Low**	• Very highly likely to be mitigated. • Low likeliness to be reversed. • High likeliness to be avoided with mitigation. • Very unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks	Increase in disturbing noise levels	Noise	• Construction	**Low**	• Use noise barriers and low noise equipment and vehicles. • Investigate use of alternatives to audible reversing alarms and maximise forward movements of mobile plant and vehicles. • Staff training and awareness of noise control plan. • Avoid clustering of mobile equipment near receptors. • Noise generating activities to be limited to daytime hours. • Maintenance of vehicles and equipment.	**Very Low**	• Very highly likely to be mitigated. • Low likeliness to be reversed. • High likeliness to be avoided with mitigation. • Very unlikely to cause irreplaceable loss.
• Site preparation • Civil works • Earthworks	Loss of cultural/heritage and paleontological resources	Cultural/heritage and paleontological resources	• Construction	**Insignificant**	• Implement the chance find procedure in the event of the discovery of cultural/heritage and/or palaeontological resources on site.	**INSIGNIFICANT**	
• Site preparation • Civil works • EarthworkS	Inward migration and economic impact	Socio-economic	•	**Medium**	• Communication with local communities to identify and manage inward migration. • Indicate the extent to which additional employment may be available for the construction phase.	**Low**	• Moderately likely to be mitigated. • Moderate likeliness to be reversed. • Moderate likeliness to be avoided with mitigation. • Very unlikely to cause irreplaceable loss.

12.SUMMARY OF SPECIALIST REPORT FINDINGS

The relevant specialist studies that were undertaken as part of the proposed project including the recommendations bay by the specialists are provided in TABLE 12-1. All relevant specialist reports have been attached as appendices to this report.

TABLE 12-1: SUMMARY OF SPECIALIST RECOMMENDATIONS

Specialist Study	Recommendation of Specialist	Specialist Recommendations that have been included in this EIAR (Mark with X)	Reference to Applicable Section in this Report

Biodiversity Study	• Minimise loss of indigenous vegetation where possible through effective planning and limiting the development footprint to what is essential. The designs must further adhere to all legislation and all possible precautions taken to prevent potential spills and /or leaks.
	• It is recommended that prior to the commencement of construction activities the entire construction servitude be fenced off, and clearly demarcated to limit footprint creep and edge effects. This will be carried out where feasible and where the fencing will not obstruct other activities.
	• It is recommended that prior to any construction/ earth moving activities are to take place, a detailed walkdown of all-natural areas falling within the final expansion footprint area be undertaken and all protected floral species be marked.
	• It is recommended that prior to the commencement of construction activities the entire proposed top cut be fenced off and clearly demarcated, any burrows should be monitored after fencing has been established to ensure no SCC are utilizing the area. If SCC are noted permits for their removal are necessary.
	• Development should consider sensitive habitats for fauna within the study area.
	• No hunting, trapping or collecting of faunal species is allowed.
	• No collection/ trapping or hunting of faunal SCCs may be allowed by any construction personnel.
	• The walkdown should be undertaken during the summer season when most herbaceous floral species will be in flower, and accurate identification will be easier.
	• Once all floral SCC and NCNCA protected floral species within the development footprint has been identified, a rescue and relocation plan should be designed specifically to each species. Rescue and relocation activities need to take place prior to commencement of any expansion activities. Rescue and relocation need to be overseen by a suitably qualified contractor/ mine employee. The success of relocation actions needs to be monitored quarterly for a minimum period of three years post-relocation.
	• The necessary permits need to be obtained from DOFF and NCDENC prior to the implementation of rescue and relocation activities.
	• During the surveying and site-pegging phases, all faunal SCC that will be affected by surface infrastructure must be marked and, where possible, relocated to suitable habitat surrounding the disturbance footprint. The relevant permits must be applied for from the Northern Cape Department of Environment and Nature Conservation (NCDENC) prior to the commencement of the construction phase.
	• Should any other faunal species protected under National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) be encountered within the study area authorisation to relocate such species must be obtained from the NCDENC or the Department of Environmental Affairs (DEA).
	• Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed project footprint area.
	• Should any SCC be observed on the site a biodiversity specialist should be contacted in order to map the best way forward.
	• Prior to vegetation clearing activities in the Kathu Bushveld habitat, the site should be inspected for the presence of burrowing scorpion burrows, pythons and Aardvark. If located, these species should be carefully excavated ensuring no harm to fauna and relocated to similar surrounding habitat outside of the footprint area.
	•
	• An AIP Management/Control Plan should be compiled for implementation:
	  ○ Removal of alien invasive species should preferably commence during the pre-construction phase and continue throughout the construction, operational, decommissioning and post-closure phases. AIPs should be cleared within areas where they have become proliferate within the existing mining and infrastructure areas (Degraded Bushveld and Transformed Habitat) as well as where new infrastructure is planned before any construction activities commence, thereby ensuring that no AIP propagules are spread, or soils contaminated with AIP seeds, during construction phases;
	  ○ An AIP Management/Control Plan should be implemented by a qualified professional. No chemical control of AIPs to occur without a certified professional;
	  ○ Of particular importance is the control of Prosopis glandules, which comprise of a deep-rooted taproot as well as an extensive lateral root system. This species subsequently not only compete with the indigenous *V. erioloba* for deep groundwater but also take-up sparse precipitation within the soil profile. This species also has a high transpiration rate, which further result in a rapid decline of the water table (Schattschneider and February 2013). The proliferation of these species have the potential to result in significant long-term negative impacts on the surrounding landscape, particularly the NFA protected species *V. erioloba* and *V. haematoxylon*, which play a vital role in the ecosystem by providing habitat for a number of floral and faunal species (Seymour &Milton, 2003); and - Prior to the commencement of construction activities on site, a rehabilitation plan should be developed for implementation throughout the development phases.
	• The footprint areas of all surface infrastructure must be minimised to what is absolutely essential and within the designated and approved boundary.
		X	Part B EMPR and Appendix N

Specialist Study	Recommendation of Specialist	Specialist Recommendations that have been included in this EIAR (Mark with X)	Reference to Applicable Section in this Report

	• No additional habitat is to be disturbed during the operational phase of the development. All material placed on the top-cut stockpile should be restricted to the footprint area that is authorised. Weekly monitoring and recording of the footprint area must be done.
	• Vehicles should be restricted to travelling only on designated roadways to limit the ecological footprint of the construction activities. Additional road construction should be limited to what is absolutely necessary, and the footprint thereof kept to a minimum. Any temporary roads should be rehabilitated as soon as they are no longer in use to prevent effects of habitat fragmentation; STS 190041: Section B: Floral Assessment May 2020 30.
	• No dumping of waste on site should take place. As such it is advised that waste disposal containers and bins be provided during the construction phase for all construction rubble and general waste.
	• Cut vegetation from site clearing to be removed immediately and not allowed to accumulate within surrounding natural habitat.
	• If any spills occur, they should be immediately cleaned up to avoid soil contamination that can hinder floral rehabilitation later down the line. Spill kits should be kept on site within workshops. In the event of a breakdown, maintenance of vehicles must take place with care, and the recollection of spillage should be practised preventing the ingress of hydrocarbons into the topsoil.
	• Natural habitat outside of the direct mining footprint areas must be avoided, and no construction vehicles, personnel, or any other construction-related activities are to encroach upon these areas.
	• The footprint of daily operational activities must be strictly monitored to ensure that edge effects from the operational facilities do not affect the surrounding floral habitat outside of the Mining Right Area.
	• Alien vegetation that is removed must not be allowed to lay on unprotected ground as seeds might disperse upon it. All cleared plant material to be disposed of at a licensed waste facility which complies with legal standards.
	• No collection of floral SCC or medicinal floral species within the site boundary must be allowed by construction personnel.
	• Edge effect control needs to be implemented to prevent further degradation and potential loss of floral SCC and protected floral species outside of the proposed expansion footprint area.
	• An effective dust management plan must be designed and implemented in order to mitigate the impact of dust on flora through the construction and operation phase.
	• No illicit fires must be allowed during the construction and operational phases of the proposed expansion activities.
	• Fire breaks should be maintained during the operational phase.
	• Adequate stormwater management must be incorporated into the design of the proposed development in order to prevent erosion of topsoil and the loss of floral habitat through the discharge of dirty water into the receiving environment. In this regard, special mention is made of:
	  ○ Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; and
	  ○ Runoff from paved surfaces should be slowed down by the strategic placement of bioswales.
	• Rehabilitation of natural vegetation should proceed in accordance with a rehabilitation plan compiled by a suitable specialist. This rehabilitation plan should consider all development phases of the project indicating rehabilitation actions to be undertaken during and once construction has been completed, ongoing rehabilitation during the operational phase of the project as well as rehabilitation actions to be undertaken during decommissioning and closure.
	• The construction process should be phased where possible to limit the extent of exposed areas at any one time and ensure that the time between initial disturbance and completion of construction is as short as possible with rehabilitation occurring concurrently where feasible.
	• Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint.
	• Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own.
	• Should any snakes be encountered, either a suitably trained staff member or expert should be contacted to capture and relocate the specimen. No harm should be done to any snakes located within the study area.
	• Any natural areas beyond the expansion footprint, that have been affected by the construction and operational activities, must be rehabilitated using indigenous species.
	• As part of a Biodiversity Action Plan (BAP), floral monitoring should be done every two to three years during operational activity. Please also refer to the monitoring guidelines below.
	• No hunting/trapping or collecting of faunal species is allowed
	• As part of a Biodiversity Action Plan (BAP), faunal monitoring should be done annually.
	• Rehabilitation must be implemented concurrently, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.
	• All soils compacted as a result of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.
	• All infrastructure and mining operation footprints should be rehabilitated in accordance with a rehabilitation plan compiled by a suitable specialist.		

Specialist Study	Recommendation of Specialist	Specialist Recommendations that have been included in this EIAR (Mark with X)	Reference to Applicable Section in this Report
	• All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective. • Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure. • Edge effects of decommissioning and closure activities, such as erosion and alien plant species proliferation, which may affect adjacent sensitive habitat, need to be strictly managed adjacent to the expansion footprint. • Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase of the development, and the Mamatwan Operations and immediate surrounding area should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural area. • An Alien and Invasive Plant Management and Control Plan must be designed and implemented in order to monitor and control alien floral recruitment in disturbed areas. The alien floral control plan must be implemented for a period of at least 5 years after decommissioning and closure.		
HIA and PIA	• Implement chance find procedures in case where possible heritage or palaeontological finds are made.	X	Chapter 9.12 and Appendix D
Soils, Land Capability and Agricultural Compliance Statement	• Temporary erosion control measures may be used to protect the disturbed soils until adequate vegetation has established. • All disturbed areas can be re-vegetated with an appropriate indigenous veld reclamation mix, if necessary, to re-establish a protective cover, to minimise soil erosion. • Avoid vehicular movement on arable soils as far as practically possible. • Compacted soils adjacent to disturbed areas should be ripped at 25cm as soon as possible to alleviate compaction and potential crusting. • Contractors and mining crew conducting the works on site should be informed about approved waste disposal facilities. • Stockpiles should be revegetated to establish a vegetation cover as an erosion control measure. These stockpiles should also be kept alien vegetation free at all times to prevent loss of soil quality; SAS 219162 December 2019 27. • Temporary berms can be constructed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion. • The stockpiled soil should only be used for intended purpose of rehabilitation at closure of mine operation. Soil stockpiles should be clearly demarcated with No Go areas and monitored regularly. • Dumping of waste material next to or on the stockpiles must be prohibited at all times. Integrated soil stockpile management plans and monitoring programmes as well as an employee awareness programme must be put in place to significantly reduce the risk of soil stockpile robbery and/or contamination. • The recovered soils should be re-used to rehabilitate the development footprint following mine closure. • Loss of Land Capability and Agricultural Potential Management compilation and implementation during operation and decommissioning phases. • During the decommissioning phase the footprint should be thoroughly cleaned, and all waste material should be removed to a suitable disposal facility. • The footprint should be ripped to alleviate compaction where necessary. • Stored topsoil should be replaced (if any) and the footprint graded to a smooth surface. • The landscape should be backfilled and reprofiled to mimic the natural topography for potential agricultural activities and grazing opportunities post mining. If possible, ensure a continuation of the pre mining surface drainage pattern. • Slopes of the backfilled surface should change gradually since abrupt changes in slope gradient increase the susceptibility for erosion initiation. • The topsoil should be ameliorated according to soil chemical analysis taken on the undisturbed areas. • The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation). Soil amelioration should be done according to the soil analyses as recommended by a soil specialist, to correct the pH and nutrition status before revegetation. • The footprint should be re-vegetated with a grass seed mixture as soon as possible, preferably in spring and early summer to stabilise the soil and prevent soil loss during the rainy season.	X	Chapter 9.4 and Appendix K

Air Quality	• Construction and closure phases:
	  ○ Air quality impacts during construction would be reduced through basic control measures such as limiting the speed of haul trucks and to apply water sprays on regularly travelled unpaved road sections.
	  ○ When haul trucks need to use public roads, the vehicles need to be cleaned of all mud and the material transported must be covered to minimise windblown dust.
	• Operational phases:
	  ○ For the control of vehicle entrained dust it is recommended that water (at an application rate >2 litre/m^2/hour), be applied. Literature reports an emissions reduction efficiency of 75%.
	  ○ In controlling dust from mobile crushing operations, it is recommended that water sprays be applied to keep the ore wet, to achieve a control efficiency of up to 50%.
	  ○ Mitigation of materials transfer points should be done using water sprays at the tip points. This should result in a 50% control efficiency. Regular clean-up at loading points is recommended.
		X	Chapter 9 and Appendix H

Specialist Study	Recommendation of Specialist	Specialist Recommendations that have been included in this EIAR (Mark with X)	Reference to Applicable Section in this Report
	○ In minimizing windblown dust from stockpile areas, water sprays should be used to keep surface material moist. A mitigation efficiency of 50 % is anticipated. ○ In minimizing windblown dust from the conveyors, roofing and covering of one side of the conveyor should be installed to achieve a mitigation efficiency of 50 %. ○ To ensure that mitigation is effective, it is recommended that the dustfall monitoring network at the mine be expanded to include single dust buckets at AQSR 4 and AQSR 5 and also that PM_{10} sampling be conducted at AQSR 5 (or AQSR 6 if it is more secure). This can be done as an annual campaign before the project commences (as part of the baseline) and again once mitigated project operations are in place. • Greenhouse Gas Emissions: ○ The fuel usage and electricity usage by the mine needs to be supplied in order to complete the GHG quantification for the project.		
Noise	• Train staff on noise control plan during health and safety briefings. • Avoid clustering of equipment near receptors. • Ensure periods of respite are provided in case of unavoidable maximum noise level events. • Ensure high level of maintenance on all equipment. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance. • Other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours. • Machines should intermittently be shut down between work periods and not left running unnecessarily. • Equipment generating noise directionally should be orientated so the noise is directed away from the sensitive receptors. • Regular and effective maintenance of equipment and plants must be carried out.	X	Chapter 9 and Appendix I
Surface Water	• Drip trays should be placed under all standing machinery. • Oil recovered from any vehicle or machinery on-site should be collected, stored and disposed of by accredited vendors for recycling. • Traffic and movement over stabilised areas should be controlled (minimised and kept to specific paths), and damage to stabilised areas should be repaired timeously. • A water quality monitoring plan must be formulated before construction. • Construction must be undertaken during the dry season as far as possible This will significantly reduce the potential for sedimentation through erosion due to construction activities. • Concurrent rehabilitation of disturbed land and revegetation should be carried out to minimise the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff. • The development of a stormwater infrastructure will result in positive impacts such as pollution control however clean water must be released into the environment to minimize alteration of natural drainage flow.	X	Chapter 9 and Appendix J
Groundwater	• Replacement boreholes as well as cone of drawdown and contaminant plume monitoring borehols are drilled and added to the monitoring network. • Much of the current mitigation and management measures that are in place at the mine will reduce the significance of potential impacts.	X	Chapter 9 an Appendix G

13.ENVIRONMENTAL IMPACT STATEMENT

13.1 SUMMARY OF KEY FINDINGS

This section provides a summary of the findings as part of the proposed project and assessed potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts. A summary of the potential impacts associated with the preferred alternative in the unmitigated and mitigated scenarios for all project phases is included in Table 13-1.

The assessment of the proposed project presents the potential for negative impacts to occur (in an unmitigated scenario) on the biophysical environments both on the project footprint and in the surrounding area. With the implementation of management actions, these potential impacts can be prevented or reduced to acceptable levels.

It follows that provided the EMPR is effectively implemented, there is no biophysical, cultural heritage or socio-economic reason why the proposed project should not proceed.

Table 13-1: Summary of Potential Impacts

Aspect	Potential impact	Cumulative impact significance of the impact (the ratings are negative unless otherwise specified)	
		Unmitigated	Mitigated
Geology	Loss and sterilisation of mineral resources	**INSIGNIFICANT**	
Topography	Altering topography	**INSIGNIFICANT**	
	Hazardous excavations and infrastructure resulting in safety risks to third parties and animals	**Low**	**INSIGNIFICANT**
Soil and land capability	Soil erosion	**Medium**	**LOW**
	Disturbance of original soil profiles	**Medium-Low**	**VERY LOW**
	Chemical pollution of soils	**Medium**	**LOW**
Biodiversity	Floral Habitat and Biodiversity	**High**	**MEDIUM**
	Floral Species of Conservation Concern	**High**	**MEDIUM**
	Loss of Faunal Habitat and Biodiversity	**Medium**	**LOW**
	Faunal Species of Conservation Concern	**Medium**	**VERY LOW**
Surface water resources	Soil erosion and Sedimentation	**Medium**	**LOW**
	Alteration of natural drainage patterns	**Medium**	**LOW**
	Contamination of surface water resources	**High**	**MEDIUM**
Groundwater	Contamination of groundwater resources	**Medium**	**LOW**
	Drawdown	**Medium**	**LOW**
Air quality	Air pollution	**Medium**	**LOW**
Noise	Increase in disturbing noise levels	**Medium**	**LOW**
Visual	Negative visual views	**INSIGNIFICANT**	
Traffic	Road disturbance and traffic safety	**INSIGNIFICANT**	
Cultural heritage and palaeontology	Loss of cultural/heritage and palaeontological resources	**INSIGNIFICANT**	
Socio-economic	Inward migration	**Medium**	**LOW**
	Job creation	**Very Low**	**LOW**

13.2 FINAL SITE MAP

Please see Figure 4-1.

13.3 SUMMARY OF POSITIVE AND NEGATIVE IMPACTS AND RISKS OF THE ACTIVITY AND IDENTIFIED ALTERNATIVES

The positive and negative impacts and risks of the proposed activity and preferred alternatives are summarised above in Section 13.1.

14.IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES FOR INCLUSION IN THE EMPR

Based on the outcome of the impact assessment, and where applicable from the specialist reports, the proposed management objectives and outcomes are provided within this chapter.

14.1 PROPOSED MANAGEMENT OBJECTIVES AND OUTCOMES FOR ENVIRONMENTAL AND SOCIO-ECONOMIC IMPACTS

Specific environmental objectives and outcomes to control, remedy or prevent potential impacts from the proposed project are provided in the table below.

Table 14-1: Environmental Objectives and Outcomes

Aspect	Environmental Objective	Environmental Outcome
Topography	The objective is to minimise changes to natural topography.	The outcome is to limit the alteration of topography during the proposed project and through rehabilitation.
	The objective is to prevent physical harm to third parties and animals resulting from potentially hazardous excavations and infrastructure.	The outcome is to ensure no third parties or animals are harmed during the proposed project.
Soils and Land Capability	The objective is to minimise the loss of soil resources and related land capability from erosion.	The outcome is to handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-mining land capability.
	The objective is to minimise the loss of soil resources and related land capability from physical disturbance and compaction and soil pollution.	
	The objective is to minimise the loss of soil resources and related land capability from soil pollution.	
Biodiversity	The objective is to prevent the unacceptable loss and disturbance to floral species, and to prevent the proliferation of alien invasive species within and surrounding the project area.	The outcome is to prevent the spread of alien species in the project area, as well to limit disturbance as far as practically possible to existing faunal and floral habitats and species of conservation concern.
	The objective is to prevent the unacceptable destruction and disturbance to faunal species.	The outcome is to ensure that no faunal species are harmed or disturbed in the project area.
Groundwater Resources	The objective is to prevent pollution of groundwater resources.	The outcome is to ensure that groundwater quality remains within acceptable limits for both domestic and agricultural purposes.
Air Quality	The objective is to prevent air pollution health impacts.	The outcome is to ensure that any pollutants emitted as a result of the proposed project remains within acceptable limits so as to prevent health related impacts.

Aspect	Environmental Objective	Environmental Outcome
Cultural/Heritage and Palaeontology	The objective is to minimise the disturbance of cultural/heritage and paleontological resources.	The outcome is to protect heritage resources where possible. If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements.

14.1.1 Impacts that require monitoring programmes

The following impacts will require extensive monitoring programmes during the construction, operation and decommissioning phases of the project.

- Hydrocarbon and dangerous goods handling, storage and disposal to avoid spills that may impact on soil or water quality;
- Erosion of soils on disturbed areas;
- Fencing of working areas;
- Stormwater management and the separation of clean and dirty water;
- Surface water quality and volumes within local surface water resources;
- Groundwater quality at specified monitoring points;
- Air quality PM_{10} and dust fallout;
- Noise monitoring at sensitive receptors, if applicable;
- Rehabilitation Management Plan.

14.1.2 Activities and infrastructure

The source activities of potential impacts which require management include:

- Site preparation;
- Earthworks;
- Civil works;
- Transport systems;
- General site management;
- Demolition;
- Rehabilitation; and
- Maintenance and aftercare.

The phases of development associated with the above-mentioned source activities are provided in Table 4-1.

14.1.3 Management actions

Management actions which will be implemented to control the proposed project activities or processes which have the potential to pollute or result in environmental degradation are provided in chapter 12 and Table 12-1.

14.1.4 Roles and responsibilities

The key personnel to ensure compliance with this EIAR and EMPR are the operations executive and the Environmental Department Manager and officers. As a minimum, their roles as they relate to the implementation of monitoring programmes and management activities, include:

- Ensuring that monitoring programmes and audits are scoped to be fit for purpose and included in the annual mine budget;
- Identifying and appointing appropriately qualified specialists/engineers to undertake the monitoring programmes;
- Appointing specialists in a timeous manner to ensure work can be carried out to acceptable standards;
- Liaising with the relevant company, municipal and community structures in terms of the commitments in the Social and Labour Plan (SLP);
- Ensuring that commitments in the SLP are developed and implemented timeously;
- Establishing and maintaining good working relations with surrounding communities and landowners; and
- Facilitating stakeholder communication, information sharing and a grievance mechanism.

Further defined roles and responsibilities will be discussed within the EIAR.

15. FINAL ALTERNATIVES

The alternatives that have been assessed for this EIAR are discussed in Section 7.2.

16. ASPECTS FOR INCLUSION AS CONDITIONS OF THE AUTHORISATION

Management actions (refer to chapter 12 and TABLE 12-1) including monitoring requirements should form part of the conditions of the EA. With reference to Regulation 26 of Government Notice Regulation (GNR) 982 of NEMA, additional conditions that should form part of the EA 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.

17.ASSUMPTIONS, UNCERTAINTIES, LIMITATIONS AND GAPS IN KNOWLEDGE

17.1 ENVIRONMENTAL ASSESSMENT LIMIT

The EIA process focussed on third parties only and did not assess health and safety impacts on the South32 employees and contractors. It is assumed that this would be regulated separately by the Health and Safety Legislation, policies and standards and that South32 will adhere to these.

The Impact Assessment is based on the expertise and recommendation of the specialist team. However, where there needs to be an adjustment of ratings to a particular specialist ranking, this is done in order to ensure that all ratings across the environmental aspects are consistent. Where any ratings have been adjusted by the EAP, there is a comment indicating this and providing reasons therefore.

17.2 AIR QUALITY ASSESSMENT

The main assumptions, exclusions and limitations are summarized below:

- Meteorological data: no onsite meteorological data was available. Data from the South African Weather Services (SAWS) Kuruman Weather Station (located approximately 43 km to the southeast of the mine) was obtained for the period January 2016 – December 2018.
- Operational hours for the processing plant were provided as 7920 hours per year. Operational hours for mining activities were calculated from provided annual and hourly throughputs as 12 hours per day, 7 days a week. It was assumed that this information is correct.
- Emissions:
    - The quantification of sources of emission was for project activities only. Background sources were not included.
    - Information required for the calculation of emissions from fugitive dust sources for the facility's operations were provided in the form of run-of-mine (ROM), top-cut, overburden and product tonnages.
    - Throughputs were provided for current activities only. Since no other information was available, it was assumed that project operations will have the same throughput as baseline operations.
    - Only routine emissions were estimated and modelled. This was done for the provided operational hours.

- Gaseous emissions from vehicle exhaust and other auxiliary equipment were not quantified as the impacts from these sources are usually localized and unlikely to exceed health screening limits outside the project area. The main pollutant of concern from the operations at the study site is particulate matter and hence formed the focus of the study.
- Particle size distribution for ROM, overburden, topsoil, discard and product material was based on information from similar mining processes.
- Greenhouse gas emissions could not be calculated, since no information was made available at the time of writing the report.

- Impact assessment:
  - Impacts due to two operational phases (baseline and project) were assessed quantitatively, whilst the construction, closure and decommissioning phases were assessed qualitatively due to the limited information available.
  - The impact assessment was limited to airborne particulate (including TSP and PM_{10}).
  - There will always be some degree of uncertainty in any geophysical model, but it is desirable to structure the model in such a way to minimize the total error. A model represents the most likely outcome of an ensemble of experimental results. The total uncertainty can be thought of as the sum of three components: the uncertainty due to errors in the model physics; the uncertainty due to data errors; and the uncertainty due to stochastic processes (turbulence) in the atmosphere. Nevertheless, dispersion modelling is generally accepted as a necessary and valuable tool in air quality management and typically provides a conservative prediction of emission concentrations.

17.3 BIODIVERSITY

- The biodiversity desktop assessment is confined to the study area and does not include detailed results for the neighbouring and adjacent properties, although the sensitivity of surrounding areas is included on the respective maps; and
- It is important to note that although all data sources used provide useful and often verifiable, high-quality data, the various databases used do not always provide an entirely accurate indication of the actual site characteristics within the study area at the scale required to inform the EIA process. However, this information is considered useful as background information to the study, and based on the desktop results, sufficient decision making can take place with regards to the development activities.
- The floral assessment is confined to the study area and does not include the neighbouring and adjacent properties or the entire MMT.
- With ecology being dynamic and complex, certain aspects (some of which may be important) may have been overlooked. The most limiting condition was the extreme drought still experienced at the time of the assessment, with the majority of forbs reduced to underground plant parts or died back to unidentifiable parts. On-site data were augmented with historic studies undertaken for the Mamatwan Mine (NSS, 2018). On this basis, the floral ecology associated with the study area is considered to be adequately assessed and considered, and the information provided is sufficient to allow for informed decision making and to facilitate integrated environmental management.
- Sampling by its nature means that not all individuals are assessed and identified. Some species and taxa within the study area may, therefore, have been missed during the assessment.
- A field assessment was undertaken from the 5th to the 7th of November 2019 (spring season), to determine the floral ecological status of the study area, and to “groundtruth” the results of the desktop

assessment (presented in Part A). A more accurate assessment would require that assessments take place in all seasons of the year, especially within the flowering season of most floral species. On-site data was significantly augmented with all available desktop data and previous studies undertaken for the Mamatwan Mine (NSS, 2018), and together with project experience in the area, the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the study area.

- Herbaceous floral SCC during the site assessment were reduced to underground parts, with a few remnant leaves/ seeds identified. The abundance of herbaceous SCC is therefore anticipated to be higher than what was observed during the field assessment. It is recommended that a summer walkdown (January to February) be undertaken and all herbaceous SCC marked, in order to accurately determine the number of individuals that need to be rescued and relocated during the proposed mining development, as part of the requirements for the permit application.
- The faunal assessment is confined to the study area and does not include the neighbouring and adjacent properties nor the MRA (Mining Right Area).
- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked. It is, however, expected that most faunal communities have been accurately assessed and considered and the information provided is considered sufficient to allow informed decision making to take place and facilitate integrated environmental management.
- Due to the nature and habits of most faunal taxa, the high level of surrounding anthropogenic activities, it is unlikely that all species would have been observed during a field assessment of limited duration. Therefore, site observations were compared with literature studies where necessary.
- Sampling by its nature, means that not all individuals are assessed and identified. Some species and taxa within the footprint area may therefore have been missed during the assessment.
- A field assessment was undertaken from the 5th to the 7th of November 2019 (spring season), to determine the faunal ecological status of the study area, and to “groundtruth” the results of the desktop assessment (presented in Section A). A more accurate assessment would require that assessments take place in all seasons of the year. However, on-site data was significantly augmented with all available desktop data and specialist experience in the area, and the findings of this assessment are considered to be an accurate reflection of the ecological characteristics of the study area.

17.4 CULTURAL HERITAGE

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

17.5 NOISE

- Meteorological data: As no onsite meteorological data was available, use was made of measured meteorological data from the closest SAWS monitoring station located at Kuruman approximately 43 km east of the project site. Data for the period 2015 to 2018 was considered for this assessment.
- The quantification of sources of noise was limited to the operational phase of the project. Construction and closure phase activities are expected to be similar or less significant and its impacts only assessed qualitatively. Noise impacts will cease post-closure.
- The assessment is based on the list of noise sources provided by SLR Consulting (South Africa) (Pty) Ltd. The list was found to be appropriate. The assumption is that this information is correct and reflects the routine operational phase of the project.
- Process activities such as the crushing and screening plants and the stacker reclaimer for railway loadout station Option 3, were assumed to be 24 hours per day.
- The loadout station Option 3 was assumed to receive one train per day during day-time hours.
- Location of the crushing and screening plant for the waste material was assumed to be below the western waste rock dumps.
- The change in noise due to the increase in dump height was tested and shown to have minimal change in noise impacts. This source was therefore not modelled for the current assessment as the list of equipment operating on the waste rock dumps was not available.
- Although other existing sources of noise within the area were identified during the survey, such sources were not quantified but were considered during the baseline sampling.

17.6 SOIL AND LAND CAPABILITY

- Sampling by definition means that not all areas are assessed, and therefore some aspects of soil and land capability may have been overlooked in this assessment. However, it is the opinion of the specialist that this assessment was carried out with sufficient sampling and in sufficient detail to enable the proponent, the Environmental Assessment Practitioner (EAP) and the regulating authorities to make an informed decision regarding the proposed mining related activities.
- Land Potential was classified according to current soil restrictions, with respect to prevailing climatic conditions on site; however, it is virtually impossible to achieve 100% purity in soil mapping, the delineated soil map units could include other soil type(s) as the boundaries between the mapped soils are not absolute but rather form a continuum and gradually change from one type to another. Soil mapping and the findings of this assessment were therefore inferred from extrapolations from individual observation points.
- Since soils occur in a continuum with infinite variances, it is often problematic to classify any given soils as one form, or another. for this reason, the classifications presented in this report are based on the "best fit" to the soil classification system of South Africa.
- Soil fertility status was not considered a limitation, seeing as inherent nutrient deficiencies and/or toxicities would be rectified by appropriate liming and/or fertilization prior to cultivation. It should be noted that soil fertility is more of land suitability importance than agricultural potential. Therefore, for this study it was not considered a limitation as soil fertility status can be corrected to suit acceptable ranges for plant uptake for that particular plant/s to be cultivated.

17.7 VISUAL

- No specific national legal requirements for VIAs currently exist in South Africa. However, the assessment of visual impacts is required by implication when the provisions of relevant acts governing environmental

management are considered and when certain characteristics of either the receiving environment or the proposed project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required (Oberholzer, 2005).

- No viewshed analysis was undertaken, as the topography of the area surrounding and within the MMT is relatively flat. Within this context, minor topographical features, SAS 219163 – Mamatwan Mine VIA November 2019 6 vegetative screening and anthropogenic structures would be important factors influencing the degree of visibility and visual intrusion, which is not considered during the viewshed analysis.
- Distance and terrain play a critical role when assessing visual impacts of an area. Due to the relatively flat terrain of the MMT area and height of the proposed structures, it was deemed necessary to identify all potential sensitive receptors within a 10km radius, on a desktop-level, which would then be verified during the field assessment. The 10km radius can be considered the visual assessment zone. It should be noted that the visibility of an object decreases exponentially the further away the observer is from the source of impact. During the field assessment it was established that the bushveld vegetation limits the view of the observer to the immediate surroundings, not allowing one to see across the vistas. Consequently, it was deemed unnecessary to visit all potentially sensitive receptors within the visual assessment zone, thus focus was placed on visiting sensitive receptors within a 2 km radius. Several sensitive receptors situated further than 3 km were however visited to confirm that both the MMT and proposed expansion activities are not visible from these locations.
- Due to a lack of visual specialist guidelines within the Northern Cape Province, the “Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process” (Oberholzer, 2005), prepared for the Western Cape Department of Environmental Affairs & Development Planning, was used.
- All information relating to the proposed project as referred to in this report is assumed to be the latest available information. Additionally, best practice guidelines were taken into consideration and utilising the maximum expected heights of the infrastructure and the placement thereof in viewshed calculations as a precautionary approach.
- Abstract or qualitative aspects of the environment and the intangible value of elements of visual and aesthetic significance are difficult to measure or quantify and as such depend to some degree on subjective judgments. It therefore is necessary to differentiate between aspects that involve a degree of subjective opinion and those that are more objective and quantifiable.

17.8 WASTE CLASSIFICATION

- Models are only as accurate as the input data provided.
- Samples from the historical tailing’s dams were not collected as these facilities have been rehabilitated.
- Multiple stockpiles are stored in the stockyard. As part of this project each individual stockpile was not sampled, rather the four samples of product that were collected (top cut, high grade, low grade and standard sinter product) provide an understanding of the various grades. The leachate results are considered to be representative of product stockpiles not sampled, as the only difference is the size of the particles and as such the constituents of concern are not anticipated to differ significantly.
- Plant spillages constitutes 1% of the overall Adam’s pit stockpile and is a mixture of Sinter de-dust and product. As part of the project, it was not possible to collect a sample of the plant spillages given that this material was not easily distinguishable. Given that plant spillages constitute 1% it is unlikely that the exclusion of this proportion from the source term model for the Adam’s stockpile would significantly change the results.

18.REASONED OPINION AS TO WHETHER THE ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

18.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

The proposed activities and infrastructure will optimise the current mining operation. The activities and infrastructure will remain within the current Mining Rights area and disturbed footprint. The proposed activities will optimise current activities, such as the transport of material by rail, thereby negating the potential for additional impact to roads and road users generated where trucking of materials is carried out. Similarly, the use of piped water from the Middelplaats shaft reduces the amount of clean water required for the MMT operation and promotes recycling of the Middelplaats water within the mine process. The increase in the WRD height means that no new location and footprint will be required for the disposal of waste rock, but that the use of the existing footprint can be enhanced.

The reprocessing of materials within Adams Pit is also a reuse of disposed waste, thereby aligning with the waste hierarchy in the handling of waste, remediating the Adams Pit from much of the disposed material, and promoting sale of aggregate to local SMMEs. This strongly aligns with many principals of responsible environmental management and waste management.

18.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

18.2.1 Specific conditions for inclusion in the EMPR

See chapter 16 as well as chapter 12.

18.2.2 Rehabilitation requirements

Rehabilitation requirements are included within the discussion in chapter 14.

19.PERIOD FOR WHICH AUTHORISATION IS REQUIRED

With specific reference to Table 4-1, the identified activities relate to all phases of the mining operation. Given that the proposed project will supplement mining operations at MMT, it follows that the authorisation is required for the remaining life of mine, until 2037.

The section below provides an indication of the environmental authorisation period relevant to each listed activity.

TABLE 19-1:ENVIRONMENTAL AUTHORISATION PERIOD ASSOCIATED WITH EACH LISTED ACTIVITY

Listed activity number, applicable listing notice and activity description	Period of authorisation
NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, Activity 15: The clearance of an area of 20 ha or more of indigenous vegetation, excluding where	The clearance of indigenous vegetation would have required environmental authorisation for a period of one to two years during site preparation for the rail loop and associated infrastructure, and topcut stockpile. The clearance of indigenous vegetation is

such clearance of indigenous vegetation is required for: (i) The undertaking of a linear activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan.	however unlikely to be required for the remaining life of mine.
NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, 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 m3 or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	The construction of the PCD with a depth of 5m including supporting infrastructure such as the stormwater channels and diversion berms will need to be authorised for the entire life of mine. The clearance of indigenous vegetation would have required environmental authorisation for a period of one to two years during site preparation for the proposed project including the PCD and the clearance of 5.6 ha of land for the establishment of the future stockpile area and contractors' areas. The clearance of indigenous vegetation is however unlikely to be required for the remaining life of mine.
NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, Activity 27: The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation, except where such clearance of indigenous vegetation is required for: (i) The undertaking of a linear activity; or (ii) Maintenance purposes undertaken in accordance with a maintenance management plan.	
NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, Activity 16: The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 m or higher or where the highwater mark of the dam covers an area of 10 ha or more.	
NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018: Listing Notice 1, Activity 34: The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions, effluent or pollution, excluding -	The change in the height of the WRDs from 50m to 80m will permanently increase the volume of the existing dumps and will need to be authorised for the entire life of mine.

(i) where the facility, infrastructure, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; (ii) the expansion of existing facilities or infrastructure for the treatment of effluent, wastewater, polluted water or sewage where the capacity will be increased by less than 15 000 cubic metres per day; or (iii) the expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 cubic meters or less per day.	
NEMA (GNR 983 of 2014) as amended by GNR.327 of 2017 (G.G. 40772 of 07/04/2017) and GNR.706 of 2018 (G.G. 41766 of 13/07/2018): Listing Notice 1, Activity 9: The development of infrastructure exceeding 1 000 m in length for the bulk transportation of water or stormwater: (i) With an internal diameter of 0,36 m or more; or (ii) With a peak throughput of 120 l/s or more. excluding where: (a) Such infrastructure is for bulk transportation of water or stormwater or stormwater drainage inside a road reserve or railway line reserve; or (b) Where such development will occur within an urban area.	A new pipeline of 10 inches (0.26 m) in diameter, with a maximum pumping capacity in excess of 120 l/s exceeding 1 000 m in length will be required to transport water from the Middelplaats mine workings to MMT. The pipeline will need to be authorised for the entire life of mine.
NEMA (GNR 984 of 2014) as amended by GNR.325 of 2017 (G.G. 40772 of 07/04/2017: Listing Notice 2, 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 winning, extraction, classifying, concentrating, crushing, screening or washing; but	The sale of waste rock as aggregate may require crushing and screening prior to sale to third parties. The re-processing of material in Adams Pit requires the use of screening materials for various processing, handling and disposal. These activities will require approval for the LoM. The reprocessing of material currently stored / disposed of at Adams Pit will allow for optimisation of the material and will allow for the rehabilitation of the Pit.

excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.	

