SECTION 24G ENVIRONMENTAL IMPACT ASSESSMENT REPORT FOR THE MAMATWAN MINE

AVAILABLE FOR PUBLIC REVIEW

SUBMITTED FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998), AS AMENDED IN RESPECT OF A SECTION 24G RECTIFICATION PROCESS FOR LISTED ACTIVITIES THAT COMMENCED WITHOUT ENVIRONMENTAL AUTHORISATION

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EXECUTIVE SUMMARY

PROJECT BACKGROUND

Hotazel Manganese Mines (Pty) Ltd (HMM) operates the South32 opencast manganese mine known as the Mamatwan Mine (MMT). MMT is located approximately 25km to the south of the town Hotazel in the John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality of the Northern Cape Province of South Africa. MMT holds the following environmental permits and authorisations:

- A Mining right (Reference number: NC 256 MR) issued and approved by the former Department of Minerals and Energy (DME) (currently the Department of Mineral Resources (DMR)) in May 2006;
- An Environmental Management Programme Report (EMPr) (Reference number: NC 6/2/2/118) issued and approved by the former DME (currently the DMR) in November 2005;
- An amended 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 amended Integrated Water Use Licence (IWUL) (License number: 10/D41K/AGJ/1537) issued by the Department of Water and Sanitation (DWS) in January 2012 and amended in 2017;
- An Environmental Authorisation (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 Environmental Authorisation (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 DMR in January 2020.

Certain activities at the MMT commenced without environmental authorisation in terms of the National Environmental Management Act (No. 107 of 1998) (NEMA), as amended, and the National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA), as amended. These activities include the establishment of the North Eastern (NE) topsoil stockpile and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust. Under the NEMA, the unlawful commencement of both NEMA and NEM:WA listed activities may be authorised through an application for rectification made in terms of Section 24G of the NEMA.

SLR Consulting (South Africa) (Pty) Ltd (SLR), an independent firm of Environmental Assessment Practitioners (EAP), has been appointed by South32 to manage the Section 24G rectification process.

SUMMARY OF AUTHORISATION REQUIREMENTS

Environmental authorisation is requested from the DMR for the following activities:

- The establishment of the NE topsoil stockpile in terms of NEMA (refer to Section 4.1 for further detail pertaining to the relevant listed activity);
- The use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) in terms of NEM:WA (refer to Section 4.1 for further detail pertaining to the relevant listed activity); and
- The use of Adams pit for the storage of sinter de-dust in terms of NEMA (refer to Section 4.1 for further detail pertaining to the relevant listed activity).

It is important to note that the storage of sinter de-dust into Adams pit also requires a WUL in accordance with the National Water Act (No. 36 of 1998) (NWA) in terms of Section 21(g): *Disposal of waste in a manner that may detrimentally impact on the environment.* This will be managed as part of a separate process with the DWS.

This Environmental Impact Assessment Report (EIAR) does not cover occupational health and safety legislation requirements.

PURPOSE OF THIS EIAR

The EIAR has been compiled and distributed for review and comment as part of a Section 24G rectification process that is being undertaken for the MMT. This EIAR:

- Provides a description of the activities that commenced without authorisation and the affected environment;
- Summarises the rectification process followed to date; and
- Identifies and assesses the key impacts and presents management and mitigation measures to manage/limit impacts arising from the activities.

SUMMARY OF THE PUBLIC PARTICIPATION PROCESS

The public participation process commenced prior to the submission of the EIAR and will continue throughout the Section 24G rectification process. To date, commenting authorities and Interested and Affected Parties (I&APs) have been given the opportunity to review the Background Information Document (BID), to attend a public meeting and to submit questions and comments to the project team.

Due to the COVID-19 Lockdown, the public participation process in support of the proposed project was put on hold on 27 March 2020. On 05 June 2020, the Department of Environment, Forestry and Fisheries (DEFF) issued Government Notice (GN) 650, providing direction on how to proceed with licensing processes and public participation processes. In this, regard, the distribution of the EIAR in support of the proposed project can now be made available for public review as per GN 650. 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 any of the following non-exhaustive list of methods: websites, Zero Data Portals, community or traditional authorities, Cloud Based Services, provided that all registered I&APs have access to the reports.

Taking the above into consideration this EIAR is available for a 30-day calendar day comment period from **04 August 2020** until **07 September 2020** in order to provide I&APs with an opportunity to comment on any aspect of the project and the findings of the Section 24G rectification process. Copies of the full report will be made available on the SLR website (at https://slrconsulting.com/public-documents).

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IMPACTS AND MANAGEMENT ACTIONS

This section provides a summary of the assessment of the potential impacts of the project and provides measures to prevent and/or mitigate the impacts. Potential biophysical and socio-economic impacts were identified by SLR, specialists (where relevant) and stakeholders. All identified impacts were considered both incrementally and cumulatively in the context of the existing and approved MMT mining infrastructure and activities.

The establishment of the NE topsoil stockpile and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust has commenced. The aim of a Section 24G rectification process is to understand the impact that occurred due to undertaking an unlawful activity. For the purpose of this EIAR the assessment below only focusses on the project construction and operational phases. Impacts in the construction phase are limited to the NE topsoil stockpile only as this is when the stockpile was established. Adams pit existed prior to being used for the disposal and general waste (including rubble and used conveyor belts) and storage of sinter de-dust and as such is limited to the project operational phase. The impacts are rated with the assumption that no management actions are applied and then again with management actions.

The table below provides a summary of the potential impacts in no particular order of importance.

Table A: Summary of potential impacts

Aspect	Potential impact	Summary of impact discussion and reference to mitigation measures	Incremental impact significance		Cumulative impact significance of the impact	
			Un	M	Un	M
Topography	Safety to third parties and animals	The project activities present infrastructure that has altered the natural topography and in turn has the potential risk of injury and/or death to both third parties (people) and animals (livestock and wild animals) from falling off steep slopes. The project does not present new safety risks in the context of the existing MMT operations. It follows that the impact associated with the safety to third parties and animals is expected to be negligible for the project. Management actions to ensure that this rating is maintained focus on access control and the implementation of the emergency response procedure in the event of an injury and/or death.	Insignificant			
Soils and land capability	Loss of soil resources and land capability through physical disturbances and contamination	Soil is a valuable resource that supports a variety of ecological functions. Mining activities can result in a loss of soil resources as an ecological driver through contamination and physical disturbance, particularly in the unmitigated scenario. The loss of soil resources has a direct impact on the potential loss of the natural capability of the land. Adams pit was completely mined out by 1980. The disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust could not have influenced soil resources and related land capability and as the assessment of the loss of soil resources is not applicable to this project activity. The establishment of the NE topsoil stockpile cannot be assessed in the terms of losing soil resources as stockpiling topsoil is a management action identified to manage and conserve soil resources that need to be stripped as part of clearing land for mining infrastructure. MMT with therefor continue to implement management actions required to conserve soil resources for the duration of the project.	Not applicable			
Biodiversity	Destruction of biodiversity	Areas of ecological sensitivity include functioning biodiversity areas with species diversity (including protected species) and associated intrinsic value. The transformation of land for any purpose increases the destruction of the site-specific biodiversity, the fragmentation of habitats, reduces its intrinsic functionality and	Medium	Low	High	Medium

Aspect	Potential impact	Summary of impact discussion and reference to mitigation measures	Incremental impact significance		Cumulative impact significance of the impact	
			Un	M	Un	M
		reduces the linkage role that undeveloped land fulfils between different areas of biodiversity importance. The NE topsoil stockpile destroyed protected floral species as part of vegetation clearing activities. This would have subsequently resulted in the loss of species habitat and diversity within the project footprint area. When considered cumulatively, the establishment of the NE topsoil stockpile has increased the mines overall disturbance footprint. Management actions focus on controlling further degradation. Adams pit was historically mined out by 1980. General waste (including rubble and used conveyor belts) and sinter de-dust is deposited/ stockpiled on the existing tailings material located in Adams pit. It follows that this project activity is unlikely to have destroyed any site-specific biodiversity.				
	General disturbance of biodiversity	Mining activities can generally disturb biodiversity which in turn effects the success of rehabilitation. The project activities have the potential to directly disturb vegetation, vertebrates and invertebrates particularly in the unmitigated scenario. When considered cumulatively, the project results in an increase in the number of disturbances already present at the MMT. This contributes to further disturbances and loss of favourable habitat for faunal and floral populations. Management actions focus on monitoring of edge effects, alien invasive species and implementing operational controls.	Medium	Very low	high	Low
Surface water	Alteration of natural drainage patterns	The MMT falls within the quaternary catchment D41K which has a gross total catchment area of 4 216 km2, with a net MAR of 6.53 mcm. Natural drainage across the MMT is via sheet flow. The project infrastructure has the potential to alter drainage patterns by reducing the volume of run-off into the downstream catchments. The runoff loss to the catchment as a result of the MMT (inclusive of project areas) is 0.4%. This is attributed to the high evaporation rates of the area. Any potential loss of runoff to the catchment associated with the project areas are therefore expected to be negligible. Management actions to ensure that this rating is maintained includes the separation of clean and dirty water.	Insignificant			

Aspect	Potential impact	Summary of impact discussion and reference to mitigation measures	Incremental impact significance		Cumulative impact significance of the impact	
			Un	M	Un	M
	Contamination of surface water resources	The nearest watercourses to the project infrastructure include the ephemeral Vlermuisleegte River (located approximately 3 km west of MMT) and the ephemeral Witleegte River (located approximately 4 km northeast of the MMT). Given the distance, ephemeral nature and that natural flow is in a north to north west direction away from these watercourses, it is highly unlikely that any potential contaminates would reach the nearest watercourses. In addition to this, any run-off from the Adams pit stockpile containing the sinter de-dust would be contained within the Adams pit. The potential for the project activities to contribute to the contamination of surface water resources is therefore negligible. Management actions to ensure that this rating is maintained includes ensuring that all activities remain within the MMT Mining Right area.	Insignificant			
Groundwater	Contamination of groundwater resources reducing availability to third parties	The storage of sinter de-dust in Adams Pit presents a pollution source that may have the potential to pollute water resources through long term seepage of contaminants into the groundwater system. This in turn influences the use of groundwater resources by third parties for domestic and/or livestock watering purpose. Modelling results indicate that a pollution plume does emanate from Adams pit but does not extend beyond the MMT Mining Right boundary. Third parties are unlikely to access water within the zone of the pollution plume. When considered cumulatively, the storage of sinter de-dust further deteriorates the groundwater quality within the MMT footprint. Management actions focus on compensation for loss of supply (where MMT is directly responsible), implement monitoring programmes and identify offtake markets in order to re-process material located in Adams pit.	Very low	Very low	High	Low
Air quality	Air pollution	The generation of dust fallout and PM10 and PM2.5 particularly during periods of high wind speeds when the wind speeds exceed at least 5.4 m/s. This is generated through transportation, tipping and exposed surfaces. Dust fallout monitoring results for MMT are within acceptable limits. The PM concentrations are likely to be high close to the source and decrease rapidly up to a distance of 250 m with no air quality sensitive receptors within this zone. This is informed by the very low dust fallout rates. However the ambient particulate concentrations are assumed to be higher with the potential	Low	Very low	Low	Very low

Aspect	Potential impact	Summary of impact discussion and reference to mitigation measures	Incremental impact significance		Cumulative impact significance of the impact	
			Un	M	Un	M
		to exceed the NAAQSs at the nearby AQSRs, but with mitigation measures in place these impacts should be limited to the MMT site resulting in compliance with the NAAQS at sensitive receptor locations. When considered cumulatively, the project activities present additional emission sources that generate dust fallout when considered in the context of existing sources at the MMT. Management actions focus on dust control measures such as water sprays, promoting vegetation growth and monitoring.				
Noise	Increase in disturbing noise levels	Noise generating activities/ equipment associated with the project activities include tipping material and land clearing. Night-time noise limits are currently exceeded at sensitive noise receptors. Project activities associated with Adams pit were limited to day-time periods only. It follows that the exceedances are unlikely to have been attributed to tipping material into Adams pit and were rather a result of the existing MMT and neighbouring mines (Tshipi Borwa Mine), night-time mining and processing activities. In terms of the NE topsoil stockpile, it is highly unlikely that land clearing activities would have resulted in a notable increase in ambient noise levels at noise sensitive receptors, when considered in the context of existing noise generated from MMT and neighbouring mines. The increase in noise levels at nearby noise sensitive receptors is expected to be negligible. Management actions to ensure that this rating is maintained includes equipped vehicles with noise attenuation equipment.	Insignificant			

Aspect	Potential impact	Summary of impact discussion and reference to mitigation measures	Incremental impact significance		Cumulative impact significance of the impact	
			Un	M	Un	M
Visual	Negative visual views	The establishment of the NE topsoil stockpile altered the landscape character of the project footprint, which in turn presents additional infrastructure that generates negative visual views. It is, however, important to note that the visual landscape within the MMT area has been transformed due to the presence of approved mining infrastructure and activities. It follows that the NE topsoil stockpile is absorbed into current views of the MMT mining activities. In addition to this, sensitive receptors that reside in the area, such as farmers and farm workers, are accustomed to mining infrastructure given that the MMT is one of numerous mining operations located within the Gamagara Mining corridor. The potential to generate negative visual views is expected to be negligible. Management actions to ensure that this rating is maintained includes retaining existing vegetation and promoting vegetation if needed. Adams Pit is located centrally within the existing MMT operations and is surrounded by WRDs, stockpiles and other mining infrastructure and is not visible to any sensitive receptors. Taking this into consideration, the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit is unlikely to generate negative visual views.	Insignificant			
Traffic	Road disturbance and traffic safety	The establishment of the NE topsoil stockpile and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust would not have generated additional traffic as these activities would have formed part of existing practices and as such project-related road disturbance and traffic safety impacts are not expected to occur. This issue is therefore not assessed further in this EIAR.	Not applicable			
Heritage/cultural and paleontological resources	Loss of heritage/cultural and paleontological resources	It is unlikely that any heritage/cultural resources would have been disturbed as part of the establishment of the NE topsoil stockpile. Adams pit was completely mined out by 1980. It follows that the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit took place in an area that was extensively disturbed as part of historical operations and as such could not have impacted on heritage/cultural resources. In addition, there is a low possibility of	Insignificant			

Aspect	Potential impact	Summary of impact discussion and reference to mitigation measures	Incremental impact significance		Cumulative impact significance of the impact	
			Un	M	Un	M
		palaeontological resources occurring in the area. The potential of the project activities to destroy these resources is therefore negligible. Management actions to ensure that this rating is maintained includes the chance find procedures.				
Socio-economic	Inward migration and economic impact	The project activities/infrastructure forms part of existing approved operations and would not have generated any additional employment opportunities, and as such an increase in economic benefits due to project activities/infrastructure is expected to have been negligible. In addition to this, if no additional employment opportunities were created; negative project-related socio-economic impacts including inward migration are not expected to have occurred. This issue is therefore not assessed further in this EIAR.	Not applicable			
Land use	Change in land use	The project activities are located within the existing MMT Mining Right Area and will not change the current land use. Surrounding land uses includes existing mining operations, agriculture (grazing), infrastructure (road, rail network, powerlines, water pipeline), solar plant and isolated farm homesteads. When considered incrementally, potential impacts on surrounding land uses and users is limited to the potential groundwater, biodiversity and air quality impacts. The impacts on surrounding land users do not differ from the existing MMT operations. When considered cumulatively, the project results in an increase in the number of land use disturbances already present at the MMT. Management actions include adhering to communication structures with third parties.	Low	Very low	Medium	Low

ENVIRONMENTAL STATEMENT

The assessment of the project activities presents the potential for negative impacts to occur (in the unmitigated scenario in particular) on the biophysical and socio-economic environments both on the project sites and in the surrounding area. With 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 reason the project activities should not be authorised.

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ACRONYMS AND ABBREVIATIONS

Acronym / Abbreviation	Definition
ABA	Acid Base Accounting
AEL	Atmospheric Emissions Licence
AIP	Alien and invasive plant
AIR	Air Impact Report
B	Boron
BA	Basic Assessment
BAR	Basic Assessment Report
BID	Background Information Document
Ca	Calcium
CBA	Critical Biodiversity Area
CE	Control Efficiency
CH_4	Methane
Cl	Chloride
CO	Carbon monoxide
CO_2	Carbon dioxide
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DENC	Department of Environment and Nature Conservation
DME	Department of Minerals and Energy
DMR	Department of Mineral Resources
DMS	Dense Medium Separation
DRDLR	Department of Rural Development and Land Reform
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
ECO	Environmental Control Officer
EHS	Environment, Health, and Safety
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
Golder Associates	Golder Associates Africa (Pty) Ltd
GG	Government Gazette
HIA	Heritage Impact Assessment
HMM	Hotazel Manganese Mines
HSE	Health, Safety and Environment
I&AP	Interested and Affected Party

Acronym / Abbreviation	Definition
IBA	Important Bird Areas
ICP	Inter Coupled Plasma Scan
IDP	Integrated Development Framework
IEM	Integrated Environmental Management
IFC	International Finance Corporation
IWUL	Integrated Water Use Licence
LED	Local economic development
MAR	Mean annual runoff
MMT	Manganese Mamatwan Mine
Mn	Manganese
MS	Mass Spectrometry
NAAQS	National Ambient Air Quality Standards (GNR 1210 of 2009)
NBA	National Biodiversity Assessment
NCNCA	Northern Cape Nature Conservation Act (No. 9 of 2009)
ND	No Data
NDCR	National Dust Control Regulation (GNR 827 of 2013)
NE	North Eastern
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act, 2008 (No 59 of 2008), as amended
NEMA	National Environmental Management Act, 1998 (No. 107 of 1998), as amended
NFA	National Forest Act (No. 84 of 1998), amended
NFEPA	National Freshwater Ecosystem Priority Areas 2011
NHRA?	National Heritage Resources Act 25 of 1999
NO_2	Nitrogen dioxide
NO_3-N	Nitrate
NPAES	National Protected Areas Expansion Strategy
NSS	Natural Scientific Services
NWA	National Water Act, 1998 NWA, 1998 (No. 36 of 1998)
OPP	Ore Processing Plant
PM	Particulate matter
RoM	Run-of-mine
RQO	Resource Quality Objectives
SACAD	South African Conservation Areas Database
SAHRA	South African Heritage Resource Agency
SAHRIS	South African Heritage Resources Information System
SANBI	South African National Botanical Institute
SANS	South African National Standards
SAPAD	South African Protected Areas Database
SAS	Scientific Aquatic Services
SAWS	South African Weather Station
SCC	Species of conservational concern

Acronym / Abbreviation	Definition
SDF	Spatial Development Framework
SLP	Social and labour plan
SLR	SLR Consulting (South Africa) (Pty) Ltd
SMS	Short message service
SO_4	Sulphate
T.Alk	Total Alkalinity
TDS	Total Dissolved Solids
Tshipi	Tshipi é Ntle Manganese Mining (Pty) Ltd
TSP	Total Suspended Particulates
TWQG	Target Water Quality Guideline
UMK	United Manganese of Kalahari (Pty) Ltd
WHO	World Health Organisation
WML	Waste Management Licence
WQRO	Water Quality Resource Objectives
WRD	Waste Rock Dump
WUL	Water Use Licence

1 INTRODUCTION

This chapter introduces the project, describes the purpose of the EIAR, summarises the legislative authorisation requirements and outlines the opportunity for comment.