20.UNDERTAKING

I, Sharon Meyer, the EAP responsible for compiling this EIA, undertake that:

- The information provided herein is correct;
- Comments and inputs from I&APs and commenting authorities have been included and correctly recorded in this EIAR;
- 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.

	22 November 2021
Signature of EAP	Date
Signature of Commissioner of oath	Date

21.FINANCIAL PROVISION

21.1 METHOD TO DERIVE THE FINANCIAL PROVISION

The proposed layout/activity changes at MMT that have been costed as part of the financial provision include: the top-cut stockpile area, the mobile crushing and screening plant, and the new pipeline from Middelplaats Mine to MMT and will be incorporated into the overall MMT mine-closure plan and the annual financial provision updates. In this regard, the financial provision is calculated as per the methodology of the DMR guideline document of January 2005 and inflated by the Consumer Price Index to account for escalation since January 2005. As per the DMR guideline, MMT is classified as a Class C (low risk) mine, with a medium environmental sensitivity based on the pre-mining environment of the mining area, the proximity of the mine to local communities and the surrounding area's existing economic activity.

The amount determined for financial provision for the MMT is provided in Section 25.

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

The amount required in order to manage and rehabilitate the environmental disturbance (as a result of MMT's activities) is provided for in the operating costs.

22.DEVIATION FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

22.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

There has been no deviation in the methodology as presented within the Scoping Report and Plan of Study for EIA.

22.2 MOTIVATION FOR DEVIATION

Not applicable.

23.OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

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

The impacts associated with socio-economic conditions are discussed in chapter 10. Management and management actions identified to address any socio-economic impacts are included in chapter 12.

No person will be directly affected by the project given that no I&APs currently reside within the MMT Mining Right area. However, other direct impacts include:

- Road and traffic safety (**expected to be negligible**);
- 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 (**expected to be low**); and
- Employment and procurement of goods and services (**expected to be low positive**).

Indirect socio-economic impacts include:

- Alteration of drainage patterns by reducing the volume of runoff into the downstream catchments (**Low**);
- Contamination of groundwater through long term seepage and/or runoff (**Low**);
- Contamination of surface water resources through long term seepage and/or runoff (**Low**);
- Air pollution sources that can have a negative impact on ambient air quality (**Low**);
- Increase in disturbing noise levels (**Low**); and
- Visual impacts on this receiving environment may be caused by activities and infrastructure (**INSIGNIFICANT**).

23.2 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.

23.3 DEPARTMENT OF ENVIRONMENTAL AFFAIRS SCREENING TOOL

The Department of Environmental Affairs (DEA) has developed an online screening tool, which is compulsory to use as of 04 October 2019. The report generated by the DEA screening tool was attached to the NEMA application for the project as included in Appendix B. The screening tool report outlines specialist studies that need to be considered as part of the project. In this regard, the table below outlines the specialist studies proposed in the screening tool report along with an explanation pertaining to the applicability of these proposed specialist studies in relation to the project.

TABLE 23-1: FINDINGS OF THE DEA SCREENING TOOL

Theme	Sensitivity	Requirements
Agriculture	Medium	The agricultural screening tool protocol specifies that an Agricultural Compliance Statement for a low agricultural sensitivity is required. In this regard, the required compliance statement is incorporated into the soils and land capability report included in Appendix K.

Landscape/visual	Not specified in screening tool report	A Visual study was undertaken for the project and is included in Appendix M. This study was informed by site work.
Archaeological and Cultural Heritage Impact Assessment		A Heritage/cultural study was undertaken for the project and is included in Appendix D and Appendix E respectively. This study was informed by site work.
Animal Species Assessment		A terrestrial biodiversity study has been undertaken for the project and is included in Appendix N. There is no specific protocol for this theme. The Terrestrial Biodiversity study complies with NEMA Appendix 6 requirements for specialist reports.
Hydrology Assessment		Not applicable to the MMT. The mine is not located near watercourses. However, a stormwater management plan has been provided to identify necessary infrastructure for management of clean and dirty water on site.
Geotechnical assessment.		A geotechnical investigation was undertaken for the rail loop and is included in Appendix O. This study was informed by site work.
Radioactivity		Not applicable to the MMT. The mine does not produce nor handle radioactive materials.
Seismicity		Not applicable to the MMT. The mine is not located in a highly active fault zone (Esterhuyse et al. 2014).
Noise Impact Assessment		A Noise study was undertaken for the project and included in Appendix I. This study will be informed by site work.
Traffic Assessment		The proposed activities are not associated with an increase in traffic volumes and as such a Traffic study is not applicable to this project.
Socio-economic Assessment		The proposed activities are not anticipated to influence current socio-economic conditions at the mine and as such a Socio-economic study is not applicable to this project.
Air Quality Assessment		An Air Quality study was undertaken for the project and is included in Appendix H. This study will be informed by site work.
Ambient Air Quality Assessment		
Health Impact Assessment		The need for a health assessment associated with the proposed activities is not deemed necessary based on the findings of the Air Quality study.
Aquatic Biodiversity	Low	An Aquatic assessment indicated that no aquatic habitats are present on or near the site.
Civil Aviation	Low	Not applicable as the project will not present any tall structures that could influence flight paths.
Palaeontology	Medium	A Palaeontological study was be undertaken for the project and is included in Appendix E. This study will be informed by site work.
Plant Species Assessment	Low	A terrestrial biodiversity study was undertaken for the project and is included in Appendix N. There is no specific protocol for this

		theme. The terrestrial biodiversity study complies with NEMA Appendix 6 requirements for specialist reports.
Terrestrial Biodiversity	Low	The terrestrial screening tool protocol specifies that a Terrestrial Biodiversity Compliance Statement for low terrestrial biodiversity is required. In this regard, the required compliance statement was incorporated into the Terrestrial Biodiversity study.
Defence	Low	Not applicable to the MMT. The mine is not located near any areas of defence.

24.OTHER MATTERS REQUIRED IN TERMS OF SECTION 24(4)(A) AND (B) OF THE ACT

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

PART B - ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

Note that the mitigation measures and management measures for this application have been included into the amended EMPR (2005). The Amended EMPR is available here for your review. Note that additional measures, actions and plans have been underlined, and removal of measures, actions, commitments have been strikethrough for ease of use.

Mamatwan Mine EMPR Amendment 2021

Mamatwan Mine

Prepared for: Hotazel Manganese Mine

SLR Proposal No.: Proposal No.

Date

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ENVIRONMENTAL MANAGEMENT PROGRAMME MAMATWAN MINE

The 2005 EMPR for Mamatwan Mine was originally completed by ***Jones and Wagener Consulting Civil Engineers***. However, SLR Consulting has amended this report in order to include the infrastructure layout and activities as per the Environmental Impact Assessment Report of November 2021. The following includes the original relevant 2005 EMPR chapters from the Jones and Wagener Consulting Civil Engineers Report. Everything that has been removed is demarcated by ~~strikethrough~~ and everything that has been added is denoted by being underlined.

Due reference is made to the 2005 EMPR for Mamatwan Mine as compiled by Jones and Wagener Consulting Civil Engineers.

APPLICANT

~~Samancor Limited~~ Hotazel Manganese Mines in their capacity as the holders of Mining Lease N° 622/66, N° 3/87 and N° 4/68.

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Mine

Hotazel Manganese Mines Limited acts as Service Company for the day to day administration of activities at Mamatwan Mine.

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HOTAZEL MANGANESE MINE - ENVIRONMENTAL MANAGEMENT PROGRAMME

MAMATWAN MINE Project Number: 720.19136.0002

1. ENVIRONMENTAL MANAGEMENT PROGRAMME

1.1 INTRODUCTION

Within the EIAR, the specialists identified various mitigation measures to manage the environmental impacts identified during the impact assessment. In Chapter 3 knowledge gaps (further investigations required) were identified to refine the risk assessment and determine long- term impacts associated with the mining operation. These measures need to be incorporated into an integrated environmental management programme that can be used to implement, audit and measure the performance of the mitigation measures and environmental objectives.

The purpose of this Chapter is to stipulate the short- and long-term objectives for the protection of the environment, including relevant socio-economic issues. Management measures or actions required to achieve the objectives have been identified and included in an implementation programme that can be audited during the EMP performance assessment, which is required to be carried out every two years.

1.2 ENVIRONMENTAL OBJECTIVES AND STRATEGIES

1.2.1 Operational (short-term) objectives and strategies

1.2.1.1 Topography

Objective: Avoid impacts to topography that cannot be reversed.

- Minimise the area of the disturbance by designing and constructing the most compact infrastructure practically possible.
- Rehabilitate in accordance with the approved mine closure plan to ensure a suitable post-closure land use is achieved.
- The project area will be fenced off to prevent inadvertent access by third parties and animals;
- Access control will be implemented to ensure access is only granted to those who have authorisation;
- Barriers will be erected around all hazardous excavations;
- Warning signage will be erected at all hazardous excavations; and
- Where the proposed project has caused injury to third parties or animals, appropriate compensation will be provided;
- Care must be taken to ensure that third-party infrastructure, such as telephone lines, etc. are not damaged during the construction phase.

1.2.1.2Water management

Objective: Maximise clean water runoff (minimise impact on catchment yield) Strategy:

- The rehabilitated Mamatwan area will be gently undulating, with no major natural drainage systems on-site, resulting in a non-free draining landscape. ~~The final rehabilitation plan will be designed such as to ensure a free-draining landform as~~
- The full depth of available soils and subsoils will be placed on to the hard rock spoils (as far as is practical) to limit ingress.
- In most areas, it is anticipated that a suitable cover will establish naturally. This will be assisted by harvesting seed and plant material by cutting and processing natural veld adjacent to the site and distributing this over the areas to be rehabilitated.

- ~~All available topsoil areas will be seeded prior to the rainy season to ensure maximum drainage from these areas of clean water back into the catchment system withouexcessive suspended solids~~

Objective: Prevent water quality deterioration

- The accumulation of significant volumes in the open pit areas will be avoided to limit contact time with exposed minerals. Any inflows (excess water) into the open pits will be handled as part of the overall mine water balance and pumped to Adam's Pit, and/or similar alternative, for reuse in the process plant.
- All dirty storm water will be collected and pumped to ~~Adam's Pit~~ the Pollution Control Dam for reuse in the process plant. No contaminated water will be allowed to enter the natural hydrological system.
- As much of the pit as is practical will be backfilled during the operational phase and the invert level of the rehabilitated surface will be raised to be within 25 to 30m of the natural ground surface (above the regional groundwater level) to limit evapo-concentration. Stockpile material will not be deposited above the water table during backfilling of the open pit, in order to prevent groundwater contamination. ~~The rehabilitation of the defunct tailings dams this being undertaken in order to reduce the extent of the groundwater impacts from these areas. The mitigation options to address the pollution plume associated with these tailings will be evaluated once the point source has been addressed.~~
- Proper bunding facilities will be established in all areas where organic (hydrocarbon) contaminants may originate. Spillages will be managed and rectified in accordance with the mine's standard operating procedures.
- Standard operating procedures for all point pollution sources (sewage effluent, waste disposal, refuelling points, oil storage, etc.) will be reviewed on an ongoing basis and revised when required.
- An ongoing water quality monitoring programme for both surface and groundwater will be implemented to detect any unacceptable deterioration of the water quality in the water resources.
- Drip trays should be placed under all standing machinery.
- Oil recovered from any vehicle or machinery on-site should be collected, stored and disposed of by accredited vendors for recycling.
- Traffic and movement over stabilised areas should be controlled (minimised and kept to specific paths), and damage to stabilised areas should be repaired timeously.
- A water quality monitoring plan must be formulated and incorporated into the existing plan before construction.
- Construction must be undertaken during the dry season as practical. This will significantly reduce the potential for sedimentation through erosion due to construction activities.
- Concurrent rehabilitation of disturbed land and revegetation should be carried out to minimise the amount of time that bare soils are exposed to the erosive effects of rain and subsequent runoff.
- The development of a stormwater infrastructure will result in positive impacts such as pollution control however clean water must be released into the environment to minimize alteration of natural drainage flow.
- Mamatwan should continue groundwater monitoring per existing monitoring protocols for the existing monitoring network.
- All potentially affected boreholes will be included in the water monitoring programme for boreholes located both on and off the mine site. This will be carried out where private landowners allow for access to their boreholes.
- If any mine related loss of water supply through a reduction in quality is experienced by third party borehole users, Mamatwan will provide compensation which could include an alternative water supply of equivalent water quality.

- Should any off-site contamination be detected, the mine will immediately notify DWS. The mine, in consultation with DWS and an appropriately qualified person, will then notify potentially affected users, identify the source of contamination, identify measures for the prevention of this contamination (in the short term and the long term) and then implement these measures.
  At decommissioning, the potential pollution sources, if found to be causing pollution, (residual waste rock left on surface) will either be removed or rehabilitated to manage rainfall and seepage.

1.2.1.3Land use management

Objective: Minimise Soil Erosion

- Implement the soil conservation procedure as per the EMPR.
- Establish short term perennial vegetation that will stabilise the site but allow the indigenous vegetation to establish over the site;
- Use existing established roads;
- Ensure vegetation clearing is undertaken in phases;
- Limit vegetation clearance to only the areas where the infrastructure will be constructed;
- Avoid parking of vehicles and equipment outside of designated parking areas;
- Plan vegetation clearance for dry seasons (late autumn, winter and early spring); and
- Re-establish vegetation along the railway infrastructure to reduce the impact of run-off from the compacted surface of the railway area.

Objective: Avoid impact to Soil Profiles

- Land clearance must only be undertaken immediately prior to construction activities within the development footprint; and
- Level any remaining topsoil that was removed from the railway area and that remained on the surface instead of allowing small stockpiled of soil to remain on the surface.

Objective: Minimise chemical pollution to soils

- Conduct potentially polluting activities (i.e., loading, hauling, tipping, transportation, handling and storage) in a manner that pollutants are contained at source and do not pollute soils. In this regard:
- Service all vehicles and mobile equipment regularly in workshops, service bays and wash bays with contained impermeable, floors, dirty water collection facilities and oil traps;
- Design and operate all new and used chemical, fuel and oil storage and handling facilities in a manner that all spillages are contained in impermeable areas and cannot be released into the environment;
- Report ad hoc spills of potentially polluting substances (whether in dirty areas or in the environment) to the environmental lead or specialist immediately and clean up and/or remediate immediately;
- Implement and maintain a dirty water management system;
- Implement the waste management practices, as per the IWWMP and EMPR.
- Educate and train all employees (temporary and permanent) and contractors in pollution prevention; and
- Implement formalised action plans to enable fast and efficient reaction to contain and remediate pollution incidents.
- Take into account the requirements for long term soil pollution prevention, land function and confirmatory monitoring in the design of any permanent and potentially polluting structures; and
- Implement the emergency response procedure in the event any major spillage incident.

Objective: Rehabilitation concurrent to mining operations

- Rehabilitation will be undertaken concurrent to mining operations where practical, based on the rehabilitation plan developed for the mine. However, due to the location of the crusher, no concurrent backfill and rehabilitation of the opencast pit can be undertaken. Additional unavailable areas include the footprints of permanent infrastructure, including but not limited to offices, workshops, plant areas and stockpiles. The mining plan/ schedule will be optimised to facilitate continuous rehabilitation.
- The material will be, as far as is practical, only handled once. Further, the overburden will be placed back into the pit in the same stratigraphy as is present prior to mining.
- The full depth of available soils and subsoils will be placed on to the hard rock spoils, as far as is practical, so as to limit ingress.
- The calcrete material will be placed over the hard rock spoils in order to facilitate the development of an aquiclude over the spoils.
- Slopes will generally be flatter than 12°, but steeper than 0.5%. Vegetation that is local to the area will be established to limit the risk of erosion.
- The areas will be revegetation as soon as possible to limit dust and erosion.
- The mining plan/schedule will ensure optimal placement of excavated material to facilitate concurrent rehabilitation.
- The mining plan/schedule will be updated on a continuous (monthly) basis to ensure best practice.
- Rehabilitation monitoring and auditing will be implemented to ensure conformance to this objective and the rehabilitation plan.

Objective: Effective management of topsoil

- Topsoil does not exist on the site in terms of the conventional understanding of topsoil. The upper materials do not have high nutrient values, and their primary value is due to the presence of seed bank. A minimum layer of 200mm of soil will be stripped prior to mining and stockpiled (or directly placed where possible) for final rehabilitation.
- Where soil stockpiled is used as a “topsoil” layer, tests will be conducted to determine if nutrients or fertilisers need to be added. These tests will be undertaken as and when required.
- Sampling and analysis of the placed topsoil will be carried out on a two yearly basis in order to determine the need for fertiliser application.
- Material beneath ore and overburden stockpiles will be sampled once these are removed to assess the extent to which it is contaminated, and if necessary, soil will be placed into the pit.
- Temporary erosion control measures may be used to protect the disturbed soils until adequate vegetation has established.
- All disturbed areas can be re-vegetated with an appropriate indigenous veld reclamation mix, if necessary, to re-establish a protective cover, to minimise soil erosion.
- Avoid vehicular movement on arable soils as far as practically possible.
- Compacted soils adjacent to disturbed areas should be ripped at 25cm as soon as possible to alleviate compaction and potential crusting.
- Contractors and mining crew conducting the works on site should be informed about approved waste disposal facilities.

Soil Loss and Stockpile Management.

- Stockpiles should be revegetated to establish a vegetation cover as an erosion control measure. These stockpiles should also be kept alien vegetation free at all times to prevent loss of soil quality; SAS 219162 December 2019 27.

- Temporary berms can be constructed, around stockpile areas whilst vegetation cover has not established to avoid soil loss through erosion.
- The stockpiled soil should only be used for intended purpose of rehabilitation at closure of mine operation. Soil stockpiles should be clearly demarcated with No Go areas and monitored regularly.
- Dumping of waste material next to or on the stockpiles must be prohibited at all times. Integrated soil stockpile management plans and monitoring programmes as well as an employee awareness programme must be put in place to significantly reduce the risk of soil stockpile robbery and/or contamination.
- The recovered soils should be re-used to rehabilitate the development footprint following mine closure.

Loss of Land Capability and Agricultural Potential Management.

- During the decommissioning phase the footprint should be thoroughly cleaned, and all waste material should be removed to a suitable disposal facility.
- The footprint should be ripped to alleviate compaction where necessary.
- Stored topsoil should be replaced (if any) and the footprint graded to a smooth surface.
- The landscape should be backfilled and reprofiled to mimic the natural topography for potential agricultural activities and grazing opportunities post mining. If possible, ensure a continuation of the pre mining surface drainage pattern.
- Slopes of the backfilled surface should change gradually since abrupt changes in slope gradient increase the susceptibility for erosion initiation.
- The topsoil should be ameliorated according to soil chemical analysis taken on the undisturbed areas.
- The soil fertility status should be determined by soil chemical analysis after levelling (before seeding/re-vegetation). Soil amelioration should be done according to the soil analyses as recommended by a soil specialist, to correct the pH and nutrition status before revegetation.
- The footprint should be re-vegetated with a grass seed mixture as soon as possible, preferably in spring and early summer to stabilise the soil and prevent soil loss during the rainy season.

Objective: Effective, long-term sustainable revegetation practices

- In most areas, it is anticipated that a suitable cover will establish naturally. This will be assisted by harvesting seed and plant material by cutting and processing natural veld adjacent to the site and distributing this over the rehabilitated areas.
- If monitoring shows that the establishment of vegetation is not satisfactory, the top 15cm of soil will be analysed, upgraded and seeded either with a seed mixture of local indigenous plant species, or with a short term perennial that will allow prevention of erosion and the establishment of indigenous vegetation.
- Due to the dry climate and sandy soil it is anticipated that some difficulties will be experienced in obtaining a good germination and initial cover. Therefore, certain areas may need to be re-seeded if the initial establishment proves to be inadequate.
- The success of the revegetation program will be based not only on basal cover, but also on the diversity of species and the extent to which there are local indigenous species. Satellite imagery and aerial photography will be used to monitor the effects of mining on vegetation and the status of revegetation on an annual basis.

Objective: Clearance of exotic vegetation

- An eradication program will be initiated on the mine. The invader plants will be eradicated on an ongoing basis during the life of the mine and following rehabilitation until a suitable self-sustaining vegetation cover is achieved in rehabilitated areas.

- Newly disturbed areas will be checked for the emergence of seedlings, which will be removed and manually monitored.
- A monitoring programme to determine conformance to these objectives will be initiated, including monitoring of the success of removal (follow-up investigations).

Objective: Maintain remaining natural environment

- In areas included in the proposed mining plan, the natural vegetation will be retained as long as possible before topsoiling commences in order to limit dust and erosion.
- In areas not impacted by the mining activities, the natural vegetation will be maintained by implementing the following:
- Fire breaks are made by clearing vegetation, and these are also used for security patrols.
- No grazing is allowed.
- Vehicle movement is restricted to existing roads. ~~burning programmes~~ ~~rotational grazing programmes~~
- ~~- alien vegetation programme~~
- ~~- restricting vehicle movement to existing roads.~~

1.2.1.4 Fauna and Flora

Objective: Value indigenous vegetation and endangered fauna

- ~~During the spring and summer months, surveys will be undertaken for *Nymania capensis* (chinese lantern) and *Acacia erioloba* (camel thorn) which are listed as a protected species. If found, a permit will be applied for to remove these species.~~
- Minimise loss of indigenous vegetation where possible through effective planning and limiting the development footprint to what is essential. The designs must further adhere to all legislation and all possible precautions taken to prevent potential spills and /or leaks.
- It is recommended that prior to the commencement of construction activities the entire construction servitude be fenced off, and clearly demarcated to limit footprint creep and edge effects.
- It is recommended that prior to any construction/ earth moving activities are to take place, a detailed walkdown of all-natural areas falling within the final expansion footprint area be undertaken and all protected floral species be marked.
- The walkdown should be undertaken during the summer season (February/March) when most herbaceous floral species will be in flower, and accurate identification will be easier.
- Once all floral SCC and NCNCA protected floral species within the development footprint has been identified, a rescue and relocation plan should be designed specifically to each species. Rescue and relocation activities need to take place prior to commencement of any expansion activities. Rescue and relocation need to be overseen by a suitably qualified contractor/ mine employee. The success of relocation actions need to be monitored quarterly for a minimum period of three years post-relocation.
- The necessary permits need to be obtained from DOFF and NCDENC prior to the implementation of rescue and relocation activities.
- An AIP Management/Control Plan should be compiled for implementation.
- During the surveying and site-pegging phase of surface infrastructure, all potential floral SCC as well as protected floral species that will be affected by surface infrastructure must be marked and, where possible, relocated to suitable habitat surrounding the disturbance footprint. The removal and/or rescue and relocation should be overseen by a qualified specialist, in association with a suitably qualified horticulturist. The relevant permits must be applied for from the various authorities prior to the commencement of the construction phase.

- Following heavy rains, access roads are to be inspected for signs of erosion, which if found, must be immediately rectified through the appropriate erosion control measures.
- It is recommended that prior to the commencement of construction activities the entire proposed top cut be fenced off and clearly demarcated, any burrows should be monitored after fencing has been established to ensure no SCC are utilizing the area. If SCC are noted permits for their removal are necessary.
- Where possible, and feasible, all access roads should be kept to existing roads so to reduce fragmentation of existing natural habitat.
- Development should consider sensitive habitats for fauna within the study area.
- Prior to the commencement of construction activities on site a rehabilitation plan should be developed for implementation throughout the development phases.
- As part of the planning and preparation phase, a Fire Management Plan and Erosion plan should be developed and be in place before construction activities can commence.
- Design of infrastructure should be environmentally sound, and all possible precautions taken to prevent potential spills and /or leaks.
- At all times, ensure that sound environmental management is in place during the planning phase.
- The footprint areas of all surface infrastructure must be minimised to what is absolutely essential and within the designated and approved MMT expansion activities boundary.
- Vegetation outside of the footprint area is not to be cleared.
- Vegetation clearance and commencement of construction activities should either be scheduled to coincide with low rainfall conditions when erosive stormwater is anticipated to be limited or alternatively stormwater controls must be established at the start of construction and dust suppression implemented.
- Excavated topsoil must be stored with associated native vegetation debris for subsequent use in rehabilitation.
- Any railway infrastructure and mining related activities including stockpiles should be placed within transformed areas or where possible, existing infrastructure should be used.
- No collection/ trapping or hunting of faunal SCCs may be allowed by any construction personnel.
- Should any other faunal species protected under National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) or the Northern Cape Nature Conservation Act, 2009 (Act No. 9 of 2009) (NCNCA) be encountered within the study area authorisation to relocate such species must be obtained from the NCDENC or the Department of Environmental Affairs (DEA).
- Edge effect control needs to be implemented to ensure no further degradation and potential loss of faunal SCC outside of the proposed project footprint area.
- Should any SCC be observed on the site a biodiversity specialist should be contacted in order to map the best way forward.
- Prior to vegetation clearing activities in the Kathu Bushveld habitat, the site should be inspected for the presence of burrowing scorpion burrows, pythons and Aardvark. If located, these species should be carefully excavated ensuring no harm to fauna and relocated to similar surrounding habitat outside of the footprint area.
- Smaller species such as scorpions and reptiles are likely to be less mobile during the colder period, as such should any be observed in the construction site during clearing and construction activities, they are to be carefully and safely moved to an area of similar habitat outside of the disturbance footprint.
- Construction personnel are to be educated about these species and the need for their conservation. Smaller scorpion species and harmless reptiles should be carefully relocated by a suitably nominated construction person or nominated mine official. For larger venomous snakes, a suitably trained mine official should be contacted to affect the relocation of the species, should it not move off on its own.

- Should any snakes be encountered, either a suitably trained staff member or expert should be contacted to capture and relocate the specimen. No harm should be done to any snakes located within the study area.
- All soils compacted as a result of construction activities falling outside of the project area should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas.
- No collection of firewood (as this often provides microhabitats for small insect and arachnids) or faunal SCC is allowed by mining personnel.
- As part of a Biodiversity Action Plan (BAP), faunal monitoring should be done every two years.
- No collection of floral SCC or medicinal floral species within the site boundary must be allowed by construction personnel.
- Any natural areas beyond the expansion footprint, that have been affected by the construction and operational activities, must be rehabilitated using indigenous species.
- An effective dust management plan must be designed and implemented in order to mitigate the impact of dust on flora through the construction and operation phase.
- ~~The mine area is fenced and mine security personnel are permanently on duty to secure the area from poaching. Regular patrols are also conducted to destroy snares. No hunting is allowed.~~
- No illicit fires must be allowed during the construction and operational phases of the proposed expansion activities.
- Fire breaks should be maintained during the operational phase.
- Adequate stormwater management must be incorporated into the design of the proposed development in order to prevent erosion of topsoil and the loss of floral habitat through the discharge of dirty water into the receiving environment. In this regard, special mention is made of:
    - Sheet runoff from cleared areas, paved surfaces and access roads needs to be curtailed; and
    - Runoff from paved surfaces should be slowed down by the strategic placement of bioswales.
- All rehabilitated areas should be rehabilitated to a point where natural processes will allow the ecological functioning and biodiversity of the area to be re-instated as per the post-closure objective.
- Rehabilitation efforts must be implemented for a period of at least five years after decommissioning and closure.
- Edge effects of decommissioning and closure activities, such as erosion and alien plant species proliferation, which may affect adjacent sensitive habitat, need to be strictly managed adjacent to the expansion footprint.
- Ongoing alien and invasive vegetation monitoring and eradication should take place throughout the closure/ decommissioning phase of the development, and the Mamatwan Operations and immediate surrounding area (50 m from the perimeters) should be regularly checked during the decommissioning phase for alien vegetation proliferation to prevent spread into surrounding natural area.
- Rehabilitation must be implemented at all times, and disturbed areas must be rehabilitated as soon as such areas become available. This will not only reduce the total disturbance footprint but will also reduce the overall rehabilitation effort and cost.

An environmental awareness campaign will be launched, both internally and externally ~~(local communities)~~ as described later in this document.

1.2.1.5Social impact management

Objective: Limit impact on well-being of communities

- The intent of the mine management will be to continue with the socio-economic upliftment of the local communities until closure.
- Contractors and workers will be required to reside either in Kuruman, Kathu or Hotazel and no “squatting” on the adjoining properties will be allowed.

- The mine will provide suitable security measures to ensure that site visitors are properly monitored.
- No loitering by the employees outside the designated working hours will be allowed in the vicinity of the mine.
- To enhance the benefits of the mine development to the local area and to reduce
- pressure associated with influx of outsiders to the area, there is preferential employment of locals. The contractors are encouraged to preferentially employ local people.

Objective: Limit visual impact

- No new buildings or structures will be constructed unless unavoidable. Use will be made of the existing buildings, roads and other infrastructure or facilities.
- No unnecessary features e.g. stockpiles will be created and care will be taken that no structure will change the original topography permanently.
- Lighting of any new infrastructure will avoid impact to local visual receptors by installing directional lighting as far as possible.

Objective: Prevent dust pollution

- Dust around the surface roadways is controlled by means of water spray. A detailed dust suppression procedure will be developed and implemented prior to mining. The procedure will include all areas associated with the mining operations, including access and haul roads, mine residue deposits, process plant areas, opencast mining activities and rehabilitation and revegetation activities.
- Trucks and vehicles are maintained to ensure exhaust emissions. New vehicles purchased must comply with maximum permissible diesel exposure standards.
- Reduction of wind blown dust will be achieved by ensuring that rehabilitation and vegetation follows mining undue delay. Practical limitations do result in some lag between placement and rehabilitation of spoils.
- General good housekeeping will be maintained in all areas prone for dust release. Regular inspection and maintenance routines will be implemented in these areas to address spillages on ground level and along conveyors, thereby preventing the re- suspension of settled dust.
- The mine will implement a dust monitoring program consisting of a bucket collection system. Monitoring will take place on a monthly basis~~, and the composition of the dust will also be determined~~.

Objective: Limit noise impact on employees and surrounding communities

- In the assessment of simulated noise levels, reference was made to the IFC noise level guidelines for residential, institutional and educational receptors (55 dBA during the day and 45 dBA during the night) which is also in line with the SANS 10103 rating for urban districts). The predicted increase in noise levels due to project operations were less than 1 dBA above baseline at all potential noise sensitive receptors within the study area. For a person with average hearing acuity an increase of less than 3 dBA in the general ambient noise level is not detectable. ~~Noise measurements will be taken annually according to the procedures outlined in the SABS code 0103 in order to evaluate the impact of the mining. The target will be that adjacent residences should not experience more than a 5dBA increase over the background levels.~~
- All employees are subjected to an annual audiometric assessment conducted at the Hotazel clinic.
- Where over exposure cannot be rectified, employees are issued with variphone and disposable hearing protection units. Train staff on noise control plan during health and safety briefings.
- Avoid clustering of equipment near receptors.
- Ensure periods of respite are provided in case of unavoidable maximum noise level events.

- Ensure high level of maintenance on all equipment. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance.
- Other non-routine noisy activities such as construction, decommissioning, start-up and maintenance, should be limited to day-time hours.
- Machines should intermittently be shut down between work periods and not left running unnecessarily.
- Equipment generating noise directionally should be orientated so the noise is directed away from the sensitive receptors.
- Regular and effective maintenance of equipment and plants must be carried out.

Objective: Limit impacts to cultural and heritage resources

- In the unlikely event of any archaeological resources being found during mining activities, the mine will immediately cease mining in that area and will appoint an archaeologist to investigate the occurrence.

Objective: Ongoing public participation

- The mine is committed to holding a meeting with the interested and affected parties listed in the stakeholder register (and with any others that express an interest in attending such meetings that have a relevant involvement with the mine) at two yearly intervals.

1.2.2 Closure (long-term) objectives and strategies

Apart from the short-term objectives and strategies that will require implementation and monitoring over the full life of mine, even after closure of the operation, the following long- term objectives have been set in order to address post-closure issues.

Objective: Surface rehabilitation

- The final surface area will not be freedraining, due to the prohibitively high cost associated with backfilling of the pit. However, the length and extent of the void will be minimised by finishing off and backfilling part of the highwall during the operational phase. The final void will be approximately 1.7 to 2km long, by 0.4km in width (as measured at surface)
- On closure, the remaining void will be shaped with side slopes of 1:5 on the highwalls, and an invert level within 25 to 30m of the natural surface. This is to ensure that the pit floor after rehabilitation is above the regional groundwater table.
- The rest of the rehabilitated pit area will be flat, similar to the existing topography, with slopes draining away from the “final void” area. The overburden will be placed back to line and levelled similar to the surrounding topography. Slopes will be flatter than 1:5, but generally a fall of 0.5% or more will be targeted to ensure drainage off the rehabilitated area.
- Permanent stockpiles will be flattened to 1:3 slopes with benches where necessary, covered with 0.5m of soil and vegetated.
- Temporary stockpiles will be removed and the base area cleared from all the remaining ore. The base area will then be ripped to a depth of ±1.0m and covered with soil where necessary to return back to its natural state.
- All overburden material will be placed back into the pit post mining.
- Soils contaminated by operations will also be placed back into the pit.

- Water control systems will be implemented where required in order to prevent erosion on slopes. However, based on the slopes and the successful establishment of vegetation, no additional measures are expected to be required.
- All compacted areas will be ripped and levelled in order to re-establish a growth medium.

Objective: Verify and manage post-closure decant

- Development of a post-closure water balance for Mamatwan Mine (including geohydrology and geochemistry).
- Implementation of the required monitoring programme to calibrate the post-closure model, including quality, quantity, water-levels and geochemical sampling.
- Ongoing evaluation and reassessment of alternative options for the final water use and required associated water quality, together with the technologies required to achieve the required quality.
- Active involvement in regional integrated water management plans in the catchment management area.

Objective: Develop final land use plan

- Define, in consultation with all I&APs, the final (post-closure) land use. The target land ~~capability~~ use is grazing.
- Develop a final land use plan and implementation programme, taking into account important issues such as ongoing operational and maintenance requirements and long- term responsibilities and ownership.
- Set final closure objectives and standards to ensure conformance to the final land use plan and the requirements of the I&APs and relevant environmental legislation.
- Develop a detailed **closure plan** for Mamatwan Mine five years prior to closure and obtain approval from the relevant authorities.

Objective: Limit impact of mine closure on employees and surrounding communities

- The Social and Labour Plan for Mamatwan Mine has been revised taking into consideration the negative impacts associated with mine closure.
- The mine will continually review all of the available opportunities that are economically and practically viable with a view to minimising the impact on the communities established around the Hotazel area.

2. ENVIRONMENTAL MONITORING AND AUDITING

The objective of the environmental monitoring system is to:

- Prevent and/or minimize the environmental impact associated with the current mining operation
- Ensure that the environmental management system at Mamatwan Mine perform according to specifications
- Ensure conformance with the environmental objectives
- Ensure timeous implementation of the environmental strategies and implementation programme
- Act as a pollution early warning system
- Obtain the necessary data required to address knowledge gaps
- Check compliance with license requirements
- Ensure consistent auditing and reporting protocols

A comprehensive monitoring system was developed for the current mining activity and includes a detailed environmental monitoring system and an implementation, auditing and reporting protocol. These are given below in Table 2-1 and Table 4.2 respectively.

The monitoring system will be implemented as part of Mamatwan Mine's ongoing monitoring schedule and all existing monitoring and reporting procedures will be revised and updated to reflect the requirements of this system.

EMP performance assessments, as required in terms of the MPRDA, will be performed on a biennial basis and submitted to the DMRE for distribution to other relevant authorities. The monitoring system will be reviewed on an annual basis, and revised if necessary.

Table 2-1: Environmental Monitoring Programme for Mamatwan Mine

Aspect	Issue	Purpose	Monitoring points	Frequency	Sampling method	Variables
Surface water	Water quality	Determine any deterioration in water quality as a result of the mining related activities	To be determined	Monthly	Grab sampling	EC, pH, TDS, SS, Cl, SO_4, NO_3, Na, F, Fe, Al, Mn, Zn, Total Alkalinity, Ca, Mg, K, Total Hardness.
				Six monthly	Grab sampling	Analyses to 95% charge balance, including all metals and hydrocarbons.
	Water management infrastructure	Monitoring of condition, identifying areas that require maintenance	Along clean & dirty water canals, dirty water dams	Quarterly After a big rain event.	Visual	Evidence of erosion, cracks, subsidence, overgrowth, etc.
	Water use	To allow more informed management decisions regarding the volume of water used for specific purposes within the mine area (Reduce water consumption)	11 sampling points along distribution system	Monthly readings	Water meters	m^3
Groundwater	Groundwater quality	To determine and monitor any impact on the groundwater quality as a result of mining	~~To be determined~~ Existing Groundwater Monitoring network	~~Quarterly for 2 years, thereafter~~ six monthly	High integrity grab sampler (double valve), preferably made from PVC/Teflon	Neutral to alkaline pH-environments: pH, EC, TDS, Ca, Mg, Na, K, Cl, SO_4, NO_3, Total Alkalinity, F, Fe, Al and Mn.
						Acidic pH-environments: All of the above parameters, and including a full range of heavy metals. (Note: An ICP-scan will give a semiquantitative indication of heavy metals that are mobilized at significant levels, which could be utilised to determine heavy metals to be monitored).

Aspect	Issue	Purpose	Monitoring points	Frequency	Sampling method	Variables
	Groundwater levels	To determine any impact on the groundwater ~~quantity~~ levels as a result of mining	As above	As above	High integrity dip meter (non-stretchable material)	Water level
Land use management	Concurrent rehabilitation	To determine conformance with environmental objective for concurrent rehabilitation	Mining area	~~Bi-annually~~ Annually	Survey	Hectares disturbed, levelled, topsoiled and revegetated
	Rehabilitation plan	To ensure conformance to final rehabilitation plan and final gradients	Rehabilitated areas	~~Bi-annually~~ Annually	Survey	Final level of rehabilitation
	Soil analysis	To determine any deficiencies in soil fertility and need for rectification	Topsoiled areas	~~Annually~~ Every two years	Soil samples	As per specialist advise
	Revegtation	To determine the success of the revegetation programme	Revegetated areas	Annually	Satellite imagery and Aerial photography	As per specialist advise
	Natural vegetation	To identify protected species prior to mining	Mining area	~~Spring/summer~~ Annually	Visual	*Nymania capensis* (chinese lantern) *Acacia erioloba* (camel thorn)
	Alien vegetation	To monitor conformance with alien vegetation programme	Total mining area, including rehabilitated areas	Annually	Survey	Area (hectares)
Air quality	Dust outfall	To determine the levels of dust outfall as a result of the mining activities	To be determined	~~Continuous~~ Monthly	Dust outfall buckets	Settleable particles (mg/m^2/day) Composition of dust
Environmental noise	Noise levels	To determine the noise levels within the communities and sensitive areas	~~To be determined~~ At closest local receptors	~~Annually~~ As necessary	SABS 0103	dBA

Table 2-2: Implementation, Auditing and Reporting Protocol

Aspect	Programme/Audit	Schedule/Frequency	Comments
PROGRAMMES/PLANS			

Aspect	Programme/Audit	Schedule/Frequency	Comments
Water management	Authorisation of water use	Within first year of approval	Integrated water use licence
	~~Verification of groundwater resource~~ Management and monitoring of water sources from Middelplaats	~~Within first year of approval~~ Continuous	The quality and volumes of water abstracted from Middelplaats for use at Mamatwan must be managed and monitored for use at the mine.
Mining plan/schedule	Revision of mining plan/schedule and materials balance	Monthly	
Rehabilitation plan	Ongoing revision of rehabilitation plan	Any substantial changes to mining plan/schedule	Take cognisance of knowledge gaps
	Review of final pit-floor levels	Prior to final rehabilitation plan for closure	
	Initiate rehabilitation trials for defunct tailings dams	Within first year of approval	Initiate rehabilitation of tailings dams as soon as possible
Monitoring programme	Revision of monitoring programme	~~Annually~~ Every two years or as appropriate with an update to the operation	
Standard Operating Procedures (SOPs)	Revision of all environmental SOPs to include the environmental objectives and strategies adequately.	Within first year of mining. Any substantial changes to mining plan/schedule	The necessary inspection and auditing programmes and procedures will be included in the revised SOPs.
Post-closure water- and salt-balance	Post-closure water balance	Within 5 years of approval Any substantial changes to mining plan/schedule	
Closure plan	Final land use plan and detailed closure plan	Five years prior to closure	In consultation with IAPs.
AUDITING PROGRAMME			
Implementation programme	Conformance to environmental objectives & strategies and the implementation thereof	Six monthly, as part of the BHP Billiton HSEC reporting schedule	Internal audit

Aspect	Programme/Audit	Schedule/Frequency	Comments
EMP performance assessment	To determine conformance with the Mamatwan EMP amendment, including effectiveness & ppropriateness of EMP	~~Biennially~~ Every two years	External audit As required by the MPRDA Submitted to DMRE
~~ISO 14001~~	~~Continuation of certification audit~~	~~Annually~~	~~External audit~~
Legal compliance	Environmental legal compliance audit	~~Bi Annually~~ Every two years	External audit
Financial provision	Revision of closure cost assessment for immediate (unplanned) closure	Annually	Internal assessment External audit every 5 years
REPORTING SCHEDULE			
Environmental monitoring	Review and analyses of monitoring data for: • Surface water • Land use management • Air quality	Quarterly	Develop reporting protocol Report to Mine Management ~~Report to IAPs during annual IAP meeting~~
	Review and analyses of monitoring data for: • Groundwater • Environmental noise	Annually	Develop reporting protocol Report to Mine Management ~~Report to IAPs during annual IAP meeting~~
EMP performance	Reporting to DME	~~Biennially~~ Every two years	Reporting protocol to DWAF to be addressed in integrated water use licence
HSEC performance	Reporting to South32 Corporate	~~Monthly~~ Annually	Reporting procedures in place

3. EMERGENCY CONTINGENCY PLAN

3.1 INTRODUCTION

The environmental management programme and associated management options are intended to minimise environmental risk as far as possible. However, should circumstances lead to unacceptable risks, emergency systems and procedures have been designed and will be implemented in the case of an emergency to prevent or minimise the consequential environmental damage. The emergency contingency plan addresses any reasonably anticipated failure (most probable risk) for the existing and future mining activities and focuses on environmental emergencies. The plan would be formalised in the mine's emergency procedures as soon as the EMP has been approved.

The most crucial aspect of the emergency system is the identification and communication of the emergency to the appropriate persons. Consequently, the names of the appropriate contact person together with their contact numbers would be prominently displayed around the facility. The contact details will be updated on a regular basis. First-party employees (such as security, safety superintendents, mine overseers, environmental officers) will be trained to respond to the responsible personnel in the event of an emergency.

Each person's responsibility would be cleared with him/her beforehand and a copy of the emergency contingency plan would be distributed to each person, including the responsible and/or affected persons not associated with the mine, i.e.:

- disaster management and firefighting agencies,
- downstream water supply authorities,
- downstream users that could be affected in the case of an emergency such as neighbouring mines, farmers and local communities,
- relevant government authorities such as DWAF and DME, and
- approved professional person (engineer).

It must be ensured that operating and supervisory staff is familiar with the emergency plan, and that the content thereof is understood and familiar to them. The emergency procedures will therefore be included in the induction programme of Mamatwan Mine. Regular training sessions in this regard on a more business-specific basis will be performed. On order to ensure that the emergency procedure is effective, regular mock exercises will be initiated.

The emergency contingency plan will be updated as circumstances change or operating procedures are amended, and as a minimum in the event of:

- any additional recommendations made by a professional engineer (annual safety inspections) or environmental auditors;
- any change in operational procedures and/or management of the mining activity;
- the identification of any issues of concern or additional risks as a result of regular inspections and/or monitoring results; and
- any unplanned or unforeseen emergency situation.

The emergency contingency plan for Mamatwan Mine is detailed overleaf.

3.2 EMERGENCY SITUATIONS AND PROCEDURES

A document on Emergency response procedures for Hotazel Manganese Mines is included in Appendix A. This document includes emergency preparedness and response, reporting defects, incidents and accidents and accident review and communication.

3.3 WARNING SYSTEM

The list of responsible persons/authorities who should issue warnings and take certain actions in the event of an emergency situation is provided in Appendix B. The Appendix B provides the Mandatory Code of Practice on Emergency Preparedness and Response. All information around protocol for emergencies is provided within this document.

4. ENVIRONMENTAL AWARENESS PLAN

4.1 INTRODUCTION

Mamatwan Mine has a well-established internal and external communication strategy that was developed and successfully implemented as part of an integrated management system of the mine. Mamatwan Mine is in the process of implementing OHSAS18001. The environmental awareness plan forms a major part of the communication strategy, together with other issues such as health, safety, operations, productions, etc. The communication strategy is reviewed on a regular basis (at least annually) and revised if necessary.

4.2 INTERNAL COMMUNICATION AND AWARENESS CAMPAIGN

The mine has a newsletter, as well as various Communication Meetings. Details of these are available on request.

4.3 EXTERNAL COMMUNICATION AND AWARENESS CAMPAIGN

~~The mine holds meetings with IAPs, and also issues an annual HSEC Report that is published within the public domain.~~

APPENDIX A – EMERGENCY PREPAREDNESS AND RESPONSE, REPORTING DEFECTS, INCIDENTS AND ACCIDENTS AND ACCIDENT REVIEW AND COMMUNICATION

APPENDIX B – SOUTH32 MANDATORY CODE OF PRACTICE ON EMERGENCY PREPAREDNESS AND RESPONSE.

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PR-HSS-019	

DOCUMENT TITLE
EMERGENCY PREPAREDNESS AND RESPONSE, REPORTING DEFECTS, INCIDENTS AND ACCIDENTS AND ACCIDENT REVIEW AND COMMUNICATION

PURPOSE
To document a procedure detailing the method in which accidents, incidents and near misses are responded to, investigated, periodically tested and potential Occupational Health and Safety hazards and Environmental impacts are minimised.

BRIEF DESCRIPTION OF CHANGE
Integration of QP 022, PR-HSS-028 and SP-HM-007 to form a new controlled document.

APPROVAL SIGNATURE RECORD		
Reviewer Role	**Title**	**Signature**
Document Owner	Originator	
Reviewer 1	HOD	
Reviewer 2	General Manager	

Draft

DOCUMENT CONTROL			Document No. PR-HSS-019
DOCUMENT REVISION CONTROL			Control Copy 1
Revision	**Page**	**Change Effected**	**Date of Issue**
1	All	General revision and integration of QP 022, PR-HSS-019, PR-HSS-028 and SP-HM-007.	11 May 2004
2	8	Include the removal of a person that have fallen from a height and is suspended from a lanyard.	03 June 2004
3	All	Incorporation of separate emergency procedures, Changes to emergency telephone numbers	24 June 2004
4	25	Include a waiting time of 24 hours before anyone is allowed near mobile equipment that was burning. This is to prevent exposure to the risk of a tyre explosion with the severe consequences to bystanders.	02 July 2004
5	9 (4)	Inform doctor if injured was exposed to smoke, fumes, gas, chemicals, etc.	22 July 2004
6	6 19 22,29,34,39 17,32	Add requirement to send SMS to HOD's in the event of an accident Insert GPS coordinates for Hotazel airstrip and helipad on Mamatwan and Wessels Mines. Add Pitram Control Room phone numbers. Emergency phone numbers updated.	20 October 2004
7	9	Add emergency call out organogram and emergency critical questions checklists	29 April 2005

ROUTING SLIP FOR LAST REVISION NUMBER			
Role	**Responsibility**	**Signature**	**Review Date**
Reviewer 1			
Reviewer 2			
Reviewer 3			

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1. QUICK REFERENCE

Type of emergency	1st Contact	2nd Contact	3rd Contact	Comment
Fire/Explosion	Fire team	Supervisor of the area or official on standby	Site Manager and HSE Manager	
Less serious injury	Doctor	Supervisor of the area or official on standby	Site Manager and HSE Manager	GM and HSE Manager to be informed by manager on standby of all injuries on next working day
Fatality and Reportable injury/ Restricted Work case	Doctor	Site Manager and HSE Manager	Emergency response	Manager on standby to contact GM and HSE Manager immediately
Environmental incident	Emergency response coordinator	Supervisor of the area or official on standby	Site Manager and HSE Manager	Level 4 and above to be communicated immediately
Flooding	Emergency response coordinator	Supervisor of the area or official on standby	Site Manager and HSE Manager	Level 4 and above to be communicated immediately
Labour unrest/unprotected strike	HR Coordinator	Site Manager and HSE Manager	IR Supt. and HR manager	Manager on standby to contact GM immediately
Loss of Electrical supply	RE responsible for the area	If problem persists: Site Manager and HSE Manager	If problem persists: General Manager / HSE Manager	Evacuate all people from underground after 1 hour to station
Natural disaster	Emergency response coordinator	Site Manager and HSE Manager	If problem persists: General Manager	
Land slide/bench failure	Emergency response coordinator	Site Manager and HSE Manager	If problem persists: General Manager	

Gassing	Emergency response coordinator		If problem persists: General Manager	

The standby schedule will be distributed by the Communication specialist every week and should be made available to (at least) all secretaries, control rooms and security.

All accidents to be reported by the HSE standby Person and the Senior Official on Standby, via SMS to all the HOD's.

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2. SCOPE

This procedure applies to all levels of HMM employees and contractors to effectively address the response to incidents and emergency situations for preventing and mitigating the likely illness, injury and environmental impacts that may be associated with it.

3. OBJECTIVES

To ensure that:

- The relevant HOD and his teams **review** emergency preparedness and response plans and procedures, as well as the reporting of and implementation and evaluation of the effectiveness of remedial actions after the occurrence of incidents or emergency situations in their department.
- The HOD and his teams periodically **test** emergency preparedness and response plans and procedures.
- The HOD and his teams effectively respond in the event of a defect/incident/injury to mitigate, **report**, implement corrective **actions** and to **evaluate** the effectiveness of corrective actions implemented, and the **communication** of lessons learnt.

4. DOCUMENT CONTROL

Any amendments to this procedure will be carried out in accordance with the Business Documentation Management Policy: - PO-HSS-001 and the Document and Data control Procedure: - PR-HSS-004.

5. DEFINITIONS AND ABBREVIATIONS

Term	Description
HOD	Head Of Department
HMM	Hotazel Manganese Mines
SAMRASS	South African Mines Reportable Accidents and Statistics System

6. REFERENCES

No.	Doc. No.	Title
1.	OHSAS 18001: 1999 element 4.4.7	Emergency Preparedness and Response
2.	ISO 14001: 1996 element 4.4.7	Emergency Preparedness and Response
3.	ISO 9001: 2000 element 8.3	Control of Non-conforming product
4.	PR-HSS-004	Document and Data control Procedure
5.	PO-HSS-001	Business Documentation Management Policy
6.		Bhpbilliton 15 HSEC Management Standards
7.		Bhpbilliton incident reporting requirements
8.	Act 130 of 1993	Compensation for Occupational Injuries and Diseases Act
9.	Act 29 of 1996	Mine Health and Safety Act
10.		Bhpb Accident and Incident Reporting Guideline
11.		Bhpb Crisis and Emergency Organisation

7. REPORTING AN EMERGENCY

External reporting of all emergencies (incidents and accidents), as well as to ensure that adequate emergency actions being implemented, is the responsibility of the General Manager.

8. REFER TO THE FLOW DIAGRAM ON PAGE 7 OF THIS PROCEDURE FOR REPORTING OF AN EMERGENCY.

Activity number	Activity	Checks	Responsibility	Records
1	Obtain an Employer's report of an accident form W.CL. 2 (E) from Afroch or via e-mail from www.@wcomt.gov.za	Compensation for Occupational Injuries and Diseases Act,	All Supervisors and Superintendents	Retain 10 blank W.CL. 2 (E) forms per Section or

		1993		Department
2	Complete an Employer's report of an accident form W.CL. 2 (E) when an accident or injury has occurred requiring medical treatment	Refusal to administer medical treatment at Afroch or at the Municipal Hospital	All Supervisors and Superintendents	Completed W.CL. 2 (E) form
3	Inform the HSE Manager per telephone immediately after an accident has occurred	Daily telephonic communication with Afroch Health Centre by the HSE Manager	All Supervisors and Superintendents	None
4	Transport the injured with the completed W.CL. 2 (E) form to the Afroch Health Care Centre	AOR forwarded to the SHEQ Department upon arrival of patient without the W.CL. 2 (E) form Inform the doctor if the injured was exposed to smoke, fumes, gas, chemicals, etc.	All Supervisors and Superintendents	Completed W.CL. 2 (E) form
5	Treat the patient and forward the W.CL. 2 (E) form to The Compensation Commissioner P O Box X 955 Pretoria 0001 or e-mail to www.@wcomt.gov.za	Submission of W. CL. 2 (E) to	Afroch Medical Practitioner	Completed W.CL. 2 (E) form
6	Complete a SAMRASS 1, Accident or Dangerous Occurrence Report and a SAMRASS 2, Injury Report Form as required by legislation	Current Legislation, Regulation 23.4	All Supervisors and Superintendents	Completed SAMRASS 1 and 2 records
7	Forward completed SAMRASS 1 and 2 forms per facsimile or e-mail to The Department of Minerals and Energy Private Bag X 6093 Kimberley 8301	Fax reporting slip or e-mail verification slip	All Supervisors and Superintendents	Fax reporting slip or e-mail verification slip

	or e-mail kimall@mekim.ncape.gov.za And the SHEQ Superintendent.			
8	Communicate the injury details to the HSE Manager and specify the period of absence from work	e-mail	Afroch Medical Practitioner	Daily injury report
9	In the event of 1-13 day injuries complete a SAMRASS 4 record of the injury and forward the information to the Department of Minerals and Energy to the addresses supplied	Fax reporting slip or e-mail verification slip	Afroch Medical Practitioner	Fax reporting slip or e-mail verification slip
10	In the event of an injury extending 14 days or longer, the injured is required to consult the Afroch Medical Practitioner on the fourteenth day and every consecutive fourteen days until the injured is fit for duty (This is also applicable to injured Employee who consulted his own Medical Practitioner)	Fortnightly Afroch attendance record	All Supervisors and Superintendents including the Injured Employee	Afroch attendance record
11	Upon certifying fitness for work, complete a SAMMRASS 9 record and forward the information to the Department of Minerals and Energy to the addresses supplied	Fax reporting slip or e-mail verification slip	Afroch Medical Practitioner	Fax reporting slip or e-mail verification slip
12	Follow up on WCL claims on a monthly basis and report deviations to the HSE Manager.	Fax reporting slip or e-mail verification slip	Afroch Medical Practitioner	Fax reporting slip or e-mail verification slip
13	Report all emergencies, incidents and injuries to the HSE Manager.	Fax reporting slip or e-mail verification slip	All Supervisors and Superintendents	Fax reporting slip or e-mail verification slip
14	Complete the Significant Incident Report for approval by the HSE Manager and external communication by the General	Fax reporting slip or e-mail verification slip	HOD	Fax reporting slip or e-mail verification

	Manager.			slip or completed Significant Incident Report

9. PROCEDURE FLOWSHEET

Emergency guidelines:

1. **Determine type of emergency**
2. **Determine the scale of events / consequences**
3. **Go to relevant section below:**

\\Smmhtz-fp001\HSECQ\SOP's\SHEQ\Draft Documents\Emergency Reporting Organogram.xls

\\Smmhtz-fp001\HSECQ\SOP's\SHEQ\Draft Documents\Emergency Reporting critical question checklist.doc

Draft

ACTIVITY Nr.	INCIDENT	ACTIVITY	CHECKS	WHO IS RESPONSIBLE	RECORDS
1.	Fire/Explosion	Activate fire-fighting procedures, obtain emergency information, and follow the emergency/exit plans and initiate actions.	Fire	All HMM Employees	As per Integrated Management System requirements PITRAM log
2.	Fatality/Reportable incident/Restricted Work case	To direct the sequence of events if a fatality or other reportable injury occurs involving any person in the services of HMM.	Fatality	All HMM Employees	As per Integrated Management System requirements PITRAM log
3.	Environmental Incident	Record any possible incidents, which could affect the activities of the company or have a negative impact on the environment. Report to PITRAM and register AOR. Complete Significant Incident Report and forward report to HSE Dept. Conduct ICAM Investigation. Clean spillage and rehabilitate polluted area and polluted soil	Environ mental spill.doc	All HMM Employees	As per Integrated Management System requirements PITRAM log
4.	PERSON WHO HAVE FALLEN FROM A HEIGHT AND ARE SUSPENDED FROM A LANYARD	Calm person down. **Encourage person to keep moving his feet to ensure good blood circulation. This will help to prevent suspension trauma.** Contact Proto Captain to activate rope rescue actions SCAN THE ENVIRONMENT Record any possible incidents, which could affect the activities of the company or have a negative impact on the environment.		All HMM Employees	As per Integrated Management System requirements PITRAM log
5.	Labour unrest/unprotected strike	Contact Mine Manager, who will contact relevant HR people		All HMM Employees	As per Integrated Management System requirements PITRAM log
6.	Loss of Electrical		Power	All HMM Employees	As per Integrated Management

ACTIVITY Nr.	INCIDENT	ACTIVITY	CHECKS	WHO IS RESPONSIBLE	RECORDS
	supply				System requirements PITRAM log
7.	Natural disaster	Treat same as Below		All HMM Employees	As per Integrated Management System requirements PITRAM log
8.	Land slide/bench failure/Flooding	Activate the emergency procedures as defined in the relevant documentation	Fire	All HMM Employees	As per Integrated Management System requirements PITRAM log
9.	BOMB TRHEAT	Receive bomb threat, record and conduct emergency actions		All HMM Employees	As per Integrated Management System requirements PITRAM log

In the event if an incident and assistance is required the following procedure is required:

Activation of International SOS Alarm Center

1) The International SOS Alarm center in Johannesburg is to be activated at the earliest opportunity. Tel 011 541 1300/1350, Fax + 27 11 541 1058, E-mail alarm@isos.co.za

2) The caller must clearly state that they are calling as a BHP Billiton employee and provide the **Corporate Access Membership number 12ACMA000050**.

3) The SOS Alarm Center Coordinating Doctor (CD) on duty must be asked for and all medical, logistical and insurance information discussed directly with the CD.

4) The decision to evacuate using SOS Air Ambulances is completely at the discretion of the client.

5) SOS Will advise in the event of a multiple patient scenario on the most appropriate course of action wrt dispatch of medical staff resources from JHB.

6) Air Ambulance evacuation will be to Johannesburg or Bloemfontein as the nearest appropriate centers of medical excellence.

7) SOS will contact the Authorizing Parties of BHP Billiton to confirm that BHP Billiton is comfortable with the plan of action.

8) The following information is considered vital information: Name, age, sex, weight and medical condition including vital signs.

9) Site staff must keep the Alarm center updated of the patient's condition for the duration of the evacuation.

10) Any dispute or disagreement must be escalated to the SOS Medical Director or Regional Medical Director for resolution.

11) No passengers are permitted on Air Ambulance evacuations and only one soft 40cm X 40cm X 20 cm bag will be allowed as baggage.

9.1.1 BHP BILLITON AUTHORISING PARTIES

In the event that BHP Billiton wish to evacuate a patient outside of what is covered in terms of the insurance that is on place, the following parties must be contacted for authorization of costs for BHP Billiton's.

1) **André van der Bergh, Regional Advisor HSE, Tel +27 82 467 7877**

2) **Dr Peter Shanahan, Vice President Health Tel +61 419 367 512**

(Must be 24-hour contact numbers, billing details must be supplied to SOS and payment strictly 30 days)

9.1.2 AIR AMBULANCE DETAILS

9.1.3 Air Ambulance

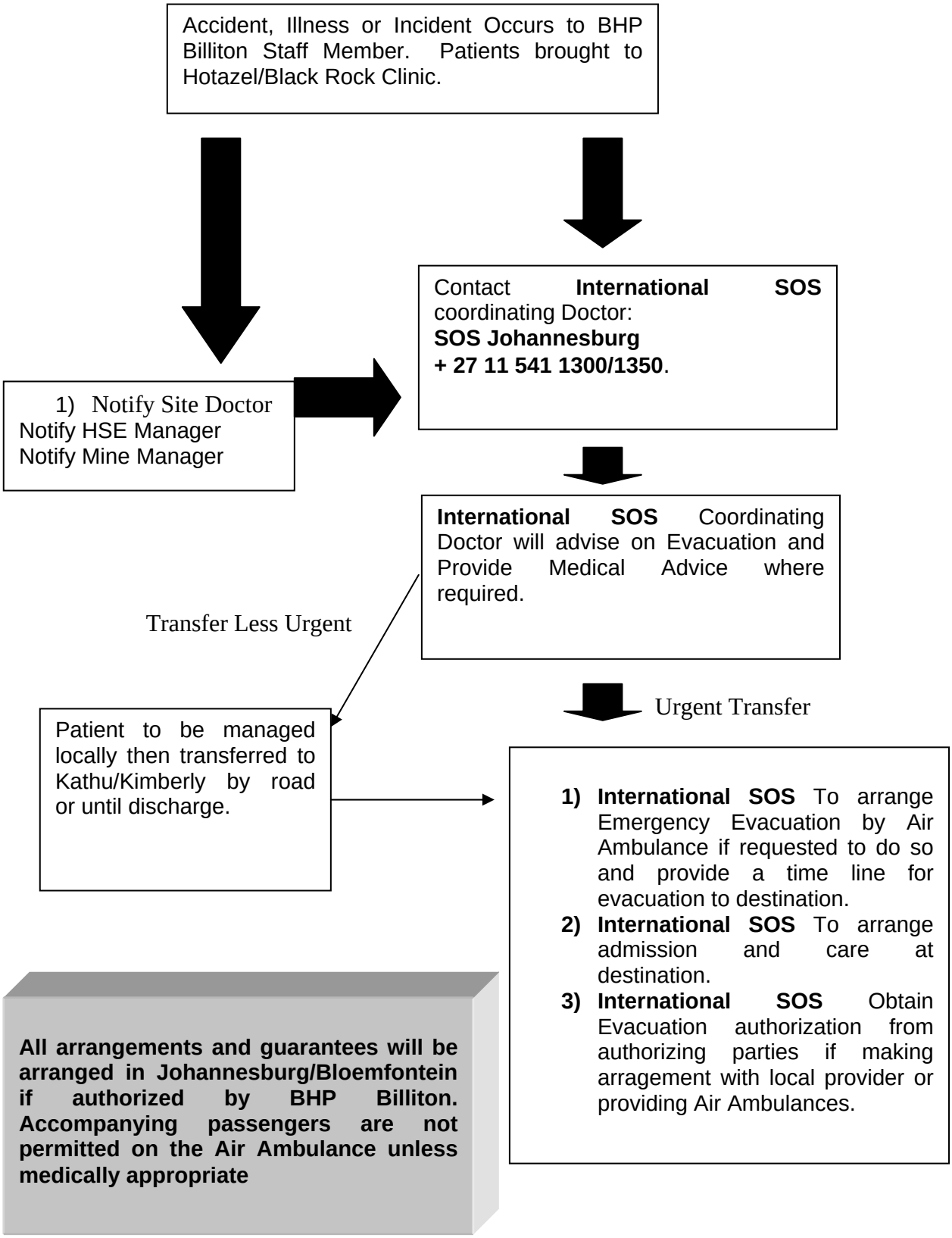
1) Dassault Falcon 200 – Registration ZS – SOS, 2 patient capability.

2) Dassault Falcon 10 – Registration ZS – FOX, One to 2 patient capability. 45 Min to Kuruman.

3) Lear Jet – Registration ZS – FUN, One patient capability. 45 Min to Kuruman.

4) King Air 90 Registration ZS – OHB, One patient capability. 1 hour 15 to Hotazel, Black Rock

Evacuation Flow Chart



10. AMBULANCE CALL-OUT PROCEDURES

10.1 CALL-OUT

The ambulance is an emergency vehicle and must only be used to transport patients suffering from serious injury or illness.

The following information should be provided during the initial call:

1. NAME OF CALLER **TELEPONE NUMBER**

_____ _____

2. TYPE OF EMERGENCY Specify

a. Mine Accident ☐ _____

b. Vehicle Accident ☐ _____

c. Assault ☐ _____

3. **LOCATION (EXACT DESCRIPTION)**

_____

_____

_____

_____

4. NUMBER OF INJURED AND TYPE OF INJURY

a. Major (Life threatening) ☐

b. Minor (Need medical assistance before transport) ☐

c. Transportable ☐

5. DESCRIPTION OF INJURIES

	NUMBER OF PATIENTS	DESCRIPTION
HEAD		
NECK		
THORAX		
ABDOMINAL		
BACK		
LIMBS		

10.2 UNDERGROUND (Wessels Mine)

- Patients suffering from serious injury or illness will be transported from their place of incapacitation to the ambulance waiting at the shaft, using the underground transport. Where the injuries or illness are not serious, they will be transported to Hotazel clinic using a vehicle from the mine. Trained medical staff will only decide this.

10.3 SURFACE (Hotazel, INFRA, Wessels Mine and Mamatwan Mine)

- In the event of an injury/illness on surface, the ambulance will be used to transport the patient from the place of incapacitation to the Hotazel clinic. Serious injuries should receive first aid on the scene when it is save or be moved to a save place. They must be transported with the ambulance to Hotazel clinic. Time and accessibility must be taken into consideration and must be discussed with the trained medical staff.

- Please note: In the event of an ambulance being called out for a non-work related injury or illness, the cost will be for the patient's own account.

10.4 CALL OUT PROCEDURE

- The supervisor to report to Hotazel clinic or the sister on call (after hours) who will decide, based on the severity reported, whether to call out the ambulance and the doctor.

10.5 PROCEDURE TO BE FOLLOWED IN THE EVENT OF AN ACCIDENT/ILLNESS

- Between 07:30am and 04:00pm during the week (Monday to Friday):

- The Supervisor will contact the following people:

- Clinic - 2164, 2165

- After 04:00pm on weekdays and over weekends when there are no medical staff at the clinic: The Supervisor will phone the Occupational Health Nurse on standby, who will call out the ambulance and inform the Occupational Medical Practitioner. Where the ambulance is called out, the Occupational Health Nurse and/or the Occupational Medical Practitioner will meet the patient at the collection point.

10.6 Emergency Medical Response, or Evacuation, including Air Ambulance Services

- For ad hoc services (user pays) under the BHPBilliton Global Access Agreement place a single point call to ISOS.
- ISOS will co-ordinate all road, helicopter and fixed wing Air Ambulance assistance as authorised and directed by the one of the following people: Regional Advisor HSE, Manager Health, or Vice President Health**,** in Melbourne, in the unlikely event of neither of these persons responding, will authorise the appropriate response.
- ISOS will hand over to any specific provider as requested but render these services themselves if required in terms of the agreement, as authorised by one of the 3 parties mentioned.
- The Johannesburg ISOS Alarm Centre Number is (011) 541 1350/1300, Fax (011) 541 1058.
- In the event of any issues arising these can be escalated to the ISOS Country Medical Director, Dr Michelle Theunissen, or the ISOS Medical Director, Dr Fraser Lamond, via the Alarm centre.
- Mention that the words BHPBilliton site, but using the three contacts would be the preferred route and ensure a response that bypasses some of the red tape.

10.7 CONDITIONS

- The ambulance must be parked at the Clinic during weekdays (07:30 – 16:00) and at the house of the ambulance driver or at Hotazel security after 16:00.

- AFROHC must ensure that the ambulance will be serviced on a scheduled basis and kept in a roadworthy condition at all times.

- The Clinic staff must carry out a daily examination and log the condition of all first aid equipment and apparatus in the ambulance.
- A spare set of keys to the ambulance will be kept at the clinic and issue under signature when required by non-AFROCH staff.

10.8 TRANSPORT OF NON-MINE EMPLOYEES (CONTRACTORS)

- Non-mine employees must utilise the Provincial ambulance from Kuruman Emergency Centre in the case of illness. The Occupational Health Nurse in charge will use her discretion in case of emergency.
- All mine accidents of contractors will be transported as per our protocol for mine accidents.

10.9 CLEANING OF AMBULANCE

- The ambulance must be kept clean.

11. EMERGENCY NUMBERS

Managers Phone numbers:

Jeff Leader	General Manager	0824998001
Ian Thomson	Logistics Manager	0834060393
Hannes Cronje	Wessels Manager	
Fanie van Jaarsveld	Mmt Manager	0834472834
Ferdie van Staden	Finance Manager	0833883418
Andy Taunyane	HR Manager	0834511157
L Venter	HSEQ Supt	0832695901
M vd Merwe	Services Supt	0832695903

Clinic

2164/2165 : (Short Dial) at AFROHC Clinic

083 238 3136 : Sister on call at Hotazel

André van der Bergh, Regional Advisor HSE, on +2782 467 7877.

André Stockhusen, Manager Health, on +2783 325 4164.

Dr Peter, Vice President Health, on +61 419 367 512

♦ Rescue teams

WESSELS PROTO TEAM

T Smith : 083 695 5053/11743

Emergency Response

F v/d Merwe – 2202 0832352974 Security

AMBULANCE SERVICES KURUMAN	**712 0044(053)**
FIRE BRIGADE KURUMAN	**083 448 9223**
SAPD KURUMAN	**(053)7121111**

♦ BLACKROCK

Security	**-**	**053 751 5209**
Switchboard	**-**	**053 751 5555**

♦ SISHEN

Security	**-**	**053 739 2117**
Switchboard	**-**	**053 739 2911**
Hospital	**-**	**053 723 3255**
Fire Brigade	**-**	**053 7139 2111**
	-	**083 304 0254 (Emergency Cell No.)**

♦ Company Employee Cell Phones

See dial list to be printed and an updated copy kept with these documents.

\\Mnos016\users\Siemens\Excel

♦ Coordinates

Airstrip	Hotazel	Y + 5140.000	X + 3010700.00
Helipad	Wessels	Y + 4423.000	X – 40.000
Constant		Y + 1000.000	X + 3 000 000.000
Helipad	Mamatwan	Y + 945.000	X + 30440.000
Constant		Y + 0.0	X + 3 000 000.000

12. RECORDS

Identify	Collect	Index	Access	File	Store	Maintain	Dispose	Retain
Safety Management System	Line Managers	Department	-	Safety	Line Managers off	File	Line Managers	Indefinite
Blank W.CL. 2 forms	Superinten-dents and Supervisors	Name	-	Blank W. CL. 2 forms	Department	Box file	Na	Na
Completed W.CL. 2 forms	Afrox Medical Practitioner	Claim number	Protected personal information	IOD file	Per Mine	Box file	Na	Indefinite

SAMRASS 1	Superinten-dents and Supervisors	Name	Protected personal information	Personal file	Per Mine	File	Na	Indefinite
SAMRASS 2	Superinten-dents and Supervisors	Name	Protected personal information	Personal file	Per Mine	File	Na	Indefinite
SAMRASS 4	Superinten-dents and Supervisors	Name	Protected personal information	Personal file	Per Mine	File	Na	Indefinite
SAMRASS 9	Superinten-dents and Supervisors	Name	Protected personal information	Personal file	Per Mine	File	Na	Indefinite

13. FIRE/FLOOD/IN RUSH/EXPLOSION

PURPOSE
To establish a Standard Operating Procedure detailing the actions to be taken during the event of a Fire/Flood/In Rush/Explosion.

14. PROCEDURE STATEMENTS

The aim of this procedure is to direct the sequence of events in the case of an uncontrolled Fire/Flood/In Rush/Explosion with the view to minimize injury to people and/or damage to equipment and loss of production .

15. SCOPE

This standard operating procedure will apply:

- To all areas at HMM and immediate surroundings.
- To all people in their areas of responsibility.
- To any process or situation that requires a particular technique that may be applicable.

16. OBJECTIVES

- To provide a reporting procedure in the event of Fire/Flood/In Rush/Explosion.
- To allocate responsibility in the event of an emergency.
- To provide a Guideline for the safe evacuation of personnel in the event of a Fire/Flood/In Rush/Explosion
- To ensure that personnel and management in particulars are aware of, and understand the risk of Fire/Flood/In Rush/Explosion exposure.

17. DEFINITIONS AND ABBREVIATIONS

Term	Description
Major incident:	Means an occurrence of catastrophic proportions, resulting from the use of plant or machinery, or from activities at a workplace (normally level 3 and above)

18. REFERENCES

No.	Doc. No.	Title
1		Environmental Conservation Act (Act No.73 of 1989)
2		Occupational Health and Safety Act (Act No.85 of 1993)
3		Mine Health and Safety Act (Act No.29 of 1996)
4		Minerals Act (Act No.50 of 1991)

19. PROCEDURE FLOWSHEET

No.	Activity	Responsibility
1	Raise alarm (Contact Pitram Control Room at 2303[Mamatwan] or 2514[Wessels] per radio)	1st Observer
2	Take charge of the area	Most senior person
3	Perform First Aid (if necessary)	Trained First Aid person
4	Evacuate all people to the nearest demarcated assembly point or open area. Remove combustible material/mobile equipment/tools/plant from the immediate area of the Fire/Flood/In Rush/Explosion.	All
5	Extinguish if possible in case of fire (take safety precautions and use correct extinguishing method)	All
6	If major event contact Fire/Flood/In Rush/Explosion team coordinator (Proto or fire team coordinator)	Control room operator
7	In all events inform Supervisor, Official on standby/Responsible Superintendent	Control room operator
8	Inform relevant manager and emergency response personnel	Official on standby/Responsible Superintendent
9	Monitor progress at all times	Control room operator
10	Inspect the area for unsafe conditions and take action if necessary to make safe.	Responsible Supervisor
11	Follow up/perform ICAM investigation	Responsible Superintendent

The following guideline should be used by the control room operator:

ON RECEIPT OF NOTIFICATION OF A FIRE /FLOODING / IN RUSH / EXPLOSION THE FOLLOWING STEPS ARE TO BE TAKEN

	Ask the following questions	**Answer**	
	What is the location of the fire / flood / in rush / explosion		
	What is the extent of the fire / flood / in rush / explosion		
	Are any of the people injured		
	Do you require an ambulance or transport to the section		
	Total amount of people involved		
	Can the flood / in rush / fire be controlled		
	What was the cause of the fire / flood /		
	Are all the people accounted for		
	Contact the following people	**Contacted** **Signature**	**Not Contacted** **Signature**
	Supervisor responsible for the area where the incident occurred		
	Superintendent responsible for the area where the incident has occurred.		
	Mine Manager		

MINER/SUPERVISOR

ON DISCOVERING OR BEING NOTIFIED OF A FIRE/FLOOD/IN RUSH IN HIS AREA THE MINER/SUPERVISOR WILL

NO	**STEP**	**COMPLETED**
	Contact the control with the following information	
	Location of the fire / flood / in rush / explosion	

	Extent of the fire /flood / in rush / explosion	
	Injuries to any people	
	If an ambulance or extra transport is required	
	Total amount of people involved	
	If the fire / flood / in rush is under control or not	
	If all the people are accounted for	
	If the fire / flood / in rush can be controlled, he must take the names of the people assisting in fighting the fire / flood / in rush and send all others to a fresh air base	
	If the fire / flood / inrush cannot be controlled he evacuate to the nearest safe area	
	Maintain a waiting time of 24 hours before anyone is allowed near mobile equipment that was burning. This is to prevent exposure to the risk of a tyre explosion with the severe consequences to bystanders.	

- **In the event of a serious incident an emergency control centre will be established in the Mamatwan / Wessels Board Room.**

PERSON IN CHARGE OF EMERGENCY CONTROL CENTRE

- **The control of the emergency response centre will be successively handed up the line until the most senior official is in control**

The central control centre (board room) should contain the following
All emergency telephone numbers
Communication method, i.e. telephone (with outside line), radio
Computer network access

- Depending on the extent of the fire /flood / in rush / explosion the following table can be used as a guideline

FUNCTION	Completed	Not completed
Appoint a scribe		
The area of the fire / flood / in rush / explosion is to be plotted as soon as possible		
Notify emergency teams and arrange for extra teams if required		
Notify regional director		
Notify head office		

ENGINEERING CONTROLS

FUNCTIONS	COMPLETED	NOT COMPLETED
An engineering control function will be established in the Emergency Control Centre under the control of the Resident Engineer		
A duty roster will be completed and forwarded to HR Coordinator		
Portable telephones and sufficient cable must always be kept available.		
Arrange for uninterrupted power supply.		
Arrange for sufficient radio's to be available for communication		
Check and maintain water supply, and ensure that spare pumps and motors are available		
Draw up plans for supplying additional water at high pressure if required		
Ensure that the following equipment is made available on an ongoing basis: • truck and driver at stores. • adequate LDVs and driver at central control • Mobile crane and driver		

20. PERMITTED FIRE

All open flame or Fire, (specifically for the purpose of a braai), is subject to the following conditions:

No Fire to be left unattended

All Fire to be put out if not in use

At a designated area specific for this purpose.