PROJECT BACKGROUND

HMM operates the South32 opencast manganese mine known as Mamatwan Mine (MMT). MMT is located approximately 25km to the south of the town Hotazel in the John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality of the Northern Cape Province of South Africa. MMT holds the following environmental permits and authorisations (included in Appendix A):

- A Mining right (Reference number: NC 256 MR) issued and approved by the former DME (currently the DMR) in May 2006;
- An EMPr (Reference number: NC 6/2/2/118) issued and approved by the former DME (currently the DMR) in November 2005;
- An amended AEL (Licence number: NC/AEL/JTG/MAM01/2012) issued by the DENC in March 2020;
- An amended IWUL (License number: 10/D41K/AGJ/1537) issued by the DWS in January 2012 and amended in 2017;
- An Environmental Authorisation (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 Environmental Authorisation (Reference number: NC 30/5/1/2/3/2 (252) MR for the merging of the Mamatwan Sinterfontein WRD with the Tshipi Eastern WRD from the DMR in January 2020.

Certain activities at the MMT commenced without environmental authorisation in terms of the NEMA and the NEM:WA. These activities include the establishment of the NE topsoil stockpile and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust. Under the NEMA the unlawful commencement of both NEMA and NEM:WA listed activities may be authorised through an application for rectification made in terms of Section 24G of the NEMA. Refer to Figure 1-2 for the location of the Section 24G activities.

SLR, an independent firm of EAP's, has been appointed by South32 to manage the Section 24G rectification process.

PURPOSE OF THIS EIAR

This EIAR has been compiled and distributed for review and comment as part of a Section 24G rectification process that is being undertaken for the MMT. This EIAR:

- Provides a description of the activities that commenced without authorisation and the affected environment;
- Summarises the rectification process followed to date; and
- Identifies and assesses the key impacts and presents management and mitigation measures to manage/limit impacts of the activities.

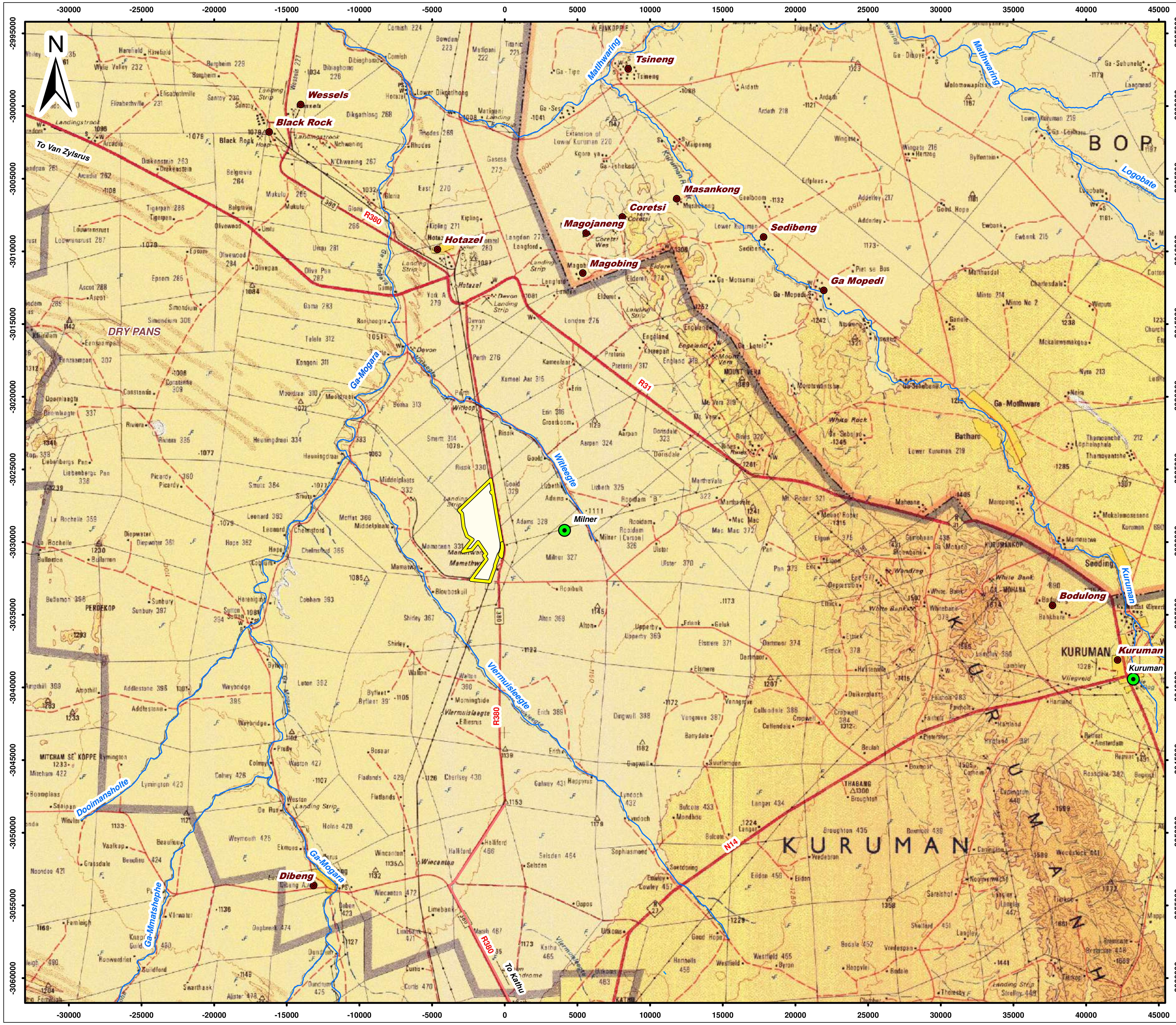
SUMMARY OF AUTHORISATION REQUIREMENTS

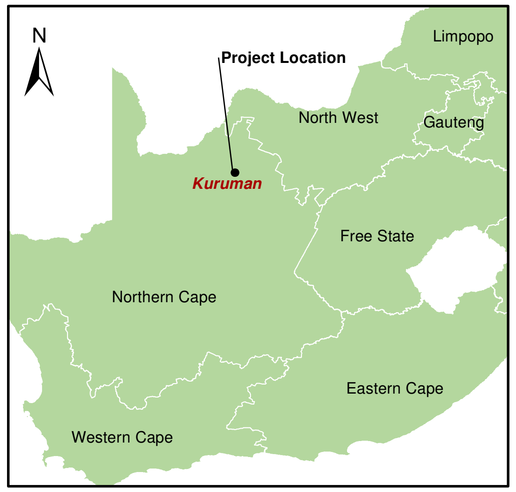
Environmental authorisation is required from the DMR for the following activities:

- The establishment of the NE topsoil stockpile in terms of NEMA (refer to Section 4.1 for further detail pertaining to the relevant listed activity);
- The use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) in terms of NEM:WA (refer to Section 4.1 for further detail pertaining to the relevant listed activity); and
- The use of Adams pit for the storage of Sinter de-dust in terms of NEMA (refer to Section 4.1 for further detail pertaining to the relevant listed activity).

It is important to note that the storage of Sinter de-dust into Adams pit also requires a WUL in accordance with the NWA in terms of Section 21(g): Disposal of waste in a manner that may detrimentally impact on the environment. This will be managed as part of a separate process with the DWS.

This EIAR does not cover occupational health and safety legislation requirements.





Legend

- Towns / Villages
- Main Roads
- Rivers
- Mamatwan Mining Right Area
- Weather Stations

0 4 8 Kilometers

Scale: 1:250 000 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

Mamatwan Mine

Figure 1-1

Regional Setting

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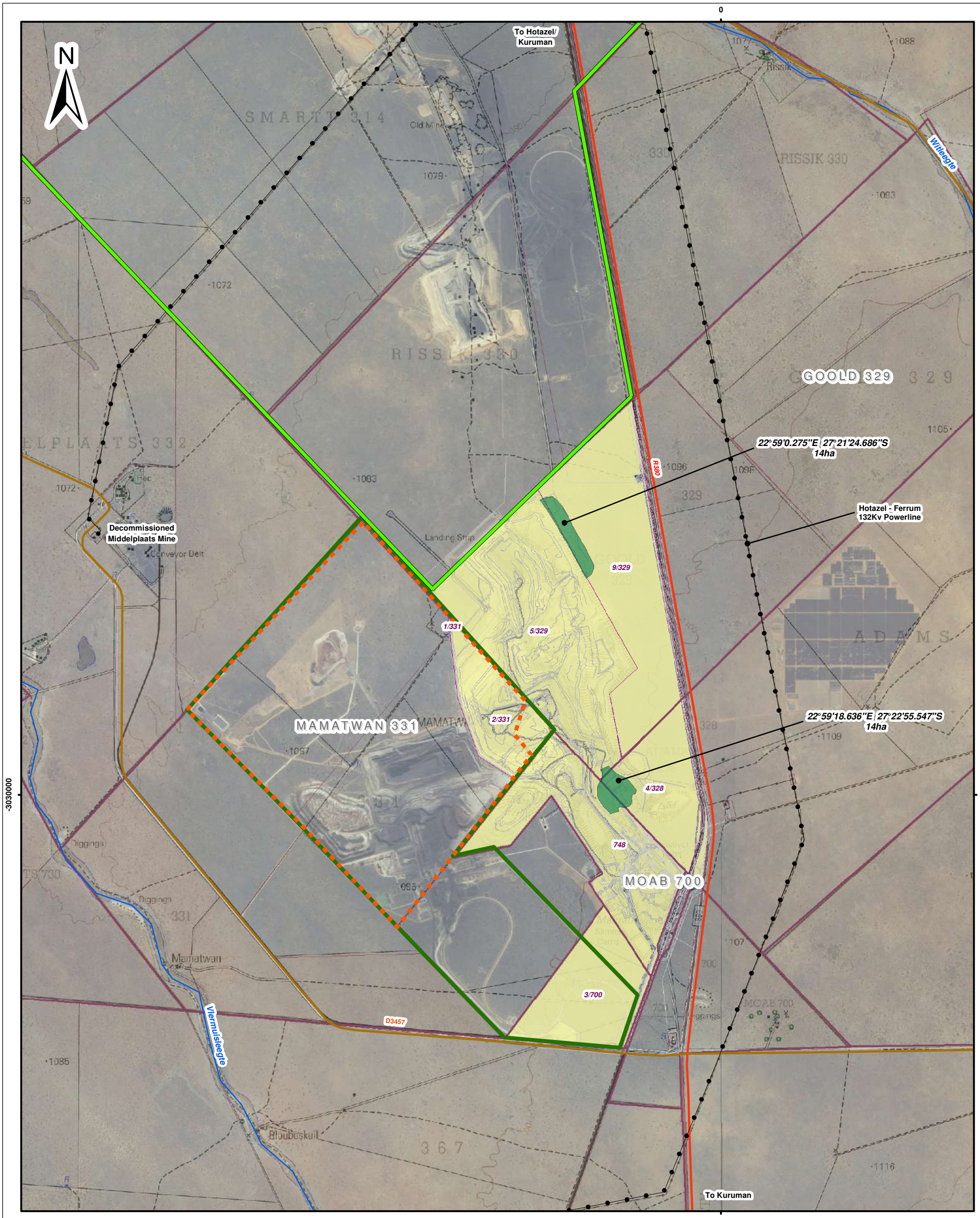
Tel: +27 (11) 467-0945 Fax: +27 (11) 467-0978

720.19136.00002	2020/04/30



Legend

- Mamatwan Mining Right Area
- Section 24g Activities
- Current Mamatwan Infrastructure
- Farm Boundaries
- portion_boundaries_for_mra_only
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- UMK Mining Right Area
- Tshipi Surface Use Area
- Tshipi Mining Right Area

0 500 1 000 Meters

Scale: 1:55 500 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 1-2

Local Setting

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720.19136.00002 | 2020/05/06

This EIAR will be distributed for a 30-day calendar day comment period from **04 August 2020** until **07 September 2020** in order to provide I&APs with an opportunity to comment on any aspect of the project and the findings of the Section 24G rectification process. Copies of the full report will be made available on the SLR website (at https://slrconsulting.com/public-documents) and at the Joe Morolong Local Municipality, John Taolo Gaetsewe District Municipality, Hotazel Public Library, Kathu Public Library and the Black Rock Library. 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 addressed in the EIAR. Issues and concerns raised including responses are included in Section 8.3.

SLR Consulting (South Africa) (Pty) Ltd
Attention: Natasha Smyth

PO Box 1596, Cramerview 2060 (if using post please call SLR to notify us of your submission)

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PART A - SCOPE OF ASSESSMENT

2 DETAILS OF THE EAP

2.1 DETAILS OF THE EAP WHO PREPARED THE REPORT

The details of the EAPs that were involved in the preparation of this EIAR are provided in Table 2-1 below.

TABLE 2-1: DETAILS OF THE EAP

Details	Project manager and author	Reviewer
Name of the practitioner:	Natasha Smyth	Rob Hounsome
Tel No.:	011 467 0945	011 467 0945
Fax No.:	011 467 0978	011 467 0978
E-mail address:	nsmyth@slrconsulting.com	rhounsome@slrconsulting.com

SLR does not have any interest in the project other than fair payment for consulting services rendered as part of the Section 24G rectification process. An undertaking by SLR is provided in Section 19.

2.2 EXPERTISE OF THE EAP

2.2.1 SLR PROJECT TEAM

Natasha Smyth holds a BSc Honours degree in Geography and Environmental Management and has approximately eleven years of relevant experience (curriculum vitae attached in Appendix B). Rob Hounsome has approximately 25 years of relevant experience and holds an MSc degree in Environmental Geochemistry (Appendix B). Both Natasha Smyth and Rob Hounsome have been involved in several impact assessments for large scale mining developments in southern Africa.

3 LOCATION OF ACTIVITY

3.1 LOCATION OF OVERALL ACTIVITY

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

TABLE 3-1: DESCRIPTION OF THE PROPERTY

Description	Details
Farm Names associated with the project area	**Adams pit:** • Located on portion 4 of the farm Adams 328. The surface owner is Hotazel Manganese Mines (Pty) Ltd • Located on portion 5 of the farm Goold 329. The surface owner is Hotazel Manganese Mines (Pty) Ltd • Located on the farm Sinterfontein 748. The surface owner is Hotazel Manganese Mines (Pty) Ltd **Establishment of the NE topsoil stockpile area:** • Located on portion 9 of the farm Goold 329. The surface owner is Hotazel Manganese Mines (Pty) Ltd
Application area (ha) (refer to Figure 1-2)	The total Section 24G application area is 28 ha.
Magisterial district	MMT is located within the Kuruman Magisterial District and in the John Taolo Gaetsewe District Municipality.
Distance and direction from nearest town	The project area is located approximately 25km south of the town Hotazel (Refer to Figure 1-1).
21-digit Surveyor General Code for each farm portion	Adams pit: • C04100000000032800004 • C04100000000032900005 • C04100000000074800000 Establishment of the NE topsoil stockpile: • C04100000000032900009
Co-ordinates (Refer to Figure 1-2)	• Adams pit: 22° 59’ 18.636’’E and 27° 22’ 55.547’’S • NE topsoil stockpile: 22° 59’ 0.275’’E and 27° 21’ 24.686 S’’

3.2 LOCALITY MAP

The regional and local settings are illustrated in Figure 1-1 and Figure 1-2, respectively.

4 DESCRIPTION OF THE SCOPE OF THE ACTIVITY

4.1 OVERVIEW OF EXISTING OPERATIONS

Information in the following section was sourced from the approved EIA and EMPr compiled by Jones and Wagener (JAWS, 2005) and the project team.

4.1.1 MINING AND MINERAL PROCESSING

MMT consists of an open pit operation that commenced in 1963. This pit is still operational and is being extended to the north and west. The current Run of Mine (RoM) for MMT is in the order of 3 million tons per annum. MMT has a remaining life of mine of 17 years.

Manganese ore is sold to both the local and international markets.

Table 4-1 below provides a high-level overview of the mining and mineral processing activities that currently take place at the MMT.

TABLE 4-1: OVERVIEW OF MMT EXISTING OPERATIONS (JAWS, 2005)

Activity	Detail
Stripping and stockpiling of topsoil and waste rock	MMT is a conventional opencast operation in that topsoil is tripped and waste rock is blasted and removed to uncover the manganese ore body using truck and shovel methods. Topsoil is transported via truck to designated topsoil stockpile areas for later use as part of rehabilitation. 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.
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.
Crushing, screening and washing (ore processing)	Ore from the RoM stockpile is conveyed to 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. Slimes material from the OPP is sent to Adams pit for disposal.
Dense Medium Separation (DMS) Plant and sintering	The natural Mamatwan ore ideally lends itself to upgrading by technologically advanced beneficiation processes. In this regard, the -40+6MM 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.

Activity	Detail
	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 size (M1FT product) 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 Adams pit. Plant spillages occurs within the plant area. Fines (-6+1MM) 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 this 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 bulk bags which is currently stored in Adams pit. Off gas and particulate matter is extracted and scrubbed.

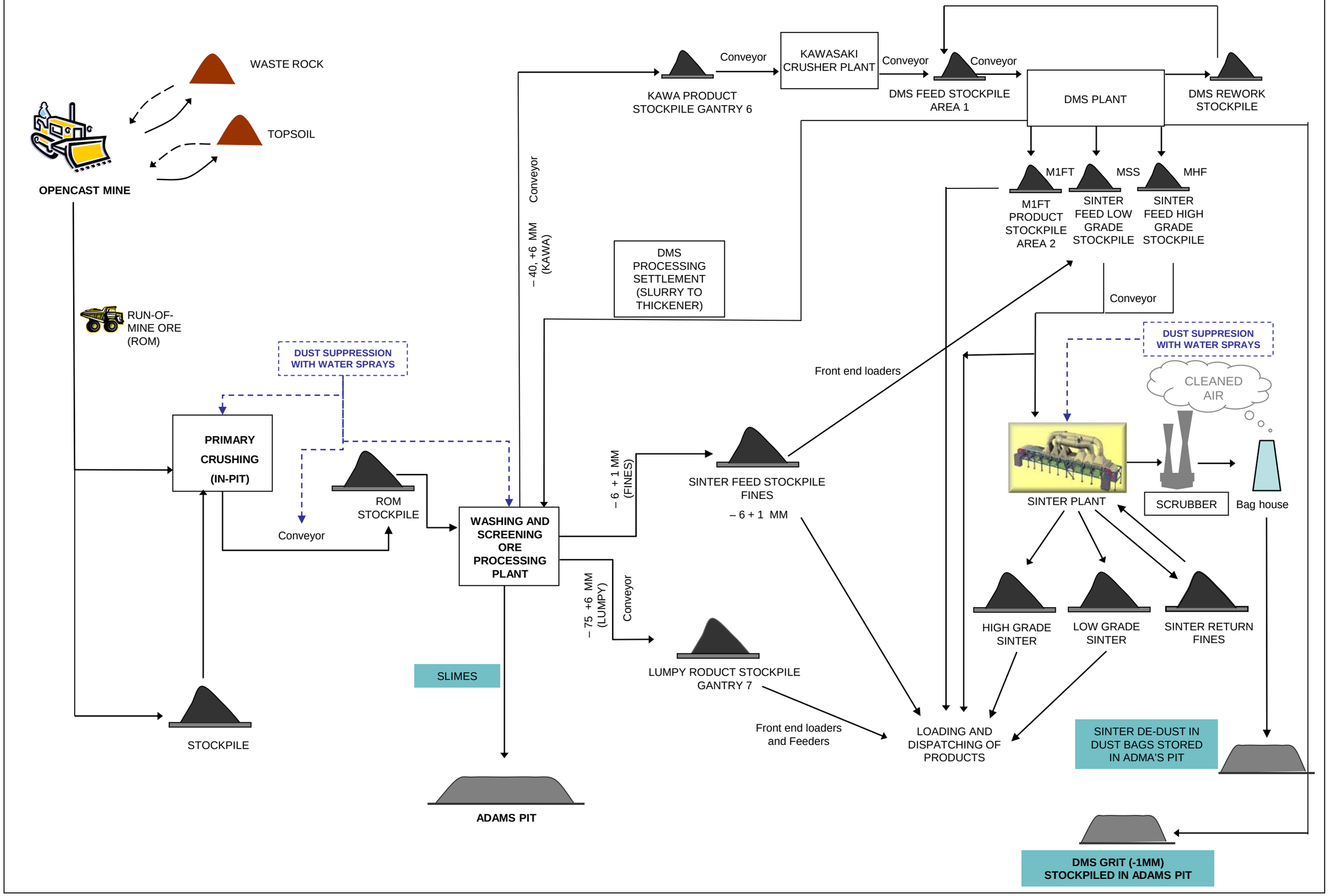

FIGURE 4-1: PROCESS FLOW DIAGRAM

4.1.2 CURRENT INFRASTRUCTURE

An overview of key infrastructure currently located at the MMT is illustrated in Figure 4-2 below and includes the following:

- Topsoil stockpiles
- WRDs (North WRD, Central WRD, South east WRD, South WRD, Sinterfontein WRD, DMS discard dump and Adams pit rehabilitated WRDs)
- Open pit and Adams open pit
- Crushing and screening (in-pit crusher, Kawasaki crushers, ROM cone crusher)
- Product stockpile area
- DMS plant
- Sinter plant
- OPP
- Tailings dam (rehabilitated)
- Transport infrastructure (conveyors, internal haul roads, loadout station and weighbridge and railway siding)
- Water storage (Water tanks, water reservoirs and pump house)
- Stores
- Substation and MMC (loadout station, in-pit crusher, sinter plant, OPP, ROM)
- Sewage treatment plant
- Office buildings, OPP office, main office, sinter offices, walkways and change house
- Parking (north pit parking) and parking
- Clinic
- Workshops, Barloworld workshop, sinter workshops, OPP workshop
- Washbays
- Tyre bay
- Tea room
- Waste management areas (general and hazardous waste yard)
- Soil remediation facility
- Diesel refuelling and storage facilities (fuel bay)
- Main gate with security and access control
- Explosive magazine
- Laboratory

Legend

Mamatwan Mining Right Area

0 50 100 Meters

Scale: 1:3 500 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo23

Mamatwan Mine

Figure 4-2

Current Infrastructure Layout B (Zoomed In)

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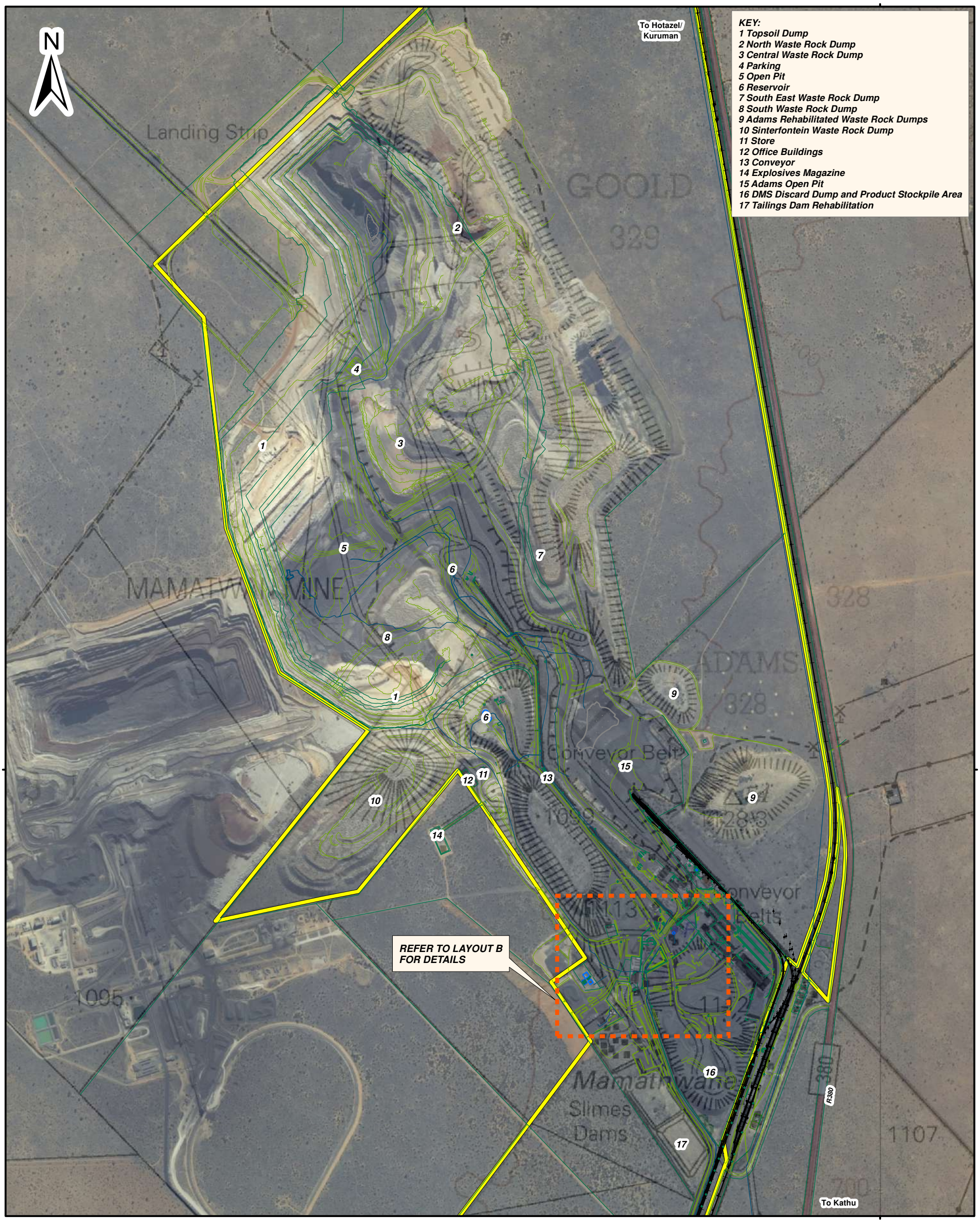

Legend

Mamatwan Mining Right Area

Mamatwan Infrastructure

0 300 600 Meters

Scale: 1:30 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 4-2

Current Infrastructure Layout A

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4.2 LISTED AND SPECIFIED ACTIVITY AND DESCRIPTION OF ACTIVITY – NE TOPSOIL STOCKPILE

MMT operates in accordance with an approved EMPr (Reference number: NC 6/2/1180) issued and approved in November 2005. The approved 2005 EMPr makes provision for the storage of topsoil on a NE topsoil stockpile. The approved 2005 EMPr does not make provision for the establishment of a NE topsoil stockpile on the east of the north eastern WRD. The location of the NE topsoil stockpile is illustrated in Figure 4-4. The establishment of the NE topsoil stockpile commenced in May 2015 and required the clearing of indigenous vegetation (more than 1 ha but less than 20 ha) without authorisation in terms of NEMA. Table 4-4 below specifies the relevant NEMA listed activity that required environmental authorisation prior to the establishment of the NE topsoil stockpile.

TABLE 4-2: ACTIVITIES/INFRASTRUCTURE AND LISTED ACTIVITIES THAT REQUIRED AUTHORISATION – NE TOPSOIL STOCKPILE

Description of the project activity	Aerial extent of the activity (ha)	Listed activity (mark with an x)	Listed activity number, applicable listing notice and activity description
Establishment of the NE topsoil stockpile	14 ha	X	**NEMA Environmental Impact Assessment (EIA) Regulations (GNR 983 of 2014): Listing Notice 1, Activity 27:** The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation.

The clearance of indigenous vegetation for the establishment of the NE topsoil stockpile has been completed. MMT will continue to monitor the NE topsoil stockpile to ensure that management actions set out in Section 28 for the conservation of soil resources are implemented for the remaining life of mine until closure when topsoil will be required as part of rehabilitation.

4.3 LISTED AND SPECIFIED ACTIVITY AND DESCRIPTION OF ACTIVITY – THE USE OF ADAMS PIT FOR THE DISPOSAL OF GENERAL WASTE (INCLUDING RUBBLE AND USED CONVEYOR BELTS) AND STORAGE OF SINTER DE-DUST

4.3.1 LISTED AND SPECIFIED ACTIVITY

MMT operates in accordance with an approved EMPr (Reference number: NC 6/2/1180) issued and approved in November 2005 and an IWUL (License number: 10/D41K/AGJ/1537) issued by the DWS in January 2012 and amended in 2017. Adams pit historically formed part of Assmang (Pty) Ltd (Assmang). The Adams pit was completely mined out by 1980. Adams pit contains numerous materials that are stockpiled in the pit. These include tailings, slimes, sinter de-dust, plant spillages, general waste (including rubble and used conveyor belts) and DMS grit (refer to Figure 4-5). A description of each of these materials and the EIAR relevant approval status is summarised in Table 4-3 below.

With reference to Table 4-3 below, the disposal of general waste (including rubble and used conveyor belts) commenced without authorisation in terms of the NEM:WA and the storage of Sinter de-dust commenced without authorisation in terms of the NEMA. The listed activities in terms of NEMA and NEM:WA that required environmental authorisation prior to the commencement of these activities are provided in Table 4-4 below.

TABLE 4-3: ADAMS PIT

Material stockpiled in Adams pit	Description		Reference in the approved 2005 EMPr	Reference in the existing IWUL	Relevance to this project
	Description of material currently located in Adams pit	Current status			
Tailings	This is grit generated from the OPP. In 1998, MMT obtained permission from Assmang and approval from the DME (currently the DMR) in 1998 to dispose of tailings material generated at the OPP into Adams pit given that at the time, the two tailings dam had been decommissioned. Majority of the Adams pit stockpile comprises tailings material. In this regard tailings material constitutes 86% of the Adams pit stockpile and forms the base of the Adams pit stockpile.	This material is no longer generated at MMT due to a change in process.	The use of Adams pit for the disposal of tailings is catered for in the approved 2005 EMPr.	Not included in the existing IWUL.	The use of Adams pit for the disposal of tailings and slimes will need to be incorporated into the existing IWUL. This will be managed as part of a separate process with the DWS and does not form part of this project. The need to apply for environmental authorisation in terms of NEMA for activities that required a WUL for the release of pollution were included in the NEMA EIA Regulations (GNR 543 of 2010) promulgated in June 2010. The use of Adams pit for the disposal of tailings and slimes was approved in the 2005 EMPr and as such commenced prior to the promulgation of the NEMA EIA Regulations (GNR 543 of 2010) and as such environmental authorisation for these activities is not applicable.
Slimes	This is slurry (sludge) material that is generated as part of the ore washing within the OPP. Slimes is pumped to the eastern section of Adams pit and constitutes 6% of the overall Adams pit stockpile.	Forms part of current practises.	The pumping of slurry (sludge) is catered for in the approved 2005 EMPr.		
General waste (including rubble and used conveyor belts)	Rubble from the DMS and Sinter plant, which includes old and used conveyors and metal (general waste (including rubble and used conveyor belts)). General waste (including rubble and used conveyor belts). Trucks are used to transport general waste (including rubble and used conveyor belts) to Adams pit.	No longer takes place. General waste (including rubble and used conveyor belts) is disposed at the MMT	The disposal of general waste (including rubble and used conveyor belts) in Adams pit is not catered for in the approved 2005 EMPr.	Not applicable.	It is unclear when the disposal of general waste (including rubble and used conveyor belts) commenced. This disposal was however not catered for in the approved 2005 EMPr. The List of Waste Management Activities (Regulation 921 of 2013) that required a waste management licence (WML) was promulgated in July 2009. The disposal of rubble is considered to be a general waste (including rubble and used

Material stockpiled in Adams pit	Description		Reference in the approved 2005 EMPr	Reference in the existing IWUL	Relevance to this project
	Description of material currently located in Adams pit	Current status			
		designated waste storage area.			conveyor belts) in terms of schedule 3 of NEM:WA. *The transitional provisions set out in the List of Waste Management Activities (Regulation 921 of 2013) state that: a person who lawfully conducts a waste management activity listed in this Schedule on the date of the coming into effect of this Notice may continue with the waste management activity until such time that the Minister by notice in a Gazette calls upon such a person to apply for a WML.* The disposal of general waste (including rubble and used conveyor belts) into Adams pit was not included in the approved 2005 EMPr and as such the transitional arrangements don't apply. This activity required a WML for the disposal of general waste (including rubble and used conveyor belts) to land.
Sinter de-dust	This is de-dust from the sinter plant and is considered to be a product. It is estimated that the use of Adams pit for the storage of sinter de-dust commenced in 2010. Following the receipt of a Notice of Intension from the DMR in September 2019 the storage of sinter de-dust in Adams pit has ceased. Sinter de-dust is stored on the tailings stockpile in de-dust bags and constitutes 3% of the Adams pit	Sinter de-dust is temporarily stockpiled in the plant area.	Sinter de-dust should be returned to the sinter process as specified in the approved 2005 EMPr and not stored in Adams pit.	Not included in the existing IWUL	It is estimated that the use of Adams pit for the storage of sinter de-dust commenced in 2010. The need to apply for environmental authorisation in terms of NEMA for activities that required a WUL for the release of pollution were included in the NEMA EIA Regulations (GNR 543 of 2010) promulgated in June 2010. It follows that the storage of Sinter de-dust required a WUL in terms of the NWA for a Section 21(g) water use in terms of NEMA EIA Regulations (GNR 543 of 2010). These regulations have been repealed

Material stockpiled in Adams pit	Description		Reference in the approved 2005 EMPr	Reference in the existing IWUL	Relevance to this project
	Description of material currently located in Adams pit	Current status			
	stockpile. Trucks are used to transport the material from the Sinter plant to Adams pit. The de-dust bags have been reported to tear during stockpiling activities. It follows that de-dust material is not always contained within the de-dust bags.				and as such the corresponding listed activity in terms of the current regulations (NEMA EIA Regulations (GNR 983 of 2014)) has reference. The application for an IWUL for the storage of sinter de-dust (inclusive of the plant spillage component) will be managed was part of a separate process with the DWS.
Plant spillages	This is a combination of sinter de-dust and product material. Plant spillages constitute 1% of the Adams pit stockpile and is stockpiled on the tailing's material.	Forms part of current practises.	The storage of product is catered for in the approved 2005 EMPr.		
DMS grit	This is low grade product that has the potential to be sold to third parties. DMS grit constitutes 5% of the Adams pit stockpile and is stockpiled on the tailing's material.	Forms part of current practises.	Placing of DMS grit (also known as DMS discard) into Adams pit is catered for in the approved 2005 EMPr.	Disposal of course low-grade material into Adams pit is catered for in the existing IWUL as a Section 21(g) water use.	Not applicable to this project as all the necessary approvals are in place.

TABLE 4-4: ACTIVITIES/INFRASTRUCTURE AND LISTED ACTIVITIES THAT REQUIRED AUTHORISATION – USE OF ADAMS PIT FOR THE DISPOSAL OF GENERAL WASTE (INCLUDING RUBBLE AND USED CONVEYOR BELTS) AND STORAGE OF SINTER DE-DUST

Description of the project activity	Aerial extent of the activity (ha)	Listed activity (mark with an x)	Listed activity number, applicable listing notice and activity description
Disposal of general waste (including rubble and used conveyor belts) (including	14 ha (Full extent of Adams pit). The disposal of general	X	**NEM:WA List of Waste Management Activities that have, or are likely to have, a detrimental effect on the environment (GNR 921 of 2013): Category A, Activity 10** – The disposal of general

Description of the project activity	Aerial extent of the activity (ha)	Listed activity (mark with an x)	Listed activity number, applicable listing notice and activity description
rubble and used conveyor belts) into Adams pit	waste (including rubble and used conveyor belts) takes place within this overall extent.		waste (including rubble and used conveyor belts) to land covering an area of more than 50 m^2 but less than 200 m^2 and with a total capacity not exceeding 25 000 tons.
Storage of Sinter de-dust (inclusive of material that forms part of the plant spillages) into Adams pit	14 ha (Full extent of Adams pit). The disposal of Sinter de-dust takes place within this overall extent.	X	**NEMA EIA Regulations (GNR 983 of 2014): 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 NEM:WA in which case the NEM:WA 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 m^3 per day; or iii) The expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 m^3 or less per day.

4.3.2 PROPOSED PLAN FOR HANDLING OF GENERAL WASTE (INCLUDING RUBBLE AND USED CONVEYOR BELTS) AND SINTER DE-DUST

MMT is proposing an alternative to the management of the Adams pit general waste (including rubble and used conveyor belts) and sinter de-dust for the remaining life of mine. This follows the receipt of the DMR Notice of Intension issued in September 2019 specifying that the storage of sinter de-dust in Adams pit could not continue.

Following the receipt of the DMR Notice of Intension, the sinter de-dust is currently stockpiled in the plant area. Given the volume of material that needs to be stored on a daily basis (750 tons in approximately 25 (30 ton) bags per day) within a limited space, the storage of sinter de-dust within the plant area is a temporary solution. MMT is therefore 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 can be sold to third parties per month. A high-level overview of the process is illustrated in Figure 4-3 below. The re-processing of the material stored in Adams pit includes:

- The use of an excavator to mine the material located in the Adams pit;
- The use of a new temporary mobile screen to remove unwanted material (including general waste (including rubble and used conveyor belts) and sinter de-dust bags) before the material is transported using trucks to dispatch using road or rail for sale to third parties. Unwanted material will be deposited at the designated MMT waste disposal site temporarily before being removed off-site by contactors and taken to licenced waste disposal sites. The Sinter de-dust bags will be taken to a licenced hazardous waste facility; and
- Waste rock will be used to backfill the open pit as part of rehabilitation.