A Fire permission to be obtained from the Mine Manager or Superintendents.

Specific caution should be taken to ensure that no Fire be closer than 5 meters from any plant, combustible material, or any other area where damage may be caused.

Open flames/Fire is prohibited from the following areas:

Inside the explosives magazine fence
At any refuelling bay (Diesel/Petrol/other fuel), offloading and/or storage area of flammable material/petroleum products
Gas storage
Coke offloading/storage/processing area
Main store area
Tyre bay

21. PROCEDURE TO BE FOLLOWED WHEN A FATAL OR SERIOUS INJURY OCCURS

PURPOSE
To establish a Standard Operating Procedure that are adequately documented, communicated and implemented to ensure that the correct steps are taken in the case of a fatal or other serious injury that occurred on the mines. (Including reportable accidents in terms of Regulation 25.1 of the Mine Health and Safety Act)

22. PROCEDURE STATEMENTS

The aim of this procedure is to direct the sequence of events if a fatality or other reportable injury occurs involving any person in the services of HMM.

23. SCOPE

- This standard operating procedure will apply:
- To all relevant functions and levels within Hotazel Manganese Mines.

24. OBJECTIVES

- To direct the activities in the event of an emergency involving serious/fatal injury to people.
- To ensure compliance to all applicable legislations.
- To ensure that all legal and other requirements are identified.

25. DEFINITIONS AND ABBREVIATIONS

Term	Description
Accident investigation team	Representatives of the Health and Safety Committee on the mine, who may co-opt any technical or other specialist, to investigate the accident.

26. PROCEDURE FLOWSHEET

No.	Activity	Responsibility
1	Duties of the first person who arrives at the scene of the accident	
1a	Make safe. (Stop running machine/vehicle)	First person arriving at the scene
1b	Apply first aid treatment. (Obtain first-aid equipment from the nearest first-aid box)	First person arriving at the scene
1c	In the case of a mine accident: contact Pitram Control Room, 2303 (Mamatwan), 2514 (Wessels) who will communicate the accident to the responsible officials and to call for help. For all other accidents call the manager on standby.	First person arriving at the scene
1d	Remember to bandage all wounds, even the small ones, because these may become infected.	First person arriving at the scene
1e	If possible, transport the injured on a stretcher.	First person arriving at the scene
1f	Communicate as quickly as possible the circumstances of the accident to the area/standby supervisor and to official on standby/relevant Superintendent.	First person arriving at the scene
1g	Make notes of the names, numbers, etc of all the witnesses and other people who may contribute to the accident investigation.	First person arriving at the scene
1h	In the case of a fatal accident, or other serious accident, leave the scene undisturbed until such time as the Mine Manager/Inspector gives permission to clean up. (Remove all people and barricade the area)	First person arriving at the scene
	Note: All injuries on duty must report to the doctor who provides occupational health services to the Samancor Manganese Mines. This doctor will give further instruction in terms of medical treatment.	
2	Duties of the Supervisor	
2a	Attend to the scene of the accident immediately after being notified.	Supervisor
2b	If possible, move the injured to a place of safety, and apply first aid treatment if not done already.	Supervisor
2c	Take charge and ensure that no one else is exposed to further danger.	Supervisor
2d	Barricade the area to prevent unauthorized people gaining access to the scene.	Supervisor
2e	Notify the Official on standby/Superintendent as soon as possible of the circumstances.	Supervisor
2f	Notify AFFROHC to arrange for an ambulance. Complete the Workman's compensation form (obtain from security at the gate or Safety Coordinator)..\..\..\Templates\WCL2 employers report.dot	Supervisor
2g	The responsible supervisor/official completes the	Supervisor

	”Preliminary Accident Report” (Preliminary accident form ,and Injury assessment form) in duplicate. One copy to accompany the injured to the hospital and the other copy to be handed over to the Head of the Department.	
2h	Representatives of the Health and Safety Committee investigate the accident and complete the ICAM Accident Report (containing the responsible Superintendent’s comments and signature) . Now the completed Accident Report will be given to the Mine Manager/Head of the Department for his comments/signature .	Supervisor
2i	In the case of a fatal injury, or if the possibility exist that the injured may die in transit, a witness should accompany the injured/body from the mine to the hospital to identify the body.	Supervisor
3	Duties of the Superintendent	
3a	Notify the Mine Manager and the Safety Officer of the accident.	Superintendent
3b	If possible, move the injured to a place of safety and apply first-aid treatment if not done already.	Superintendent
3c	Ensure that an ambulance was called for.	Superintendent
3d	Take charge of the accident scene.	Superintendent
3e	Ensure that the Supervisor has fulfilled his responsibilities. (as per clause 2.9)	Superintendent
3f	Do a roll call to identify persons who are missing.	Superintendent
3g	Ensure that the “Preliminary Accident Report” is completed and sent off with the injured to the hospital.	Superintendent
3h	Arrange for representatives of the Health and Safety Committee and other specialists where necessary to investigate the accident. Ensure that the Accident Report is completed and forwarded to the Mine Manager for his comments/signature.	Superintendent
3i	Distribution of copies of accident reports: a) Original copy to the Medical Superintendent. b) Second copy to the Safety Officer for registration on the network. c) One copy to be retained for own records.	Superintendent
3j	Property damage and personal injury in the same incident - complete two separate Accident/Incident Report forms.	Superintendent
4	Duties of the Manager	
4a	Notify the General Manager as soon as possible.	Manager
4b	Notify the Inspectorate (Dept. of Minerals and Energy - Northern Cape Region) as soon as possible and arrange for investigation.	Manager

4c	Ensure that all relevant information required for official Reporting of the incident to the Dept. of Minerals and Energy (Northern Cape Region) and also reporting the accident on the intranet within 24 hours after the accident.	Manager
4d	Visit the scene of the accident, accompanied by a surveyor, who will prepare plans of the accident scene for the investigation.	Manager
4e	Ensure that the Superintendent and their subordinates have fulfilled their responsibilities (clauses 2.9 and 3.6). Ensure that the SAPS are notified in case of a fatal injury.	Manager
5	Duties of medical official	
5a	Attend the scene of the accident immediately after being notified.	Medical officer
5b	Ensure that efficient first-aid treatment was given to the injured.	Medical officer
5c	Supervise the transport of the injured from the scene of the accident/bank to the hospital.	Medical officer
5d	Ensure that clause 2.9 is adhered to (witness to identify the injured/body)	Medical officer
5e	In the case of a fatal injury a medical doctor should be asked to certify that the injured is dead.	Medical officer
5f	Notify the South African Police Service to collect the body of the deceased for transport to a mortuary and to arrange for a postmortem by the district medical practitioner.	Medical officer
5g	Obtain as soon as possible the under mentioned documents and hand them over to the Human Resources Superintendent. - Copy of the report of the post mortem - Certificate of death - Form BA294, in duplicate, signed by the district medical Practitioner.	Medical officer
5h	Where necessary, arrange for a lung biopsy.	Medical officer
6	**Duties of the human resources superintendent**	
6a	Notify the next of kin of the deceased/injured.	Human Resources Superintendent
6b	Arrange with the pay office for the payment of pro-rata earnings, pro-rata leave bonus and accumulated leave.	Human Resources Superintendent
6c	Arrange for the payment of benefits w.r.t. The Group Pension/Provident Fund.	Human Resources Superintendent
6d	Notify the relevant retirement Fund and Alexander Forbes per fax w.r.t. the fatal injury.	Human Resources Superintendent
6e	Arrange /liaise with the next of kin of the deceased to obtain the required documents to initiate claims for the payment of pension benefits and the 24- hour personal injury cover.	Human Resources Superintendent
6f	Send off all relevant documents to the Administrators of the relevant pension funds for the payment of benefits.	Human Resources Superintendent

6g	Where the deceased was a member of a Provident Fund, arrange a visit to the family of the deceased as soon as possible after the funeral to complete a "Disposal of Death Benefits". Forward this completed document to the Administrators of the relevant Provident Fund.	Human Resources Superintendent
6h	Monitor the process in order to speed up payment of benefits to the next of kin of the deceased	Human Resources Superintendent
7	**Duties of the pay office in the case of a fatal injury**	
7a	Forward the final cheque w.r.t. the deceased's final earnings as soon as possible to the Human Resources Department who will hand over the cheque to the next of kin of the deceased.	Pay office
7b	Supply information on request to the Human Resource Department.	Pay office
8	**Duties SHEQ Superintendent**	
8a	Complete accident report for the Department of Minerals and Energy. Ensure that this report is typed, signed and sent off within 24 hours after the accident. Ensure that the Mine Manager has copies of the report. Copies of the accident report must be distributed to: • Original copy to the Human Resource Administration who will administer the W.CL.2 (E) document.	Safety department
8b	Report all fatal injuries to the Chamber of Mines.	Safety department
8c	Take photographs where necessary which will serve as evidence in the accident investigation and take care of the storage of evidence.	Safety department
8d	Assist with the accident investigation.	Safety department
9	**Duties of the surveyor**	
9a	Prepare a plan that indicates: - The location of the accident on the mine. - Details of the scene of the accident. - Sections of the scene of the accident as requested by the Mine Manager.	Surveyor
9b	In the case of a fatal accident. Forward ten copies of the plan to the Mine Manager within 48 hours after the accident has occurred, or even earlier if the Inspector has indicated that he will conduct the accident investigation earlier.	Surveyor

TELEPHONE NUMBERS

DEPARTMENT OF MINERALS AND ENERGY (N/Cape)

		OFFICE	CELL
First Inspector	Mr. TE Gazi	(053) 8300822	0824466065
Senior Inspector (Mining)	Mr. M J Grobler	(053) 8300800	0824592781
Senior Inspector (Mining Equipment)	Mr. GC Britz	"	0824585251

SO-HHS-00	Hotazel Manganese Mines

DOCUMENT TITLE
27. ENVIRONMENTAL SPILLAGE

PURPOSE
To establish a Standard Operating Procedure detailing the actions to be taken during the event of an environmental spillage.

28. PROCEDURE STATEMENTS

- The aim of this procedure is to direct the sequence of events in the case of an uncontrolled environmental spillage with the view to minimize injury/health/safety risk to people and/or damage to equipment and/or loss of production and damage to the environment.
- This procedure will cover all possible emergencies resulting from spills and ensure that the response in the event of spillage to ground, storm water and process water is adequately monitored and managed

29. SCOPE

This standard operating procedure will apply:

- To all areas at Mamatwan Mine and immediate surroundings.
- To all people in their areas of responsibility.
- To any process or situation that requires a particular technique that may be applicable.

30. OBJECTIVES

- To provide a reporting procedure in the event of an environmental spill.
- To allocate responsibility in the event of an emergency.

- To ensure that personnel and management in particulars are aware of, and understand the risk of the environmental incident.

31. DEFINITIONS AND ABBREVIATIONS

Term	Description
Major incident:	Means an occurrence of catastrophic proportions, resulting from the use of plant or machinery, or from activities at a workplace (normally level 3 and above)

32. REFERENCES

No.	Doc. No.	Title
1		Environmental Conservation Act (Act No.73 of 1989)
2		Occupational Health and Safety Act (Act No.85 of 1993)
3		Mine Health and Safety Act (Act No.29 of 1996)
4		Minerals Act (Act No.50 of 1991)

33. PROCEDURE FLOWSHEET

No.	Activity	Responsibility
1	In the event of a liquid spillage directly into the clean water or process water system, the Manager must be notified immediately. In the event of an after hours event, the incident must be reported to the Pitram Control Room, 2303 (Mamatwan) or 2514(Wessels) who will contact the Manager.	1st Observer/Control room operator/Supervisor
2	The Manager, who will ensure that corrective action is taken, will assess the magnitude and impact of this spillage	Manager
3	If the spillage cannot be contained on site resulting in unplanned/uncontrolled release into the clean water systems, the Department of Water Affairs and Forestry and other possible affected parties will be notified immediately if it is believed that the magnitude of the spillage resulted in a non-compliance with the clean water quality requirements. The effect of the discharge will be monitored through water quality sampling and analysis, and where possible, appropriate actions taken to remedy the effect	Manager
4	If such a spill occurs directly onto soil, the immediate reaction must be to contain the spill (e.g. digging of containment trench) and avoid any run-off into the water systems. The contaminated soil and spilled material must be removed and disposed as per the normal waste management procedure in accordance with the hazardous nature thereof	Manager
5	The Department of Water Affairs and Forestry must be notified by the fastest possible means of any emergency	Manager

	incident or potential emergency incident involving a water resource at or incidental to the operation of a mine or the conducting of any activity, furnishing information regarding: The date and time of the incident; A description of the incident; The source of the pollution or potential pollution; The impact or potential impact on the water resource and the relevant water users; Remedial action taken or to be taken by the person in control of the mine or activity to remedy the effects of the incident; and	
6	Within 14 days after the date on an incident contemplated above inform the Department of Water Affairs and Forestry in writing of measures taken to correct and prevent a recurrence of such incident	Manager
7	. The ***Department of Environmental Affairs and Tourism*** must be notified by the most effective means reasonably available of any emergency incident or potential emergency incident involving the environment or incidental to the operation of HMM or the conducting of any activity, furnishing information regarding: The nature of the incident; Any risks posed by the incident to public health, safety and property; The toxicity of substances or by-products released by the incident; and Any steps that should be taken in order to avoid or minimize the effects of the incident on public health and the environment to: (a) The Director General; (b) The South African Police Services and the relevant fire prevention service; (c) The relevant provincial head of department or municipality; and (d) All persons whose health may be affected by the incident. As soon as reasonably practicable after knowledge of an incident the Environmental Coordinator should: Take all reasonable measures to contain and minimize 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 cleanup procedures; Remedy the effects of the incident; Assess the immediate and long-term effects of the incident on the environment and public health.	Manager Environmental Coordinator

	Within 14 days of the incident, the incident must be reported to the Director General, provincial head of department and municipality with 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 and their possible acute effect on persons and the environment and data needed to assess these effects; Initial measures taken to minimize impacts; Causes of the incident, whether direct or indirect, including equipment, technology, system, or management failure; and Measures taken and to be taken to avoid a recurrence of such incident.	

34. POWER FAILURE

PURPOSE
To establish a Standard Operating Procedure detailing the actions to be taken during the event of a total power failure.

35. PROCEDURE STATEMENTS

- The aim of this procedure is to direct the sequence of events in the case of an uncontrolled power failure with the view to minimize injury to people and/or damage to equipment and loss of production.

36. SCOPE

This standard operating procedure will apply:

- To all areas at Mamatwan Mine and immediate surroundings.
- To all people in their areas of responsibility.
- To any process or situation that requires a particular technique that may be applicable.

37. OBJECTIVES

- To provide a reporting procedure in the event of a total power failure.
- To allocate responsibility in the event of an emergency.
- To provide a Guideline for the safe evacuation of personnel in the event of a power failure
- To ensure that personnel and management in particulars are aware of, and understand the risk of power failure.

38. DEFINITIONS AND ABBREVIATIONS

Term	Description

Major incident:	Means an occurrence of catastrophic proportions, resulting from the use of plant or machinery, or from activities at a workplace (normally level 3 and above)

39. REFERENCES

No.	Doc. No.	Title
1		Environmental Conservation Act (Act No.73 of 1989)
2		Occupational Health and Safety Act (Act No.85 of 1993)
3		Mine Health and Safety Act (Act No.29 of 1996)
4		Minerals Act (Act No.50 of 1991)

40. PROCEDURE FLOWSHEET

No.	Activity	Responsibility
1	Notify the Pitram Control Room Operator, 2303(Mamatwan) or 2514 (Wessels), by means of radio, telephone or word of mouth.	1st observer
2	Remove all people from underground after one hour	
3	Start main fans and all booster fans underground	
4	Inspect all areas before re-entering	

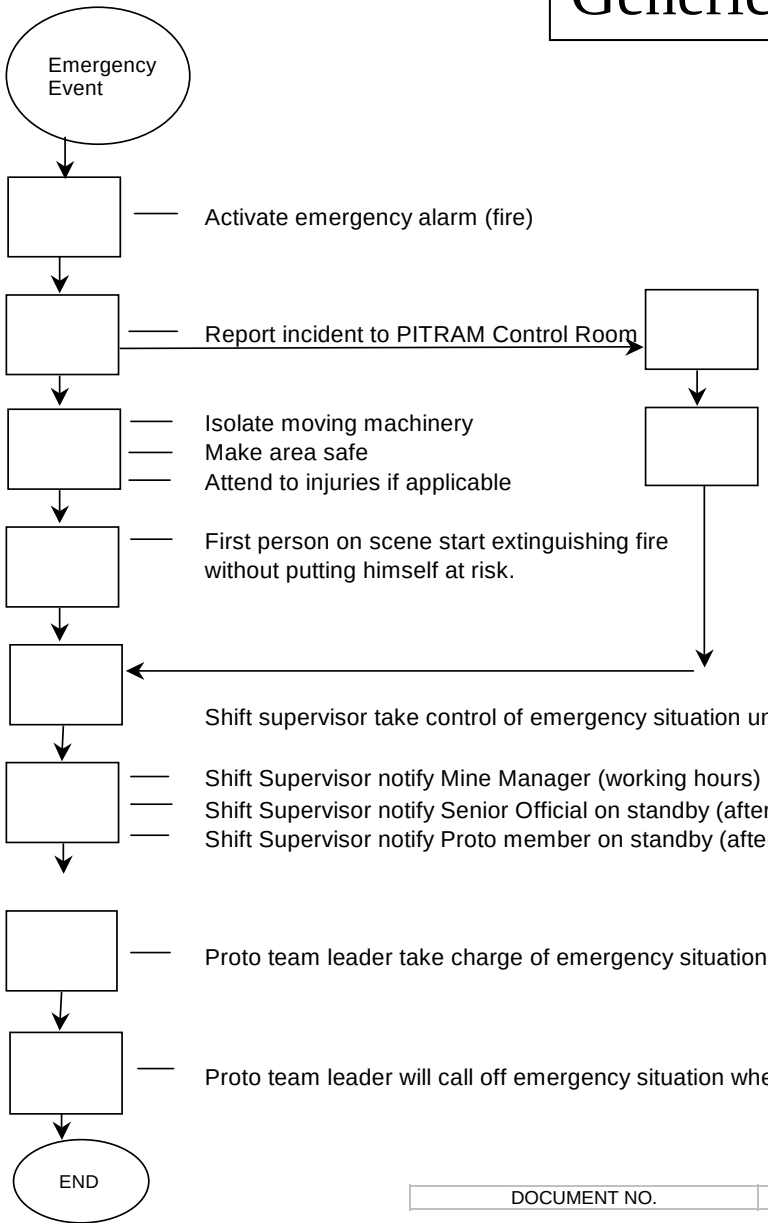
The following guideline to be followed by the control room operator:

NAME (of control room Operator) _____

DATE _____ Time _____

NO	STEP	COMPLETED/ SIGNATURE
2	Notify the Shift Electrician	
3	Notify the Electrical Supervisor	
4	After 1 hour notify the Resident Engineer	
5	Remind all people that points are to be treated as live, by radio.	
6	Upon restoration of power, follow normal start-up procedure	

Generic Emergency Flow Diagram



- Pitram controller call Proto member on standby duty
- Pitram Controller call medical assistance if requested to
- Pitram Controller notify shift supervisor per radio.

Note in

Supporting documents / records

1. PITRAM logbook (Pitram incident record)
2. ICAM report
3. AOR
4. Significant incident report to HO.
5. SOP - Incident reporting & Investigation
   Data capture & statistics
6. Legal documents : MHSA

1 TITLE PAGE

1.1 Name of Mine

Name of Mine: Mamatwan Mine

1.2 Heading

Mandatory Code of Practice on Emergency Preparedness and Response

1.3 Statement

This COP is mandatory and is drawn up in accordance with Department of Minerals and Energy (DME) guideline reference number DMR 16/3/2/1-A5, issued by the Chief Inspector of Mines

1.4 Mine Reference Number

OLD-MMT-MIN-COP-003 Mandatory Code of Practice on Emergency Preparedness and Response

1.5 Effective Date

Effective Date: 31 October 2010

1.6 Revision Date

Last Revision Date: 18 September 2020
Next Revision Date: 19 September 2022

Approval Signature Record			
Reviewer Role	Title	Signature	Date
Originator	MES Superintendent		18/9/20
Reviewer 1	Union Representative NUM		18/09/20
Reviewer 2	Union Representative Solidarity		18/09/2020
Reviewer 3	Union Representative UMCO		18/9/20
Approved by	HSEC (Reg. 2.17)		18/9/2020
Approved by	Manager Maintenance (Reg. 2.13.1)		18/9/20
Approved by	Mine Manager (Reg. 3.1)		18/09/2020
Approved by	OPS Manager (Reg. 4.1)		2020/09/18

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3 Status of Mandatory Code of Practice

3.1 Origin of Code of Practice (COP)

This COP is mandatory and is drawn up in accordance with Department of Minerals and Energy (DME) guideline reference number DMR 16/3/2/1-A5, issued by the Chief Inspector of Mines and GLD.006 – Asset Protection.

3.1.1 Intent

The purpose of this procedure to describe the Mamatwan Crisis and Emergency Management (CEM) organization and to:

Address expectations for the use of the CEM systems and processes

- Align all CEM systems in use
- Promote the use of a common terminology and structure to avoid confusion during the management of incidents and emergencies.
- This procedure covers the organisation to be used for managing incidents, emergencies and crises at MMT Complex.
- To Provide a Crisis and Emergency Management plan for Mamatwan Mine
- To ensure that:
    - Leadership and efficient decision making are demonstrated through a well-developed and rehearsed plan.
    - Our people are protected as much as possible against injury or loss of life.
    - Well-coordinated emergency response arrangements are in place.
    - The potential for significant asset loss is mitigated.
    - A range of contingencies are considered and planned for.
    - Our reputation is protected.
    - Business continuity and recovery are assured.

3.1.1.1 This Code of Practise Applies to:

- Areas at HMM Mamatwan Mine and immediate surroundings.
- People in their areas of responsibility.
- All levels of HMM employees and contractors to effectively address the response to incidents and emergency situations for preventing and mitigating the likely illness, injury and environmental impacts that may be associated with it.
- Crisis and emergency risks that have potential material impact on the business must be managed in accordance with its severity and supported by the development of a Crisis and Emergency Management (CEM) Plan.

3.2 Legal Status of COP

This COP is a legal document in terms of Section 9 (2) and (3) of the Mine Health and Safety Act, 1996 (Act No. 29 of 1996) and is applicable to any person, including non-employees and contractors in the workings of Mamatwan Mine. Non-compliance with the provisions of this COP shall be an offence in terms of Section 91 (1)(c) of the same Act.

3.3 Accident Investigations

This COP could be used in an accident investigation / enquiry to ascertain compliance and to establish whether the COP is effective and fit for purpose

3.4 COP Status

This COP supersedes all previous relevant COP's

3.5 Standard and Managerial Instructions

All applicable managerial instructions, standards and procedures must comply with the COP and be reviewed to ensure compliance.

3.6 Apply and Review

The OPS Manager must consult with the Mine Health and Safety Committee for the preparation, revision and implementation of this COP (Sect 9(4), MHSA). A team comprising operational and engineering personnel will review this COP. This team will also approve any subsequent changes to this COP.

The HSEC and MES Superintendent will technically review the contents of the COP on a regular basis with a period between reviews not exceeding 12 months.

In addition to the periodic review required by Section 11(4) of the MHSA, this Code of Practice will be reviewed after every serious accident or if significant changes are introduced to mining procedures or methods or equipment and material.

3.7 Distribution of COP

The master copy of this COP must be lodged with the Systems Co-ordinator (Document Administrator). In addition, an electronic copy of this COP will be available on the Hotazel Intranet.

3.8 Displaying of Standard Operating Procedures and Code of Practise Documents

Copies of the relevant SOP's are available from the Systems Co-ordinator (Document Administrator). The Systems Co-ordinator shall be responsible to ensure that the SOP's and COP's are updated with the latest revisions.

3.9 Employees' Access to Code of Practice and SOP's

Employees or official representatives of employees shall have unrestricted access to the Code of Practice and Standard Operating Procedures.

3.10 Communication and Amendments

Any amendments to the COP's and the SOP's will be communicated through meetings and communication briefs.

3.11 General

This COP remains in force should the mine change ownership or close temporarily.

3.12 Legal Implications

Any contravention of or failure to comply with the COP is not, in itself, a breach of the MHSA, except a contravention or failure by an employer that also constitutes a failure to prepare or implement the COP. The fact that a contravention of, or failure to comply with the COP is not a breach of the MHSA, does not mean that such breaches will have no legal implications.

As far as the employer is concerned, there are numerous specific and general obligations on the employer in the MHSA aimed at ensuring the health and safety of all employees and all persons who are not employees but who may be directly affected by the activities at the mine.

Where any failure to comply with a COP also constitutes a breach of any of the employer's obligations under the MHSA, the employer could be liable to an administrative fine for such breach. An inspector could also issue various instructions to the employer and employees in terms of Section 54 to protect the health and safety of persons at the mine. Failure by an employer to comply with such an instruction could render the employer liable to an administrative fine.

As far as employees are concerned, Section 22 places a number of obligations on employees, including that they must take reasonable care to protect their own health and safety and the health and safety of other persons who may be affected by their conduct.

Where a failure by an employee to comply with a COP would also constitute a breach of the employee's duties in terms of Section 22 (or a breach of Section 84, 86(1) or 88), the employee could be criminally charged for such breach.
As is the case with employers, the inspectorate could issue instructions to employees in terms of Section 54 and failure to comply with such an instruction constitutes a criminal offence.

Employers should deal with breaches by employees of the COP in terms of the Mine's SOP's and disciplinary procedures. This is not the responsibility of the State.

4 Members of Drafting Committee

4.1 Consultation with Mine Health and Safety Committee

The OPS Manager will consult with the Mine Health and Safety Committee on the preparation, implementation or revision of this COP.

4.2 Appointment of Drafting Committee

The OPS Manager will appoint the committee tasked with drawing up this COP.

4.3 Composition of Drafting Committee

The OPS Manager will appoint supervisory as well as employee level personnel to the drafting committee. Drafting Committee (December 2013)

Full Name And Designation	Affiliation	Professional Qualifications And Experience
Hannes vd Merwe Production Manager	Management	BC Mining Engineering, 14 Years Mining related experience
Wynand Vosser	Management	B-tech Project management, 14 years Mining related experience
Louis Venter	Management	Higher Diploma in Health and Safety Management, 26 Years Mining related experience
Stephanus le Roux	Occupation Hygiene	Intermiddiate Certificate in Mine Environmental and Hygiene Control
Gert vd Bank Mining Manager	Management	BC Mining Enginering, 14 Years mining related experience
Jamal Sahib Plant Manager	Management	Bachelor of Engineering (Metallurgical Engineering), 8 years related experience
Dr. Mosterd	Life Occupational Health	General Practioner. MBCHB. 30 Years

Full Name And Designation	Affiliation	Professional Qualifications And Experience
Doret Fishchree District Sister	Life Occupational Health	Occupational Health Practioner. 20 Years
J Mackenzie	Occupation Hygiene	Certificate in Mine Environmental Control
Elrico Ferris	Specialist: Emergency Responce	Intermediate Life Support (5 Years) Fire Fighting Hazmat Technician (15 Years)

5 General Information

5.1 Locality

The Kalahari Manganese Fields, site of the Mamatwan Manganese Mine, are located in the Northern Cape Province of South Africa, 60 kilometres northwest of the town of Kuruman and 510 km west of Johannesburg. The average altitude of the mine is 1090m above sea level. The climate is predominantly dry and warm. During summertime, temperatures can rise to 45ºC whilst wintertime temperatures often drop to below freezing point. Rainfall is sporadic and the average annual rainfall of 300mm usually falls during the summer months.

5.2 Geological Setting

5.2.1 Overview

The Kalahari Manganese Field consists of five structurally preserved erosional remnants of the Hotazel Formation of the Transvaal Supergroup. The main manganese field extends continuously in a north-westerly direction between Mamatwan Mine and Wessels mines and is thirty-five kilometers long and five to twenty kilometers wide.

These deposits comprise the largest manganese resource in the world, with an area of 23,000 hectares and reserves estimated at thirteen billion tons of manganese ore.

Manganese mineralization occurs within banded iron rocks of the Hotazel Formation (Postmasburg Group) of the Transvaal Supergroup, with strata dipping generally to the west at two to five degrees. The primary manganese ores are substantially enriched by near surface supergene processes and by hydrothermal activity near fractures and dykes. These structural features are however not dominant enough in the Mamatwan Mine open pit to control the general rock mass behavior. Three manganese horizons occur within the Hotazel Formation.

At Mamatwan Mine the upper two horizons have been eroded and replaced by the Tertiary Kalahari Formation. This consists of Aeolian sand, calcrete, gravel and clay, with a maximum thickness of up to forty-five meters.

Figure 1: Regional map

The Kalahari Formation rests unconformable on the lowermost manganese horizon.

The thickness of the manganese is dependent on the extent of erosion that occurred prior to the deposition of the Kalahari beds and varies from nothing to forty-five meters. The Hotazel Formation conformably overlies pillowed basaltic and andesitic lavas of the Ongeluk Formation

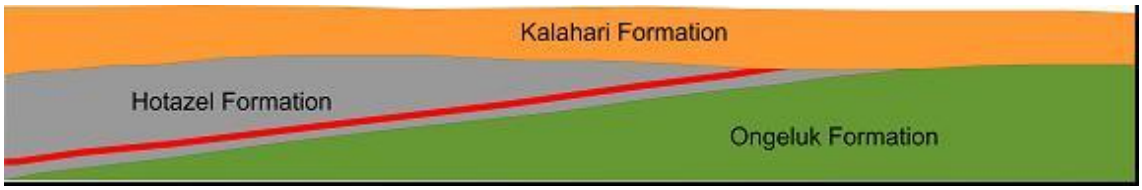


Figure 2: Generalized cross-section through the Mamatwan open pit (northwards)

5.2.2 Structural Geology

The manganese ore body sub-outcrops at the eastern edge of Mamatwan Mine. It then dips gently at some five degrees to the west and is continuous to the Middelplaats Mine, five kilometers away at the south western edge of the manganese field, where the ore is some four hundred meters below surface. Faulting with displacements up to nine meters has occurred and two directions of folding have given rise to gentle basin and dome structures. However these have had very little effect on mining operations, as the amplitude of the folding and the displacement on the faults is not significant. Some open fissures are present and do have an effect on the rock mass conditions in their vicinity but the orientation of the structures with regards to the high wall orientations, indicate that structures will mostly be approached at a 90° angle and should not have significant impact on high wall stability. At the same time the geological structures would not affect the stability of the Kalahari formation as it does not appear to extend into this formation.

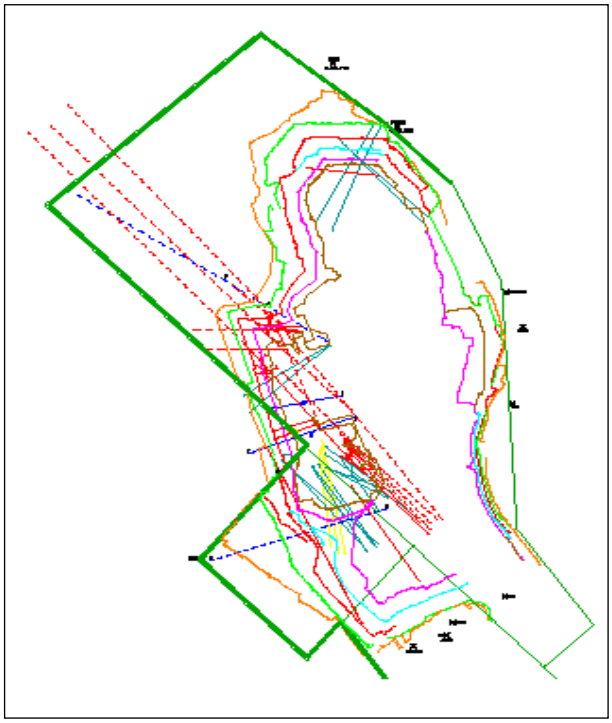


Figure 3: View westwards into Mamatwan Mine showing the structural disturbances.

5.3 Mining Environment

5.3.1 Ore Body Description

The manganese ore body lies within the Hotazel Formation and can be subdivided into three separate zones (see Figure 3).

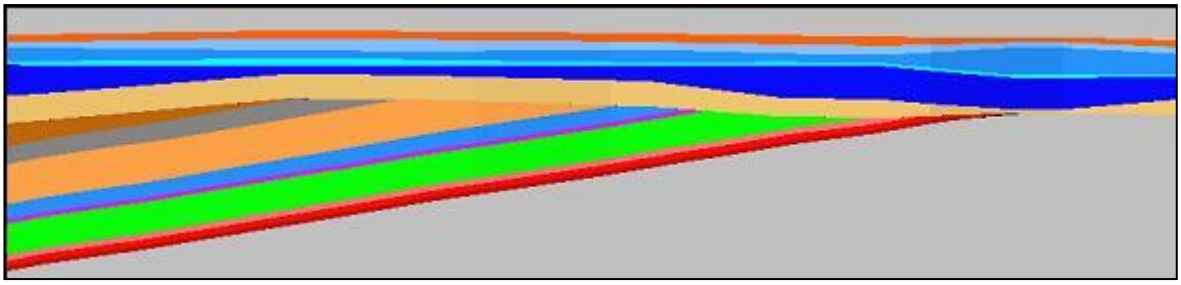


Figure 3 Cross-section through the Manganese ore body (shown in pinks and reds) and overburden zones.

The colors of the stratigraphy are explained in Figure 4.

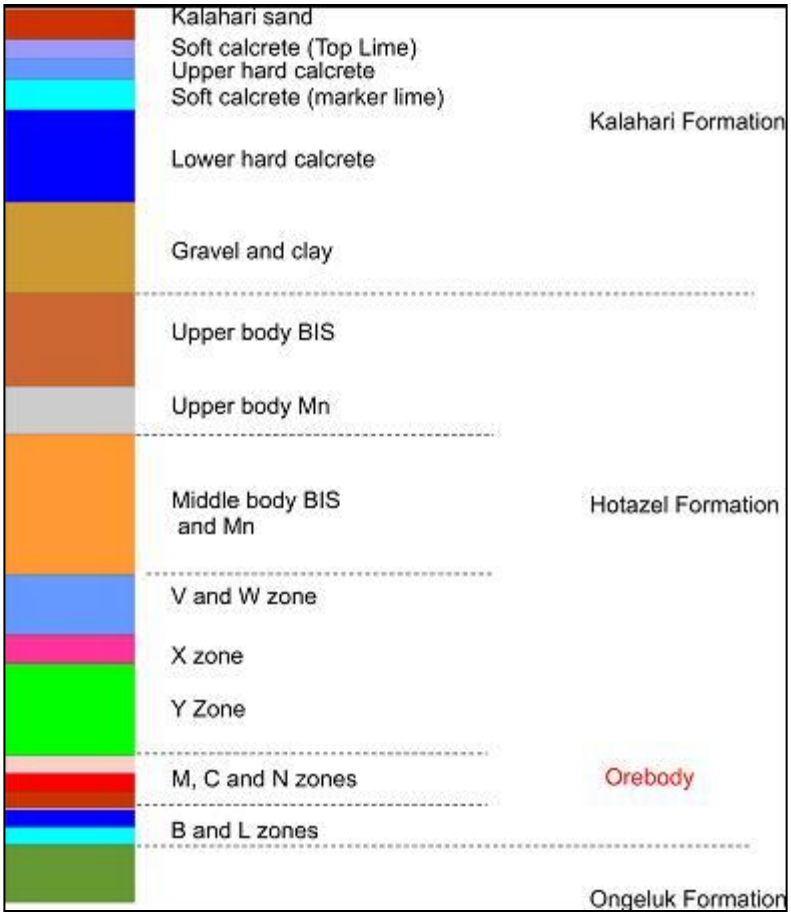


Figure 4 Stratigraphical column of Mamatwan Mine, showing the ore body and overburden

The lower zone or footwall is an uneconomic zone (B and L Zones), approximately 6 meters thick with an average manganese content of less than 30%. It is not mined and forms the footwall of the opencast mining operation where it is retained in situ.

The middle zone or economic zone (*M, C and N Zones*) has an average thickness of 19.5 meters, a manganese content of 38% and Mn:Fe ratio of 8:1 or better. This is either mined in one or two benches, depending on the thickness of the zone. The upper bench is maintained at a height of approximately 11 meters and the lower bench is variable in height depending on the overall width of the economic zone.

The upper zone (*V to Y Zones*) of lower grade manganese and slightly higher Fe is approximately 19 meters thick and averages over 30% manganese. This is mined as a single bench.

5.3.2 Regional Hydrology

Natural ground water levels are well below the current mining depth, generally resulting in a dry mine, but with the only exception being the tendency of the calcrete layers to hold water during the rainy season, which could result in slippery road conditions. It is uncommon to encounter water on the mining face, but water does tend accumulate in the boreholes drilled ahead of mining, creating problems with the explosives. Limited seepage within and below the clay layers are sometimes observed, but have been low enough not to affect stability of the high walls.

The following hydrological information was gathered by literature surveys:

- The topography slopes towards the north and has a gradient of 20m over 5000m, which is effectively 0.004;
- The catchment area has a mean annual precipitation of 344mm, with most of the rain occurring in the summer months. The climate is arid and the temperatures range from 40° C during the day in summer to 10° C during the day in winter;
- The Kuruman eye is a well-known regional spring, which originates from the Mooidraai dolomite formation. There are a number of springs in the vicinity, most of which are not currently flowing, nor is there evidence of the spring occurrence (e.g. oasis, local vegetation clustering, borehole development, canalization etc.);

The indication from a groundwater use survey is that the average water level is at 30m below surface.