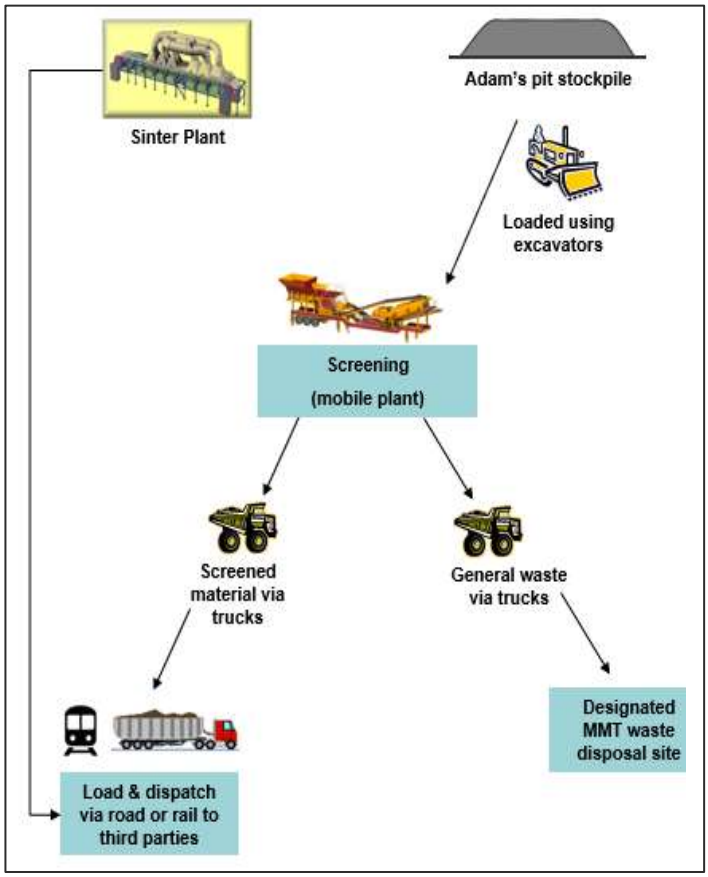
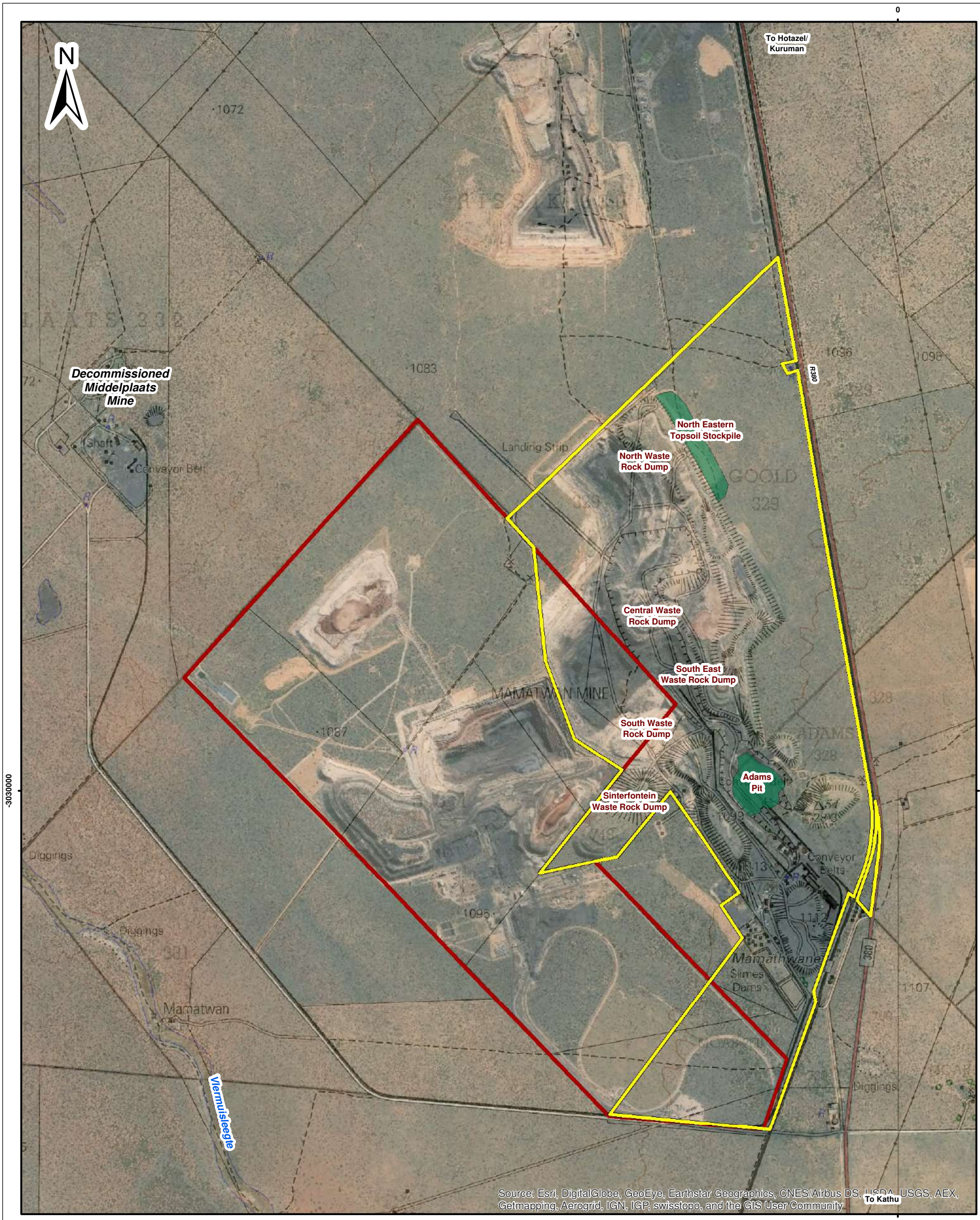


FIGURE 4-3: HIGH-LEVEL OVERVIEW OF THE RE-PROCESSING OF MATERIAL STOCKPILED IN ADAMS PIT

Authorising the re-processing of material within Adams pit will require environmental authorisation from the DMR. It is important to note that the re-processing of the material in Adams pit cannot be authorised as part of this Section 24G rectification process. A separate process will need to be undertaken to authorise the proposed re-processing activities. This has however been mentioned for the sake of completeness.



Legend

- Mamatwan Mining Right Area
- Tshipi Surface Use Area
- Section 24g Activities

0 300 600 Meters

Scale: 1:30 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 4-4

Location of Project Activities

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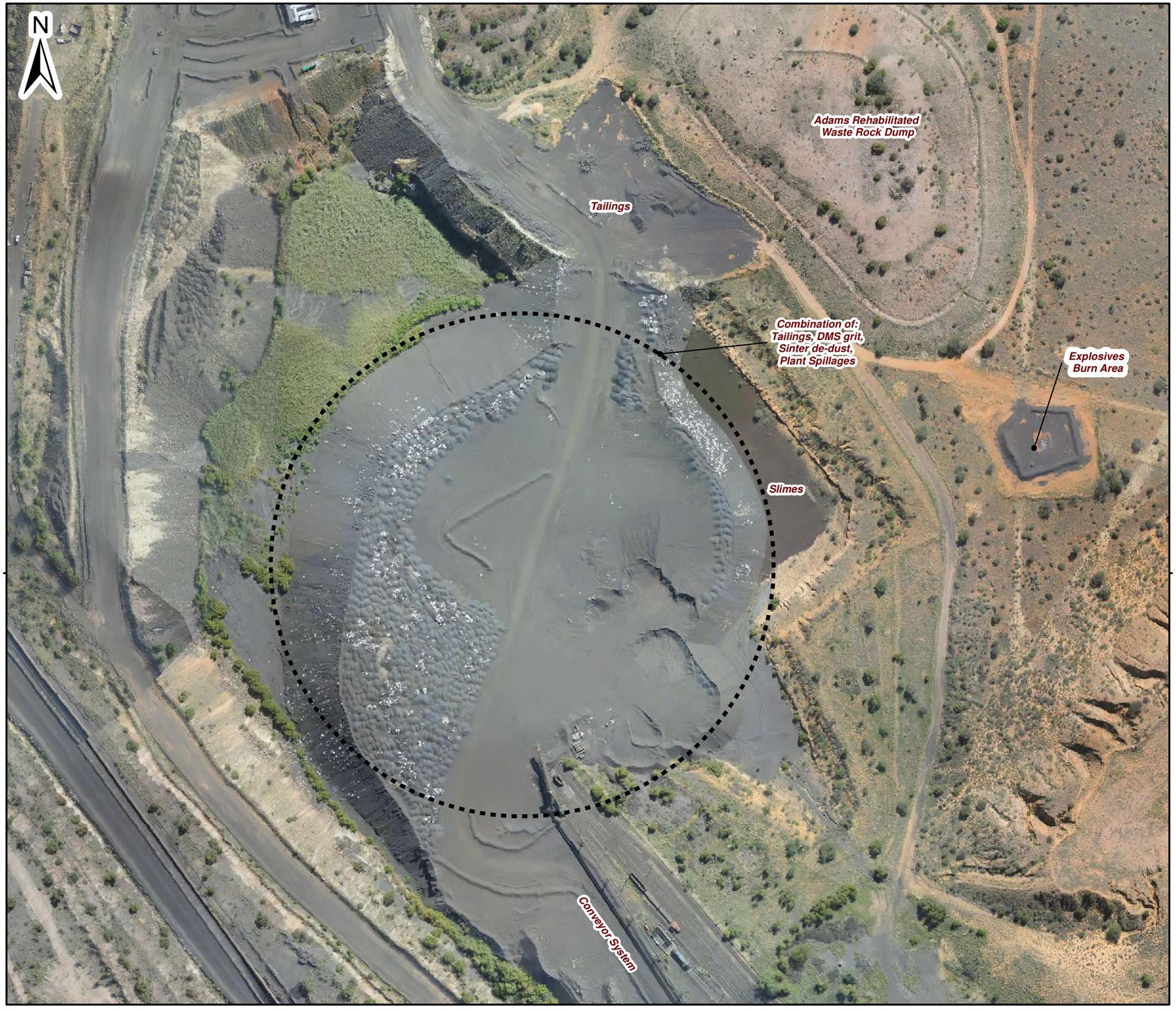

0 50 100 m

Scale: 1:2 500 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo23

Mamatwan Mine

Figure 4-5

Adams Pit

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5 POLICY AND LEGISLATIVE CONTEXT

This chapter outlines the key legislative requirements applicable to the project and outlines the guidelines, policies and plans that have been considered during the Section 24G rectification process.

5.1 LEGISLATIVE CONSIDERATION IN THE PREPARATION OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

In accordance with the NEMA EIA Regulations 2014 (as amended), all legislation and guidelines that have been considered must be documented. Table 5-1 below provides a summary of the applicable legislative context.

TABLE 5-1: LEGAL FRAMEWORK

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context?
National Environmental Management Act (No. 107 of 1998) (NEMA), as amended	Introduction and Section 4.2 and 4.3	The establishment of the NE topsoil stockpile and the use of Adams pit for the storage of sinter de-dust commenced without authorisation in terms of the NEMA. The rectification process is being undertaken in accordance with Section 24G of NEMA. Listed activities in terms of NEMA Listing Notice 1 required environmental authorisation prior to the establishment of these facilities. The use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) commenced without a WML in terms of NEM:WA. Under the NEMA:WA the unlawful commencement of a NEM:WA listed activity may be authorised through an application for rectification made in terms of Section 24G of the NEMA. A listed activity in terms of NEMA:WA (GNR 921 of 2013), Category A required a WML prior to the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) . The integrated Section 24G rectification application (catering for both NEMA and NEM:WA activities) was submitted to the DMR on 23 March 2020.
NEMA: Listing Notice 1: List of Activities and Competent Authorities Identified in terms of Section 24(2) and 24D (GNR 983 of 2014), as amended		
National Environmental Management: Waste Act (No 59 of 2008) (NEM:WA), as amended	Introduction and Section 4.3	
NEM:WA: List of Waste Management Activities that have, or that are likely to have, a detrimental effect on the environment (GNR 921 of 2013), as amended		
NEMA: Environmental Impact Regulations (GNR 982 of 2014), as amended	Section 8.2	The public participation process has been undertaken in line with the EIA Regulations, 2014 (Government Notice Regulation (GNR) 982 under Government Gazette (GG) 38282 of 4 December 2014 as amended.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context?
National Water Act (No. 36 of 1998), as amended	Section 4.1	The storage of Sinter de-dust will require a WUL in terms of the NWA in terms of Section 21(g)
The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA) list of threatened ecosystems (2011)	Section 8.4.1.4	The NEM:BA list of threatened ecosystems was taking into consideration to determine the sensitivity of the project areas.
Northern Cape Nature Conservation Act, (No. 9 of 2009) (NCNCA)	Section 8.4.1.4	The NCNCA provides a list of species that are protected under the NCNCA. These were taken into consideration in determining the habitat sensitivity of the project areas.
National Forest Act (No. 84 of 1998) (NFA), as amended	Section 8.4.1.4	The NFA provides a list of species that are protected under the NFA. These were taken into consideration in determining the habitat sensitivity of the project areas.
Alien Invasive Species Regulations GNR 598 of 2014 in terms of the NEM:BA and the alien and Invasive Species List, GNR 864 of 2016	Section 8.4.1.4	The NEM:BA List of Alien and Invasive Species (2016) provides a list of species that need to be eradicated, controlled or prohibited. Alien and invasive species associated with the project areas were classified in accordance with the NEMBA List of Alien and Invasive Species (2016).
National Heritage Resource Act (No. 25 of 1999)	Section 8.4.1.11 and Appendix L	Heritage/cultural and palaeontological resource studies were compiled for the project.
National Dust Control Regulation (GNR 827 of 2013) (NDCR)	Section 8.4.1.7	Dust fallout results were compared to the NDCR in order to define the current baseline status.

5.1.1 NEMA

The 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 the EIAR needs at the forefront of its concern, and serve the EIAR 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 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) 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 NEMA EIA Regulations 2014

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

The EIA Regulations, 2014 (as amended) set out the procedures and documentation that need to be complied with when applying for environmental authorisation. A Basic Assessment (BA) 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 Scoping and 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 project activities (storage of sinter de-dust and the establishment of the NE topsoil stockpile) would have triggered activities specified in Listing Notice 1 (see Section 4.2 and 4.3) and therefore a BA process would have been required for the DMR to consider the application in terms of NEMA prior to the commencement of the project activities.

5.1.3 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.

5.1.4 Listed waste management activities

Listed waste management activities are included in GN R 921 of November 2013. 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 WML but are subject to the provisions of National Norms and Standards (GN R 926, November 2013).

The disposal of general waste (including rubble and used conveyor belts) would have required a WML in terms of Category A (see Section 4.3), prior to commencement. A person who wishes to commence, undertake or conduct a waste management activity listed under Category A, should have conducted a BA process set out in the NEMA as part of a WML application.

5.2 GUIDELINES, POLICIES, PLANS, STANDARDS AND FRAMEWORKS

The guidelines, policies and plans listed in Table 5-2 have been considered during the rectification process and as part of specialist studies, where applicable.

TABLE 5-2: GUIDELINE AND POLICY FRAMEWORK

Guideline	Governing body	Relevance
Public participation guideline in terms of NEMA (2017)	Department of Environmental Affairs	The purpose of this guideline is to ensure that an adequate public participation process is undertaken.
Guideline on need and desirability (2017)	Department of Environmental Affairs	This guideline informs the consideration of the need and desirability aspects of the project.
Joe Morolong Local Municipal Integrated Development Plan 2016	Joe Morolong Local Municipality	The Joe Morolong Local Municipality Integrated Development Plan is the principle strategic instrument guiding all planning, management, investment and development within the province in order to provide best solutions towards sustainable development.
Northern Cape Provincial Spatial Development Framework (NCPSPF, 2012)	Department of Rural Development and Land Reform	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.
SANS 10103 (2008)	South African Bureau of Standards	These local and international standards provide best practice for the prediction, prevention and management of mine drainage. These standards were considered during the geochemical study (Refer to Appendix E and Section 8.4.1.6)
WHO Standard for drinking water	WHO	
IFC Mining Effluent (2007)	IFC	
SANS 241 (2015) (Operational, Aesthetic, Acute health and Chronic	South African Bureau of Standards	These local and international standards provide best practice for the prediction of noise related impacts to third parties. These standards were considered during the preparation of the Noise Study (Refer to Appendix J and Section 8.4.1.8).
WHO guidelines for community noise, 1999health)	WHO	
IFC General EHS Guidelines on noise	IFC	
NAAQS	DEA	This local standard provides emission limits aimed at reducing harmful effects on the environment
Quality of Domestic Water Supplies Volume 1: Assessment Guide, Second Edition, (1998)	DWS	Groundwater quality was compared against these guidelines and standards (Section 8.4.1.6).
South African Water Quality Guidelines – Volume 1 Domestic Use (1993 and 1996)	DWS	

Guideline	Governing body	Relevance
SANS for drinking water (SANS 241:2015)	South African Bureau of Standards	
National Freshwater Ecosystem Priority Areas 2011 (NFEPA)	South African National Botanical Institute (SANBI)	Numerous national and provincial databases were utilised to determine the conservational sensitivity of the project sites (Section 8.4.1.4).
Northern Cape Critical Biodiversity Areas (2016) (CBA)		
Mining Biodiversity Guideline (2012)		
National Biodiversity Assessment (NBA)		
Important Bird and Biodiversity Areas (IBAs)	Birdlife International	
National Threatened Ecosystems (2011)	DEA	
South African Conservation Areas Database (SACAD, 2017)		
South Africa Protected Area Database (SAPAD, 2017)		
National Protected Areas Expansion Strategy 2008 (NPAES)		
Northern Cape Provincial Spatial Development Framework	Joe Morolong Local Municipality	The Northern Cape Spatial Development Framework was taken into consideration to motivate the need and desirability of the project (Section 6)

5.3 LEGISLATIVE REPORT CONTENT REQUIREMENTS

The project activities required authorisation in terms of NEMA Listing Notice 1 activities and a NEM:WA Category A waste activity (refer to Section 4.2 and 4.3 for detail) and would therefore have triggered a BA process. This document has therefore been prepared in accordance with the DMR Basic Assessment Report (BAR) template format and was informed by the guidelines posted on the official DMR website, in the absence of a template for Section 24G processes. The report also complies with the requirements of Section 24G of the NEMA. Table 5-3 below, provides a summary of the requirements, with cross references to the report sections where these requirements have been addressed.