5.3.3 Seismological Setting Of Mamatwan Mine

Seismic activity in this area is natural and not caused by mining activities. Information drafted from the United States Geological Survey in the form of a Seismic Hazard Map is presented below (Figure 5). The project area is located in the Northern Cape Province (red dotted circle) and is expected (with a 10% probability of being exceeded in 50 years) to experience peak ground acceleration levels of below 0.2m/s2. This low expected peak ground acceleration level yielded a Seismic Coefficient of 0.02 compared to a normally used value range of between 0.1 and 0.3. Due to this low value, seismic loading was excluded from all analyses and designs conducted for this project.

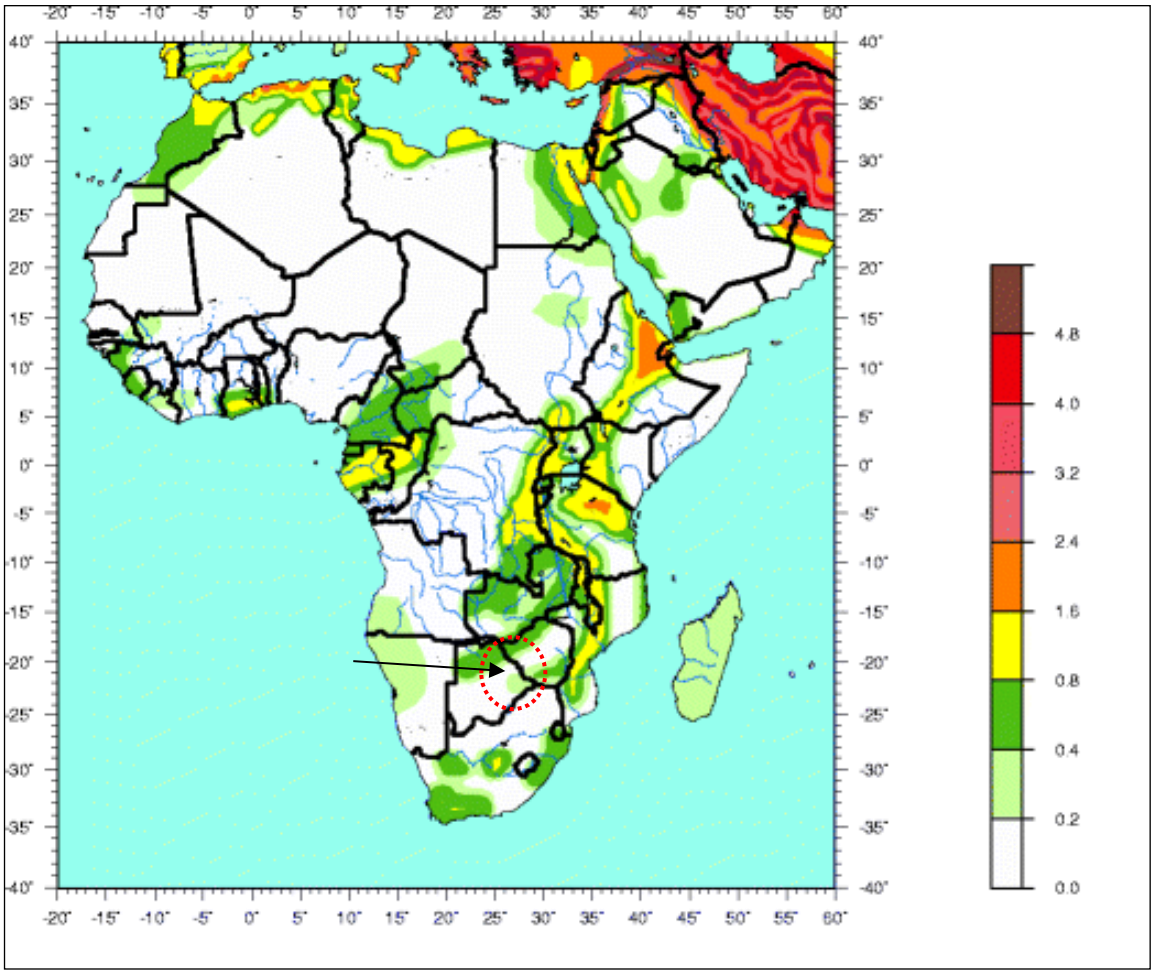


Figure 5: Seismic Hazard Plots for Africa (USGS)

Figure 6 shows seismic events (earthquakes) plotted within the boundaries of South Africa for the period 1990 to 2006 (Council for Geosciences). The absence of any large natural earthquakes close to the project area during this period confirms the appropriateness of excluding seismic loading on the high wall design at this stage.

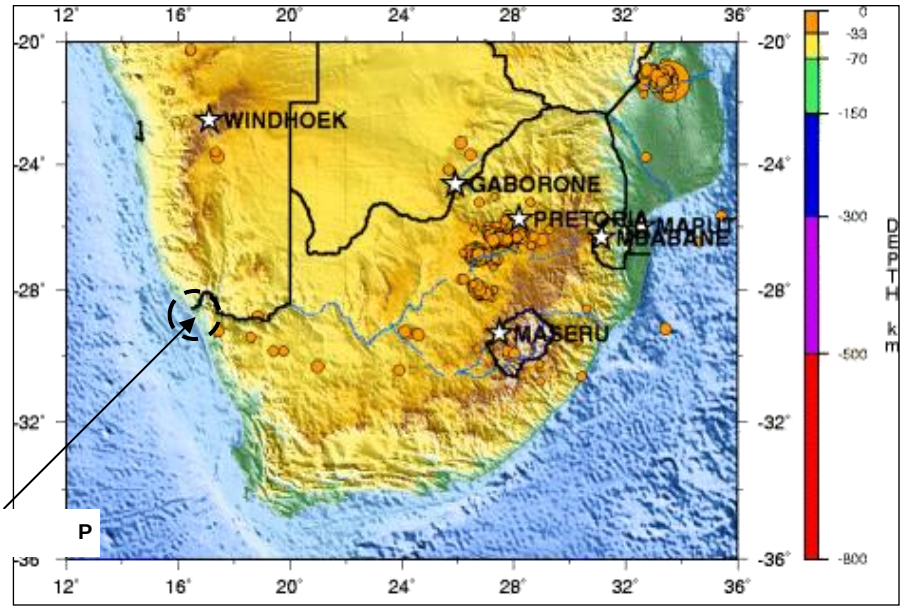


Figure 6: Seismic Event Plots 1990 – 2006 Southern Africa (CGS)

5.4 Ground Control Districts

5.4.1 Overburden

The overburden comprises all non-economical and sub-economic zones, from the surface downwards. They include the Kalahari sand, calcrete, clay, banded ironstone and low grade manganese (see Figure **4**). Overburden is pre-stripped from top to bottom in benches. The general thickness of the overburden ranges from 50 meters to 100 meters, with a weighted average specific gravity of 2,300 kg/m^3, derived mostly from the heavier Top Cut and Mid Lime Benches.

Owing to the low intact strengths, which dominate the characteristics of the upper zones of the overburden, the main geological hazards include the natural slope angle and stand up time of the benches after blasting. Because of the low overall pit slope angles, thorough cleaning of loose material (after the blast) and by widening the road width, these hazards can however be reduced.

Brittle geological structural features such as faults, shears and joints in the Kalahari sand and calcrete zones are so rare and small that they are un-important for the determination of the rock mass behavior of these zones. The rock mass behavior of the clays and gravels that may form part of the mid-lime bench is also not dominated by brittle geological features, but rather by the low strength of the intact rock.

The Rock Mass Ratings for all material types are summarized in Table 1 below.

Table 1: Rock Mass Rating Summary

Geotechnical Domain	Mean RMR_{89}	Min RMR_{89}	Max RMR_{89}	Std Dev RMR_{89}
Kalahari Formation				
Kalahari sand	*N/A*	*N/A*	*N/A*	*N/A*
Soft Calcrete	75.85	60.00	89.00	7.49
Hard Calcrete	75.85	60.00	89.00	7.49
Gravel	74.46	62.00	86.00	6.25
Clay	77.27	60.00	87.00	9.91
Hotazel Formation				
Banded Ironstone	65.05	49.00	71.00	6.82
Lower Body Manganese	70.18	57.00	76.00	3.72

Table 2: Rock Densities (Rocklab)

Rock Type	Density ($kg/m^{3)}$
Kalahari Formation	
Kalahari sand	1900.00
Soft Calcrete	2190.00
Hard Calcrete	2190.00
Gravel	2190.00
Clay	1980.00
Hotazel Formation	
Banded Ironstone	3156.00
Lower Body Manganese	3729.00

Table 3: UCS Test Results

Rock Type	Mean UCS (MPa)	Minimum UCS (MPa)	Maximum UCS (MPa)	Standard Deviation
Kalahari Formation				
Kalahari sand	*N/A*	*N/A*	*N/A*	*N/A*
Soft Calcrete	5.13	0.63	9.79	3.16
Hard Calcrete	19.65	8.14	33.55	8.78
Gravel	12.56	0.63	33.55	9.23
Clay	2.95	1.69	4.05	1.01
Hotazel Formation				
Banded Ironstone	295.56	165.46	446.83	96.41
Lower Body Mn	238.46	143.06	309.30	61.21

5.4.2 Field Estimates Of Strength

Reliable estimates of the strength and deformation characteristics of rock masses are required for almost any form of analysis used in the design of surface mining layouts. The strength and deformability of a jointed rock mass depends on both the properties of the intact rock pieces as well as the freedom of these pieces to slide and rotate under different stress conditions.

In order to use geotechnical software to model the response of the rock mass to mining induced stress changes (such as slope unloading), it is necessary to derive appropriate input parameters for the software package being used.

An empirical approach developed by Hoek (2002) was used in conjunction with the rock mass rating and laboratory data to evaluate the field strength, deformation and failure parameters required for the stability analysis. The ROCLAB program (from Rocscience Inc) is designed to calculate failure criteria for the rock mass based on the input of representative intact rock and rock mass parameters for each rock type or geotechnical domain.

In conjunction with appropriate assumptions regarding the disturbance factor (Hoek et al., 2002), this facilitates the calculation of site specific rock mass strength, modulus of deformation, friction and cohesion, as well as the Hoek-Brown failure criterion parameters mi, mb, s and a.

In order to develop appropriate failure criteria for estimating the strength and deformability of the rock masses present in the project area, three basic properties of each distinct geotechnical domain have to be estimated. These are:

- The Uniaxial Compressive Strength (UCS) of the intact rock,
- The value of the Hoek-Brown constant mi for the intact rock and,
- The value of the Geological Strength Index (GSI) for the rock mass.

Table 5 and
Table 6 summarize the field properties derived for the different rock types within each of the formations. Within these tables, the following symbols were used:

Table 4: Symbols

Symbol	Description	Symbol	Description
RMR_{89}	Rock Mass Rating – Bienawski 1989.	**a**	Power (Hoek and Brown failure criterion)
GSI	Geological Strength Index	□	Density
mi	Intact rock m-value (Hoek and Brown failure criterion)	**c**	Cohesion
D	Blasting damage rating	□	Friction angle
mb	Rock mass m-value (Hoek and Brown failure criterion)	**E_{def}**	Rock Mass stiffness
s	Rock mass s-value (Hoek and Brown failure criterion)	**s_{global}**	Rock Mass strength

Table 5: Rock Mass Field Properties (Kalahari Formation)

Rock properties	Units	Kalahari sand	Soft Calcrete	Hard Calcrete	Gravel	Clay
Mean RMR89	*N/A*	*N/A*	75.85	75.85	74.46	77.27
Min RMR89	*N/A*	*N/A*	60.00	60.00	62.00	60.00
Max RMR89	*N/A*	*N/A*	89.00	89.00	86.00	87.00
Std Dev RMR89	*N/A*	*N/A*	7.49	7.49	6.25	9.91
GSI	*N/A*	*N/A*	70.85	70.85	69.46	72.27
UCS (Mean)	MPa	*N/A*	5.13	19.65	12.56	2.95
UCS (Std dev)	MPa	*N/A*	3.16	8.78	9.23	1.01
UCS (Min)	MPa	*N/A*	0.63	8.14	0.63	1.69
UCS (Max)	MPa	*N/A*	9.79	33.55	33.55	4.05
mi	*N/A*	*N/A*	6.706	9.811	9.811	5.299
D	*N/A*	*N/A*	0.80	0.80	0.80	0.80
mb	*N/A*	*N/A*	1.183	1.730	1.594	1.017
s	*N/A*	*N/A*	0.012	0.012	0.010	0.015
a	*N/A*	*N/A*	0.501	0.501	0.501	0.501
□	kg/m3	1900	2190.00	2190.00	2190.00	1980.00
c	kPa	0	180.34	492.12	353.72	152.77
□	degrees	34	32.95	43.01	39.29	25.58

Rock properties	Units	Kalahari sand	Soft Calcrete	Hard Calcrete	Gravel	Clay
Edef	GPa	N/A	4.51	8.83	6.52	3.71
sglobal	MPa	N/A	0.84	3.76	2.28	0.47

Table 6: Rock Mass Field Properties (Hotazel Formation)

Rock properties	Units	Banded Ironstone	Lower Body Manganese
Mean RMR89	N/A	65.05	70.18
Min RMR89	N/A	49.00	57.00
Max RMR89	N/A	71.00	76.00
Std Dev RMR89	N/A	6.82	3.72
GSI	N/A	60.05	65.18
UCS (Mean)	MPa	295.56	238.46
UCS (Std dev)	MPa	96.41	61.21
UCS (Min)	MPa	165.46	143.06
UCS (Max)	MPa	446.83	309.30
mi	N/A	29.40	23.72
D	N/A	0.80	0.80
mb	N/A	2.73	2.99
s	N/A	0.002	0.01
a	N/A	0.50	0.50
□	kg/m3	3156.00	3729.00
c	kPa	17090.00	14414.00
□	degrees	34.69	35.43
Edef	GPa	10.70	14.38
sglobal	MPa	65.22	55.88

5.4.3 Ore Zone

The ore zone consists of the M, C and N zones (Figure **4**) mined up to a height of approximately 20 meters after the overburden were removed. The overall bench layouts are either mining perpendicular to the major structures. This reduces the probability of failure associated with these fissures.

In addition to these major discontinuities, several joint sets are present in rock mass.

Recent logging of boreholes in the area allowed the derivation of joint sets and orientations present within the Hotazel formation. It is clear that all joint set are steeply dipping while the flat dipping set in the BIF represents the bedding within this laminated body.

Table 7 Joint Sets and Orientations

Rock type	Joint set 1		Joint set 2		Joint set 3		Joint set 4	
	Dip	Dip direction	Dip	Dip direction	Dip	Dip direction	Dip	Dip direction
Banded Ironstone	88	164	88	029	80	121	01	099
Manganese	86	035	90	263	81	115	85	162

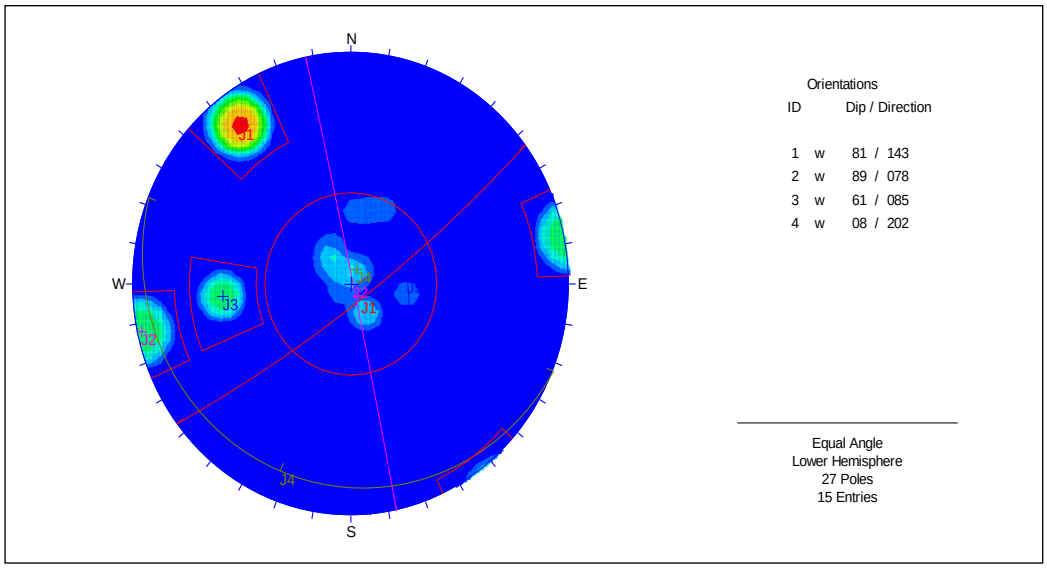


Figure 7: Example of DIPS Output

5.5 Mine Rock Fall and Slope Instability Analysis

5.5.1 Rock-Related Accident Statistics

Mamatwan mine is a safe opencast mine where the exposure of workers to hazards including fall of ground and rock burst occurrences is low on a general comparison to other mines. This can be seen in the following statistics.

Date	Description	Control Failure
20 Nov 2008	Excavator E5 was busy loading at Mid Mine when a big rock 1.5 x 1.5 x 1.8m dislodged from the high wall	Miner Geotechnical Assessment
20 Jan 2009	When loading overburden a rock dislodged from the high wall and rolled against E 10 Excavator damaging the rails and step.	Blasting Induced damage Miner Geotechnical Assessment
22 Jul 2009	Loading at Bottom Lime South with E12 when rock dislodged from High wall and struck hauler	Blast Induced damage Geology and Geotechnical Assessments

Basic cause:
Failure to identify loose rock. Poor illumination.
Poor loading practices

Basic cause:
Loading unsafe Muck pile due to bench height and blast fragmentation.
Substandard Loading pad

Basic cause:
Blast induced cracks interacting with planes in the calcrete.

Table 8

5.5.2 Incidents

The only rock related incidents that had occurred during the last 5 years occurred within the benches containing the clay layer:

- Loading operations undercut a calcrete bench by removing clay material from the high wall toe. This resulted in the overhanging calcrete collapsing to the bottom bench, damaging equipment;
- Time dependant creep of the clay toe of the high wall created tensile cracks above the high wall containing clay. These were recognised and remedial action put in place prior to any collapse occurring.
- Isolated failure on Bottom Lime South material due to geological formations of weathered material. Slight damages to hauling equipment occurred.

6 Terms, Definitions and Acronyms

Abbreviations and Definitions	
Abbreviation / Term	**Description**
SOP	Standard Operating Procedure
COP	Code of Practice
Mine Superintendent	A person that has been appointed by the manager to take charge of an area of the mine in terms of the Minerals Act No. 50 of 1999 and the Mine Health and Safety Act No. 29 of 1996.[MHSA]
Accident Investigation Team	Representatives of the Health and Safety Committee on the mine, who may co-opt any technical or other specialist, to investigate the accident.
Major incident	An occurrence of catastrophic proportions, resulting from the use of plant or machinery, or from activities at a workplace (normally level 3 and above)
Operations Supervisor	A person who is appointed by the manager to take charge of an area of the mine in terms of the Minerals Act No 50 of 1991, and regulation 2.15.1 and 2.9.2, and the Mine Health and Safety Act No 29 of 1996. [MHSA]
U/G	Underground
HOD	Head Of Department
HMM	Hotazel Manganese Mines
SAMRASS	South African Mines Reportable Accidents and Statistics System
OCC	Operational Control Centre
ECC	Emergency Control Centre
FRT	Field Response Team
BRT	Business Response Team

Abbreviation / Term	Description
IMT	Incident Management Team
EMT	Emergency Management Team
GLD	Group Level Document
BCP	Business Continuety Plan
CEM	Crisis and Emergency Management
CSG	Customer Sector Group
GMC	Group Management Comittee
MRS	Mine Rescue Services
DMR	Department of Mineral Resources

7 Risk Management

The HSEC risk management model, depicted in Figure 1, is intended to illustrate the critical elements in the risk management process. All of these elements are required to ensure that risks are effectively managed and reduced at all levels of organizational risk.

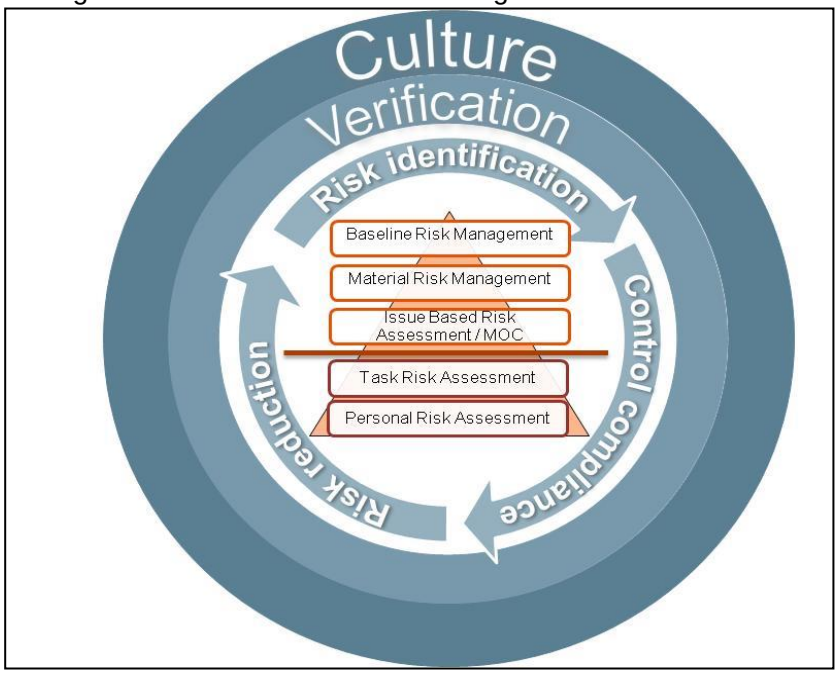


Figure 5: Manganese SA Risk Management framework

A Baseline risk assessment must be conducted to assess the mine wide hazards and associated risks. These identified hazards and risks are used to determine the material risk issues by applying the mandated materiality and tolerability. These material risks often relate to catastrophic consequences resulting from or may lead to the following:

- multiple fatalities;
- short or long term health affects leading to multiple fatalities, or significant irreversible human health effects to >50 persons;
- serious environmental effects, including impairment of ecosystem function;
- ongoing significant social issues;
- significant adverse attention from national media or non-governmental organisations (NGO), or loss of licence to operate.

Once these material risks have been identified, critical preventative and mitigating controls have to be designed, documented, implemented and monitored. An issue based risks assessment is conducted when there are changes to work, equipment or people. It is normally linked to management of change process that highlights the systems needed to support that change. All routine tasks are governed by standard operating procedures and safe work instructions.

A number of continuous risks assessments are conducted within the organisation which include task based and personal risk assessments to highlight on a regular basis the inherent risks of day-to-day activities.

The official approach to deal with all hazards identified and associated risks is to apply the Hierarchy of Control. This methodology applies a systematic approach to manage risks by first:

- Eliminate – remove the hazard from the workplace, task, process method or material (Most effective).
- Substitution – Replace the activity, process, material or substance with a less hazardous one.
- Engineering (Separation or redesign)- Isolate the hazard by using mechanical aids, barriers, machine guarding, ventilation, insulation, space or time.
- Administration- Establish policies, procedures, work practices and training programs to reduce exposure to risk
- PPE- provide suitable and properly maintained PPE to protect persons from hazards (Least effective).

8 Aspects to be Addressed in the COP

8.1 Emergency Preparedness Measure

8.1.1 Detection And Early Warning Systems

8.1.1.1 Lightning Detection

See OLD-MMT-MIN-SOP-001 – Lightning Detection. Early warning system via SMS messages to warn of lightning in the Mamatwan Mine area.

8.1.2 Communications Systems

Consistent and reliable communication forms the backbone of an emergency response and the procedures and schedules for the installation, operation and maintenance of these systems are essential.

- Hand-held radios are used for communication in all Mine areas. A local phone system (VOIP) and uninterrupted conventional lines are installed at all offices on the mine. All essential personnel have cellular telephones, and their number is available in the OCC.
- Communication systems are continually monitored and maintained. Systems are tested on a continuous basis.
- A “barking dog” telephone system is available from Mine Rescue Services for use in an emergency.
- A Satellite phone is available in the ECC for use during emergencies.
- A fixed line, unrestricted by area dialing, to facilitate calls to emergency equipment (material) suppliers and the requisitioning of rescue teams by mines rescue service provider;
- Telephone communication with all workshops.

External Services Contact Details

Kuruman Hospital	(053) 712 8100
Kathu Medi-Clinic	(053) 723 3231
Kuruman Fire & Disaster Management	(053) 712 0457
Life Health Clinic	(053) 742 2164/ 083 238 3136
Kuruman Ambulance Services	(053) 712 0457
South African Police Services	10111
Black Rock Mine	(053) 751 5209

UMK	(053) 742 3000

8.1.3 Emergency Medical Care

See “OLD-MMT-HSE-SOP-008 – First Aid and use of ambulance” for details.
First Aid is an essential component of the emergency response. Continual training and reviews are performed on First Aid and all supervisors are trained on the basics. First aid equipment is available in various designated areas and is marked on a map which will be kept in the individual areas. The supervisors of each section will be knowledgeable of these locations.

One of the first decisions required of the OCC and/or FRT/IMT is the Medical Care requirements of an emergency, and the required services should be contacted as soon as possible, e.g. airborne ambulance and road going ambulance. During this time access to site will be arranged for these Emergency Services.

Review, maintain and test First aid equipment, medical transport and processes on a monthly basis to ensure performance and reliability.

A medical emergency procedure that identifies medical support, personnel and response personnel, equipment, patient transportation including criteria for medical evacuation, medical facilities, response escalation and ongoing case management.

A medical Station and clinic is available at Mamatwan Mine for all emergencies on site. The Hotazel Clinic will provide further support and the Hotazel Clinic is set up to respond to Mine injuries and the transport of injured employees and is equipped with;

- 10 Medical/ Surgical Beds
- 2 High care beds
- Total of 12 beds
- Casualty room
- Radiology
- One General practitioner
- Three Full Time registered Nurses
- One Enrolled Staff Nurse
- Two part Time Staff
- Two Basic Ambulance Assistants

The Clinic also renders Occupational Health Services and plays an important role in the prevention of Health incidents

Their services include Medical Surveillance for Mine Workers, treatment of Mine accidents and injury on duty and the treatment of minor ailments.
When an incident is reported, the OCC will inform the Medical station/ Clinic of the incident with as much detail of the injuries as possible

The medical station/Clinic will handle each case as per protocol and in line with the Life OH services policies and procedures.
MMT Mine has an Emergency Medical Station on site that is manned with an advanced life support practitioner and a basic ambulance assistant on each shift and equipped by Life OH Services which includes an intermediate life support ambulance to render basic services and deal with emergencies.

8.1.4 Mine Evacuation and Escape Procedures

Evacuation procedures are an essential response measure, which is maintained continuously through awareness training, daily safety meetings and notice boards
Emergency Response Drills & Exercises

- Surface evacuation drills (All surface offices and buildings) to be conducted at least every 12 months and recorded by the person conducting the drill.
- Potential level 5 + response drills & exercises to be conducted on an annual basis and recorded by the relevant Mine Manager. A copy of the record will be forwarded to the Safety Superintendent for recordkeeping.

Lessons from all emergency response drills, exercises and incidents shall be documented, incorporated into revisions of procedures, plans and resources, and shared.
Emergency Exits available through neighboring, UMK and Tshipi mines. These agreements are in the process of being formalised.

8.1.5 Training and Awareness

Personnel assigned to crisis/emergency/incident teams must understand their roles and responsibilities and be familiar with emergency response systems and processes.

Training is therefore a vital part of ensuring crisis and emergency preparedness. When deciding on the appropriate frequency and level of CEM training, the nature and locations of activities and the risks being managed should be considered.

Emergency preparedness is also ensuring that all the necessary procedures are put in place so that loss of life/injury to personnel are kept to a minimum and damage to property or equipment in the event of any disaster is minimized.

Evacuation drills must be practiced to ensure that all personnel become familiar with the routine and the route for escape in the event of an emergency (i.e. explosions, fires, flooding, disasters of large proportions in their area, etc.) which threaten their lives.

Knowledge is a vital aspect of risk management and personnel are vigorously trained in the standards, procedures, requirements and policies of HMM. Training is a continual process.

Employees are trained during induction (periodic and on-site) on emergency evacuation procedures. Emergency drills are performed monthly by supervisors and a comprehensive emergency drill for the plants and mine respectively annually.

Supervisors are trained and in possession of valid first aid certificates.

Specialists are identified and trained for tasks such as search and rescue (includes Proto; FRT, Mine Rescue Services and Snake handling and Treatment).

Qualified medical staff is contracted through Life Occupational Health and a medical clinic is maintained at Hotazel town. This includes doctors, nurses, ambulance drivers and paramedics.

Proto Teams training scheduled per MRS requirements.

8.1.5.1 IMT Training Matrix & Schedule

FRT and IMT Training Schedule				
Response Level	**Training**	**Date**	**Specific Exercise**	**Outcome**
All	Induction	Within one month from joining	Induction	CEM Training
All	Call Out Test	Once a Quarter	Test all Emergency Response Numbers	Test all Emergency Response Numbers
Level 1-5 Every 4 Months	Desktop Exercise	August	CEM Training	CEM Training for IMT Team
	Desktop Exercise, Material Risk 1	February	CEM Response Exercise	Material Risk Response
	Desktop Exercise, Material Risk 2	June	CEM Response Exercise	Material Risk Response
	Desktop Exercise, Material Risk 3	September	CEM Response Exercise	Material Risk Response
Level 1 – 5 Annual	Desktop Exercise	March	CEM Response Exercise involving EMT	Material Risk Response Exercise with EMT

8.1.5.2 FRT Members Training Matrix

Training Module	Initial Training	Refresher Training
Confined Space Rescue (5 Days)	On joining team	Every Second Year
High Angle Rescue (5 Days)	On joining team	Every Second Year
Self-Contained Breathing Apparatus (2 Days)	On joining team	Annually
Introduction to Hazardous Material (1 Day)	On joining team	Annually
Intermediate Petrochemical Fire Fighting Course (2 Days)	On joining team	Annually

FRT Members should be fully trained on all the listed courses within 6 months of joining the team

8.2 Emergency Response Measure

8.2.1 Rescue and Responce Capabilities

Personnel trained to administer first aid are available on every team in the working place. All workshops, LDV and other designated areas are equipped with first aid equipment. Rescue and Response Capabilities - see first aid and use of Ambulance SOP.

FRT and IMT teams have been elected/nominated and is trained in the managing of emergency response management.

Mamatwan has access to an onsite medical station, a medical station at Infra, Ambulances, fire trucks as stated in this COP to react to all identified risks and possible emergencies.

FRT members are trained to respond to all anticipated emergencies from the risk assessment.

First Aid

See “OLD-MMT-HSE-SOP-008 – First aid and use of Ambulance” for more detail. First aid and Ambulance services are available at designated areas as stipulated in the First aid and Ambulance SOP.

8.2.1.1 Operational Control Centre

The OCC is the hub for emergency response; emergencies are reported with the 2444 number. Emergency contact details for Management, Emergency Services and Municipal role-players are kept and maintained in the OCC.

The OCC Controller will collect the following basic information upon receiving an Emergency Call. This may differ slightly depending on type of emergency.

Detailed Information to be collected for various types of emergency situations will be kept and maintained in the OCC.

- Name of Caller
- Nature of Emergency
- Telephone number or preferred means of communication and location
- Establish Callers Safety
- More detail regarding nature of Emergency like number of injured
- The OCC operator chooses the level of response when an incident is reported, and which emergency measures are implemented.

The OCC operator notifies the clinic and gives the following information:

- Name of Caller
- Telephone Number
- Type of Emergency (Mine Accident, Vehicle Accident or Assault)
- Location of Casualty (Exact Description)
- Number of Injured and Type of Injury (Major Life threatening, Minor Need medical assistance before transport, Transportable.)
- The doctor on call will decide on patient transport (ambulance, airlift, etc.) For any injuries to head, back or abdomen the ambulance must be used.

Depending on the Incident / Emergency the OCC will mobilize FRT. For incidents of a less serious nature the Senior on standby will be notified as well as the HSEC person on standby. The Senior on standby will call the Manager on standby who will call the Operations Manager. On instruction from the Operations Manager, the IMT will be mobilized.

With the assistance of the supervisor or other responsible person the documents for the clinic will be completed for all injured personnel. The medical response team will collect these forms with the injured personnel upon their arrival at the mine.

The forms to be completed are the following:

- ***Notification of Injury*** for all personnel
- ***RMA(Rand Mutual Assurance)*** for HMM employees and certain contractors
- ***WCL2*** for Contractors
- ***Request for Medical Evaluation and Medical Report (HMM-HSEC-FRM-002)*** for all personnel, when a drug/alcohol test needs to be performed.

OCC personnel will ensure that the ambulance or any other response vehicle have access to the property and will arrange for escorts to accompany emergency response vehicles and personnel to the scene of the emergency.

8.2.1.2 Emergency Control Centre

A fully equipped ECC Room is located in the Mamatwan Main office building.

The first person to arrive at the ECC is to commence preparing the room for the IMT .As soon as the IMT convenes, an initial team briefing should be held. This brief should be conducted and coordinated by the IMT Leader, with the various IMT members having specific information gathering responsibilities.

The member responsible for Operations should be prepared to brief the IMT on the latest incident information which he/she would have received directly from the person reporting the incident.

A checklist to follow during the initial briefing is attached as Appendix 4.

8.2.1.3 MMT Clinic an Ambulance

MMT Mine has an Emergency Medical Station on site that is manned with an advanced life support practitioner and a basic ambulance assistant on each shift and equipped by Life OH Services which includes an intermediate life support ambulance to render basic services and deal with emergencies. All IOD cases will be stabilized by MMT clinic personnel and transported to Hotazel Clinic to consult with OHP.

8.2.1.4 Hotazel Clinic & Ambulance

The Hotazel clinic is staffed and maintained to deal with minor to serious injuries, an ambulance is maintained at the clinic.

The ambulance is parked at the Clinic during weekdays (07:30 – 16:00) and at the house of the ambulance driver or at Hotazel security after 16:00.

Life Occupational Health ensures the ambulance is serviced on a scheduled basis and kept in a roadworthy condition at all times. The ambulance is cleaned on a daily basis and after each incident.

Clinic staff carries out a daily examination and logs the condition of first aid equipment and apparatus in the ambulance. A spare set of keys to the ambulance is kept at the clinic. OHP will refer injuries to appropriate medical facilities and Life personnel will arrange transport.

8.2.1.5 Air Ambulance

The OHP will activate the air ambulance, with the approval of the MMT manager.

The Johannesburg ISOS (Emergency Response Contractor) Alarm Centre Number is (011) 541 1350/1300, Fax (011) 541 1058.

In the event of any issues arising these can be escalated to the ISOS Country Medical Director, or the ISOS Medical Director, via the Alarm Centre, but only when the OHP or appropriate Life personnel is not available

8.2.1.6 Surrounding Mines

Standing arrangement exist with surrounding mines for use of their emergency personnel in times of need.

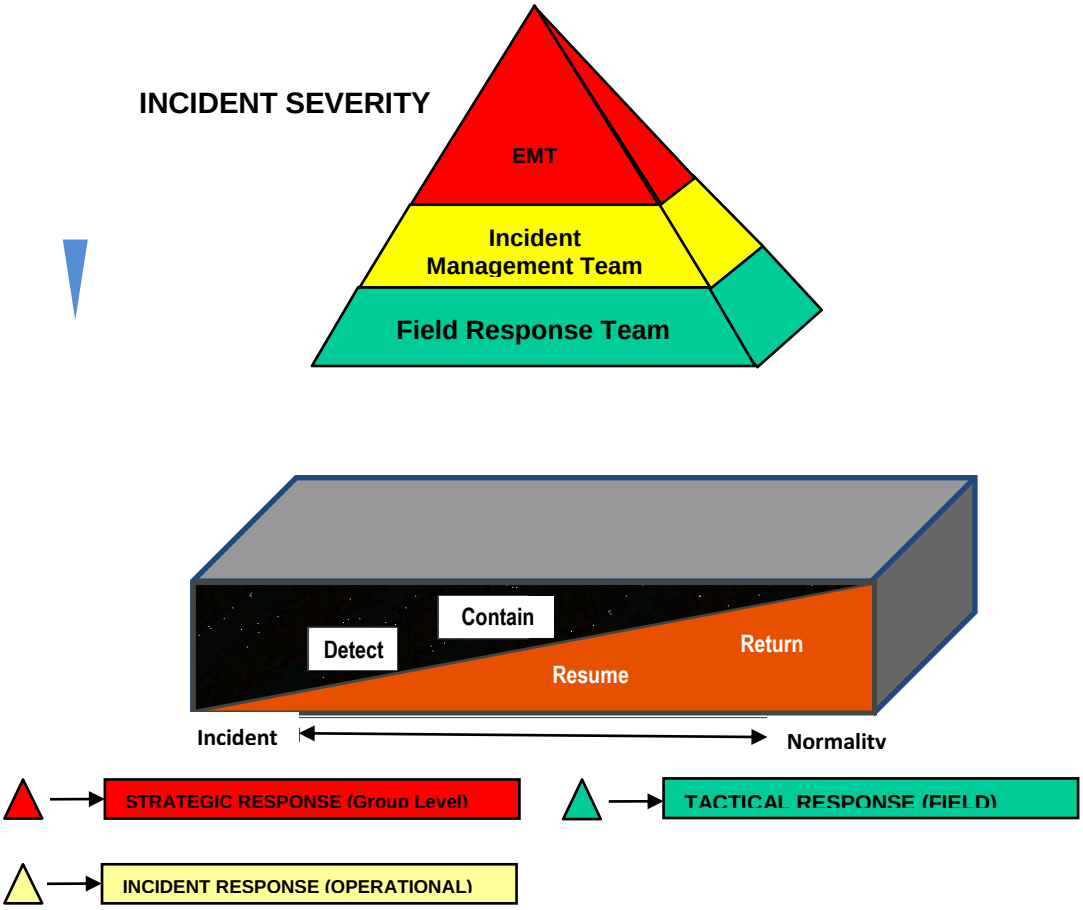
8.2.1.7 Mine Rescue Services (PROTO)

It is the responsibility of the IMT (Manager in charge / on call) to instruct the OCC Controller to mobilize the FRT team, IMT team and other emergency response services required.

Proto team rooms are maintained at Wessels Mine, and Proto teams are called in when and as required. The Wessels team will be called out immediately in case of emergencies and backup teams are called in as required by Mine Rescue Services. Backup teams are available from neighboring mines including Black Rock, Finsch, Koffiefontein, Kimberly and Welkom.