TABLE 5-3: STRUCTURE OF THIS EIAR

BAR Report Requirements as per the DMR Template	EIAR Requirements as per Section 24G of NEMA	Reference in the EIAR
Part A of DMR report template	**Section 24G (vii)**	**Section/Appendix**
(a) i) Details of the EAP who prepared the report	-	Section 2
(a) ii) Expertise of the EAP	-	Section 2.2

BAR Report Requirements as per the DMR Template	EIAR Requirements as per Section 24G of NEMA	Reference in the EIAR
(b) Description of the property	-	Section 3.1
(c) Locality map	-	Section 3.2
(d) Description of the scope of the proposed overall activity i) Listed and specified activities	-	Section 4.1
ii) Description of the activities to be undertaken	-	Section 4.1
(e) Policy and legislative context	-	Section 5
(f) Need and desirability of the proposed activity	A description of the need and desirability of the activity	Section 6
(g) Motivation for the preferred development footprint within the approved site including:	-	Section 7
i) Details of the development footprint alternatives considered	-	Section 8.1
ii) Details of the public participation process followed	A description of the public participation process followed during the course of compiling the report, including all comments received from interested and affected parties and an indication of how the issues raised have been addressed	Section 8.2
iii) Summary of issues raised by IAPs		Section 8.3
iv) Environmental attributes associated with the development footprint alternatives	-	Section 8.4
v) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree of the impacts	-	Section 8.5
vi) Methodology used in determining the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks.	-	Section 8.6
vii) 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.	-	Section 8.7
viii) The possible mitigation measures that could be applied and the level of risk		Section 8.8
ix) Motivation where no alternative sites were considered	-	Section 8.9

BAR Report Requirements as per the DMR Template	EIAR Requirements as per Section 24G of NEMA	Reference in the EIAR
x) Statement motivating the alternative development location within the overall site	-	Section 8.10
(h) 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	-	Section 9
(i) Assessment of each identified potentially significant impact and risk	an assessment of the nature, extent, duration and significance of the consequences for or impacts on the environment of the activity, including the cumulative effects and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;	Section 10
(j) Summary of specialist reports	-	Section 11
(k) Environmental impact statement: i) Summary of the key findings of the environmental impact assessment; ii) Final site Map iii) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives	-	Section 12
l) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr	-	Section 13
m) Final proposed alternatives	-	Section 14
n) Aspects for inclusion as conditions of authorisation	-	Section 15
o) Description of any assumptions, uncertainties and gaps in knowledge	-	Section 16
p) Reasoned opinion as to whether the proposed activity should or should not be authorised: i) reasons why the activity should be authorised or not ii) conditions that must be included in the authorisation	-	Section 17

BAR Report Requirements as per the DMR Template	EIAR Requirements as per Section 24G of NEMA	Reference in the EIAR
q) Period for which environmental authorisation is required	-	Section 18
r) Undertaking	-	Section19
s) Financial provision: i) explain how the aforesaid amount was derived ii) confirm that this amount be provided for from operating expenditure	-	Section 20
u) Other information required by the competent authority	-	Section 21
v) Other matters required in terms of section 24(4)(a) and (b) of the Act.	-	Section 21.3
Part B of the DMR report template	**Section 24G (vii)**	**Section/Appendix**
a) Details of the EAP	-	Section 23
b) Description of the aspects of the activity	-	Section 24
c) Composite map	-	Section 25
d) Description of impact management objectives including management statements:	-	Section 26
i) The determination of closure objectives	-	Section 26.1
ii) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity	-	Section 26.2
iii) Potential acid mine drainage	-	Section 26.3
iv) Steps taken to investigate, assess and evaluate the impact of acid mine drainage	-	Section 26.4
v) Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage	-	Section 26.5
vi) Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage	-	Section 26.6
vii) Volumes and rate of water use required for the mining, trenching or bulk sampling operation.	-	Section 26.7
viii) Has a water use license been applied for?	-	Section 26.8
ix) Impacts to be mitigated in the EIAR respective phases	-	Section 26.9
e) Impact management outcomes	-	Section 27
f) Impact management actions	A description of mitigation measures undertaken or to be undertaken in respect of the consequences for or	Section 28

BAR Report Requirements as per the DMR Template	EIAR Requirements as per Section 24G of NEMA	Reference in the EIAR
	impacts on the environment of the activity	
	an environmental management programme	
i) Financial provision:	-	Section 29
(a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation (22) (2) (d);	-	Section 29.1.1
(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected party	-	Section 29.1.2
(c) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.	-	Section 29.1.3
(d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives	-	Section 29.1.4
(e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline	-	Section 29.1.5
(f) Confirm that the financial provision will be provided as determined	-	Section 29.1.6
(j) Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon	-	Section 30
i) Indicate the frequency of the submission of the performance assessment report	-	Section 30.1
m) Environmental Awareness Plan: (1) manner in which the applicant intends to inform his or her employees of any environmental risk which may result from the EIAR work; and (2) manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment	-	Section 31
n) Specific information required by the competent authority	-	Section 32
2) Undertaking	-	Section 33

6 NEED AND DESIRABILITY OF THE PROJECT

The DEA guideline on need and desirability (GNR 891, 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 DEA published an updated guideline, 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 sustainable development – in other words, that a development is ecologically sustainable and socially and economically justifiable – and ensuring the simultaneous achievement of the triple bottom-line.

When considering how the project may affect or promote justifiable economic and social development, the relevant spatial plans must be considered, including Municipal Integrated Development Plans (IDP), Spatial Development Frameworks (SDF) and Environmental Management Frameworks (EMF). The assessment reports will need to provide information as to how the project will address the socio-economic impacts of the development, and whether any socio-economic impact resulting from the project impact 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 EIA, the concept of "need and desirability" relates to, amongst others, the nature, scale and location of project, as well as the wise use of land.

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

- In a South African context, sustainability (or a sustainable society) implies ecological sustainability. 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 Integrated Development Plans ("IDPs") and Spatial Development Frameworks ("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 its 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 deviation 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 Environmental Assessment Practitioner) to show why the impacts associated with the deviation might be justifiable. The need and desirability of 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.

6.1 ECOLOGICAL SUSTAINABLE DEVELOPMENT AND USE OF NATURAL RESOURCES

Due to the nature of mining projects, impacts on sensitive biodiversity areas, linkages between biodiversity areas and related species and the role that they play in the ecosystem are probable. The project also had the potential to directly disturb vegetation, vertebrates and invertebrates. As part of the project, an independent biodiversity specialist was appointed to determine the sensitivity of the project area. In this regard, the vegetation associated with the affected area would have been of medium (NE topsoil stockpile) and low (Adams pit) sensitivity from a floral biodiversity management perspective.

Adams pit was mined out in 1980, and as such the vegetation has been transformed for a long period of time. The extent of disturbance and habitat transformation that has occurred within the Adams pit prior to the storage of sinter de-dust would not have been deemed important for floral communities and would have negatively impacted on floral communities. Of current concern is that the disturbed condition of the Adams pit has resulted in alien and invasive plant proliferation. It is recommended that an AIP management plan be developed to ensure these species do not spread to adjacent natural vegetation where indigenous species could be displaced.

Prior to the stockpiling of topsoil, the affected area was considered largely natural and comprised indigenous vegetation. The development of the NE Topsoil Stockpile likely resulted in the loss of some Species of Conservational Concern (SCC). This would have subsequently resulted in the loss of species habitat and diversity within the project footprint area. The establishment of the NE topsoil stockpile would not have resulted in a material change in the exiting MMT footprint, nor changed the type of habitat or species currently influenced. The establishment of the NE topsoil stockpile has however increased the mines overall disturbance footprint, which is located in the Griqualand 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. These impacts can be managed by controlling edge effects and limiting disturbances to what is absolutely necessary.

6.2 PROMOTING JUSTIFIABLE ECONOMIC AND SOCIAL DEVELOPMENT

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 Joe Morolong Local Municipality's Integrated Development Framework (IDP) and the John Taolo Gaetsewe District Municipality's Spatial Development Framework (SDF) (May 2016) are mainly focused around 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. One of the ways of achieving this, according to the SDF, is to discourage urban sprawl, and to promote more compact and efficient cities. In order to achieve this, development must be channelled into specific nodes and corridors (John Taolo Gaetsewe District Municipality, 2016). In addition, one of the Key Focus Areas for economic growth is the Gamagara Development Corridor, within which the mine is located (Figure 6-1).

Taking the above into consideration the project activities provide the necessary support to current operations of the MMT which will in turn sustain economic benefits and negative environmental and social impacts. The mine already contributes to the national SA economy at macro level by exporting its product that leverages foreign income into the country. Direct economic benefits will be 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 the EIAR education through the skills development plan of the mine's social and labour plan (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). Further to this, the SLP includes plans in line with the IDP of the John Taolo Gaetsewe District Municipality and the Joe Morolong Local Municipality. In a broad sense this will include housing and living conditions plan to improve living conditions of employees, an LED project plan and a procurement plan focusing on assisting HDSAs.

The project activities/infrastructure forms part of existing approved operations and would not have generated any additional employment opportunities, and as such an increase in economic benefits due to project activities/infrastructure is expected to have been negligible. In addition to this, if no additional employment opportunities were created; negative project-related socio-economic impacts including inward migration are not expected to have occurred. MMT is located within the Gamagara Development Corridor (refer to Figure 6-1), which has been identified as a key sector to develop within the province to enhance economic growth as per the Northern Cape SDF. While the project activities/infrastructure won't directly enhance economic benefits, the project activities indirectly supports the daily operations of a mine within the Gamagara Development Corridor which as a whole contributes to economic growth.

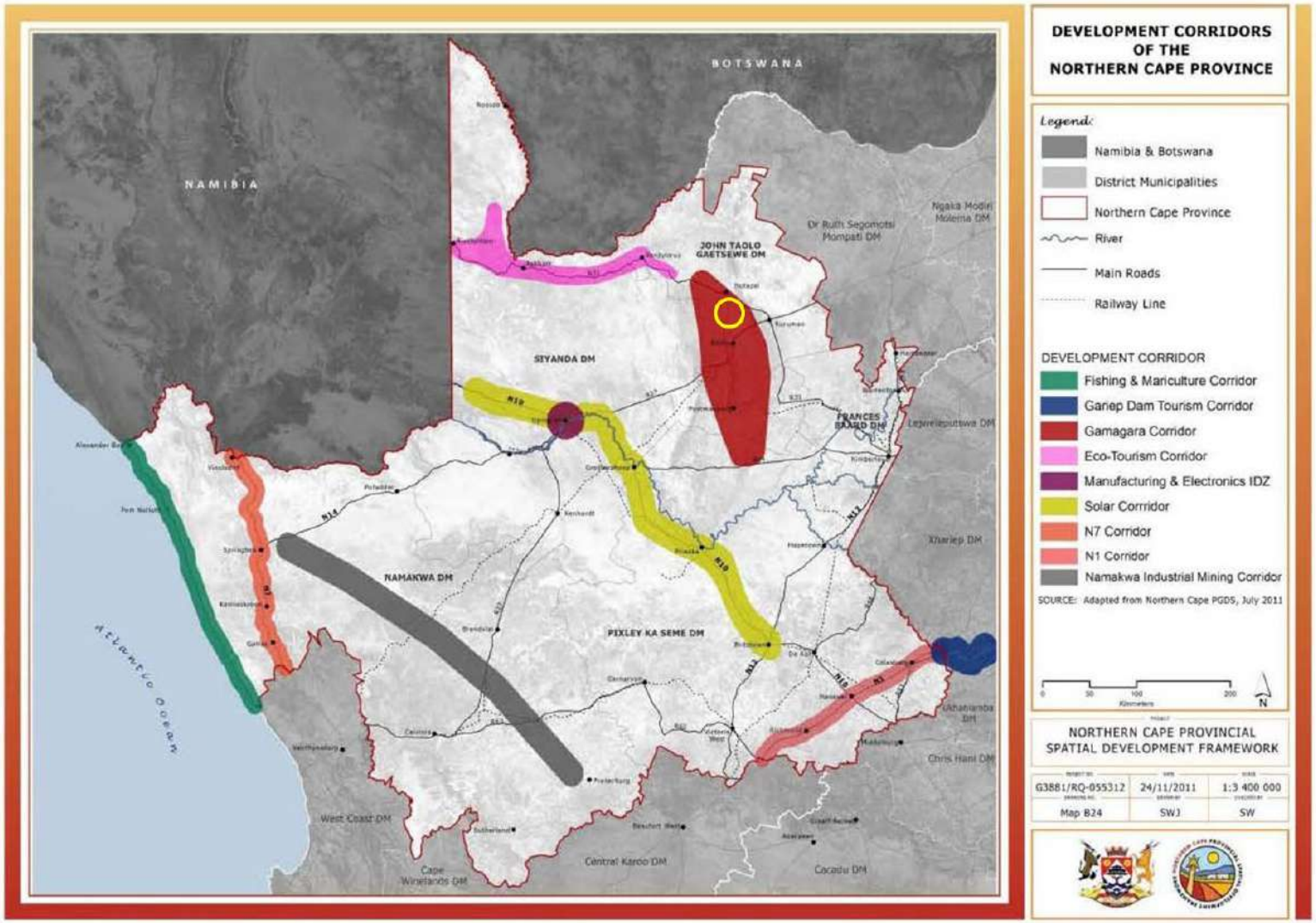


FIGURE 6-1: Mining right area (yellow circle) in relation to development regions and corridors of the Northern Cape (NPSDF, 2012)

7 MOTIVATION FOR THE PREFERRED SITE, ACTIVITIES AND TECHNOLOGY ALTERNATIVES

No feasible alternatives exist for the project as activities already exist on site and as such this section is not applicable.

8 PROCESS FOLLOWED TO REACH THE PREFERRED ALTERNATIVES WITHIN THE SITE

8.1 DETAILS OF THE DEVELOPMENT FOOTPRINT CONSIDERED

The consideration of locality, activity, layout, technology or operational aspect alternatives is not applicable for the purpose of this EIAR as the NE topsoil stockpile has already been established and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust already takes place.

8.1.1 THE "NO-GO" ALTERNATIVE

The assessment of this option requires a comparison between the options of proceeding with a project with that of not proceeding with the project. The project activities have commenced and as such this section is not applicable to this EIAR.

8.2 DETAILS OF THE PUBLIC PARTICIPATION PROCESS FOLLOWED

8.2.1 PUBLIC PARTICIPATION PROCESS

This section describes the public participation process being followed and details the information provided to I&APs. The intent of the public participation process is to inform I&APs of the project in sufficient detail, in order that they may contribute meaningfully to the process as a whole including the identification of impacts. The public participation process has been undertaken in line with the EIA Regulations, 2014 (Government Notice Regulation (GNR) 982 under Government Gazette (GG) 38282 of 4 December 2014 as amended.

TABLE 8-1: PUBLIC PARTICIPATION PROCESS UNDERTAKEN

Step	Detail
Notification – Commenting authorities and I&APs	
DMR Pre-application meeting	A pre-application meeting was held with the DMR in Kimberly on 11 July 2019. The purpose of the meeting was: • To provide information pertaining to the project; • To provide an overview of the environmental process relevant to the project; • To provide an indication of the potential specialist studies to be undertaken; and • To outline and obtain input on the public participation process.
Land claims commissioner consultation	The Land Claims Commissioner was consulted to verify if any land claims have been lodged on the farms on which the project activities are located. Refer to Appendix C for a copy of the correspondence received from the Land Claims Commissioner in November 2019. Refer to Section 8.4.2 for further detail pertaining to land claims.
Desktop social scan and development of project database	MMT has an existing stakeholder database. As part of this project the database was updated through a desktop social scan to verity details of the existing I&AP and commenting authorities' database for the MMT. The desktop social scan included the following: • The verification of the relevant surrounding landowners, land occupiers, relevant ward councillor, municipalities, organs of state, commenting authorities and other interested and affected parties;

Step	Detail
	• The verification of contact details on the existing MMT database; and • Verification of appropriate communication structures. A copy of the project database is included in Appendix C. An overview of the I&AP identified and involved in this project process are listed in Section 8.2.2.
BID	A BID was compiled by SLR and distributed to I&APs and commenting authorities registered on the project database. The BID provided: • Information about the project; • Information about the baseline environment of the project area; • Information about the Section 24G rectification process; • Information regarding possible biophysical and socio-economic impacts; • Details pertaining to a public participation process; and • Information on how I&APs and commenting authorities could have input into the Section 24G rectification process. A registration and response form was attached to the BID, which provided I&APs with an opportunity to register as an I&AP and submit comments on the project. Copies of the BID in English, Afrikaans and Setswana together with the proof of distribution are included in Appendix C.
Site notices	SLR placed laminated site notices (in English, Afrikaans and Setswana) at key conspicuous positions in and around MMT, as well as in nearby towns. Photographic proof is included in Appendix C. A map illustrating the location of the site notices is also included in Appendix C.
Newspaper advertisements	Block advertisements were placed in two local newspapers. In this regard, advertisements were placed in the Kathu Gazette on 07 March 2020 and in the Kalahari Bulletin on 05 March 2020. Copies of the adverts are included in Appendix C.
Public and commenting authorities meeting	The public and commenting authorities were invited to attend a public meeting was on 12 March 2020 at the Hotazel Recreational Club. The purpose of the meeting was as follows: • To provide an overview of the project; • To provide an overview of the Section 24G rectification process that was undertaken for the project; • To provide an overview and obtain input on the existing status of the environment; • To outline and obtain input on biophysical and socio-economic impacts identified for the project; • To provide details pertaining to the public participation process; and • To record any comments and issues raised. These issues and concerns will be used to inform the EIAR. No, I&APs or commenting authorities attended the scheduled public meeting.
Review of the EIAR	
Public review and commenting authority Review of the EIAR	The EIAR will be made available for public review and comment for 30 days. Summaries of the EIAR will be made available to all I&APs registered on the project database via email. I&APs will also be notified when the EIAR will be available for review via SMS. Electronic copies will be made available on the SLR website.

Step	Detail
Submission of the EIAR to the DMR	The EIAR will be updated to include all comment received during the public and commenting authority review period. This updated report will be made available to the DMR for decision making purposes.

8.2.2 KEY I&APS

According to the NEMA EIA Regulations, 2014 I&APs include: "any person, group of persons or organisation interested in or affected by such operation or activity; and any organ of state that may have jurisdiction over any aspect of the operation or activity". Key stakeholders identified as part of this public participation process include:

- I&APs:
  - Surrounding landowners, land users and community forums;
  - Surrounding mines and industries; and
  - Parastatals (Eskom and Transnet).
- Competent authorities:
  - Northern Cape DMR (Kimberly office); and
  - Northern Cape DWS (Kimberly office).
- Commenting authorities
  - Northern Cape Department of Agriculture, Forestry and Fisheries (DAFF);
  - Provincial South Africa Heritage Resource Agency (SAHRA);
  - Northern Cape Department of Rural Development and Land Reform – inclusive of the Land Claims Commissioner; and
  - Northern Cape DENC.
- Local authorities
  - Joe Morolong Local Municipality (includes ward councillor – ward 4); and
  - John Taolo Gaetsewe District Municipality.

8.3 SUMMARY OF ISSUES RAISED BY I&APS

A summary of the issues and concerns raised by I&APs, regulatory authorities and commenting authorities to date as part of the public participation process are tabulated below.

TABLE 8-2: SUMMARY OF ISSUES AND CONCERNS RAISED

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this EIAR where the issues and or responses were incorporated
Commenting authority				
SAHRA				
Natasha Higgit	27 March 2020 – Interim comments (Case ID: 14985)	As the proposed development is undergoing an EA Application process in terms of the NEMA, as amended, it is incumbent on the developer to ensure that a Heritage Impact Assessment (HIA) is done as per section 38(3) and 38(8) of the NHRA as required by section 24(4)b(iii) of NEMA. This must include an archaeological component, palaeontological component and any other applicable heritage components. The HIA must be conducted as part of the EA Application in terms of NEMA, as amended and the NEMA EIA Regulations. SAHRA requests that an assessment of the impacts to heritage resources that complies with section 38(3) of the NHRA as required by section 38(8) of the NHRA and section 24(4)b(iii) of NEMA be conducted as part of the EA process.	Heritage/cultural and Palaeontological Studies were compiled for the project. Copies of these studies are included in Appendix L. These studies confirm that no heritage/cultural resources would have been disturbed as part of the project activities. Further to this, the palaeontological sensitivity of the area is low.	Section 8.4.1.11 and Appendix L

Interested and affected party	Date comment received	Issues raised	Response provided	Section and paragraph reference in this EIAR where the issues and or responses were incorporated
		The assessment must include an assessment of the impact to archaeological and palaeontological resources. The assessment of archaeological resources must be conducted by a qualified archaeologist and the report comply with the SAHRA 2007 Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment Reports (see www.asapa.co.za or www.aphp.org.za for a list of qualified archaeologists). Should the appointed specialist deem it necessary, a Letter of Exemption for Further Studies may be submitted. The proposed development is located within an area of moderate Palaeontological Sensitivity as per the SAHRIS Palaeo Sensitivity map. As such, a desktop Palaeontological Impact Assessment (PIA) must be undertaken by a qualified palaeontologist. The report must comply with the 2012 Minimum Standards: Palaeontological Components of Heritage Impact Assessments. Should the appointed specialist deem it necessary, a Letter of Exemption for Further Studies may be submitted (a list of qualified palaeontologists can be found at https://www.palaeosa.org/heritage-practitioners.html). Any other heritage resources as defined in section 3 of the NHRA that may be impacted, such as built structures over 60 years old, sites of cultural significance associated with oral histories, burial grounds and graves, graves of victims of conflict, and cultural landscapes or views capes must also be assessed.		