8.2.2 Management of Emergencies

This COP provides Emergency Preparedness and Response guidelines for the Field response Team and Business Response Teams.


INCIDENT SEVERITY
EMT
Incident Management Team
Field Response Team
Contain
Detect
Return
Resume
Incident
Normality
STRATEGIC RESPONSE (Group Level)
TACTICAL RESPONSE (FIELD)
INCIDENT RESPONSE (OPERATIONAL)

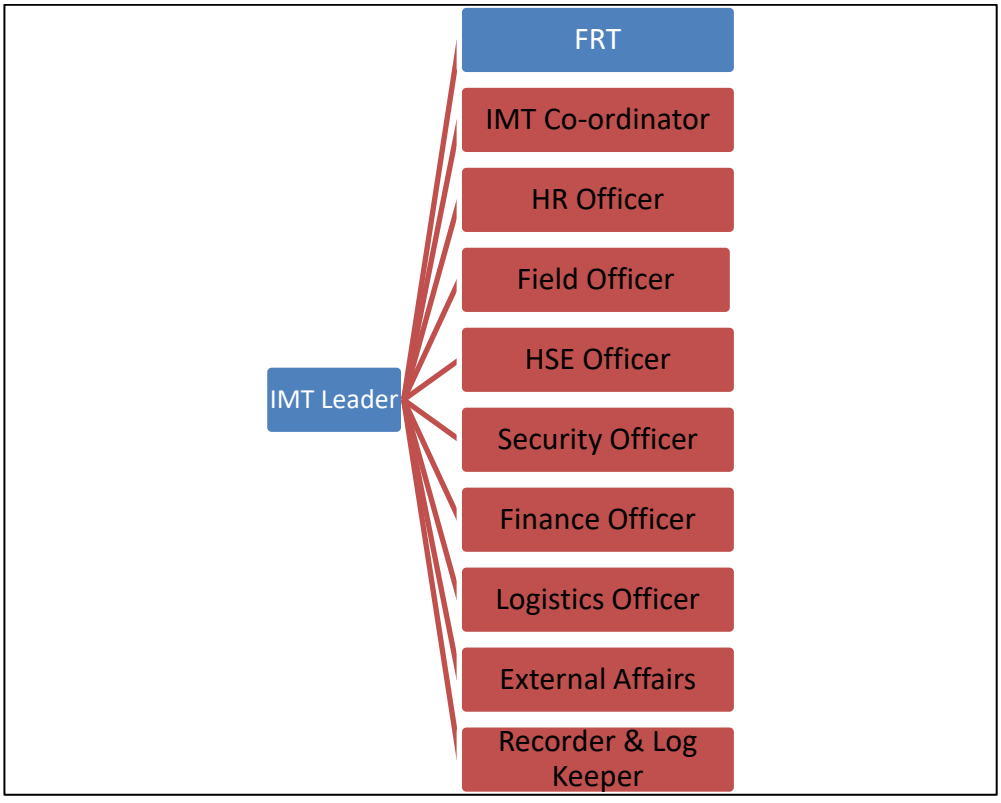
8.2.2.1 Emergency Management Team (EMT)

The role of EMT, which is located Melrose Arch, is to provide support to the IMT, to manage the emergency from a regional perspective. The EMT must take the lead in communicating with the media and other key stakeholders, if required. The EMT must also liaise with the relevant senior stakeholders.

8.2.2.2 Incident Management Team (IMT)

- The Incident Management Team are located at the Operation level – Mamatwan. The role of the IMT is to immediately respond to an emergency, and contain and control the situation. While the IMT is primarily focused on the incident response, it should keep the EMT informed of the emergency's impact on employee health and safety, and business continuity. The role of the IMT is to support the Field Response Team(s) and manage the emergency at a tactical level. This team provides direction in resolving the incident and safeguarding employees, third parties, the community, the environment, assets and earnings, and company reputation. This document relates directly to the responsibilities of the IMT and FRT at Mamatwan.
- Additional members may be co-opted to assist the IMT if deemed appropriate by the IMT Leader

8.2.2.3 IMT Structure



Names and contact details of IMT members for Mamatwan as listed in APPENDIX 7. Responsibilities of team members as defined in this plan.

8.2.2.4 Field Response Team (FRT)

An onsite Field Response Team who are equipped and resourced to immediately respond to incidents or emergencies, containing and controlling the situation at the source. The FRT will report to the Business Response Team and will consist of the onsite FRT team in liaison with the Wessels Proto team, Wessels Fire Team and Life Ambulance Service and on site Medical Resources.

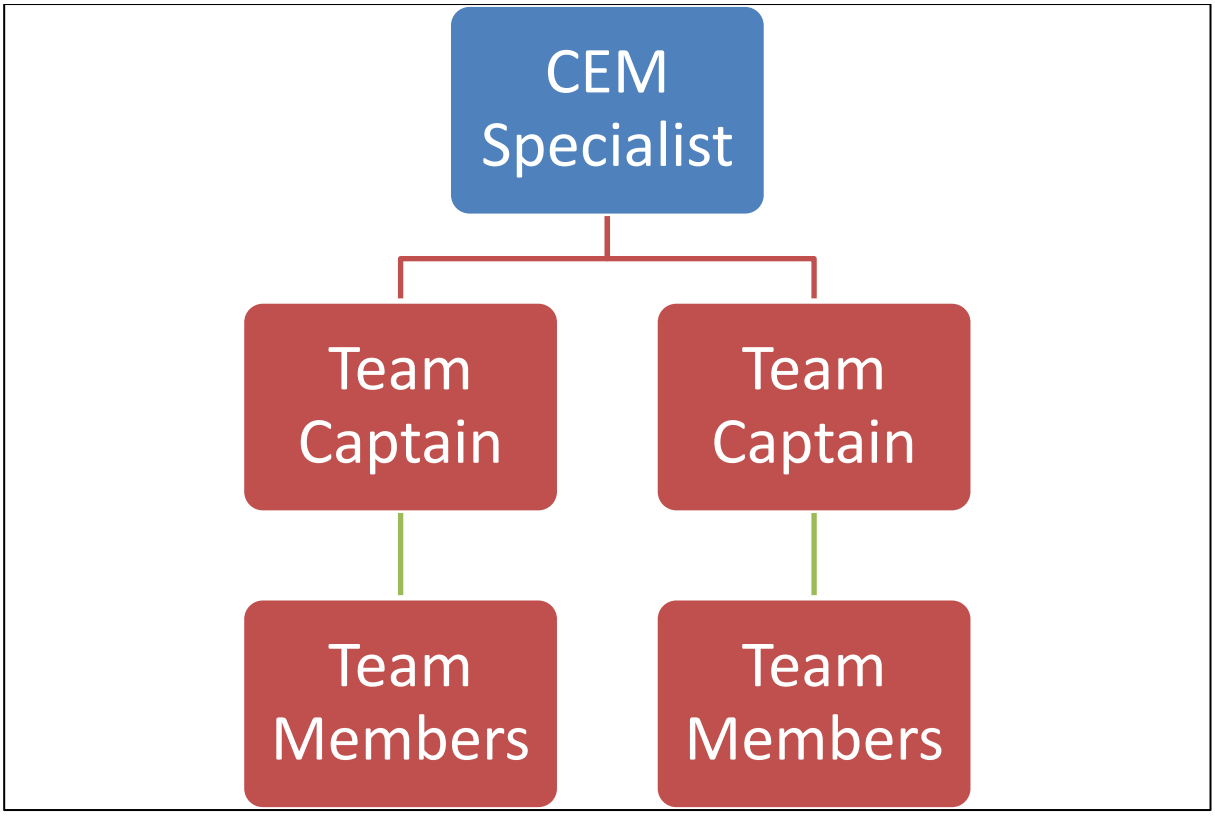


Figure 8

8.2.2.5 OCC (Operational Control Centre)

The OCC is an essential part of the emergency preparedness system forming the central hub for communications. When an emergency situation arises the OCC is the first point of contact for all operations.

The OCC is responsible to evaluate all incidents and emergencies, and per the Crisis and Emergency Management Plan mobilise FRT and IMT. The OCC will coordinate all incidents and emergencies until the IMT (Manager in charge) arrives and take control of the situation.
Trained Controllers staff the OCC 24 hours a day, 7 days a week and 365 days a year.

8.2.2.6 ECC (Emergency Control Centre)

The ECC is an essential part of the emergency preparedness system forming the central hub for rescue and recovery operations. During serious incidents and emergencies, the ECC is the origin of all strategies, decisions and instructions to employees, emergency Rescue personnel and outside Agencies. Crisis and Emergency Management will be done for the ECC.

8.2.2.7 Procedure to activate CEM response

South32‘s risk rating scheme as per risk ranking matrix (See APPENDIX 4)

- The matrix is to identify levels of response:
  - IMT — activated at management‘s discretion to manage site-level incidents with a risk scheme rating.
  - EMT — activated at management‘s discretion to manage asset/business-level incidents with a risk scheme rating.

8.2.2.8 Incident Management Process – General

Incident / emergency reporting

- The witness to the incident must report the incident to the relevant Foreman on shift.
- Foreman shall notify the Control room (053 742 2444) and Line Management.
- The control room will require the following information:
- Name: Please give your name before starting to report the emergency
- Telephone number / Radio channel: ensure that the control room can contact you on this
- number / channel if more information is require. Do not use the phone / radio while waiting for the response team.
- Location of the emergency: It is important to give a detailed description of your location as well as the best route to get there. It is recommended that the foreman send somebody to escort the response team.
- Type of emergency e.g. fire, rescue, flooding (the type of emergency determine the resources and equipment dispatched)
- Brief description of incident: be as specific and detailed as you can to ensure the correct Response.
- The control room shall call the Health & Safety Official(s) and other relevant Mine Official(s) on stand-by

The relevant Mine Official on stand-by will notify the IMT leader of the emergency to activate the IMT in accordance with the incident severity.

In the interim the first aider / volunteer / on site medic if available, will apply the necessary first aid and wait for the permanent Medical Response Member to arrive at the scene and take over the patient.

Immediate Action during Any Emergency or Incident

- Commence rescue operations immediately.
- Do not take chances that will jeopardise the safety of rescuers.
- Render first aid to injured people.
- Send for the first aid attendant and the necessary first aid equipment.
- Send a messenger, with a note if possible to phone the following information to the OCC Tel. No 2444
    - Nature of the accident.
    - Nature of the injury/injuries.
    - Number of people trapped, injured or deceased.
    - The name of the working place where the accident happened.
    - The designation of the section.
    - The number of the telephone being used.
    - Location to where patients could be taken.
- Send for the Supervisor.
- State which of the following are required:
    - Medical assistance, Resuscitator, Rescue jacks, Additional support material, Additional Personnel to help with the rescue operation, are FRT / Proto Teams needed.
- The messenger must wait at the telephone for any further messages.
- Record the time of the accident.
- Record the company numbers of witnesses and select a continuity witness.
- This witness will accompany all fatally or seriously injured persons to specific location.
- The same witness will also accompany the ambulance either to the hospital or mortuary.

In case of a fatal accident or possible fatality:

- Do not disturb the scene of the accident, other than for rescue purposes.
- Barricade off the scene at the accident site.

8.2.3 CEM Teams Activation

The CEM activation and escalation to other crisis and emergency management structures within South32 is described in Figure below:

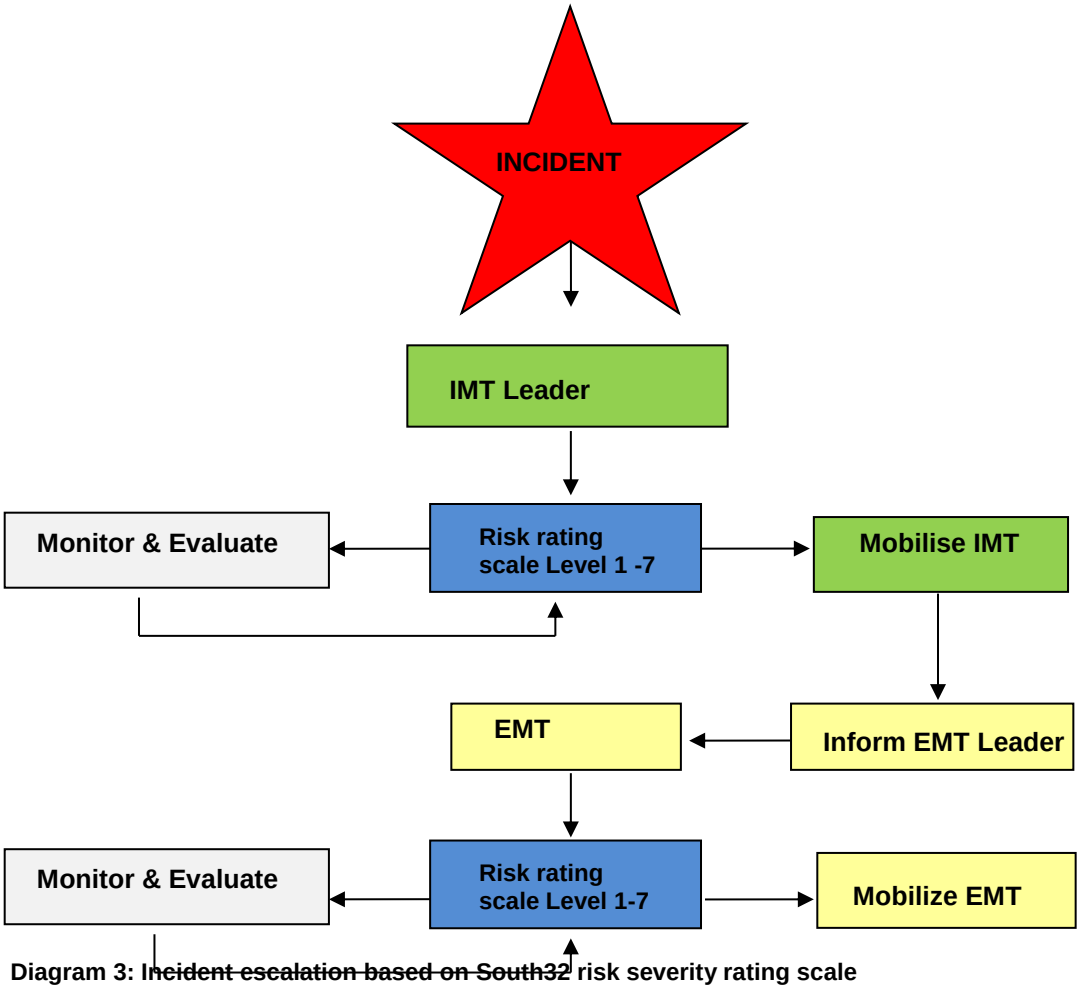


Diagram 3: ~~Incident escalation based on South32~~ risk severity rating scale

8.2.3.1 IMT Mobilization

Step	Elements	Who	Output
Gather key staff	Assemble staff	IMT Leader IMT Team	Focused Effort
Confirm situation	Provide known facts of the situation	IMT Leader	Common understanding across IMT
Assign key function group leaders	Duties should be tailored to Organisational needs identified (personnel, etc)	IMT Leader	Focused Effort
Identify critical tasks	Assign critical tasks	IMT Leader IMT Team	Focused Effort
Resources	Currently committed to	All	Administration and

Step	Elements	Who	Output
	the incident		logistics
Questions	Questions Confirmatory questions for the meeting	All	Clarification
Timings	Critical known timings Initial response timeline Next meeting	IMT Leader IMT Team	IMT coordination

8.3 Reporting and Recording

- Check / Test First aid, early warning and other emergency equipment on a monthly schedule.
- Sectional Fire Drill (Monthly checklist filed at Risk Department)
- Ambulance Checks (Monthly filed at Life Occupational Health Clinic)
- Over inspections by Safety Department (Monthly filed at Risk Department)
- Ensure ECC comply to standards monthly.

8.4 Emergency Aspects Addressed in other Mandatory COPs

Doc. No.	Title
OLD-MMT-HSE-COP-002	Mandatory Code of Practice for an Occupational Health Programme on Personal Exposure to Airborne Pollutants for MMT
OLD-MMT-HSE-COP-006	Mandatory Code of Practice for Thermal Stress for HMM Mamatwan Complex
OLD-MMT-MIN-COP-001	Mandatory Code of Practice to Combat Rockfall and Slope Instability Accidents in Surface Mines at Mamatwan Mine

9 Emergency Response Objective

9.1 Prevention

Perform Risk assessments on tasks, duties, equipment, materials and the environment to identify hazards and reduce inherent risks. These risk assessments form the basis of all activity at HMM. Mamatwan Mine, manage risks with elimination, reduction, separation or controls.

- Eliminate inherent risks out of activities, equipment, etc. through design and planning.
- Reduce the likelihood of risks with technology, design, etc.
- Separate the risk away from the operator, equipment, material, or place it threatens.
- Control risks through procedures, PPE, training, verification (Planned Task observation) etc.

9.2 Emergency Methodology

To ensure a responsible approach to manage emergency situations, MMT Complex will define a scope of activities to manage the implementation and ongoing improvement of the emergency preparedness and response process.

Hazards shall be identified with inputs from:
The initial review

- Case studies, historical data and information from other mines
- Existing Codes of Practice
- Legal requirements and other requirements applicable to MMT Complex
- Material Risks, Fatal Risks and Risk Assessments
- Best Practice Principles
- Corporate recommendation for Best Practice

The associated risks identified from the hazards shall be prioritized using the Risk Assessment Methodology Procedure.

Existing controls shall be considered and evaluated for acceptability using the Risk Assessment Methodology Procedure. Where controls are inadequate or absent they shall be identified for action.

The requirements of preparing for an emergency shall be compiled considering:

- HSEQC implications (direct impacts as well as secondary or consequential impacts)
- Competency requirements
- Available control measures
- Requirements for monitoring and measuring
- Responsibilities and authorities
- Fatal risk register and learning registers
- Resource needs (equipment, people, power, additional assistance, etc.)
- Tools (Risk assessment methodology, historical data, Tools as per South32 Asset Protection Guidelines, etc.)
- Documentation needed (SOP's, checklists, forms, etc.)

From this activity actions shall be taken to prepare for all identified possibilities, which include but are not limited to:

- Incident assessment
- Mobilization
- Notification

- Response times
- Facilities
- Priorities
- Rapid deployment
- Family support
- Media (South32 Media response team)
- Telephone response team
- Documentation
- Training (competence and awareness)
- Job descriptions
- Budget
- Post incident management
- Networking
- Implementation
- Toolbox (which includes but not limited to):
- Emergency response plan
- Crisis and emergency protocols
- Evacuation plans etc.

An emergency response plan shall be compiled to make best use of and take cognizance of foreseeable emergencies.

Emergency strategies, where practicable, shall be tested by performing emergency drills. The success of which shall be evaluated and improvements introduced from the experience gained. The actions taken to prepare the emergency preparedness and response shall follow the same process as the original design, including but not limited to training and communication.

Response to actual emergencies shall be evaluated and improvements introduced in the same way that drills addressed.

9.3 Crisis and Emergency Management - CEM Preparedness

9.3.1 Preparation

Being prepared is fundamental to a timely and appropriate emergency response.

9.4 Assessment Criteria (Evaluation of Emergency Situation)

9.4.1 Incident Description:

- What has happened?
- Where has it happened?
- When did it happen?
- How & why did it happen?
- Who caused it?
- What is at risk?
- Is everybody accounted for (casualties?)

9.4.2 Incident Status:

- Contained or Escalating
- The potential to escalate - what is potentially at risk
- What are your objectives (what are you trying to make happen/prevent from happening)
- What actions are being taken?
- Who is taking them?
- Who is responding?
- What resources [equipment/manpower] are being used?

9.4.3 Incident Assessment:

- What are the health & safety issues?
- What is the likely environmental impact?
- Are there any social or cultural heritage issues
- What are the community, government, media and / or reputation issues?
- What are the legal implications?
- What is the operational impact - short, medium and long term?
- How effective is the response? What can the Emergency Management Team do to support the Incident Management Team?
- Immediately or longer term (Set date and time for calls between EMT and IMT).

9.5 CEM Levels of Response

9.5.1 HSE Consequence Severity Matrix

Use the HSE Consequence Severity Matrix **Appendix 5** to identify levels of response.

9.5.2 The Process to Manage how Responses to incidents with a MFL Exceeding 5 will be Coordinated with Head of Group Public Affairs:

Once an incident has been declared as an MFL ≥5, the IMT leader will;

- Confirm the severity of the incident,
- Draft content for notification to the Asset Present,
- Approves communiqué to be sent to asset President,
- Endorsement by HOF External Affairs,
- The Asset President briefs the EMT,
- Asset /CSG President approves communiqué,
- President sends communiqué to Head of Group Public Affairs, and Notification to Head of Group Public Affairs

9.6 Communication Procedure- Major Incident and Disaster

9.6.1 Purpose

To establish a communication procedure for all parties who are identified as having a legitimate interest in the disaster or crisis at any of the group operations.

9.6.2 Definitions

The definitions of major incident and disaster are in general terms and it remains the responsibility of the Chief Operating Officer and President after consultation with the OPS Manager to declare the incident to be a disaster or major incident. The following definitions will apply in terms of the requirements of this document;

9.6.2.1 Disaster

Any accident so big or sensitive it to be the best interest of the company to keep the media and other interested parties fully informed about the action taken to save those trapped or injured or to recover bodies.

9.6.2.2 **Major Incident**

Any health, safety, environmental, loss in production, loss in assets, labour actions and criminal activity events, impacting or having the potential to impact the business of the company due to the magnitude, duration or the influence on the image of the company

9.6.3 Policy

- It is acknowledge that various publics such as the authorities, employees and their representatives, the media, shareholders and associates and often the general public, may have a legitimate interest in the disaster or major incident
- It is specifically acknowledged that the press and other media have a role to inform the public about the crisis or disaster. This implies a collaborative relationship with the media, particularly in the form of timely and adequate disclosure of information in which there is public interest
- A policy of full disclosure will generally pursued subject to the following exception: - An essential delay , where premature and unilateral disclosure could constitute breach of faith with another party
- legal implications as a result of a disclosure , e.g. where incautious disclosure of information or comment could constitute proof of legal liability- Factual uncertainty of the event
- humanitarian considerations e.g. like withholding the names of accident victims until the next of kin is informed
- the confidentiality of particular business interest where it can be justifiable claimed that disclosure would not be in the public interest of any involved (In the instances indicated above it will be endeavoured to make some disclosure with the least delay)
- As a general rule the name ages and job titles of accident victims may be released to the media after their next of kin have been notified. Addresses should not be provided to protect the privacy of their next of kin.
- The media should generally be allowed access to the crisis or disaster site provided it does not interfere with operations and that they are accompanied by an appointed company official and it is safe to visit the area
- Media representatives are permitted to have access to hospital patients as long it is with the consent of the patient and approved by the hospital authorities. The company should not withhold permission for these visits
- Unless it cannot be prevented, the OPS Managershould not be the spokesperson to permit him to focus on the management of the crisis.

9.6.4 Employee Guide to Handling Enquiries

9.6.4.1 Next of kin enquiries

- Demonstrate care and listen carefully, but do not confirm an employee‘s condition.
- Inform the person that you are not an authorised spokesperson, and as such, you are not in a position to comment.
- Try to transfer the call to the Investor Relations and Communications group or Telephone
- Response Team.
- If unsuccessful, tell the person you will arrange for someone to call them back as soon as possible and log the call in the Telephone Message Sheet.
- Enter the enquiry details in the Communication Log Sheet.
- Ensure their call is returned promptly.

9.6.4.2 Media Enquiries

- Inform the person that you are not an authorised spokesperson, and as such, you are not in a position to comment or provide detailed information.
- Tryto transfer the call immediately to the Investor Relations and Communications Advisor or the Media Response Team.
- If unsuccessful, tell the caller that someone will call them back as soon as possible and ensure this occurs.
- Log the call in the Telephone Message Sheet, including as much detail as possible about the enquiry and deadlines.
- Log the enquiry on the Communication Log Sheet.

9.6.4.3 Government Enquiries

- Inform the person that you are not an authorised spokesperson, and as such, you are not in a position to comment or provide detailed information.
- Try to transfer the call immediately to the Government Relations group.
- If unsuccessful, ask for the nature of enquiry, noting the details on a Telephone Message Sheet.
- Log the enquiry on the Communication Log Sheet.
- Tell the person you will arrange for someone to call them back as soon as possible.

9.6.4.4 General Enquiries

- Inform the person that you are not an authorised spokesperson, and as such, you are not in a position to comment or provide detailed information.

- Try to transfer the call immediately to the Telephone Response Team.
- If unsuccessful, ask for the nature of enquiry and log the details on the Telephone Message Sheet.
- Log the enquiry on the Communication Log Sheet.
- Tell the person you will arrange for someone to call them back as soon as possible.

9.6.4.5 Actions to be taken

- ***OPS Manager***

  Inform the Vice President Production and President Manganese immediately, irrespective of the time of the day of a disaster, a fatality and major incident.

  The notification to include as much as possible information on the disaster, fatality or crisis.

In the Case of a Disaster or Fatality the Following to be Reported;

- Exact time, location and nature of the accident
- Fatalities, injuries persons trapped, missing or unaccounted for
- Total number of people affected by the accident
- Names of the deceased, missing or trapped persons and or seriously injured
- Details of rescue operations and expected timeframe of the rescue work to be completed

In the Case of Any Other Major Incident, the Following:

- The nature of the incident
- Locality
- Potential impact on health, safety, environment, assets, production or labour relations
- Expected duration of impact
- Potential impact on public relations.
- Refer all media enquiries to the Vice OPS Managerand President Manganese until such time the Crisis Management Committee has been convened.
- Assist in the establishment of the Crisis Management Committee Control room and Crisis Communication Control room.
- Designate senior staff to support the crisis management control and the crisis communication committees
- Inform the relative authorities and relatives concerned
- Keep own employees informed
- OPS Manager and President Manganese SA
- Inform the Chairman irrespective of the time
- Inform and convene the Crisis Management Committee if it is an major incident or disaster
- Appoint spokesperson/media relations official to convene the Crisis Communications Committee

- Keep the Chairman informed as the situation develops.

9.7 Initial Briefing Checklist and Actions

9.7.1 Initial Actions In Case of an Emergency

The IMT Leader facilitates the initial briefing. The IMT Leader and the Coordinator should ensure that the briefing is kept short and effective.

IMT Leader:

- Introduces himself and establish team leadership
- Conduct roll call
- Brief the IMT / FRT on the incident using the checklist below

Coordinator – capture key information on the display boards in the IMT room (ECC)
Log keeper – Log time of briefing and capture key issues and actions in the Issues/ Actions log.

9.8 Other Relevant Reference Documents

- HSEC Consequence and Severity Ranking Table
- South32 Crisis & Emergency Management Organisation
- South32 Corporate Crisis Management
- First aid and use of Ambulance
- Business Continuity Plans

9.9 Review and Maintenance Schedule

In addition to the periodic review (two yearly) required by Section 11(4) of the MHSA, this COP will be reviewed and updated after every Emergency or Crisis situation or if significant changes are introduced to procedures, processes, equipment, material etc.

The following emergency contact details are required on the network, in the ECC and in the OCC:

- Hotazel Clinic, ISOS and AirPartner.
- Proto Team Captain and Members.
- FRT (Field Response Team)
- IMT (Business Response Team)

Check and test emergency numbers on a monthly basis.
The following contact details are required on the network, and in the OCC.

- General Manager, Mine Manager, Engineers and level 2 personnel.

- FRT (Field Response Team)
- IMT (Business Response Team)
- Wessels Proto Team
- Standby Personnel
- Local Municipalities

Check numbers on a monthly basis.

9.9.1.1 Emergency Control Centre (ECC)

Emergency Equipment like plans, stationary, communication equipment, documentation and information is available in the ECC. Equipment is checked and tested once a month. See Appendix 4 attached for complete checklist.

9.9.1.2 FRT (Field Response Team) Room

- In an event of emergency a boardroom will be utilized as FRT room

9.10 Duties and Responsibilities of IMT during Emergency

Refer to Appendix 3

9.11 Potential Emergency Scenarios from Identified Material Risks

9.11.1 Emergency Response to Identified Material Risks

- The following are the identified Material Risks and their Emergency Response / Management Processes

Material or Fatal Risk / Emergency Incident	Reference emergency response / management scenario
Uncontrolled movement of ground	50065072 Bench & Dump Height Width Angle 50065074 Workplace Safe Declarations 50065075 Catchment & Safety Berms 50065073 Design & Exec of Drilling & Blast MMT-COP-002 – Rock fall and Slope Instability. MMT-MIN-SOP-007 Geotechnical Controls.
Fire in mobile equipment	CTRL-0004596 Fire suppression system (manual and automatic) CTRL-0004593 Heat shields around critical heat

Material or Fatal Risk / Emergency Incident	Reference emergency response / management scenario
	components of mobile equipment CTRL-0004595 Fire Wall - Separation of heat components and fuel source (not haulers) TMM COP and MMT-ENG-SOP-007
Vehicle to vehicle / pedestrian interaction	50074526 Intolerable Conditions Suspension 50074527 In Vehicle Monitoring System 50061702 Brakes Steering & Tyres 50071082 Two Way Radio Communication 50072244 Vehicle/Pedestrian Sep - Plant: Vehicle & Pedestrian separation - Plant 50071705 Vehicle/Pedestrian Sep - Mine 50072239 Trained & Competent Operators TMM COP and MMT-ENG-SOP-007: Collision Avoidance and MMT-ENG-STD-009: Traffic Management COP. Collision Avoidance Standard.
Exposure to electrical sources	50072208 Isolation Lockout & PtW 50073774 Earth Leakage - MMT 50073775 Flash Suit - MMT 50072207 Voltage Reducers MMT-ENG-SOP-002: Isolation and Permit to Work.
Entanglement and Crushing	50072168 Guarding 50072166 Isolation & lockout 50072175 Safety Devices MMT-ENG-SOP-006: Safeguarding of Equipment.
Fall from Height	50072201 WAH Competency & Training 50072198 Fall Arrest Protection 50072200 Barricading To Restrict Access 50072199 Fall Prevention Systems MMT-ENG-SOP-005: Working at Heights.
Plant structures could fail while personnel are in the area	50067324 Structural Integrity Insp Strategy MMT-ENG-STD-005: Civil Standard. Chapter 7.7.7
Dropped objects from suspended load	50072185 Drop Zones (MMT) 50072184 Rigging Lifting Comp & Training 50072299 Safety Devices for Lifting MMT-ENG-SOP-004: Lifting Operations.
Rail Loading Operations incident	50072179 Siding And Locos Access Control 50072144 LOS Comp & Training 50072183 Automatic Sample Cutter 50072177 Two Way Radio Com Protocol

Material or Fatal Risk / Emergency Incident	Reference emergency response / management scenario
	50072270 Separation Dedicated Walkway 50072145 Loco Park Brake And Deadman
Uncontrolled detonation of explosives	50074889 Access Control of Blast Block CTRL-0005976 AXXIS blast initiation system (Electronic blasting method) - 50073659 Compliance To Magazine License MMT-MIN-SOP-012: Blasthole charging operations, MMT-MIN-SOP-013: MMT Mine Opencast Blasting Operations, MMT-MIN-SOP-014: Destruction of Old Explosives, MMT-MIN-SOP-105: Transporting of Explosives, MMT-MIN-SOP-016: Management of Explosive Magazine. Chapter
Tyre explosion and dislodging of split ring	50073629 Daily Tyre Monitoring 50074986 Automatic Programmed Inflator TMM COP

Emergency Response Scenarios – Material Risks

9.11.1.1 Uncontrolled Movement of Material

The aim of this section is to direct the sequence of events in the case of an uncontrolled fall of ground with the view to minimize injury to people and/or damage to equipment and loss of production

- All fall of ground occurrences to be reported to the Shift Supervisor who in turn must report it to OCC.
- OCC controller to record incident on incident notification form
- OCC immediately inform the Mine Superintendent, Mine Manager, Rock Engineer, HSEC Superintendent and other responsible persons, according to Call Out list.

Supervisor:

- Barricade the area off
- If the fall of ground occurred in an access route, a guard must be placed to prevent entry into the area.
- Ensure to keep the area undisturbed until the investigation team have arrived and declared the area safe.
- Investigate the fall of ground and rehabilitate as per investigation team recommendations
- Emergency Response personnel to respond with the necessary, rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Establish an Incident Command post

- Ensure that nobody enters the area without the permission of the Incident Commander
- Determine status of all personnel.
- Identify the environmental impact and provide advice on evacuation requirements.
- Secure and contain the site. Remove non-casualties to a safer location.
- Activate specialist resources as appropriate (Rescue SA. Local authorities etc)
- Commence logistic planning to ensure continuation of the response, i.e.:
- Timbers, pneumatic equipment
- Earth moving equipment
- Supplies (Hardware, timber supplies, earth moving equipment)
- Logistics (Rehydrating and rehabilitation for emergency personnel)
- Utilities (power, gas, etc);
- Transportation;
- Human resources; and
- PPE.

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in a safe area, traffic, wind direction and easy access considered
- Operational Scene Safety:
- Take reasonable measures to make the scene safe. (Barricade, crowd control & traffic management.)

Equipment Staging Area:

- all the correct necessary equipment is accessible and visible for use
- Personnel & Casualty Safety considered:
- Primary stabilization done for the quick access to the casualty and rapid examination for vital function (As per protocol) should be performed
- Triage area established according to protocol
- Proper patient care is given to the casualty as prescribed by protocol.
- If no spontaneous breathing is noted, or cardiac arrest has occurred, immediate cardiopulmonary resuscitation (CPR) is required
- Identify the receiving hospital(s).
- Transportation of the casualty to the receiving facility is communicated and prioritized
- List of patient(s) send to hospital(s)

9.11.1.2 Fire in mobile Equipment

9.11.1.2.1 *Fire in mobile equipment*

- Do not attempt to manage the fire unless you can do so without any danger to yourself
- If the fire is manageable, extinguish the fire by aiming the extinguisher at the base of the fire
- Report the fire,
- Move to a safe area

- Ensure no person comes in danger zone of fire
- Call out the surface fire team

9.11.1.2.2 *Fire Outside*

- Do not attempt to manage the fire unless you can do so without any danger to yourself.

- If the fire is manageable extinguish the fire by aiming the extinguisher at the base of the fire

- Assess the situation
- If possible sound the alarm
- Contact the security and/or control room
- Give the following information:

  - Fire location
  - Type of fire
  - If the electricity has been switched off or not
  - Any casualties who require medical treatment

9.11.1.3 Vehicle to vehicle / pedestrian interaction – On or off site

Emergency Response personnel to respond with the necessary rescue and medical equipment

- Clear the area, established a cordon and control access ASAP
- Emergency Response personnel to stabilize the scene, vehicle/ mobile equipment and the patients
- Inform FRT / IMT for the necessary back up if required
- Activate the necessary mobile cranes

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety: Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic management.)
- Equipment staging area: all the correct necessary equipment are accessible and available
- Personnel & Casualty Safety:

  - Primary stabilization done for the quick access to the casualty & safe operations.(inner & outer circle)
  - Isolate the battery & the keys of the vehicle or machinery.
  - Fire extinguisher placed in case of spontaneous ignition.
  - Windshield & airbag covers in place.
  - Proper patient care is given to the casualty as prescribed by protocol.

- Transportation of the casualty to the receiving facility is communicated and prioritized
- Identify the receiving hospital(s).

9.11.1.4 Exposure to Electrical Source

- Emergency Response personnel to respond with the necessary fire, rescue and medical equipment
- Clear the area, establish a cordon and control access ASAP

- In the case of mobile equipment arrange an additional truck to stop head to head with the “damaged” truck
- The operator then spot the oncoming truck to stop closely, allowing the rescuer to climb over safely without earthing himself with the ground
- The Isolation Officer to ensure that the current source has been isolated by shutting off the current
- Emergency Response personnel to ensure that the current source has been isolated
- Inform FRT / IMT for the necessary back up

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety:

Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic management.)

- Equipment staging area:
  - all the correct necessary equipment are accessible and available

- Personnel & Casualty Safety:
  - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
  - Fire extinguisher placed in case of spontaneous ignition.
  - Proper patient care is given to the casualty as prescribed by protocol.
  - If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
  - cardiopulmonary resuscitation (CPR) is required
  - Transportation of the casualty to the receiving facility is communicated and prioritized
  - Identify the receiving hospital(s).

9.11.1.5 Entanglement and Crushing

- Emergency Response personnel to respond with the necessary rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Emergency Response personnel to stabilize the scene, equipment and the patients
- Inform FRT / IMT for the necessary back up if required

- Activate the necessary mobile cranes

Incident Management

- Vehicles Staging area:

All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered

- Operational Scene Safety:

Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic management.)

- Equipment staging area: all the correct necessary equipment are accessible and available
- Personnel & Casualty Safety:

- Primary stabilization done for the quick access to the casualty & safe operations.(inner & outer circle)
- Isolate equipment and/or energy sources.
- Fire extinguisher placed in case of fire hazard.
- Proper patient care is given to the casualty as prescribed by protocol.
- Transportation of the casualty to the receiving facility is communicated and prioritized
- Identify the receiving hospital(s).

9.11.1.6 Fall from Heights

- Emergency Response personnel to respond with the necessary, rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Determine if an ascending or descending system be assembled with the necessary Bi-line
- Establish a proper anchor point
- Inform management for the necessary back up
- Commence with Rescue Operation

Incident Management

- Vehicles Staging area:

All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered.

- Operational Scene Safety:

Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic Management.)

- Equipment staging area:

All the correct necessary equipment are accessible and visible and available.

- Personnel & Casualty Safety:

- Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
- Fire extinguisher placed in case of spontaneous ignition.
- Proper patient care is given to the casualty as prescribed by protocol.
- If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
- Cardiopulmonary resuscitation (CPR) is required
- Transportation of the casualty to the receiving facility is communicated and prioritized
- Identify the receiving hospital(s).

9.11.1.7 Plant structures could fail while personnel are in the area

- Emergency Response personnel to respond with the necessary, rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Inform management for the necessary back up

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety:

Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic Management.)

- Equipment staging area:

All the correct necessary equipment are accessible and visible and available

- Personnel & Casualty Safety:

    - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
    - Fire extinguisher placed in case of spontaneous ignition.
    - Proper patient care is given to the casualty as prescribed by protocol.
    - If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
    - Cardiopulmonary resuscitation (CPR) is required
    - Transportation of the casualty to the receiving facility is communicated and prioritized
    - Identify the receiving hospital(s).