8.4 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE ALTERNATIVES

Due to the nature of the project, the biophysical and socio-economic environments have already been altered by the commencement of the project activities. The baseline information provided in the following section is aimed at giving the reader perspective of the status of the biophysical and socio-economic environments prior to the commencement of the project activities together with the existing status.

The section below includes information sourced from the approved EMPr for the MMT (JAWS, 2005), the BAR compiled by SLR for the Merging of the Sinterfontein and Tshipi eastern WRDs (SLR, June 2019) as well as additional specialist input obtained for the project (where relevant).

The NEMA reporting regulations requires that the biophysical and socio-economic attributes associated with alternative sites is described in the following section. The project activities have already commenced and as such the consideration of biophysical and socio-economic attributes in the context of alternative sites is not applicable to this project.

8.4.1 BASELINE ENVIRONMENT

8.4.1.1 Topography

INTRODUCTION AND LINK TO IMPACT

The presence of infrastructure and mining activities has the potential to change the natural topography which may impact on visual amenity (Section 8.4.1.9) and surface water drainage (Section 8.4.1.5) 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.

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.

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 natural topography of the area surrounding the MMT has been largely influenced by 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 highest topographical features surrounding the MMT are the UMK and Tshipi Borwa Mine WRDs (see Figure 1-2).

The majority of the natural topography at the MMT has been disturbed as a result of the existing mining infrastructure and activities.

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 be harmful to both third parties and animals, this however needs to be considered within the context of the existing altered natural topography due to MMT's infrastructure and mining activities.

8.4.1.2 Climate

INTRODUCTION AND LINK TO IMPACT

Climate can influence the potential for environmental impacts. 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.

DATA SOURCES

Information in this section was sourced from previous studies undertaken for MMT (SLR, June 2019), the Air Quality Study (Airshed, September 2019a) compiled in support of the project (included in Appendix I).

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 location of the weather stations are illustrated in Figure 1-1.

DESCRIPTION

Regional climate

The MMT 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, June 2019).

Rainfall, rainfall depths and evaporation

Monthly rainfall and evaporation data for the Milner weather station is summarised in Table 8-3 below. Rainfall depth frequency data is summarised in Table 8-4 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 (refer to Table 8-3) (SLR, June 2019).

TABLE 8-3: 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
Annual	**372.0**	**2351.0**	**1972.0**

TABLE 8-4: 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

Storm Duration (m/h/d)	Return Period (years)						
	2	5	10	20	50	100	200
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 maximum of 42.6°C for 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 minima between -4.2°C in August to 10°C in January. Table 8-5 below provides the minimum, average and maximum temperature obtained from the Kumaran South African Weather Station for the period 2015 to 2017.

TABLE 8-5: MINIMUM, AVERAGE AND MAXIMUM TEMPERATURES (AIRSHED, SEPTEMBER 2019A)

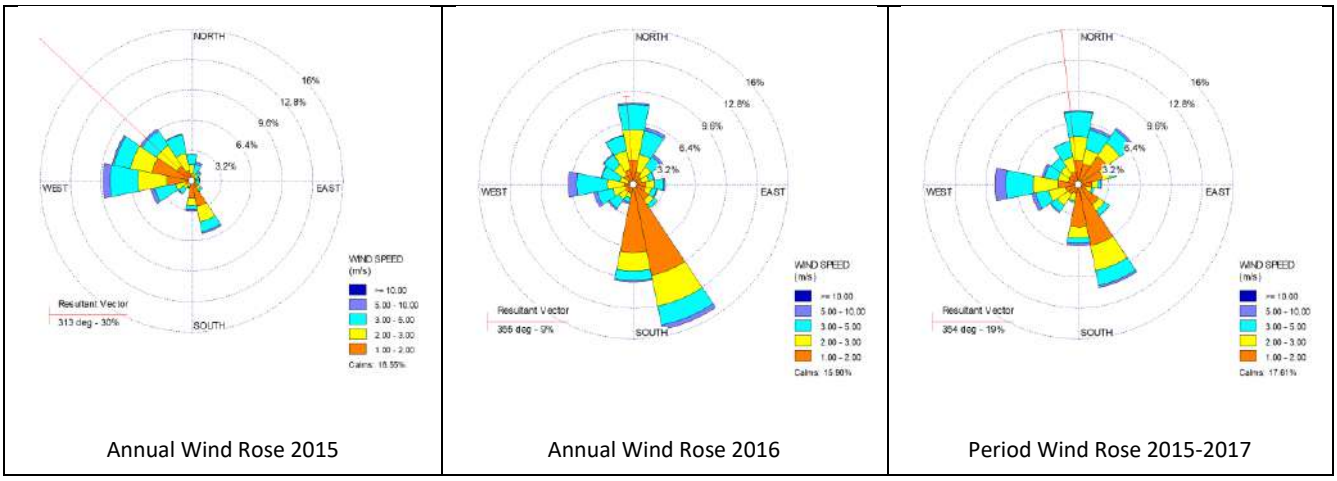
	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Min	10.1	10	6.4	3.3	2	-3.2	-3.9	-4.2	2.2	2.7	4.3	9.6
Ave	25.1	24.3	22.2	17.9	14.0	10.7	10.8	13.8	18.5	21.7	23.5	26.4
Max	42.6	38.8	35.6	35.3	28.8	25.3	27.1	31.3	34.7	38.5	39.5	39.9

Wind

The annual average wind roses for the Kuruman Weather Station for the years 2015, 2016 and 2017 are shown in Figure 8-1 with the period average wind field (2015-2017) and diurnal variability in the wind field provided in Figure 8-2. 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 (Airshed, 2018a). During the day winds are more frequent from the westerly and the northerly sectors, with the strongest winds directly from the west (see Figure 8-2). 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 (Airshed, September 2019a).

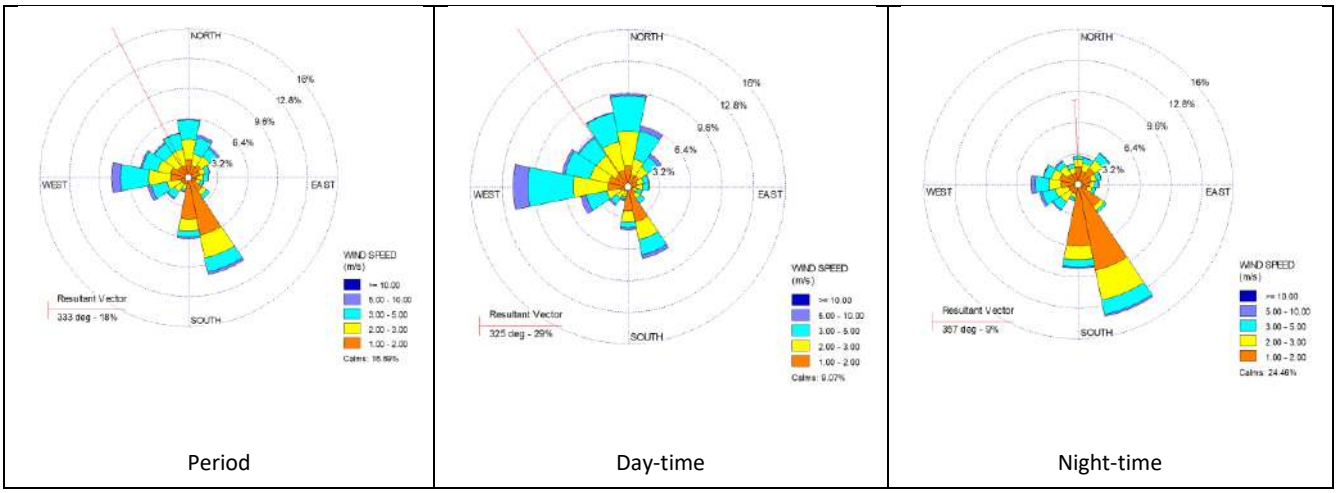
According to the Beaufort wind force scale, wind speeds between 6-8 m/s equates to a moderate breeze, with wind speeds between 14-17 m/s near gale force winds. Based on the three years of SAWS data (2015-2017), wind speeds exceeding 6 m/s occurred for only 1% of the time, with a maximum wind speed of 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 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) (Airshed, September 2019a).



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

FIGURE 8-1: PERIOD AND ANNUAL WIND ROSES (AIRSHED, SEPTEMBER 2019A)



Period | Day-time | Night-time

FIGURE 8-2: PERIOD, DAY-TIME AND NIGH-TIME WIND ROSES (AIRSHED, SEPTEMBER 2019A)

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).

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.

8.4.1.3 Soils and land capability

INTRODUCTION AND LINK TO IMPACT

Soils are a significant component of most ecosystems. As an ecological driver, soil supports vegetation growth which in turn provides a habitat in which vertebrates and invertebrates can exist. Soil is key to re-establishing post closure land capability once mining activities cease and a site has been rehabilitated.

Mining activities and infrastructure have the potential to damage soil resources through physical loss of soil and/or the contamination of soils, thereby impacting on the soils' ability to sustain natural vegetation and altering land capability. Contamination of soils may in turn contribute to the contamination of surface and groundwater resources. Loss of the topsoil resource reduces chances of successful rehabilitation and restoration. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

DATA SOURCES

Information in this section was sourced from the Soil, Land Use and Land Capability Study (Scientific Aquatic Services (SAS), October 2019a) compiled for the project (included in Appendix F).

A soil survey was conducted in order to identify the soil forms likely to be associated with the project areas which were classified according to the Soil Classification Working Group for South Africa (2018). The land capability of the project areas were classified in terms of the Land Capability Classification (Smith, 2006). A 150 m zone from the project areas was surveyed in order to identify the soil forms prior to commencement of the project activities.

DESCRIPTION

Soil forms

The soil form Ermelo was identified within the NE topsoil stockpile project area and the soil forms Witbank and Cullinan were identified within the Adams pit project area. Refer to Figure 8-3 for an illustration of the various soil forms.

The Ermelo soil form is characterised by a strong pigmenting effects of iron (Fe) in the form of hematite. These soils are generally freely drained and well aerated. These attributes (i.e. good drainage and well aeration) make these soils ideal for tillage.

Adams pit is associated with the Cullinan soil form. Cullinan soil refers to large open excavation pits associated with mines, often with little or no soil material present. The area surrounding Adams Pit is dominated by the Witbank soil form. Witbank soil forms are soil materials that have been physically altered and intentionally transported by human intervention. It follows that soil forms within and surrounding Adams pit have been subjected to the alteration from the EIAR natural state by human-related interventions and have been extensively disturbed such that no recognizable diagnostic soil morphological characteristics could be identified.

Land Capability and Land Potential

In terms of the Land Capability Classification, the land capability within the NE topsoil stockpile project area had arable land capability. The Adams pit project area was likely associated with the wilderness land capability. Refer to Figure 8-4 for an illustration of the various land capabilities. Further detail is provided below.

NE Topsoil stockpile project area

The Ermelo soil form is generally considered a high potential agricultural soil with high land capability. High potential agricultural land is defined as having the soil and terrain quality, growing season and adequate available moisture needed to produce sustained economically high crops yields when treated and managed according to best possible farming practices. While Ermelo soils have a high agricultural capability, the arid nature (low rainfall) of the area limits the use of these soils for arable purposes. While this project area is deemed to have a moderate land potential suitable for arable agricultural land use, these soils are highly suitable for rehabilitation purposes.

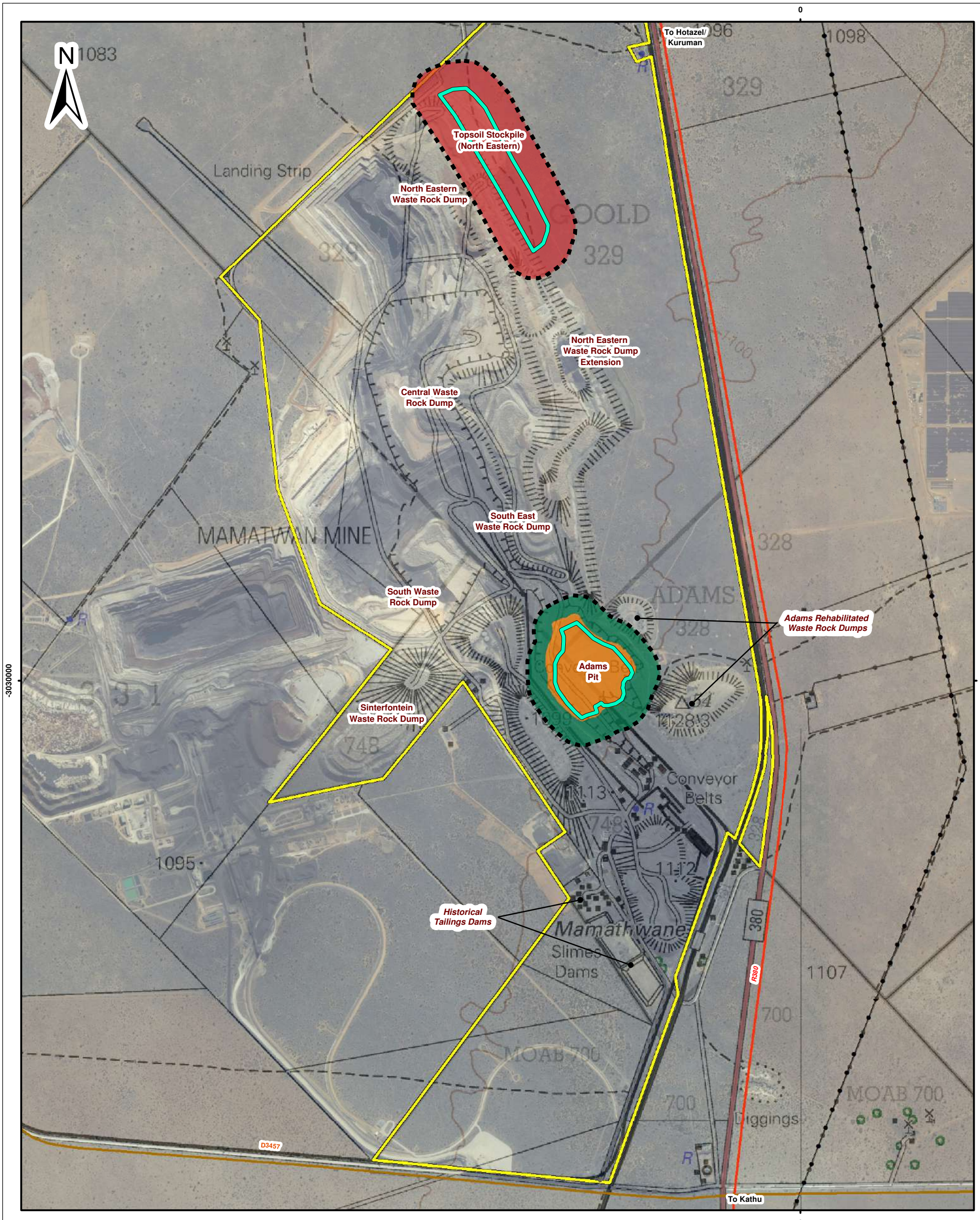
Adams pit project area

The Witbank and Cullinan soil forms have very poor land capability and very low land potential, attributed to historic and on-going mining activities. In addition, some of these soils have been subjected to long term compaction, erosion and chemical alteration. This land capability and land potential class also includes areas where the original soil has been buried and/or extensively modified by anthropogenic activities. These soils are therefore not considered to make a significant contribution to agricultural productivity even on a local scale.

CONCLUSION

The Ermelo soil form was identified within a 150 m radius from the NE topsoil stockpile area. Due to the homogenous nature of the area, the likely pre-disturbance soil form associated with the NE topsoil stockpile was the Ermelo soil form. The Ermelo soil form is a well-drained sandy soil, which allows for high infiltration rates and low organic content and is highly erodible. This soil form is highly suitable for stripping and stockpiling for rehabilitation purposes. Inadequate stockpiling of topsoil has the potential to influence soil resources and the natural capability of the land. Topsoil is key to the success of rehabilitation. Appropriate management actions to prevent the loss of stockpiled soil resources will therefore need to be taken into consideration for the duration of the operational phase until such time as soil will be utilised for rehabilitation.

Adams pit was completely mined out by 1980. It follows that little to no soil material (Cullinan soil form) was present when the disposal of general waste (including rubble and used conveyor belts) and storage of Sinter de-dust commenced. In this regard, these project activities were unlikely to have influenced soil resources and related land capability.



Legend

- Mamatwan Mining Right Area
- Section 24g Activities
- Main Roads
- Secondary Roads
- Power Line

Soil Forms

- Ermelo
- Cullinan
- Witbank
- 150m Zone

0 300 600 Meters

Scale: 1:60 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

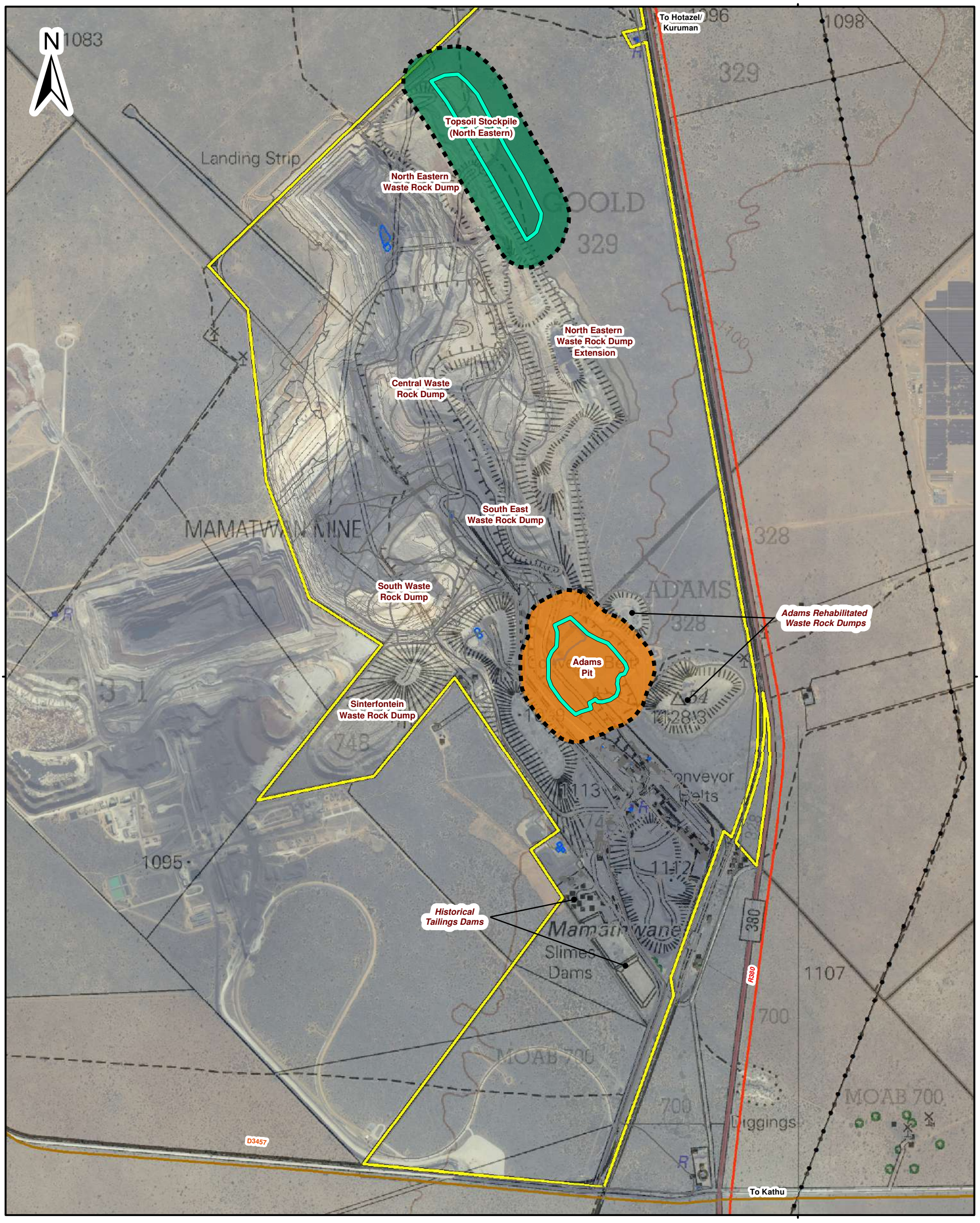
Figure 8-3

Soil Forms Assosciated With The Project Area (SAS, October 2019)

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

720.19136.00002

2020/05/12



Legend

- Mamatwan Mining Right Area
- Current Infrastructure
- Section 24g Activities
- Main Roads
- Secondary Roads
- Power Line

Land Capability

- Arable (Moderate Capability)
- Wilderness (Very Low Land Potential)
- 150m Zone

0 300 600 Meters

Scale: 1:20 100 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 8-4

Land Capability Associated With The Project Area (SAS, October 2019)

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720.19136.00002 | 2020/05/12

8.4.1.4 Biodiversity

INTRODUCTION AND LINK TO IMPACT

In the broadest sense, biodiversity provides value for ecosystem functionality, aesthetic, spiritual, cultural, and recreational reasons. The known value of biodiversity and ecosystems relate to soil formation and fertility maintenance; primary production through photosynthesis; provision of food and fuel; provision of shelter and building materials; regulation of water flows and water quality; regulation and purification of atmospheric gases; moderation of climate and weather; control of pests and diseases; and maintenance of genetic resources. Mining activities and infrastructure have the potential to disturb and destroy biodiversity that in turn can influence the natural functionality of an ecosystem. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

DATA SOURCE

Information in this section was sourced from Biodiversity Study (STS, October 2019) compiled for the project (included in Appendix G). Desktop vegetation type information and the associated conservational status information were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006). Information on plant and animal species recorded for the Quarter Degree Squares, was extracted from the database hosted by SANBI. Numerous national and provincial databases were utilised to determine the conservational sensitivity of the project areas. These databases included:

- The 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) and the South Africa Protected Area Database (SAPAD, 2017);
- The Mining and Biodiversity Guidelines (2013);
- The Griqualand West Centre of Endemism;
- The Northern Cape critical biodiversity areas (CBAs) (2016); and
- Important Bird Areas (IBA's) (2015)

Historical satellite imagery was used to obtain an understanding of the habitat units prior to the commencement of the project activities. Faunal species associated with the project areas and documented in the Biodiversity Study (STS, October 2019) was based on information extrapolated from previous biodiversity investigations undertaken for the MMT (NSS, October 2018).

DESCRIPTION

Terrestrial characteristics

The desktop terrestrial characteristics of the project areas are summarised in Table 8-6 below. The table below 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.

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TABLE 8-6: CONSERVATION CHARACTERISTICS OF THE MMT (STS, OCTOBER 2019)

<table>
<tr><th colspan="2">Details in terms of Mucina and Rutherford (2006)</th><th colspan="2">Description of the vegetation type(s) (Mucina and Rutherford 2006)</th></tr>
<tr><td>Biome</td><td>The project activities are located within the Savanna Biome.</td><td>Vegetation Type</td><td>Kathu Bushveld</td></tr>
<tr><td rowspan="2">Bioregion</td><td rowspan="2">The project activities are situated within the Eastern Kalahari Bushveld Bioregion.</td><td>Climate</td><td>Summer and autumn rainfall, very dry winters</td></tr>
<tr><td>Distribution</td><td>Northern Cape Province</td></tr>
<tr><td>Vegetation Type</td><td>The project activities fall within the Kathu Bushveld vegetation type.</td><td>Conservation</td><td>Least threatened. Target 16%. None conserved.in statutory</td></tr>
<tr><td colspan="2">Conservation details pertaining to the study area (Various databases)</td><td rowspan="3">Vegetation and landscape features</td><td rowspan="3">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.</td></tr>
<tr><td>NBA (2011)</td><td>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.</td></tr>
<tr><td rowspan="3">National Threatened Ecosystems (2011)</td><td rowspan="3">The project activities are not located in an ecosystem that is listed as threatened.</td><td colspan="2">Northern Cape Critical Biodiversity Areas (2016)</td></tr>
<tr><td rowspan="2" colspan="2">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.</td></tr>
<tr><td>NPAES (2009), SACAD (2017) and SAPAD (2017)</td><td>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.</td></tr>
<tr><td>IBA (2015)</td><td>The project activities do not fall within an Important Bird and Biodiversity Area (IBA, 2015), nor is located within 10 km of an IBA.</td></tr>
<tr><td colspan="2">Mining and Biodiversity Guidelines (2013)</td><td colspan="2">Northern Cape Provincial Spatial Development Framework (2012)</td></tr>
<tr><td colspan="2">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.</td><td colspan="2">The project activities are situated 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.</td></tr>
</table>

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Terrestrial habitat units and vegetation communities associated with the MMT

The section below provides an overview of the habitat and vegetation communities currently associated with the MMT within and adjacent to the project areas. The current baseline is used to inform an understanding of the likely habitat units and vegetation communities prior to the commencement of the project activities.

Acacia Thornveld Habitat Unit

The *Acacia* Thornveld Habitat Unit is considered an open savanna and has well-developed tree/shrub layer. In some areas denser bush clumps occur. The *Acacia* Thornveld Habitat Unit, is sub-divided into numerous vegetation communities, namely:

- *Acacia haematoxylon* - *Grewia flava* Thornveld
- *Acacia mellifera- Acacia haematoxylon* - *Grewia flava* Thornveld
- *Acacia mellifera* - *Stipagrostis* Open Thornveld; and
- *Acacia mellifera* Thornveld and Dense Bushclumps

Refer to Figure 8-5 for the distribution of current vegetation communities within the MMT. Dominant species identified within the *Acacia* Thornveld Habitat Unit are tabulated below.

TABLE 8-7: DOMINANT SPECIES ASSOCIATED WITH THE *ACACIA* THORNVELD HABITAT UNIT (STS, OCOTOBER 2019)

Vegetation type	Species	Common name
Dominant trees	*Terminalia sericea*	Silver Cluster-leaf
Dominant shrubs	*Vachellia erioloba*	Camel Thorn
	Grewia flava	Velvet Raisin Bush
	Senegalia mellifera	Black Thorn
	Tarchonanthus camphoratus	Camphor Bush
	Vachellia hebeclada subsp. Hebeclada	Candle Thorn
Dominant succulents	*Bulbine species Bulbine narcissifolia Salm-Dyck*	Strap-leafed Bulbine, Snake Flower
	Kalanchoe thyrsiflora	White Lady, Bird's Brandy
	Ruschia cf. griquensis	-
	Sansevieria aethiopica	Mother-in-laws Tongue, Bowstring Hemp
Dominant forbs	*Stipagrostis uniplumis*	Silky Bushman Grass

Transformed Habitat Unit

The Transformed Habitat Unit refers to areas that have been transformed as a result of mining activities and infrastructure. These areas contain very little natural vegetation and consist mainly of alien invasive species. Refer to Figure 8-5 for the distribution of this habitat unit within the MMT.

`

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. Refer to Table 8-8 for a list of alien and invasive species associated with the Transformed Habitat Unit in terms of the NEM:BA List of Alien and Invasive Species (2016). Limited alien and invasive species are associated with the *Acacia* Thornveld Habitat Unit.

TABLE 8-8: ALIEN AND INVASIVE PLANT SPECIES (STS, OCTOBER 2019)

Scientific name	Common name	Category
Trees/ shrubs		
Datura ferox	Large thorn apple	NEMBA: Category 1b
Melia azedarach	Syringa	NEMBA: Category 1b
Nicotiana glauca	Wild tobacco	NEMBA: Category 1b
Prosopis glandulosa var. *glandulosa*	Honey mesquite	NEMBA: Category 3 in Northern Cape.
Schinus molle	Peruvian pepper	Not listed
Forbs		
Alternanthera pungens	-	Not listed
Argemone ochroleuca subsp. *ochroleuca*	White-flowered Mexican poppy	NEMBA: Category 1b
Chenopodium sp.	-	Not listed
Gomphrena celosioides	-	Not listed
Verbesina encelioides	Wild Sunflower	Not listed
Succulent		
Opuntia ficus-indica	Sweet prickly pear	NEMBA: Category 1b
Graminoid		
Pennisetum setaceum	Fountain grass	NEMBA: Category 1b
Poa annua	Annual meadowgrass	Not listed

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 the EIAR spread.

Species of conservational concern (SCC)

The *Acacia* Thornveld habitat unit is associated with several floral SCC that are protected, either nationally or provincially, and are listed below:

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- *Babiana hypogaea* (Bobbejaankalkoentjie), protected under the NCNCA - Schedule 2 Protected family (*Iridaceae*);
- *Boophone disticha* (Century Plant, Poison Bulb, Sore-eye Flower), protected under the NCNCA - Schedule 2 Protected family (*Amaryllidaceae*);
- *Ruschia cf. griquensis*, protected under the NCNCA - Schedule 2 Protected family (*Aizoaceae*);
- *Vachellia erioloba* (Camel Thorn), protected under the NFA; and
- *Vachellia haematoxylon* (Grey Camel Thorn), protected under the NFA.

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

The Transformed Habitat Unit is not associated with any protected floral species.

MMT Faunal habitat and species

Mammals

Mammal species that have been recorded at the MMT (NSS, October 2018) are included in Table 8-9 below. In addition to this, mammal species not recorded at the MMT but that are likely to occur at the MMT (NSS, October 2018) are also tabulated below.

TABLE 8-9: MAMMAL SPECIES AT THE MMT (NSS, OCTOBER 2018)

	Scientific name	Common name
Recorded	*Pedetes capensis*	South African Spring Hare
	Gerbilliscus paeba	Paeba Hairy-footed Gerbil
	Gerbilliscus brantsii	Highveld Gerbil
	Gerbilliscus leucogaster	Bushveld Gerbil
	Desmodillus auricularis	Cape Short-tailed Gerbil
	Raphicerus campestris	Steenbok
	Hystrix africaeaustralis	Porcupine
	Pedetes capensis	South African Spring Hare
	Lepus capensis	Cape Hare
	Sylvicapra grimmia	Bush duiker
	Cynictis penicillata	Yellow Mongoose*
	Canis mesomelas	Black-backed Jackal*
	Tragelaphus strepsiceros	Greater Kudu*

`

	Scientific name	Common name
Recorded	*Phacochoerus africanus*	Common Warthog*
	Orycteropus afer	Aardvark*
	Neoromicia capensis	Cape Serotine*
	Pipistrellus hesperidus	Dusky Pipistrelle bats*
Likelihood of occurring at the MMT	-	Small nocturnal, secretive and/or otherwise inconspicuous rodents, bats, Carnivores and insectivores
	Elephantulus intufi	Bushveld Elephant Shrew
	Rhabdomys pumilio	Xeric Four-striped Grass Mouse
	Tadarida aegyptiaca	Egyptian Free-tailed Bat
	Otocyon megalotis	Bat–eared Fox
	Miniopterus natalensis	cave-roosting Natal Long-fingered
	Rhinolophus darlingi	Darling's horseshoe bats
	Rhinolophus denti	Dent's horseshoe bats

* Species not observed during field surveys, but evidence of these species were noted.

Birds

Bird species that have been noted in and around the MMT (NSS, October 2018) are listed in Table 8-10 below. Bird species that are likely to occur at the MMT are also tabulated below.

TABLE 8-10: BIRD SPECIES AT THE MMT (NSS, OCTOBER 2018)

	Scientific name	Common name
Recorded	*Sporopipes squamifrons*	Scaly-feathered Finch
	Prinia flavicans	Black-chested Prinia
	Cercotrichas paena	Kalahari Scrub Robin
	Parisoma subcaeruleum	Chestnut-vented Tit-Babbler
	Quelea	Red-billed Quelea
	Myrmecocichla formicivora	Ant-eating Chat
	Streptopelia capicola	Cape Turtle Dove
	Columba guinea	Speckled Pigeon
	Calendulauda africanoides	Fawn-coloured Lark
	Emberiza impetuani	Lark-like Bunting
	Cercomela familiaris	Familiar Chat
	Hirundo fuligula	Rock Martin
	Lanius collaris	Southern (Common) Fiscal
	Pycnonotus nigricans	African Red-eyed Bulbul

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	Scientific name	Common name
Recorded	*Ploceus velatus*	Southern Masked Weaver
	Lamprotornis nitens	Cape Glossy Starling
	Oena capensis	Namaqua Dove
	Colius	White-backed Mousebird
	Crithagra flaviventris	Yellow Canary
	Granatina	Violet-eared Waxbill
	Nilaus afer	Brubru
	Batis pririt	Pririt Batis
	Laniarius atrococcineus	Crimson-breasted Shrike
	Bradornis mariquensis	Marico Flycatcher
	Amadina erythrocephala	Red-headed Finch
	Tchagra australis	Brown-crowned Tchagra
	Cinnyris fuscus	Dusky Sunbird
Likelihood of occurring at the MMT	*Hirundo rustica*	Barn Swallow
	Saxicola torquatus	African Stonechat
	Upupa africana	African Hoopoe
	Chrysococcyx caprius	Diederik Cuckoo
	Alopochen aegyptiacus	Egyptian Goose
	Merops apiaster	European Bee-eater
	Tyto alba	Western Barn Owl
	Calendulauda sabota	Sabota Lark
	Lanius minor	Lesser Grey Shrike
	Lanius collurio	Red-backed Shrike
	Clamator jacobinus	Jacobin Cuckoo
	Ptilopsis granti	Southern White-face Owl
	Lophotis ruficrista	Red-crested Korhaan
	Tachymarptis melba	Alpine Swift
	Philetairus socius	Sociable Weaver
	Polihierax semitorquatus	Pygmy Falcon
	Erythropygia coryphoeus	Karoo Scrub Robin
	Sylvia layardi	Layard's Tit-Babbler
	Falco chicquera	Red-necked Falcon

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Herpetofauna

The Kalahari Tree Skinks and Common Barking Geckos have been recorded at the MMT (NSS, October 2018). Additional reptile species known to occur MMT include the Spotted Bush Snake, Cape Cobra, Cape Gecko, Yellow-throated Plated Lizard, Bushveld Lizard, Spotted Sand Lizard, Mole Snake and Puff Adder.

Terrestrial macro invertebrates

Butterfly species that have been recorded at the MMT (NSS, October 2018) included the *Acraea neobule* (Wandering Donkey Acraea), *Danaus chrysippus orientis* (African Monarch), *Vanessa cardui* (Painted Lady), *Lampides boeticus* (Pea Blue), *Eurema brigitta* (Broad-bordered Grass Yellow), *Catopsilia florella* (African Migrant) and *Spialia diomus ferax* (Common Sandman). None of these butterfly species has a threatened or protected status.

The exoskeleton of the *Uroplectes carinatus* (Common Lesser- Thicktail Scorpion) was recorded at the MMT. The highly venomous *Parabuthus raudus* (Kalahari Thicktail Scorpion), and *Opistophthalmus carinatus (*Radiant Burrower) are highly likely to also occur in MMT. Other potentially occurring scorpion species include *Parabuthus granulatus (*Rough Thicktail Scorpion), Opistophthalmus *wahlbergii* (Kalahari Burrower) and *Parabuthus mossambicensis* (Mozambique Thicktail Scorpion). 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*.). Banded Garden Spiders (*Argiope australis*).

Faunal SCC

The *Acacia* Thornveld habitat unit is expected to support a number of faunal SCC, namely *Orycteropus afer* (Aardvark), *Atelerix frontalis* (Southern African Hedgehog), *Felis nigripes* (Black-footed Cat), *Otocyon megalotis* (Bat-eared Fox), *Vulpes chama* (Cape Fox), *Mellivora capensis* (Honey Badger), *Anthus crenatus* (African Rock Pipit), *Ardeotis kori* (Kori Bustard) and *Sagittarius serpentarius* (Secretary bird).

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.

Characteristics and site sensitivity associated with the project areas

Vegetation communities directly adjacent to the NE topsoil stockpile, as illustrated in Figure 8-5, are representative of the *Acacia* Thornveld Habitat Unit. Due to the homogeneous nature of the general area and through the use of historical satellite imagery, the likely habitat unit associated with the NE topsoil stockpile area prior to establishment was the *Acacia* Thornveld Habitat Unit. Due to the historical nature of the Adams pit, the Transformed Habitat Unit would have been associated with Adams pit prior to the commencement of the project activities. The section below provides a discussion on the floral and faunal characteristics associated with the project areas prior to the commencement of the project activities.

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TABLE 8-11: FLORAL AND FAUANAL CHARACTERISTICS ASSOCIATED WITH THE PROJECT AERAS (STS, SEPTEMBER 2019)

Project area		Aspect
		Floral habitat and species diversity
Floral	NE topsoil stockpile project area	Given the proximity of the NE Topsoil Stockpile project area to the MMT mining operations and activities, edge effects from mining activities would have resulted in a decrease in floral diversity when compared to areas further away from mining activities. The vegetation however would have been intact prior to stockpiling topsoil, and as such a moderately high ecological function was attributed to floral communities in this habitat unit. Floral species diversity prior to the stockpiling of topsoil would have included a moderate diversity of species that mostly consisted of commonly occurring flora associated with the *Acacia* Thornveld Habitat Unit. The *Acacia* Thornveld habitat unit, is well represented regionally and the affected area would not have formed part of a unique landscape prior to the occurrence of the project activity.
	Adams pit project area	The Adams pit project area prior to the commencement of the project activities would mostly have been associated with bare ground. No unique landscapes important to flora would have been present within the Adams pit. It follows that this project areas are attributed to have had a low ecological function.
		Floral SCC
	NE topsoil stockpile project area	It is highly likely that several of the SCC that are typically associated with the *Acacia* Thornveld Habitat Unit were present within the project area prior to stockpiling topsoil.
	Adams pit project area	Due to the extent of habitat transformation associated with the Adams pit project area prior to the commencement of project activities, the habitat would not have been suitable for floral SCC to establish self-sustaining populations.
		Floral habitat integrity
	NE topsoil stockpile project area	The habitat associated with the project area was described as natural prior to stockpiling of topsoil and the presence of alien and invasive plant species were limited. Floral structure would have been representative of the reference vegetation type, i.e. the Kathu Bushveld, however, due to edge effects of mining activities the species composition was no longer fully representative. The habitat would have been largely intact and ecologically functioning prior to stockpiling topsoil.
	Adams pit project area	The Adams pit project area is associated with historic disturbance and as such the natural floral habitat has been modified and transformed. Several alien and invasive species were likely to occur within the Adams pit project area, ranging from woody species such as *Prosopis cf glandulosa* (Honey mesquite) and *Nicotiana glauca* (Tobacco tree), to weedy herbaceous species such as *Chenopodium spp*., *Gomphrena celosioides* and *Verbesina encelioides.*
Fauna		**Faunal SCC**
	NE topsoil stockpile project area	Due to the limited size and location of the NE Topsoil Stockpile, it is expected that although SCC typical of the *Acacia* Thornveld Habitat Unit would have utilised the habitat therein, it would most likely have been on a temporary basis whilst foraging. It is unlikely that any of these species would have resided permanently within the habitat, however, the loss of habitat herein will have affected the overall distribution and areas usage patterns of faunal SCC.