9.11.1.8 Dropped objects from suspended loads

- Emergency Response personnel to respond with the necessary, rescue and medical equipment

- Clear the area, established a cordon and control access ASAP
- Inform management for the necessary back up
- Obtain lifting equipment required for Emergency Response and Rescue

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety:
- Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic Management.)
- Equipment staging area:
- all the correct necessary equipment are accessible and visible and available

- Personnel & Casualty Safety:

  - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
  - Fire extinguisher placed in case of spontaneous ignition.
  - Proper patient care is given to the casualty as prescribed by protocol.
  - If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
  - Cardiopulmonary resuscitation (CPR) is required
  - Transportation of the casualty to the receiving facility is communicated and prioritized
  - Identify the receiving hospital(s).

9.11.1.9 Rail loading operation incident

- Emergency Response personnel to respond with the necessary, rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Inform OCC and management for the necessary back up
- Management to communicate with Railing authority to make arrangements for rescue operations.
  - Switching required
  - Clearance of tracks
  - Traffic Warning

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety:
- Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic
- Management.)
- Equipment staging area:

- all the correct necessary equipment are accessible and visible and available
- Personnel & Casualty Safety:

    - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
    - Fire extinguisher placed in case of spontaneous ignition.
    - Proper patient care is given to the casualty as prescribed by protocol.
    - If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
    - Cardiopulmonary resuscitation (CPR) is required
    - Transportation of the casualty to the receiving facility is communicated and prioritized
    - Identify the receiving hospital(s).

9.11.1.10 Uncontrolled Detonation of Explosives

- Emergency Response personnel to respond with the necessary, rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Inform OCC and management for the necessary support
- Management to mobilize IMT if required

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety:
- Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic
- Management.)
- Equipment staging area:
- all the correct necessary equipment are accessible and visible and available
- Personnel & Casualty Safety:

    - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
    - Fire extinguisher placed in case of spontaneous ignition.
    - Proper patient care is given to the casualty as prescribed by protocol.
    - If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
    - Cardiopulmonary resuscitation (CPR) is required
    - Transportation of the casualty to the receiving facility is communicated and prioritized
    - Identify the receiving hospital(s).

9.11.1.11 Tyre explosion and dislodging of split ring

- Emergency Response personnel to respond with the necessary, rescue and medical equipment
- Clear the area, established a cordon and control access ASAP
- Inform OCC and management for the necessary support
- Management to mobilize IMT if required

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in the safe positions, traffic, wind direction, easy access considered
- Operational Scene Safety:

- Take the reasonable measures to make the scene safe. (Barricade, crowd control & traffic
- Management.)
- Equipment staging area:
- all the correct necessary equipment are accessible and visible and available
- Personnel & Casualty Safety:

    - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
    - Fire extinguisher placed in case of spontaneous ignition.
    - Proper patient care is given to the casualty as prescribed by protocol.
    - Transportation of the casualty to the receiving facility is communicated and prioritized Identify the receiving hospital(s).

9.11.2 Medical Emergency / Medical Evacuation

- Business Issues
    - Casualty Identification and Management
    - Police liaison
    - Next of Kin management and support
    - Support for Employees
    - Employer/Contractor management
    - Media Response
    - Medivac Provider liaison
    - Casualty management
    - Hospital liaison including payment guarantees
    - Legal and liability issues
    - Corporate Image and Reputation

- Immediate Actions
    - Ascertain name(s), status and symptoms of the casualty(s)
    - If the injured person is transported to Hospital then liaison between the

Hospital and South32 will only occur between the same Senior South32 Representative and the Hospital's Customer Liaison Manager this includes initial media response team enquiries. The South32 representative
    - may delegate the hospital liaison role within the IMT once the External Affairs Coordinator has been contacted to advise who that new person may be.
    - Activate Human Resources Response Team and ensure that the relevant Employer(s) is informed ASAP.

- Maintaining the Response
    - Identify the receiving hospital
    - Seek regular updates from the hospital
    - Ensure Relatives Response Procedure is followed (Visit program, Employer (and Relatives) kept up to date, Counselling / follow on support arranged etc)
    - Inform Occupational Health provider
    - Discuss need for an Internal Investigation team with IMT.
    - Ensure HSE statutory reporting requirements are met.

9.11.3 Weather Conditions in the Opencast

- Operations will temporarily stop after consultation with the responsible supervisor, when visibility becomes poor due to rain, fog, dust, sun in eyes, or a combination of the above and/or if the distance marker is not visible
- Operations will temporarily stop after consultation with the relevant supervisors lightning is expected or anticipated.
- Operations will resume only after the production foreman and the safety representative for that area had inspected the area and declared it safe for normal work operations through a mini risk assessment
- In case of Lightning refer to: OLD-MMT-MIN-SOP-001 for preventative actions. In case of a lightning strike effecting employees or equipment:
    - Emergency Response personnel to respond with the necessary, rescue and medical equipment
    - Clear the area, established a cordon and control access ASAP
    - Inform management for the necessary back up
    - Primary stabilization done for the quick access to the casualty and rapid examination for vital function (Pulse, breathing and level of consciousness) should be performed
    - Fire extinguisher placed in case of spontaneous ignition.
    - Proper patient care is given to the casualty as prescribed by protocol.
    - If no spontaneous breathing is not observed, or cardiac arrest has occurred, immediate
    - Cardiopulmonary resuscitation (CPR) is required
    - Transportation of the casualty to the receiving facility is communicated and prioritized
    - Identify the receiving hospital(s).

9.11.4 IT Disruption During An Emergency

- In the event of the HMM or and MMT Server failing during an emergency situation, an electronic back-up device will be made available.

- This back-up device will be updated at least on a monthly basis or if significant changes are introduced to procedures, processes, equipment, change in emergency contact numbers, etc. by the responsible Control Room Official and the Occupational Health Dept by down loading it from the applicable – Drive onto the memory stick.

9.11.5 Drowning, Inrush and Flooding Procedure

- Inrush and floods (personnel affected)
- FRT personnel to respond with the necessary, rescue and medical equipment
- Clear the area, establish a cordon and control access ASAP
- Establish an Incident Command post
- Ensure that nobody enters the area without the permission of the Incident Commander

- Secure and contain the site. Remove non-casualties to a safer location.
- Activate specialist resources as appropriate (SA Rescue, Local authorities and SAPS diving unit etc)

Incident Management

- Vehicles Staging area:
- All the vehicles are parked in a safe area, traffic, wind direction and easy access considered
- Operational Scene Safety:
- Take reasonable measures to make the scene safe. (Barricade, crowd control & traffic management.)
- Equipment staging area:
- All the correct necessary equipment is accessible and visible for use
- Personnel & Casualty Safety considered:
- Primary stabilization done for the quick access to the casualty and rapid examination for vital
- function (As per protocol) should be performed
- Triage area established according to protocol
- Proper patient care is given to the casualty as prescribed by protocol.
- Identify the receiving hospital(s).
- Transportation of the casualty to the receiving facility is communicated and prioritized
- List of patient(s) send to hospital(s)
- Post incident management
- If the victim is already in the care of a doctor or hospital, contact them to establish:
- current status and prognosis of the victim;
- treatment given so far and contemplated;
- whether there are any financial or other procedural difficulties;
- if the family been informed; and

- Doctor contact details for the next 24 hours.
- Seek regular updates from the hospital.
- Ensure Relatives Response Procedure is followed (visit program, employer and relatives kept up-to date, counselling/follow-on support arranged, etc).
- Inform the occupational health provider.
- Ascertain name(s), status and symptoms of the casualty(s) follow the Incident Assessment checklist.

Confirm:
- the site of death has been protected (barricaded off and screened); and
- The site is left undisturbed and protected from the elements until police (and/or HSEC)
- investigation team arrive.

Note: Exceptions to this may be permitted in certain circumstances, for example when equipment may need to be secured to prevent further injury or damage, or when the deceased may be seen by the other personnel on board, causing a stressful situation (i.e. in cases of safety or welfare). It should be borne in mind that when isolating the site, tenting or screening may be needed to ensure that the natural elements cannot disturb or alter any aspects of the scene.
If a body has to be moved, the outline should be marked with chalk or similar material. If possible, photographs should be taken of the body in-situ and the area around the body before any steps are taken for removal.

- Non-essential access to the scene is controlled.
- The names of all witnesses have been noted and they have independently written down their own account of events (as soon as possible).
- If anything has to be moved ensure that two persons are present.
- If the body is not positively identified, SAY SO!
- Ensure the Field Manager completes the reporting forms and send it to the IMT/EMT ASAP with
- full details of the deceased:
- full name;
- date of birth;
- employing company; and
- Advise police and pass details on reporting form ASAP.

Uncontrolled Release of Affected Water

- Business Issues
  - Production impact for extended period
  - Employer/Contractor management
  - Media Response
  - Legal and liability issues
  - Corporate Image and Reputation
- Immediate Actions
  - Identify affected section/sections decanting into the river system

- Estimate volumes decanting, as well as possible future decant volumes for the duration
- Identify and implement possible mitigating actions to prevent further spillage into the river system
- Notify Management of the event and the current situation
- HSEC to notify the Department of Water Affairs (DWA) and South African Police Services (SAPS) of the spill
- Take water samples upstream and downstream of the decant area, as well as samples of the decant water

Water Management Infrastructure

- Mine water infrastructure model to indicate water storage infrastructure capacity
- Refer to latest HSEC report,
- Water pumping infrastructure needs to be available and in good working order.
- Water sampling infrastructure in place and available
- Sampling bottles and calibrated hand-held pH and TDS monitoring units are available at the HSE offices. Spare bottles can be obtained from Environmental staff.

Maintaining the Response

- Continue to take samples 3 times a day for the duration of the decant
- Record estimated decant volumes 3 times a day
- Mine Management to strategize best position/positions for pumps, piping and dewatering point/points
- in the active pit
- Mobilise portable diesel pumps to the decant area/areas
- Relocate required piping from the positioned pumps to the dewatering point/points
- management of the situation
- Ensure HSE statutory reporting requirements are met
- Notify DWA when the decant of affected water into the river system has stopped and the situation is under control.

Post incident Management

- Determine the volumes of water stored in the active pit
- Determine pumping rates of the current pumping infrastructure in place to determine time to dewater the active pit
- Liaise with the DWA to investigate a possible controlled release strategy for the dewatering of the active pit
- Management to strategize production issues with regards to the dragline, supply agreements etc.

- Management to approve other proposed water management strategies i.e. reverse osmosis etc.

9.11.6 Security Response To Emergency Situations

9.11.6.1 Purpose

To provide all security personnel with guidelines in the proper and effective handling of any emergency situation.

9.11.6.2 Compliment requirements

The nature and scale of the emergency will determine the number of people responding to the emergency.

9.11.6.3 Criminal Action

- armed attack
- vehicle hi-jack
- alarm activation
- bomb threat
- hostage situation
- kidnap
- armed robbery, etc.

9.11.6.4 Security Response Room Operator

- Take down details of the incident and record in the Occurrence Book
- Ensure details are accurate and complete (who, what, when, where, why).
- Inform all officials as per your Emergency Call Out List.
- Ensure these details are recorded in the Occurrence Book as well.
- In the event of an armed attack on the Response Room take up a protective position underneath your service hatch.
- Press your panic button and if possible inform the Shift Supervisor, Security Manager or anybody else of your situation. Make use of your radio or telephone if you have access to them.
- Should your situation become life threatening, allow the attackers into the Response Room and act according to their instructions. Remember to:
- Stay calm
- Be alert
- Take mental notes of who, what, when, where and why
- Do not argue with the attacker.
- Shift Supervisor should proceed to the affected area without delay.
- On arrival take up a protective position and record and report detail to the Response Room on an ongoing basis.
- Be sure you wear your bullet resistant vest.
- In the event of perpetrators still on the scene await the arrival of the SAPS or Senior Security members and act on their instructions.

- Do not endanger your own or anybody else's life in order to try and arrest a suspect.
- Ensure emergency vehicles have free access to the affected area
- In the event of an attack on the Response Room / Main Gate the Shift Supervisor must:
- Prevent the in and egress of people through the main gate by informing mine employees of the dangerous situation.
- The Control Room Operator can be requested to inform employees on shift.
- The Shift Supervisor to block off all traffic to the main gate. Use your mobile radio to contact nearby stations.
- Record and report as much detail as possible.

9.11.7 Bomb Threat

When a bomb threat is received:

- Stay calm. Do not upset the caller.
- Try to get as much information as possible from the caller.
- Repeat information received to the caller to ensure the information is correct.
- Complete bomb threat checklist.
- Inform all officials as per your Emergency Call-out List.

On receiving the information of the bomb threat the Shift Supervisor must proceed to the affected area immediately. Keeping the time the bomb has been set for in mind, the Shift Supervisor should assist in the following:

- Evacuate all employees from the affected area and surrounding buildings to the mine's main entrance. If possible valuables should be locked away and windows / doors left open before the building is activated.
- Arrange for electricity and fuel supplies to be out off to the affected area if possible.
- Seal off all access to the affected area, other than that of emergency services.
- Arrange for free access of emergency vehicles to he affected areas.
- If enough time is available search building in question for suspicious parcels / objects etc. Do not touch or remove any suspicious object.
- Record and report any developments to the security response room.
- Should a bomb threat be received for the security complex employees will evacuate to the parking area at the High Risk gate.

9.11.8 Labour Related Problems

- The security employee receiving the information must record down as much detail as possible and inform the Response Room immediately.
- On receiving the information the Response Room Operator will immediately inform all officials as per Emergency Call-out List.
- Clear and precise details to be obtained and recorded in Occurrence Book.
- A scribe log sheet will be kept for each incident of labour related problems from its commencement until the final conclusion
- During the event the Response Room Operator will contact teams on the

ground in 20 (twenty) minute intervals for situation report.

- On receiving the report the Shift Supervisor will proceed to the affected area.
- Keep observation and assist where possible.
- Direct all people and vehicles away from affected area.
- Await and act on instructions of Management.
- The Security Manager or his assistant will arrange assistance from SAPS.

9.11.9 Natural Disaster

- On receiving information of a natural disaster the Response Room Operator must take down clear and precise detail and record details in the Occurrence Book.
- Inform all officials as per Emergency Call-out List
- Should you experience problems with any of your communication channels due to power failures or water / fire damage, use a portable radio or cell phone to ask for assistance from the Mine's control room.
- Proceed cautiously to the affected area.
- Record and report details to Response Room.
- Assist where possible without endangering your own or anybody else's life.
- Ensure free access for emergency vehicles to the affected area.

General Security Guidelines – Emergency Situation

- All alarm signals received should be reacted to as if an actual crime is taking place.
- Always stay in radio contact with the Response Room.

- Always wear / use protective equipment and aids – bullet resistant vests, torches.
- Stay calm and record and report all detail accurately.
- Never endanger your own or anybody else's lives.
- Keeping the following in mind, where possible delaying tactics must be employed to prevent a culprit from reaching his target, some examples are:
- Do not have keys available.
- Telephone is busy.
- Time locks on safe.
- System out of order.
- The security office complex will be the prearranged assembly point for security members reacting to an alarm. In the case of an emergency at the security offices the High Risk gate or Opencast gate will be the prearranged assembly point depending whether you are on or off property.

- The senior security member on duty will be in charge of all emergency operations until relieved by a senior mine official or member of the emergency services.

9.11.10 Person Suspended In Body Harness From Lanyard

Personnel working at heights are accompanied by a "buddy" who is trained in the rescue of a person suspended in a harness.

"Gotcha" kits are available and will be issued to trained personnel when

working at heights. Persons suspended in a harness must be rescued as soon as possible.

9.11.11 Post-Emergency Management

- The Operations Manager will make the decision when the emergency no longer exists, such that the mine does not pose a hazard for persons to enter the workings for the purposes of inspection and investigation.
- The decision will be based on the condition at the scene including environmental conditions System functioning, gas monitoring of the atmosphere, rescue teams debriefing relating to the condition of roadways. This may also correspond to the Demobilisation of the Rescue Services.
- All duty cards, plans etc shall be returned to the Emergency Control Room.
- A full debrief by all persons involved in the incident shall be carried out, recording any points which may assist in the investigation phase and also for improving the Emergency Response and Evacuation Procedure.
- There may be a need to set up temporary Fire and Emergency Equipment until the investigation is completed such as to provide equipment in case of a further emergency.

- Formally stand down any emergency services, and any other support groups etc, which are no longer required (and thank them for the assistance).
- Provide necessary paperwork / purchase orders for contractors, equipment, material, etc called on in assisting with the Emergency
- Once the emergency has been declared over, an initial investigation shall be carried out by the Investigation Team. The investigation Team shall be determined by the Mine Manager, based on the nature of the emergency. A copy of the IMT Log of events and discussions shall be gathered, as well as any other material such as Control Officer Log / Record sheet. The ensuing formal investigation will be lead by the Department of Mineral and Energy.

10 Business Continuity

10.1 Recovery Phase

During the recovery phase, the EMT/IMT may coordinate mutual assistance between operations to ensure continuity of operations and facilitate a speedy recovery to full functionality. The assistance required may include:

- Extra personnel or equipment to assist in the recovery

- Re-allocation of strategic resources and personnel.

10.2 Standing Down The IMT / EMT

Emergency response will be the focal point of effort for South32 Manganese SA Asset if the EMT/IMT is activated. This will necessarily come at the expense of usual business effort. Therefore, it is critical that the EMT/IMT be stood-down as soon as the need for emergency response and business continuity has ceased.

Ideally Recovery activities commence in parallel with response activities with the EMT/IMT leader having overall responsibility for both Response and Recovery. Therefore, it is critical that the EMT transitions from Response to Recovery in a seamless manner and as quickly as possible. There may be a period of time where both Response and Recovery activities continue in parallel. Note: the management and coordination of the Response and Recovery activities will utilise the same facilities and tools.

On determining that emergency response should end, the EMTIMT Leader will stand down the EMT/IMT and return to normal operations. In its place, a Business Recovery or Business Continuity team may be required to take control of any remaining business recovery effort as per request of the EMT/IMT Leader. On standing down the EMT/IMT, the EMT/IMT Leader should detail the state of the business, the work achieved and the intent for the way forward. The EMT/IMT Leader is responsible for any administrative arrangements to support the return to normal work environment.

The EMT/IMT must furnish the Business Recovery team with a completely documented account of the emergency and emergency response effort, and a detailed state of the stabilized business elements affected by the emergency event.

The EMT/IMT Leader will advise all relevant management teams of the reporting and accounting requirements on stand down of the EMT/IMT. It is the responsibility of such management teams to ensure these requirements are met. This will support a detailed analysis of the emergency, the emergency response effort, and emergency response procedures.
Debriefing is the process of drawing out lessons learned and imparting advice for improvement to and from engaged staff and priority stakeholders after an event. This process is to be managed by the relevant management teams.

Counseling is the provision of personal support and management to people who have been exposed to potentially stress causing environments or situations. All EMT/IMT members and other relevant staff members must be debriefed and counseled after the end of ANY emergency response. This process is to be managed by the EMT HR member who may be supported by specialist external providers. They may need to coordinate on-going critical incident stress management counseling across the entire workforce and, where appropriate, to affected next-of-kin and communities.

10.3 The Incident Response ends when the following conditions are met:

- An appropriate response has been provided with all situations attended.
- Assets and people are safe, secure and above all away from any form of harm above that of standard operating conditions.
- All associated threats and hazards to the incident have been rectified or pacified as relevant to continue standard operating conditions.
- The affected area of the incident has been cleared of related risks or isolated from local areas of business operation.
- Effective controls have been put in place to mitigate further incidents.
- Incident responders are free of harm, contamination and have not reported or displayed any other physical problems.
- Upon stand down of the incident response all attending incident responders must ensure their actions and decisions are captured as soon as is possible while still fresh in memory. A recovery and continuity structure strong enough to provide guidance to all interrelated groups, yet flexible enough to allow the operation to respond to whatever type of disaster may occur.
- Providing specific recovery team action plans for each functional area to respond effectively to the situation and to resuming mission critical services.

Appendices

Appendix 1.0 Document Revision Control

Document Revision Control			
Revision	**Page**	**Change Effected**	**Date of Issue**
0.0	All	New Document	31-10- 2010
0.1	All	New Document	31-01-2011
0.2	All	Annual Revision	31-01-2012
0.3	All	Annual Revision	31-01-2013
0.4	All	Revision	11-05-2014
0.5	All	Revision	25-08-2014
0.6	All	Bi-Annual Revision	03-04-2015
1.0	All	South32 Alignment	17-04-2015
1.1	All	Amended IMT List	07-11-2016
1.2	All	Revision	28-06-2017
2.0	All	Revision	16-07-2019
3.0	All	Align numbering with guideline	18-09-2020

Appendix 2.0 References

References		
No.	**Document No.**	**Title**
	OHSAS 18001: 1999 element 4.4.7	Emergency Preparedness and Response
	ISO 14001: 1996 element 4.4.7	Emergency Preparedness and Response
	ISO 9001: 2000 element 8.3	Control of Non-conforming product
	PR-HSS-004	Document and Data control Procedure
	PO-HSS-001	Business Documentation Management Policy
		South32 HSEC Standards
		South32 incident reporting requirements
	GLD.006	South32 GLD.006 Asset Protection
	Act 130 of 1993	Compensation for Occupational Injuries and Diseases Act
	Act 29 of 1996	Mine Health and Safety Act
	PMn007 Incident Reporting Procedure Draft 1.doc	DIVISIONAL INCIDENT REPORTING PROCEDURE, including a crisis and emergency management guideline
	DMR 16/3/2/1 – A5	Emergency Preparedness and Response COP guidelines, DMR 2011

Appendix 3.0 IMT Duty Cards

IMT Leader				
NO	**ACTION**	**RESPONSIBLE PERSON**	**COMPLETED**	**SIGNATURE**
PRE-INCIDENT				
1	Ensure the operational readiness of the IMT and regular testing in terms of GLD.006			
2	Ensure that primary and alternate members of the IMT are familiar with their respective roles and responsibilities			
3	Ensure that IMT is fully staffed and adequately trained at all times			
4	Attend all training activities organised for the IMT, including simulation exercises			
5	Remain familiar with responsibilities within the IMT			
6	Responsible to formally appoint a Deputy IMT Leader to assume responsibilities in terms of this duty card when the IMT Leader is unavailable for whatever reason.			
7	Ensure that Deputy IMT Leader attends all training and simulation exercises and remains fully aware of the responsibilities contained in this CEM plan and more specifically this Duty Card.			

IMT Leader				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Obtain a verbal briefing outlining the incident from the relevant manager and or Operations Coordinator (if already deployed)			
3	Start an individual log			
4	Assess the level of the incident/issue using the South 32 risk rating scheme			
5	Decide the level of IMT activation required to respond to the incident and activate the IMT, if required			
6	Notify the IMT Leader			
7	Authorize any additional resources or specialist advisors required			
8	Proceed to the Mamatwan ECC			
9	Obtain a current situation update on the incident			
10	Confirm the IMT appointments and presence required for the crisis in question			
11	Conduct an initial team brief and detail initial response priorities to the IMT team			
12	Develop / approve clear and concise objectives for the IMT			
13	Ensure that relevant regulatory authorities are notified (in liaison with External Affairs).			

IMT Leader				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	Provide overall management and direction to the IMT and decide if the full IMT or selected members need to be present for the particular incident at hand			
2	Document all personal actions and decisions on an individual log			
3	Agree on IMT operational objectives			
4	Resolve any conflicts			
5	Authorize additional expert assistance to the IMT if required			
6	Ensure that the response is run in a safe and legally sound manner			
7	Ensure the FRT are supported in their emergency response activities			
8	Establish communications, exchange information and coordinate activities with other relevant response organisations (FRT, Emergency Services) and appropriate management personnel and ensure that communication channels remain open and are working effectively			
9	Ensure that all necessary and required internal and external notifications have been made, especially to government agencies and key stakeholders			
10	Manage the activities of the IMT until stand down and maintain overall control at the operational level			
11	Ensure the efficient closure of the incident with minimal impact on lives, assets, the community and the environment			
12	Ensure the IMT members are briefed and understand their individual and team responsibilities			
13	Request additional specialist support from IMT if required			

IMT Leader				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
14	Regularly review the response by convening IMT update briefings at regular intervals.			
15	Oversee planning and set recovery and business resumption goals			
16	Approve and authorize implementation of incident specific response and recovery plans.			
17	Approve additional expenditure necessary to manage the incident, if required			
18	Monitor and control access to the *MAMATWAN* ECC			
19	Keep the IMT informed of the situation via regular situation reports			
20	Remain aware of the South 32 communication protocols			
21	Arrange (with relevant IMT member) for authorisation and dissemination of press releases and statements to the public and media.			
22	Ensure active and on-going engagement with all relevant local stakeholders			
23	Ensure all actions, decisions and events are accurately recorded and documented in the IMT Log			
24	Decide, in conjunction with the , when the crisis is over, inform IMT and manage the process until normal activities are resumed			
25	Identify those IMT members whose assistance would be required in the recovery process			
26	Ensure that a full record of all IMT actions is kept for review and further action, if required			
27	Communicate end of crisis response internally and externally			

IMT Leader				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
POST-INCIDENT				
1	De-brief IMT members and provide feedback			
2	Determine if an investigation is required and oversee the conduct of an investigation			
3	Review and approve the incident report			
4	Allocate and supervise the implementation of the recovery plan			
5	Chair the incident post-crisis review and ensure all lessons learnt are recorded and implemented			
6	Ensure that IMT members are debriefed and receive comprehensive feedback			
7	Authorise the necessary changes to the CEM Plan and other relevant documents to ensure that learnings have been captured, if so required.			

IMT Coordinator				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Remain familiar with the Coordinator role in the IMT			
2	Arrange and attend all training activities for the IMT			
3	Maintain relevant IMT equipment, material and manuals			
4	Perform audits to ensure that IMT material and equipment are up to date and in operating condition			
5	Ensure that all specialist team members' professional certifications are in order			
6	Attend all training activities organized for the IMT			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Obtain a verbal briefing outlining the incident and current status from the initiator of the first notification			
3	Start an individual log			
4	Inform IMT Leader of situation and current status			

IMT Coordinator				
NO	**ACTION**	**RESPONSIBLE PERSON**	**COMPLETED**	**SIGNATURE**
5	Recommend to the IMT leader the level of the incident/issue using the South 32 risk rating scheme			
6	Mobilise any additional resources or specialist advisors immediately required to assist with the crisis			
7	Obtain a current situation update			
8	Inform the IMT Leader of the situation and provide regular updates			
9	In consultation with IMT Leader, determine the IMT activation level			
10	When authorised, activate the IMT, if required			
11	Proceed to the *MAMATWAN ECC*			
12	Attend initial team briefing and detail initial response priorities to the IMT			
13	Assist in developing clear and concise objectives for the IMT			
14	Should the IMT Leader not be present, assist the Deputy IMT Leader in performing his/ her duties.			
15	Assist IMT Leader in facilitating the initial team briefing.			

IMT Coordinator				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	Assist the IMT Leader in assembling and managing the Planning Group, if assembled			
2	Plan and execute plans for the protection of people, assets, communities and the environment			
3	Document all personal actions and decisions on an individual log			
4	Ensure communications are established and maintained with the IMT(if activated)			
5	Ensure all IMT members are briefed and understand their individual and team responsibilities, and assess the need for additional specialist support			
6	Provide the IMT Leader/ Deputy Leader with the necessary support in managing the incident			
7	Ensure the IMT has complete situational understanding of an emergency event, its geographic location, its condition and its layout			
8	Attend all IMT briefs and updates			
9	Coordinate activity of CEM support teams with the relevant functional area managers			
10	Ensure that all access routes to and from the affected area are open			
11	Attend IMT briefings and keep the IMT informed of progress on resolving the issue			
12	Monitor the security of information and equipment in the Mamatwan ECC			
13	Ensure the IMT is kept informed of the IMT response			
14	Develop and manage shift rosters, if required			

IMT Coordinator				
NO	**ACTION**	**RESPONSIBLE PERSON**	**COMPLETED**	**SIGNATURE**
15	Manage the development of the Response Plan			
16	Manage the implementation of the Response Plan			
17	Contribute to IMT situation reports			
18	Remind all IMT members to accurately log all actions, decisions, instructions and events in their individual logs			
19	Assist the Human Resources Officer			
20	Hand over responsibilities to the Planning Group (if assembled) on stand down of the IMT			
21	Oversee the Recorder and Log-keeper roles			
22	Maintain records of all actions taken and all activities and information relied upon by the IMT Leader/ Deputy Leader in taking decisions.			
POST-INCIDENT				
1	Contribute to the incident report			
2	Assist IMT Leader in the development and implementation of the recovery plan			
3	Contribute to the incident post-crisis review to ensure all lessons learnt are recorded and implemented			
4	Assist IMT Leader to ensure all IMT members are debriefed and receive accurate feedback			
5	Assist the IMT Leader in conducting recovery operations if so required.			

Human Resources Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Remain familiar with responsibilities within the IMT			
2	Attend all CEM Plan training and exercises			
3	Ensure that the personnel related issues in CEM plan are up to date and reflect current information			
4	Ensure that appropriate systems are in place for managing Human Resource issues during scenarios identified in the CEM plan			
5	Remain familiar with responsibilities within the IMT			
6	Remain familiar with South 32 next-of kin notification protocols			
7	Ensure that front line responders are (switchboard operators and security staff) are briefed and trained to deal with concerned relatives and friends during an incident			
8	Maintain a list of internal external advisers who can provide assistance during an incident.			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Attend the IMT initial briefing and establish identity of injured/ deceased staff members if available.			

Human Resources Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Remain familiar with responsibilities within the IMT			
2	Attend all CEM Plan training and exercises			
3	Ensure that the personnel related issues in CEM plan are up to date and reflect current information			
4	Ensure that appropriate systems are in place for managing Human Resource issues during scenarios identified in the CEM plan			
5	Remain familiar with responsibilities within the IMT			
6	Remain familiar with South 32 next-of kin notification protocols			
7	Ensure that front line responders are (switchboard operators and security staff) are briefed and trained to deal with concerned relatives and friends during an incident			
8	Maintain a list of internal external advisers who can provide assistance during an incident.			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Attend the IMT initial briefing and establish identity of injured/ deceased staff members if available.			

Human Resources Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
12	Verify and maintain a record of location and status of persons involved in the incident			
13	Arrange survivor reception and support for evacuees			
14	Liaise with the Community Representative and External Affairs Officer to provide verified facts on the situation			
15	Establish the Next-of-kin (NOK) room			
16	Assist the Logistics Manager with drafting internal messages and site notices			
17	Liaise with SAPS and any incident investigation teams			
18	Determine the nature, tone and format of communication with employees and families			
	▪ Conduct post-incident debriefing as soon as possible			
	▪ Arrange transportation for families			
	▪ Plan accommodation for next-of-kin if required			
	▪ Consider need for cash / clothing / communications with families etc.			
	▪ Establish call schedules as appropriate			
19	Facilitate visits to hospitals by relatives, as requested by			

Human Resources Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
20	Provide support for families. Consider:			
	▪ Transportation to hospital / point of arrival			
	▪ Child care			
	▪ Accommodation			
	▪ Passport / Visa issues			
	▪ Financial Support			
	▪ Counselling support			
	▪ Reassurance, as appropriate			
21	Attend all IMT briefings			
POST-INCIDENT				
1	Ensure allocated post-crisis follow-up actions are completed, especially personnel welfare related actions.			
2	Contribute to the incident post-crisis review to ensure all personnel related lessons learnt are recorded and implemented			
3	Contribute to the development of the incident report			
4	Ensure that recommended personnel related changes to the CEM Plan and other relevant documents have been completed.			
5	Assist the incident investigation as required.			

HSE Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Ensure that the HSEC information in the CEM Plan are up to date and reflect current information			
2	Ensure that all specialist professional certifications are in order			
3	Ensure that appropriate systems are in place for managing HSE related issues during scenarios identified in the CEM Plan			
4	Establish and monitor Health, Safety and Environment related training programs for response personnel and maintain training records			
5	Identify and be aware of any existing Health, Safety and Environment issues and/or sensitivities applicable to the specific Operation that may arise during an emergency			
6	Maintain a list of relevant external stakeholders which may be called upon during an emergency			
7	Attend all training activities organised for the IMT, including simulation scenarios			
8	Remain familiar with responsibilities within the IMT.			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Attend the IMT initial briefing			
5	Assist the IMT leader in developing clear concise objectives.			

HSE Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	Assess and manage any HSE related issues that may impact on the successful operation of the IMT and advise on additional HSE measures if required			
2	Document all personal actions and decisions on a personal log sheet			
3	Identify, monitor and assess HSE incidents and unsafe situations related to the incident and develop measures to ensure the safety of response personnel and the public			
4	Provide guidance on HSE practices to be followed during response operations			
5	Develop and implement incident specific HSE plans and messages			
6	Ensure the response plan and recovery plan give sufficient consideration to HSE issues			
7	Advise on potential HSE issues and areas of possible escalation			
8	Monitor response and recovery activities to ensure compliance with HSE regulations, policies and procedures			
9	In the event of a hazardous material release, obtain Material Safety Data Sheets (MSDS) or similar information for all spilled, emitted, or at risk oil or chemicals			
10	Determine whether additional HSE personnel or technical specialists are needed, and if so, coordinate their activation and supervise their activities			
11	Monitor and assess the HSE consequences of clean-up operations. If necessary, recommend against activities that may cause more HSE damage than the operations themselves			
12	Provide guidance on HSE practices and regulations, and ensuring compliance			

HSE Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
13	Ensure response personnel are receiving appropriate HSE briefings, training, monitoring, and PPE			
14	Act as the principal IMT point of contact for HSE groups at IMT level			
15	Document all personal actions and decisions in an individual log.			
POST-INCIDENT				
1	Ensure allocated post-crisis follow-up actions are completed			
2	Contribute to the incident post-crisis review to ensure all HSE related lessons learnt are recorded and implemented			
3	Continue to monitor community attitudes concerning the incident and keep management advised of any which may have a substantial impact on the Operation			
4	Contribute to the development of the incident report			
5	Ensure that recommended environmental related changes to the CEM Plan and other relevant documents have been completed			
6	Assist the incident investigation as required.			

HSE Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Ensure that the HSEC information in the CEM Plan are up to date and reflect current information			
2	Ensure that all specialist professional certifications are in order			
3	Ensure that appropriate systems are in place for managing HSE related issues during scenarios identified in the CEM Plan			
4	Establish and monitor Health, Safety and Environment related training programs for response personnel and maintain training records			
5	Identify and be aware of any existing Health, Safety and Environment issues and/or sensitivities applicable to the specific Operation that may arise during an emergency			
6	Maintain a list of relevant external stakeholders which may be called upon during an emergency			
7	Attend all training activities organised for the IMT, including simulation scenarios			
8	Remain familiar with responsibilities within the IMT.			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Attend the IMT initial briefing			
5	Assist the IMT leader in developing clear concise objectives.			

Security Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	Determine whether additional Security personnel are needed, and if so, coordinate their activation and activities			
2	Establish contact with emergency services			
3	Assess and manage any security related issues that may impact on the successful operation of the IMT and advise on additional security measures if required			
4	Document all personal actions and decisions on a personal log sheet			
5	Identify, monitor and assess hazardous and unsafe situations related to the incident and develop measures to ensure the safety of response personnel and the public			
6	Provide guidance on the security practices to be followed during response operations			
7	Develop and implement incident specific security plans and messages			
8	Ensure the response plan and recovery plan give sufficient consideration to Security issues			
9	Advise on potential Security issues and areas of possible escalation			
10	Monitor response and recovery activities to ensure compliance with Security regulations, policies and procedures			
11	Monitor and assess the Security consequences of clean-up operations. If necessary, recommend against activities that may cause more security damage than the operations themselves			
12	Exercise emergency authority to prevent or stop any unsafe acts			
13	Advise on incident investigation requirements			
14	Provide guidance on security practices and regulations, and ensuring compliance			

Security Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
15	Establish the facts relating to community involvement in coordination with:			
	Human Resources Officer			
	Community Representative on site			
	Operations Coordinator, and			
	External Affairs Officer			
16	Assess the impact of the incident on the community and identify key short and long-term issues and concerns to be addressed			
17	Advise IMT on interactions with the community and potential sensitive issues			
18	Act as the principal IMT point of contact for community and environmental groups at IMT level			
19	Document all personal actions and decisions in an individual log.			
POST-INCIDENT				
1	Ensure allocated post-crisis follow-up actions are completed			
2	Contribute to the incident post-crisis review to ensure all Security related lessons learnt are recorded and implemented			
3	Continue to monitor community attitudes concerning the incident and keep management advised of any which may have a substantial impact on the Operation			
4	Contribute to the development of the incident report			
5	Ensure that recommended Security related changes to the CEM Plan and other relevant documents have been completed			
6	Assist the incident investigation as required.			

Finance Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Attend all training activities organised for the IMT			
2	Ensure that appropriate systems are in place for managing Legal related issues during scenarios identified in the CEM Plan			
3	Ensure that the Finance related issues in CEM Plan are up to date and reflect current information			
4	Ensure that appropriate systems are in place for managing Finance related issues during scenarios identified in the CEM Plan			
5	Attend all training activities organised for the IMT, including simulation scenarios.			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Activate initial personnel required in the Logistics Group upon activation of the IMT (i.e. IT)			
4	Proceed to the Mamatwan ECC			
5	Attend the IMT initial briefing			
6	Assist the IMT leader in developing clear concise objectives.			

Finance Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	Manage financial and cost analysis matters for the IMT			
2	Document all personal actions and decisions in an Individual Log			
3	Provide for IMT procurement systems and requirements			
4	Handle IMT accounting, financial record keeping, and auditing services			
5	Track and report on incident costs			
6	Ensure that expenditures are properly controlled and audited			
7	Consult with IT Manager on site to establish the extent of any disruptions to business critical financial functions			
8	Establish emergency procurement of infrastructure, applications, services and alternative premises if required			
9	Coordinate the processing of third party claims (liaising with the Insurance Function at Asset level)			
10	Assess and advise the IMT Leader/ Finance Officer on the financial impact of the incident			
11	Perform and update calculations of financial implications of the incident			
12	Introduce emergency financial authorization and control procedures			

Finance Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
13	Sanction emergency expenditure			
14	Ensure that and audit trail is maintained			
15	Ensure the timely restoration of business-critical financial functions			
16	Attend all IMT briefings and updates.			
POST-INCIDENT				
1	De-brief the on-site Finance Department			
2	Ensure allocated post-crisis follow-up actions are completed.			
3	Contribute to the incident post-crisis review to ensure all finance related lessons learnt are recorded and implemented			
4	Contribute to the development of the incident report			
5	Ensure that recommended finance related changes to the CEM Plan/and other relevant documents have been completed.			
6	Assist the incident investigation as required.			

Logistics Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Attend all training activities organised for the IMT, including simulation scenarios			
2	Remain familiar with responsibilities within the IMT			
3	Ensure that the Logistics related issues in CEM Plan are up to date and reflect current information			
4	Ensure that appropriate systems are in place for managing Logistics related issues during scenarios identified in the CEM Plan			
5	Attend all training activities organised for the IMT, including simulation scenarios			
6	Ensure that the CEM Plan is up to date and reflect current information regarding stakeholders, external and internal factors that would influence an emergency and contains sufficient details regarding possible risks / emergency scenarios, related controls and current actions to improve insufficient controls, as well as up to date contact details of stakeholders			
7	Ensure the provision of business critical IT services to the primary and alternate Emergency Management Room			
8	Ensure the IMT IT system is regularly tested			
9	Maintain the *MAMATWAN* CEM Plan			

Logistics Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Ensure access to the facilities on site, access to the Mamatwan ECC and activation of the call-out process			
5	Assemble the IMT at the designated assembly point on the dedicated notification line			
6	Issue relevant activation packs to IMT members			
7	Attend the IMT initial briefing			
8	Assist the IMT Leader in developing clear concise objectives.			
DURING INCIDENT				
1	Document all personal actions and decisions on an individual log sheet			
2	Obtain the personnel, equipment, facilities, PPE, material, and supplies needed to carry out the response to the emergency in a safe manner			
3	Arrange for the food, shelter, communications, transportation, housing, etc. needed to keep responders and equipment working			
4	Develop the IMT Communications, Air Operations, and other logistics support plans, as necessary			
5	Identify the location and status of off-site equipment and personnel suitable to deal with the issue and coordinate their deployment as required			
6	Liaise with the Operations Coordinator to provide transport and care/accommodation for the injured, other employees and relatives if necessary			

Logistics Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
7	Ensure an overall inventory is maintained of all equipment, materials and supplies purchased, rented, borrowed or otherwise obtained			
8	Monitor the security of information, access and equipment in the Mamatwan ECC			
9	Inform the IMT Leader of logistical movements (include names and locations)			
10	Coordinate the movement of the IMT and support personnel to an alternative location, if required			
11	Facilitate the emergency purchase of approved equipment and facilities, if required			
12	Develop a resource plan in support of the response plan to:			
	▪ Prioritise needs			
	▪ Identify alternative resources and supplies			
	▪ Coordinate delivery/deployment			
13	Attend IMT briefings and keep the IMT informed on the actions of the Logistics Function			
14	In consultation with the Human Resource Officer and External Affairs Officer, ensure that:			
	▪ Media arrangements are in place (facilities, guides, etc)			
	▪ Internal employee communication is occurring and effective			
	▪ An external communications plan (for families, key stakeholders, etc) is in place			

Logistics Officer				
NO	**ACTION**	**RESPONSIBLE PERSON**	**COMPLETED**	**SIGNATURE**
15	Contribute to the development of the response plan			
16	Contribute to the development of the recovery plan			
17	Contribute to the IMT situation reports.			
POST-INCIDENT				
1	Ensure allocated post-crisis follow-up actions are completed			
2	Contribute to the incident post-crisis review to ensure all logistics related lessons learnt are recorded and implemented			
3	Contribute to the development of the incident report			
4	Ensure that recommended logistics related changes to the CEM Plan/ and other relevant documents have been completed.			
5	Assist the incident investigation as required.			
6	Ensure that the CEM documentation and CEM materials are returned back to a ready state			

External Affairs and Communications Officer				
NO	**ACTION**	**RESPONSIBLE PERSON**	**COMPLETED**	**SIGNATURE**
PRE-INCIDENT				
1	Ensure that the External Affairs related issues in IMT plan are up to date and reflect current information			
2	Ensure that appropriate systems are in place for managing External Affairs and Communications related issues during scenarios identified in the CEM Plan, including that contacts with third parties are in place to ensure prompt assistance during an incident and that standard holding statements are in place			
3	Attend all training activities organised for the IMT, including simulation scenarios			
4	Remain familiar with your responsibilities within the IMT.			
IMMEDIATE ACTIONS				
1	Respond to activation.			
2	Start an individual log.			
3	Establish communications with the Media Relations and Communications Officer at Operations and CSG level			
4	Advise the IMT Leader on potential community and media-related issues.			
5	Proceed to the Mamatwan ECC			
6	Attend the IMT initial briefing.			

External Affairs and Communications Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	In conjunction with Media Relations and Communications Officer at IMT level, determine the media strategy to be adopted for the incident and who will handle various aspects of the Operations external affairs responsibilities			
2	Serve as the principal advisor to the IMT Leader regarding interactions with the media and advise him of any pressing media issues, concerns, or problems			
3	Document all personal actions and decisions on an individual log sheet			
4	Establish a media briefing room on-site			
5	Prepare and disseminate media holding statements, press releases and “fact sheets”			
6	Assist the IMT Leader in preparing for press conferences and interviews.			
7	Pass on all press releases or statements (internal or external) to the IMT Leader as soon as possible			
8	Monitor and maintain a record of media and internet coverage of the incident			
9	Make all the necessary and required internal and external notifications, especially to government agencies and key stakeholders			
10	Ensure that the Operations Coordinator and IMT in general are aware of and are following applicable government agency directives			
11	Prior to demobilisation, ensure that all media, government relations and community issues and concerns have been resolved			
12	Identify community stakeholders and determine the best way to communicate with the community			
13	Work closely and coordinate activities with the Human Resources Officer.			

External Affairs and Communications Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
POST-INCIDENT				
1	Ensure allocated post-crisis follow-up actions are completed			
2	Keep monitoring media for reports related to the incident			
3	Contribute to the incident post-crisis review to ensure all external affairs related lessons learnt are recorded and implemented			
4	Contribute to the development of the incident report.			
5	Ensure that recommended external affairs related changes to the CEM Plan and other relevant documents have been completed.			
6	Assist the incident investigation as required.			

Recorder and Log Keeper				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Attend all training activities organised for the IMT, including simulation scenarios			
2	Remain familiar with your responsibilities within the IMT			
3	Understand where the Mamatwan ECC equipment is stored and its use			
4	Ensure status boards, charts, maps and other tools/aids are readily available			
5	Confirm that there are sufficient quantities of consumables available for the IMT.			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Assist the IMT Logistics Officer in the set-up of the IMT room			
5	Start the IMT log			
6	Attend the IMT initial briefing.			

Recorder and Log Keeper				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
DURING INCIDENT				
1	Record key incident information on the status boards			
2	Assist the Logistics Officer with updating the status boards and managing administrative functions			
3	Assist the Log Keeper with managing the flow of hard copy information and retain copies for the permanent log			
4	Assist the Log Keeper with the IMT Log as required			
5	Alert other IMT members to major changes, issues and outstanding actions			
6	Take digital photos of status boards before they are updated			
7	Proactively monitor all communications and record pertinent points as they arise			
8	Document all personal actions and decisions in an Individual Log.			
POST-INCIDENT				
1	Assist with the collection and filing of all documentation from IMT members			
2	Ensure allocated post-crisis follow-up actions are completed			
3	Participate in the IMT post-crisis review			
4	Contribute to the development of the incident report			
5	Assist with refurbishing the Mamatwan ECC back to a 'ready' state			
6	Assist the incident investigation as required.			

Field Officer				
NO	ACTION	RESPONSIBLE PERSON	COMPLETED	SIGNATURE
PRE-INCIDENT				
1	Attend all training activities organised for the IMT, including simulation scenarios			
2	Remain familiar with your responsibilities within the IMT			
3	Understand where the Mamatwan ECC equipment is stored and its use			
4	Ensure status boards, charts, maps and other tools/aids are readily available			
5	Confirm that there are sufficient quantities of consumables available for the IMT.			
6	Be informed of duties and procedure of FRT team			
IMMEDIATE ACTIONS				
1	Respond to activation			
2	Start an individual log			
3	Proceed to the Mamatwan ECC			
4	Or per instruction of Leader procedd to scene of incident			
5	Provide assistance to FRT or			
6	Attend the IMT initial briefing.			

DURING INCIDENT				
1	Provide assistance to FRT or			
2	Provide regular updates to IMT			
3	Perform duties as instructed by IMT team			
4	Be communications channel between IMT and FRT			
5	Alert other IMT members to major changes, issues and outstanding actions			
6	Take digital photos of scene and other important factors			
POST-INCIDENT				
1	Assist with the collection and filing of all documentation from IMT members			
2	Ensure allocated post-crisis follow-up actions are completed			
3	Participate in the IMT post-crisis review			
4	Contribute to the development of the incident report			
6	Assist the incident investigation as required.			

Appendix 4.0 ECC Room Checklist

EMERGENCY ROOM

MONTHLY INSPECTION CHECKLIST

OCC Administrator :_____ Signature:_____ Date:_____

Execution Systems Superintendent :_____ Signature:_____ Date:_____

CHECKLIST: TICK THE APPROPRIATE BOX	YES	NO	COMMENTS
1. Electronic Equipment			
1x Desktop phones			
1x Desktop Voice Recorder			
1x Multi plug			
1x Pocket Voice Recorder			
5x portable radio's with chargers (In OCC)			
1x Satellite phone			Tested ☐
2. Lightning			
Sufficient lightning			
3. Overhead Projector			
Installed and fully functional			
4. Wireless Internet Connection			
5x network connections (or wireless connection)			
5. Furniture			
Flipchart Stands			
Stationary cupboard			
Sufficient Seating			
Table, big enough for plans			
6. Access to			
All emergency procedures on Computer system			
7. Plans			
Mine Emergency Plans (Updated 3 monthly)			
Surface Responsibility Plans (Updated 3 monthly)			
8. Relevant telephone numbers			
IMT Contact List			
Rescue Team Members			
Persons on Standby (In OCC)			
ECC Telephone list (Hardcopy)			ISOS number tested ☐
9. Stationary			
10x Ball Point Pens			
10x Pencils			
2x Erasers			
1x Sharpener			
15x Board Markers (Red, Blue, Green x 5ea)			
2x Permanent Markers			
2x Highlighter boxes			
1x Stapler			
1x Pct. Staples			
1x Stapler Remover			
1x Punch			
3x Pct. of board Pins			
1x Scissor			
1x Pct. Wax Crayons			
5x Plastic Rulers 30cm			
2x Scale Rulers			
5x Posted Pads Pct.			
Detachable Labels			
2x Empty Files			
File Dividers			
5x Note pads A4			
5x Quotation Folders			
5x Pocket Note books A6			
5x Flipchart paper			
Graph Paper			
1x Ball of String/Wool			
10. Air conditioner			
Operational			
11. Safety Equipment			
6x Flashlights			
6x Head Lamps			
Spare Batteries for flash lights and electronic equipment			
Danger Tape			
Spray Paint			
Tape Measure			
20x Lockout Locks			

CORRECTIVE ACTION :	**Responsible person:**

Appendix 5.0 Risk Management Severity Scale

Severity level	Impact types						
	Health and safety	Environment	Social and cultural	Reputation	Legal	Financial	Severity
7	>50 fatalities. Very serious irreversible injury to >500 persons.	Unplanned permanent environmental impact over extensive area. Permanent loss of ecosystem or extinction of species.	Complete breakdown of social order. Widespread desecration of items of global cultural significance. Company directly responsible or complicit in severe, and widespread long term impacts on human rights.	Prolonged (>2 months) international multi-NGO and media condemnation.	Hostile takeover, public shareholder discontent resulting in loss of Chairman/CEO/Board, bankruptcy, closure of operations on multiple sites or South32.	>US$2.5 billion	1000
6	>20 fatalities. Very serious irreversible injury to >100 persons.	Unplanned severe impact (>20 years) on ecosystem or Threatened Species.	A breakdown of social order. Widespread damage to items of global cultural significance. Highly offensive infringements of cultural heritage. Company directly responsible or complicit in severe, long-term impacts on human rights	International multi-NGO and media condemnation. South32 direct action (includes partner/contractor action) results in reputation issue. Large violent protest (>100 people) resulting in fatal injuries.	Lack of valid operating title, forced closure of an operation, Anti-trust or Foreign Corrupt Practices inquiry.	US$250 million – US$2.5 billion	300
5	2 -20 fatalities. Short or long term health exposures leading to significant irreversible human health effects to >50 persons.	Unplanned serious or extensive impact (<20 years) on ecosystem or Threatened Species.	Extensive long-term social impacts. Widespread damage to structures/items/ locations of national cultural significance. Serious infringements of cultural heritage. Company directly responsible or complicit in multiple aggravated impacts on human rights.	Serious public or national media outcry (international coverage). Damaging NGO campaign. South32 reputation severely tarnished. Third party actions (where South32 is one of many in a group) result in reputation impact. Large protest (>100 people) with significant violence & serious,	Fines and prosecutions relating to criminal breaches including jail terms and being the subject of a royal commission.	US$50 million – US$250 million	100
4	Single fatality. Severe irreversible disability or impairment (>30% of body) to one or more persons.	Unplanned major impact (<5 years) on ecosystem or Threatened Species.	Major long-term social impacts or on-going social issues. Damage to structures/ items of national cultural significance. Major infringement and disregard of cultural heritage. Company directly responsible or complicit in major human rights impacts	Major adverse national media/ public/ NGO attention. 20- 100 people protest, people restrained with force, arrests and injuries. Asset/CSG reputation majorly impacted.	Major civil litigation including class actions.	US$5million – US$50 million	30

3	Moderate irreversible disability or impairment (<30% of body) to one or more persons. Days lost due to injury.	Unplanned moderate impact (< 1 year) to ecosystem or non- threatened species.	Moderate medium-term social impacts or frequent social issues. Moderate damage to structures/ items of local cultural significance. Moderate infringement of cultural heritage/ sacred locations. Moderate, temporary human rights impacts.	Attention from regional media and/or heightened concern by local community. Criticism by community, NGOs or activists. Asset reputation adversely affected.	Breach of regulation, Lack of valid exploration title.	US$500,000 – US$5 million	10
2	Objective but reversible disability/impairment Medical treatment injury.	Unplanned minor impact (< 3 months) to non-threatened species or their habitat.	Minor medium-term social impacts on small number of people. Minor repairable damage or disturbance to property, structures, or items. Minor infringement of cultural heritage. Minor, temporary human rights impacts.	Adverse local public or media attention and complaints. Heightened scrutiny from regulator. Asset reputation is adversely affected with a small number of people.	Minor legal issues, non-compliances and breaches of regulation.	US$50,000 – US$ 500,000	3
1	Low level short-term subjective inconvenience or symptoms. No medical treatment.	Unplanned low level environmental impact	Low-level social impacts. Low-level infringement of cultural heritage or minimal disturbance to heritage structures. Minimal impact on human rights.	Public concern restricted to local complaints. Low level interest from local media and/or regulator.	Low-level legal issue.	<US$50,000	1

Appendix 6.0 Mamatwan Mine IMT

Mamatwan Mine IMT Members					
Name	Title	IMT Role	E-mail Address	Office Number	Cell Number
B Bezuidenhout	Operations Manager	IMT Leader	Barry.bezuidenhout@south32.net	0537422300	0824426977
Rustum Norman	Manager Maintenance	Logistics Officer (ALT IMT Leader)	Rustum.Norman@south32.net	0537422393	0823173047
W Claassen	Manager Engineering	Field Officer	wally.claassen@south32.net	0537422565	0832627514
W Vosser	MES Superintendent	IMT Coordinator	wynand.vosser@south32.net	0537422404	0832961898
A Bodiba	Lead HSE Mamatwan	HSE Officer	Abram.Bodiba@south32.net	0537422081	0721849849
T Orr	Specialist HRBP	HR Officer	Tarryn.Orr@south32.net	0537422196	0723578583
T Wales	Security Specialist	Security Officer	Thomas.wales@south32.net	0537422359	0833990081
Johan Bergh	Lead Finance Manganese SA	Finance Officer	Johan.bergh@south32.net	0537422104	0828874927
Tumi Seboko	Lead Corporate Affairs Mn	External Affairs & Communications Officer	Boitumelo.Seboko@south32.net	0537422293	0824958287
Tebogo Masuku	Manager Production	Record & Log Keeper	Tebogo.Masuku@south32.net	0537422008	0823389442

25.FINANCIAL PROVISION

25.1 DETERMINATION OF THE AMOUNT OF THE FINANCIAL PROVISION

25.1.1 Closure objectives description and the alignment with the baseline environment

The preliminary closure objectives and principles specific to the project activities/infrastructure have been developed against the background of the mine location in the Kuruman region of the Northern Cape Province, and include the following objectives:

- that environmental damage is minimised to the extent that it is acceptable to all parties involved;
- that contamination beyond the mine site by surface run-off, groundwater movement and wind will be prevented;
- that mine closure is achieved efficiently, cost effectively and in compliance with the law;
- that the social and economic impacts resulting from mine closure are managed in such a way that negative socio-economic impacts are minimised; and
- rehabilitate the land to achieve an end use of grazing to the extent reasonably possible.

The closure target outcomes for the site are therefore assumed to be as follows:

- to achieve chemical, physical and biological stability for an indefinite, extended time period over all disturbed landscapes and residual mining infrastructure;
- to protect groundwater, soils and other natural resources from loss of current utility value or environmental functioning;
- to limit the rate of emissions into the atmosphere of particulate matter to the extent that degradation of the surrounding areas' land capability or environmental functioning does not occur;
- to maximise visual 'harmony' with the surrounding landscape; and
- to create a final land use that has economic, environmental and social benefits for future generations that outweigh the long-term aftercare costs associated with the mine.

25.1.2 Confirmation that closure objectives have been consulted with I&APs

The closure objectives are outlined in this EIAR which will be made available to I&APs, including landowners for review and comment (Section 8).

To date no comments regarding the closure objectives (see Section 25.1.1) have been received from I&APs, including landowners (see Section 8).

25.1.3 Rehabilitation plan

Rehabilitation will be undertaken concurrently with mining operations, based on the rehabilitation plan developed for the mine. The mining plan/ schedule will be optimised to facilitate continuous rehabilitation. The strategy for continuous rehabilitation is as follows:

- Waste rock will be placed back into the pits to 25 m below original ground level.
- The full depth of available soils and subsoils will be placed on to the hard rock spoils, as far as is practical, so as to limit ingress.

- The calcrete material will be placed over the hard rock spoils in order to facilitate the development of an aquiclude over the spoils.
- Vegetation that is local to the area will be established to limit the risk of erosion.
- The mining plan/schedule will ensure optimal placement of waste rock to facilitate concurrent rehabilitation.
- The mining plan/schedule will be updated on an annual basis.
- Rehabilitation monitoring and auditing will be implemented to ensure conformance to this objective and the rehabilitation plan.

The approach to rehabilitating is not specifically documented in the approved 2005 EMPR. The planned re-processing of material within is however in line with the approved 2005 EMPR strategy which specifies the need for concurrent rehabilitation during on-going mining activities.

25.1.4 Compatibility of the rehabilitation plan with the closure objectives

It can be confirmed that the rehabilitation plan is compatible with the closure objectives given that the closure objectives were considered during the determination of the rehabilitation plan.

25.1.5 Calculate and state the quantum of the financial provision

The MMT updates the EIAR financial provision on an annual basis. The current financial provision, as of 21 September 2021, provides for an amount of **R 13,900,305.00** exclusive of VAT. This amount will be incorporated into the overall MMT mine-closure plan and the annual financial provision updates. Layout/activity changes that have already taken place (and are not part of the approved EMPR) have been previously included in the South32 financial provision (see Appendix L).

25.1.6 Confirmation that the financial provision will be provided

The funding of the financial provision is a combination of trust fund and bank guarantees.

26. MECHANISMS FOR MONITORING COMPLIANCE AND PERFORMANCE AGAINST THE EMPR

Environmental impacts requiring monitoring are listed in Table 26-1 below.

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

- Adherence to a formal monitoring procedure;
- Use of appropriately calibrated equipment by personnel trained to use the equipment;
- The preservation of samples according to laboratory specifications by personnel trained to use the equipment, where samples require analysis;
- The identification of monitoring parameters in consultation with a specialist in the relevant field and/or the relevant authority;
- The amendment of monitoring parameters, where necessary, following the initial monitoring results and in consultation with a specialist and/or the relevant authority; and
- The interpretation of data and reporting of trends will be undertaken by an appropriately qualified person.

Table 26-1: Monitoring of compliance and performance

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
• Establishment of a top-cut stockpile and associated mobile crushing and screening plant • Establishment of stormwater management infrastructure • Changes to waste rock dump height • Establishment of a pipeline to transport abstracted water from Middelplaats Mine to MMT • Upgrading the railway and railway loadout station	Alteration of natural drainage patterns	So as to allow more informed management decisions at MMT regarding the volume of water used for specific purposes within MMT mine area, flow meters will be used within the distribution system.	Environmental Department	Mass water balance to be updated on an annual basis for the duration of the mine. This information must be submitted to the DHSWS on an annual basis.
• Re-processing of material located in Adams Pit.	Contamination of groundwater resources	Refer to FIGURE 26-1 for the location of the groundwater monitoring points for MMT. Water quality analyses results should be classified in terms of the SANS 241:2015 Water Quality Standards and the DWAF Target Quality Range for Livestock Watering (1996) and the DWS WQRO as stipulated in the IWUL. The monitoring results should be assessed by a suitably qualified professional registered with the South African Council for Natural Scientific Professional. The parameters that need to be analysed for are summarised in the table below.	Environmental Department	The MMT groundwater water quality monitoring to be undertaken on a quarterly basis. Monitoring reports need to be submitted to the DHSWS as per the conditions of the IWUL, on an annual basis. Monitoring reports need to cater for any reporting requirements stipulated in the IWUL.

		pH Conductivity in mS/m at 25 ° c Total dissolved solids (TDS) at 180 ° c Alkalinity as $CaCO_3$ Carbonate as CO_3 Bicarbonate as HCO_3 Boron as B Nitrate as N Chloride as Cl Sulphate as SO4 Fluoride as F Sodium as Na Potassium as K Calcium as Ca Magnesium as Mg Manganese as Mn Full metal scan - Inter Coupled Plasma Scan (ICP) (via Mass Spectrometry (MS)		
• Establishment of a top-cut stockpile and associated mobile crushing and screening plant • Establishment of stormwater management infrastructure	Physical destruction and general disturbance of biodiversity	The monitoring system currently used involves the use of satellite imagery and aerial photography, which are calibrated to the existing conditions on the ground through traditional vegetation sampling techniques. The satellite imagery estimates and quantifies the dynamics in vegetation cover and health, while the aerial photography is used to monitor dynamics of the woody component in terms of bush encroachment crown cover, and also the amount of bare soil present. These techniques will be used to monitor the effects of mining on vegetation and the status of revegetation.	Environmental Department	Monitoring will take place on an annual basis.

• Establishment of a pipeline to transport abstracted water from Middelplaats Mine to MMT • Upgrading the railway and railway loadout station				
• Establishment of a top-cut stockpile and associated mobile crushing and screening plant • Re-processing of material located in Adams Pit.	Air pollution	The approved 2005 EMPR, does not specify where dust buckets need to be positioned. It follows that for the purpose of this EIAR, dust fallout monitoring will be undertaken in accordance with existing practices. This includes nine single dust buckets within and around the MMT and one directional dust bucket. The location of the dust fallout buckets is illustrated in FIGURE 26-1.	Environmental Department	Monitoring reports need to be uploaded onto the National Emissions Inventory System on annual basis. Dust fallout monitoring must be undertaken on a monthly basis for the duration of the mine.

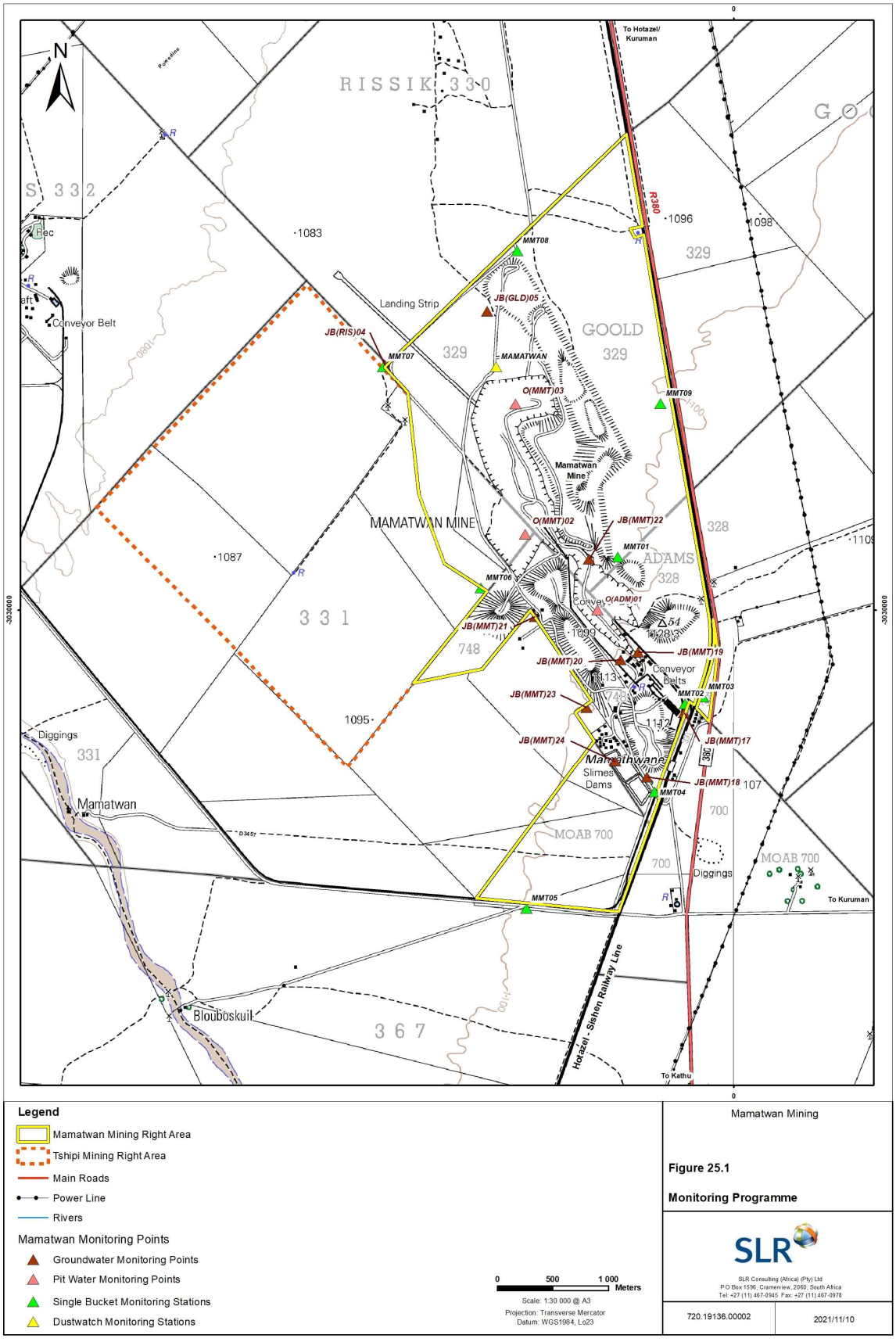


FIGURE 26-1: MONITORING PROGRAMME

26.1 FREQUENCY OF PERFORMANCE ASSESSMENT REPORT

MMT will for the period during which the environmental authorisation and the EMPR is valid, submit environmental audit reports to the DMRE.

These audits will focus on the mine's compliance with the conditions of the environmental authorisation and the commitments in the EMPR. These audits will be undertaken by a qualified independent person and will comply with the relevant NEMA Regulations 2014 (as amended).

The environmental manager will conduct internal management audits against the commitments in the EMPR in accordance with an annual audit plan. During the operational phase, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement.

26.2 CLOSURE COST REPORTING

The financial provision for the mine will be updated on an annual basis and submitted to the DMRE for the duration of the operation in accordance with the relevant legislation.

27.ENVIRONMENTAL AWARENESS PLAN

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

This section includes the environmental awareness plan for the MMT. The plan describes how employees are informed of:

- Environmental risks, which may result from the EIAR work and the manner in which the risk must be dealt with in order to avoid pollution or degradation of the environment;
- The training required for general environmental awareness; and
- The dealing of emergency situations and remediation measures for such emergencies.

All contractors that conduct work on behalf of MMT are bound by the content of the EMPR and a contractual condition to this effect will be included in all such contracts entered into by the mine. The responsibility for ensuring contractor compliance with the EMPR will remain with MMT.

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 the EIAR tasks on the basis of appropriate education, training and/or experience. The environmental awareness plan should enable MMT to achieve the objectives of South32's sustainability policy.

27.1.1 Sustainability policy

South32's sustainability policy addresses both environmental and social needs. The contents of the policy is presented below.

"South32 affirms its purpose to make a difference by developing natural resources, improving people's lives now and for generations to come. South32 is committed to Sustainable Development, defined as supporting the needs of the present without compromising the ability of future generations to meet the EIAR own needs.

- We monitor the external environment for opportunities to invest and develop natural resources that deliver shared value for society.
- We work to achieve positive social, environmental, and economic outcomes as a result of our decisions.
- We commit to respecting human rights in accordance with the UN Guiding Principles on Business and Human Rights in all of our stakeholder relationships. Our approach is guided by international human rights principles included in the Universal Declaration of Human Rights and other core international standards including the International Labour Organisation Declaration on Fundamental Principles and Rights at Work, the International Council for Mining and Metals Sustainable Development Framework and the Voluntary Principles on Security and Human Rights.
- We support employment and community practises which empower people to make choices and have control over the EIAR process of development as it affects the EIAR lives, beliefs, institutions, well-being and the lands they occupy or otherwise use.
- We identify and control risks, and continually improve our management of safety, health, environment and social impacts, through systematic management systems and processes.

- We practise responsible stewardship for the commodities we extract as well as the natural resources we consume.
- We develop and participate in conservation and rehabilitation activities to ensure ecosystems continue providing value to future generations.
- To meet the challenge of climate change, we work to reduce our greenhouse gas emissions. We continually assess our risks and opportunities to protect and create value and monitor our impact to ensure we do not compromise the ecosystems which provide resilience against climate change for our host communities.
- We uphold stringent health, safety, environment, community and governance standards in all jurisdictions in which we operate.
- We publicly report our progress and encourage high standards of transparency and accountability in our business governance, risk and government interactions."

27.1.2 Steps to achieve the environmental policy objectives

MMT's environmental policy is 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:
  - MMT will establish and appoint Managers 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 irrespective of other responsibilities, for example:
    - Compliance with environmental legislation and EMPR commitments;
    - Implementing and maintaining an environmental management system with the assistance of the appointed Environmental specialists, Superintendents and Health, Safety and Environmental (HSE) Leads;
    - 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, specifically:
    - Discussions of environmental issues and feedback on environmental projects will form part of the annual work plan of the HSE committee who will report periodically to the board of the company;
    - Progress reports on the achievement of policy objectives and level of compliance with the approved EMPR will be provided to the DMRE;
    - Ensuring environmental issues are raised at daily production meetings, monthly mine management meetings and all relevant mine wide meetings at all levels; and
    - Ensuring environmental issues are discussed at all general liaison meetings with local communities and other interested and affected parties, where possible.
- Environmental awareness training:

- MMT will provide environmental awareness training to individuals at a level of detail specific to the requirements of the EIAR 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;
  - 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;
- Design the mine to minimise the impact on the environment and to accomplish closure/rehabilitation objectives; and
- Maintain records of all environmental training, monitoring, incidents, corrective actions and reports.

27.1.3 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 communicates:

- 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;
- The individual's roles and responsibilities in achieving the aims and objectives of the environmental policy; and
- The potential consequences of not complying with environmental procedures.

27.1.3.1General 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:

- Basic training plan applicable to all personnel entering the site:
  - Short (15 min) presentation to indicate the site layout and activities at specific business units together with the EIAR environmental aspects and potential impacts; and
  - Individuals to sign off with site security on completion in order to gain access to the site.
- General training plan applicable to all personnel:
  - General understanding of the environmental setting of the mine (e.g. third-party receptors 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, noise, etc.);
  - Indicate potential site-specific environmental aspects and the EIAR impacts;
  - Identifying poor environmental management and stopping work which presents significant risks; and
  - Reporting incidents.
- Specific training plan:
  - Specific environmental aspects and impacts such as:
    - Spillage of hydrocarbons at workshops;

  - Poor waste management such as mixing hazardous and general waste (including rubble and used conveyor belts) s, inappropriate storage and stockpiling large amounts of waste;
  - Poor housekeeping practices;
  - Poor working practices (e.g. not carrying out oil changes in designated bunded areas);
  - Excessive noise generation and unnecessary use of hooters; and
  - Protection of heritage resources (including palaeontological resources).
- MMT's duty of care (specifically with respect to waste management); and

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 MMT will:

- Promote environmental awareness using relevant environmental topic posters displayed at strategic locations on the mine and toolbox talks.
- Participate and organise events which promote environmental awareness, some of which will be tied to national initiatives e.g. National Arbour Week, World Environment Day and National Water Week.

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

27.2.1 On-going monitoring and management actions

The monitoring programme as described in Section 26 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

27.2.2 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 employees/contractors, the public and/or potentially serious pollution of, or detriment to the environment (immediate and delayed). In case of environmental emergencies MMT will comply with South32's Crisis and Emergency Management procedure. In addition, MMT will implement the general and activity-specific procedures described in the sections below.

27.2.2.1General emergency procedure

For all environmental emergencies, MMT will:

- Cordon off the area to prevent unauthorised access and tampering of evidence;
- Undertake actions defined in the emergency plan to limit/contain the impact of the emergency;
- If residue facilities/dams, storm water diversions, etc. are partially or totally failing and this cannot be prevented, the emergency siren is to be sounded (nearest one available);
- Take photographs and samples as necessary to assist in investigation;
- Ensure compliance with Section 30 of the NEMA such that:
  - the Environmental specialists, Superintendents and HSE Leads must immediately notify the Director-General (DHSWS, DMRE and Inspectorate of Mines, as appropriate), the South African Police Services, the relevant fire prevention service, the provincial head of DMRE, the head of the local

municipality, the head of the regional DHSWS 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 HSE 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 HSE department must report to the Director-General DHSWS and DEA, the provincial head of DMRE, the regional manager of the DMRE, the head of the local and district municipality, the head of the regional DHSWS 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.

27.2.2.2Identification of emergency situations

The project specific emergency situations that have been identified together with specific emergency response procedures are outlined in the table below.

TABLE 27-1: EMERGENCY RESPONSE PROCEDURES

Item	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, MMT will: ○ Notify residents/users downstream of the pollution incident; ○ Identify and provide alternative resources should contamination impact adversely on the existing environment;

Item	Emergency situation	Response in addition to general procedures
		○ Cut off the source if the spill is originating from a pump, pipeline or valve (e.g. refuelling bays) 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; and ○ Remove hazardous substances from damaged infrastructure to an appropriate storage area before it is removed/repaired.
2	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/management actions.
3	Uncovering of graves and sites and fossils	• Personnel discovering a grave or site will inform the environment department immediately and all work in the vicinity will be stopped immediately. • The environmental department will inform the South African Heritage Recourse Agency (SAHRA) and contact an archaeologist and/or palaeontologist, depending on the nature of the find, to assess the importance and rescue them if necessary (with the relevant SAHRA permit). No work will resume in this area without the permission from the Environmental Control Officer (ECO) and SAHRA. • If the newly discovered heritage resource is considered significant a Phase 2 assessment may be required. • Historical buildings older than 60 years fall under the jurisdiction of the Free State Provincial Heritage Authority. If any sites are affected this provincial authority will be contacted. • Should further burial grounds, graves or graveyards be found, the SAHRA Burial Grounds and Graves Unit will be contacted. • Prior to damaging or destroying any of the identified graves, permission for the exhumation and relocation of graves will be obtained from the relevant descendants (if known), the National Department of Health, the Provincial Department of Health, the Premier of the Province and the local Police. • The exhumation process will comply with the requirements of the relevant Ordinance on Exhumations and the Human Tissues Act, 1983 (No. 65 of 1983).

27.2.3 Technical, management and financial options

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 mine of this scale and nature;
- To prevent the occurrence of emergency situations, the mine will implement as a minimum the mine plan and management actions as included in this EMPR;
- The mine will maintain an environmental management system where all operations identify, report, investigate, address and close out environmental incidents;

- As part of its annual budget, the mine will allow a contingency for handling of any risks identified and/or emergency situations; and
- Where required, the mine will seek input from appropriately qualified people.

28. SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

All information required by the competent authority has been included within this report and it is anticipated that the EIAR and EMPR will provide sufficient input to the DMRE decision making.

29.UNDERTAKING

I, Natasha Smyth, the EAP responsible for compiling this EIAR, undertake that:

- The information provided herein is correct;
- Comments and inputs from I&APs and commenting authorities have been included and correctly recorded in this EIAR;
- 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.

	15 November 2021
Signature of EAP	Date

30.REFERENCES

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APPENDIX A: CURRICULUM VITAE OF THE PROJECT TEAM

APPENDIX B: DEA SCREENING TOOL

APPENDIX C: PUBLIC CONSULTATION PROCESS

C1: Letter from Land Claims Commissioner
C2: Proof of Advertisements
C3: Proof of I&AP Notification and Correspondence
C4: Project Database
C5: Comments and Response Report

APPENDIX D: HERITAGE ASSESSMENT

APPENDIX E: PALEONTOLOGICAL ASSESSMENT

APPENDIX F: GEOCHEMISTRY ASSESSMENT

APPENDIX G: GROUNDWATER STUDY

APPENDIX H: AIR QUALITY ASSESSMENT

APPENDIX I: NOISE ASSESSMENT

APPENDIX J: STORMWATER MANAGEMENT PLAN

APPENDIX K: SOILS AND LAND CAPABILITY

APPENDIX L: FINANCIAL PROVISION

APPENDIX M: VISUAL ASSESSMENT

APPENDIX N: BIODIVERSITY ASSESSMENTS

APPENDIX O: GEOTECHNICAL ASSESSMENT FOR THE PROPOSED RAIL LOOP

APPENDIX P: HYDROCENSUS STUDY

RECORD OF REPORT DISTRIBUTION

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