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Project area		Aspect
Fauna	Adams pit project area	Prior to the development of the Adams pit, it is highly unlikely that any faunal SCC would have inhabited or temporarily utilised this area.
	Faunal habitat and species diversity	
	NE topsoil stockpile project area	Prior to vegetation clearance, the project area was considered to be part of the *Acacia* Thornveld habitat unit. This habitat unit had a fairly well-developed woody and herbaceous layer and would have provided suitable habitat and food resources to several common faunal species. Due to the arid nature of the habitat and region, many of these species would have likely utilised the habitat in which the NE Topsoil Stockpile is currently located interchangeably with the surrounding natural areas.
	Adams pit project area	The Adams Pit is located within the Transformed habitat which is associated with current mining areas. Due to the historical nature of Adams pit project area, faunal habitat and species diversity was likely limited. The project activities will have led to minor habitat disturbance as well as limited influence on the already low faunal species diversity therein.

Figure 8-7 illustrates the probable sensitivities associated with the project areas prior to the commencement of the project activities. The site sensitivity is based on the presence of floral and faunal SCC, habitat integrity, the presence of unique landscapes and species diversity as summarised in Table 8-11 above. In this regard, the Adams pit project area was considered to have a low overall biodiversity sensitivity and the NE topsoil stockpile was considered to have a moderate overall biodiversity sensitivity.

CONCLUSION

Prior to the stockpiling of topsoil, the habitat unit associated with the NE topsoil stockpile project area was the *Acacia* Thornveld Habitat Unit. This habitat unit is considered largely natural and comprises indigenous vegetation with the likely occurrence of SCC in terms of the NCNA (*Babiana hypogaea, Boophone disticha* and *Ruschia* cf. *griquensis)* and NFA (*Vachellia erioloba* and *Vachellia haematoxylon)* with limited alien and invasive species. The natural biodiversity within the MMT has been influenced by the existing mining operations and has resulted in a decreased floral diversity and species composition. The *Acacia* Thornveld Habitat Unit would have provided food resources to common faunal species but was unlikely to have provided a habitat for permanent residing faunal species due to on-going disturbances from the MMT mining operations. It is unlikely that any protected faunal species was associated with the project area. This habitat unit did not present a unique landscape prior to the commence of the project activity. It follows that the project area would have had a moderate site sensitivity prior to the establishment of the NE topsoil stockpile.

Due to the historical nature of Adams pit being (i.e mined out in 1980), the vegetation has been transformed for a long period of time and is therefore considered to be a Transformed Habitat Unit. The Transformed Habitat Unit is associated with several alien and invasive species. The extent of the disturbance and habitat transformation prior to commencement of the project activities would not have been suitable to support SCC and would not have provided a faunal habitat. It follows that the project area would have had a low moderate site sensitivity prior to the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of Sinter de-dust.

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The project activities, particularly the establishment of the NE topsoil stockpile had the potential to destroy biodiversity including SCC. The project activities also have the potential to disturb biodiversity that in turn can influence the natural functionality of the surrounding undisturbed ecosystem. It follows that management actions need to be formulated to reduce the impacts that the project activities may have towards surrounding areas.

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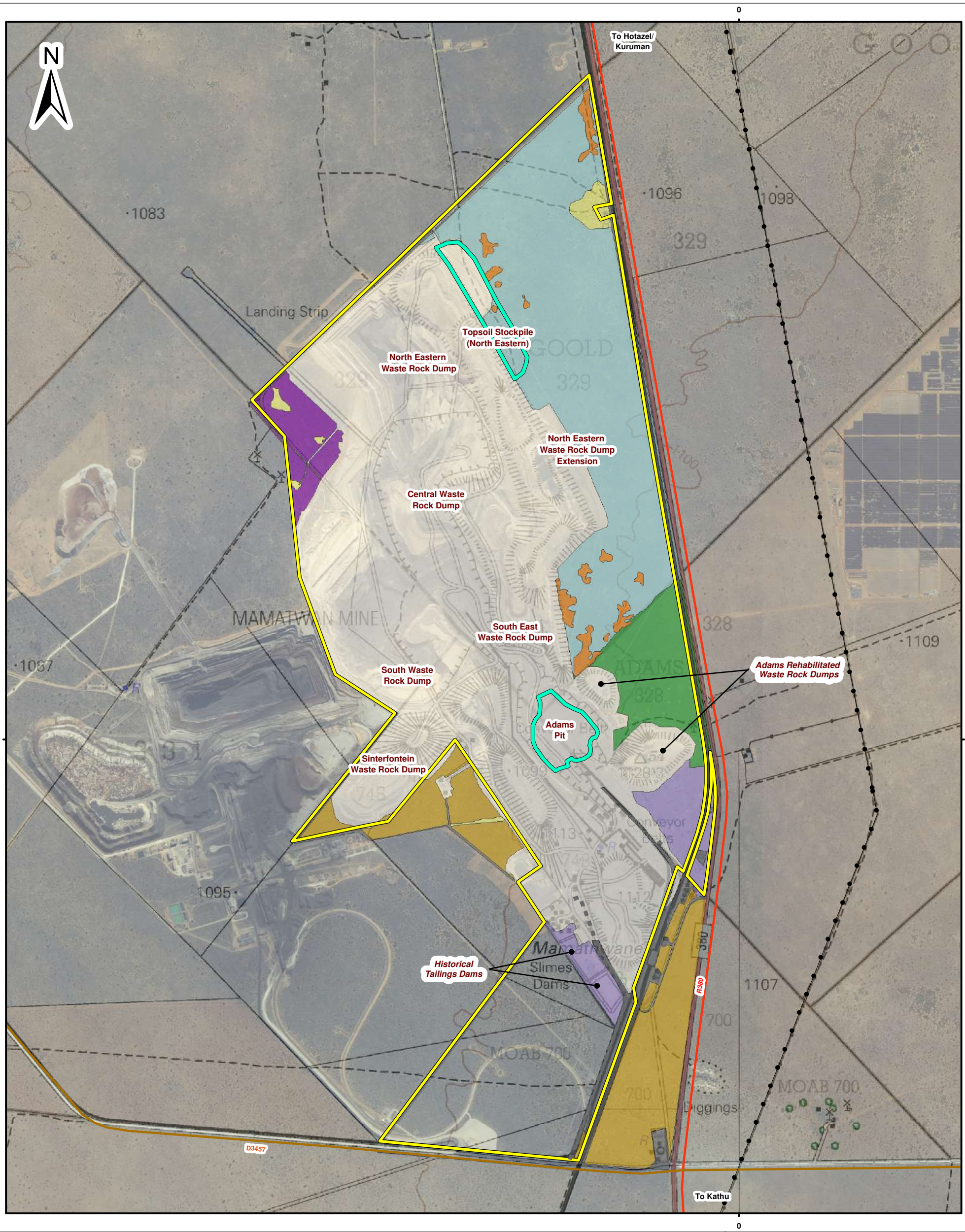

Legend

- Mamatwan Mining Right Area
- Section 24g Activities
- Main Roads
- Secondary Roads
- Power Line

Vegetation Communities

- Mining
- Infrastructure
- Vegetation in Recovery
- Disturbed Patches
- Acacia haematoxylon - Grewia flava Thornveld
- Acacia mellifera -Acacia Haemotoxylon - Grewia flava Thornveld
- Acacia mellifera - Stipagrostis Open Thornveld
- Acacia mellifera Thornveld and Dense Bushclumps
- Dense Acacia mellifera Thornveld

0 300 600 Meters

Scale: 1:24 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 8-5

Vegetation Communities

SLR Consulting (Africa) (Pty) Ltd
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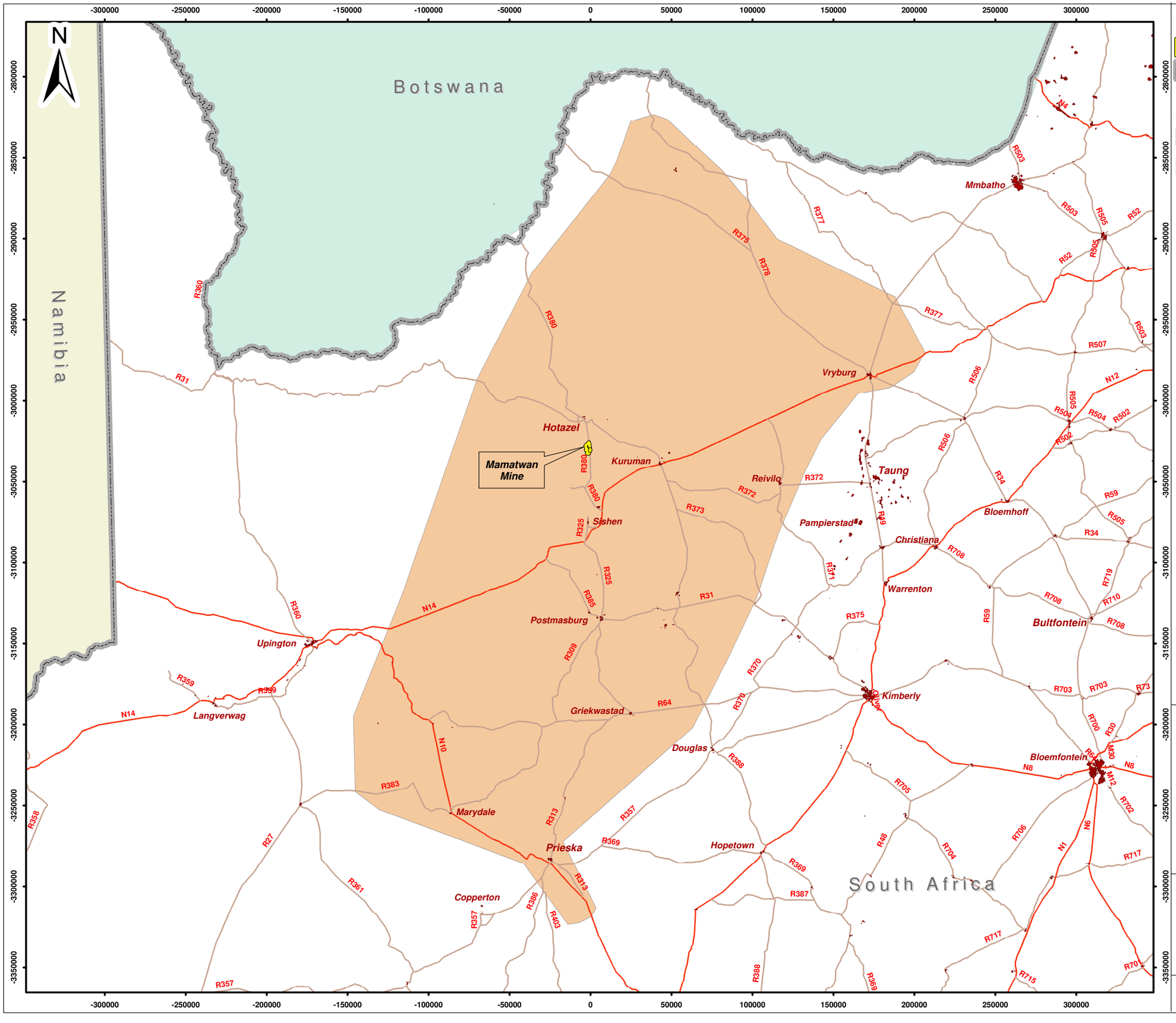
720.19136.00002

2020/04/30



Legend

- Mamatwan Mining Right Area
- National Boundary
- National Roads
- Route Roads
- Urban Areas
- Griqualand and West Center of Endemism

0 30 60 Kilometers

Scale: 1 : 2 250 000 @ A3
Projection: Transverse Mercator
Datum: Hartebeeshoek, Lo23

Mamatwan Mine

Figure 8-6

Griqualand and West Center of Endemism

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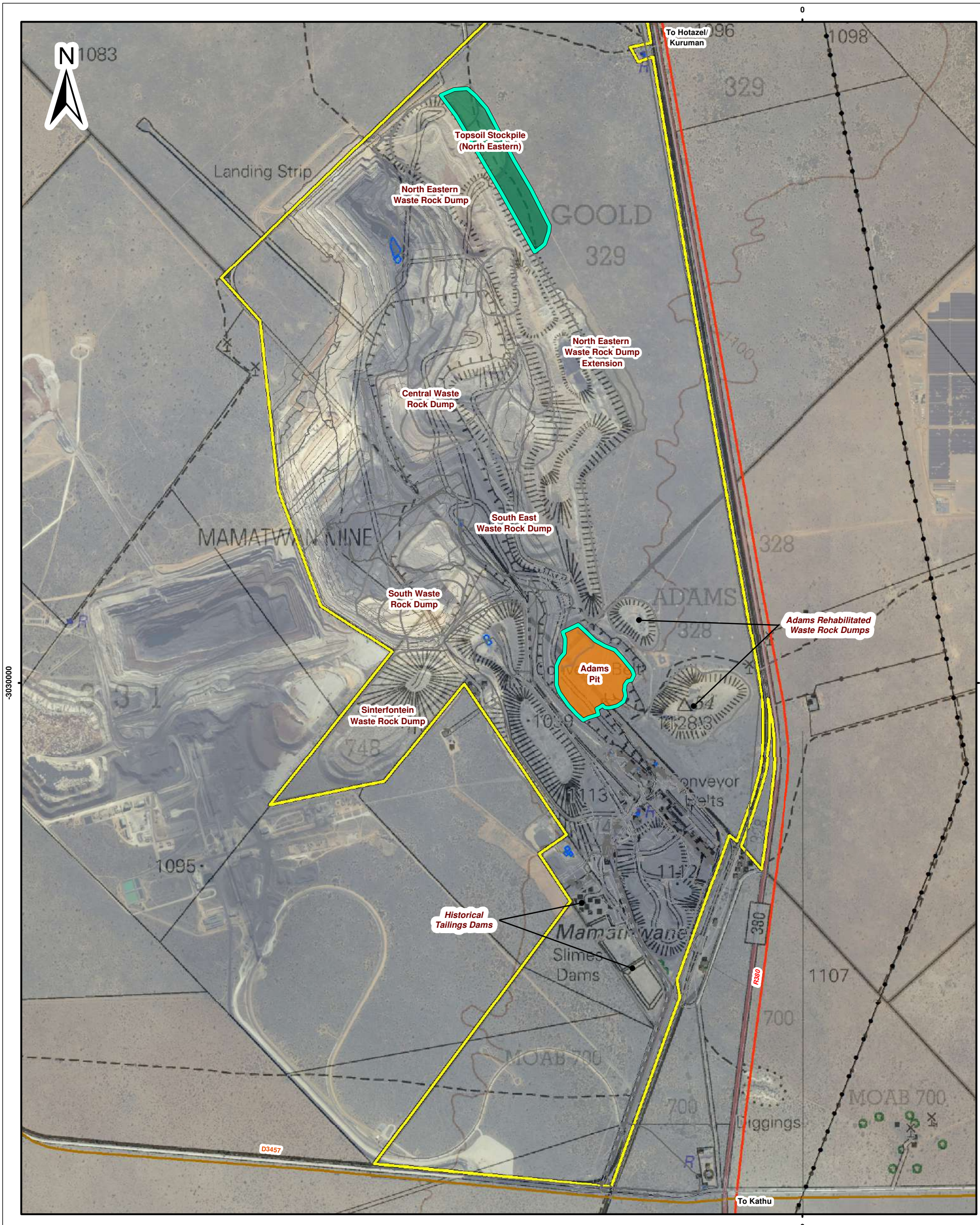

Legend

- Mamatwan Mining Right Area
- Current Infrastructure
- Section 24g Activities
- Main Roads
- Secondary Roads
- Power Line

Sensitivity

- Intermediate
- Low

0 300 600 Meters

Scale: 1:60 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 8-7

Biodiversity Sensitivity

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720.19136.00002 | 2020/04/30

8.4.1.5 Surface water

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.

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.

DESCRIPTION

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.

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 1-2). 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.

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) as illustrated in Figure 1-1. 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 8-12 below. Any natural runoff from the MMT will drain in a north and north west direction towards the Ga-Mogara River.

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TABLE 8-12: 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

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.

Surface water use

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

Floodlines

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

Wetlands

No wetlands are located at the MMT.

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.

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8.4.1.6 Hydrogeology

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. Geological processes also influence soils forms (see Section 8.4.1.3) and the potential for palaeontological resources (see Section 8.4.1.11).

DATA SOURCES

Information in this section was sourced from previous studies undertaken for MMT (SLR, June 2019), the Geochemistry Study (SLR, April 2020a) (included in Appendix E) and the Groundwater Study (SLR, April 2020b) compiled for the project (included in Appendix H).

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 Adams pit. 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 2018 (GHT, August 2018).

DESCRIPTION

Regional 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 8-13 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, June 2019).

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TABLE 8-13: GENERAL STRATIGRAPHIC COLUMN FOR THE KALAHARI MANGANESE FIELD (SLR, JUNE 2019)

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

Local 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 8-13 (SLR, June 2019).

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 8-13). 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.

Aquifer characterisation

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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.

Regional 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.

Geological 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 (SLR, April 2020b).

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Groundwater flow

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

Geochemistry analysis

As part of the project a geochemical investigation (SLR, April 2020a), as included in Appendix E, 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 Adams pit in August 2019. The ABA results for sinter de-dust (MMT-AP01) are shown in Table 8-14 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 8-14: ACID BASE ACCOUNDING RESULTS (SLR, APRIL 2020A)

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 8-15 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) exceeds 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 8-15: LEACH RESULTS (SLR, APRIL 2020A)

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

Groundwater 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 (refer to Figure 8-8). 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.

Background groundwater quality

The results, tabulated in Table 8-16 and Table 8-17, 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 8-18). 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.

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TABLE 8-16: HYDROCENSUS UNDERTAKEN IN 2018 WATER QUALITY RESULTS (SLR, APRIL 2020B)

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 8-17: HYDROCENSUS UNDERTAKEN IN 2018 RESULTS IN TERM OF DWS WQRO (SLR, APRIL 2020B)

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

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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/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 8-18: 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

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/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

Groundwater quality at MMT

Groundwater quality is monitored on a quarterly basis at the monitoring points illustrated in Figure 30-1. 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 (WRQOs) 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 8-19 and Table 8-20. 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).

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TABLE 8-19: GROUNDWATER QUALITY AT MMT (2020) (SLR, APRIL 2020B)

Sample ID	Site description	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	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	%
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 Adams pit 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	North west 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	Adams Pit	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

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TABLE 8-20: MINE BOREHOLE WATER QUALITY COMPLIANCE WITH WRQS (2020) (SLR, APRIL 2020B)

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

`

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.

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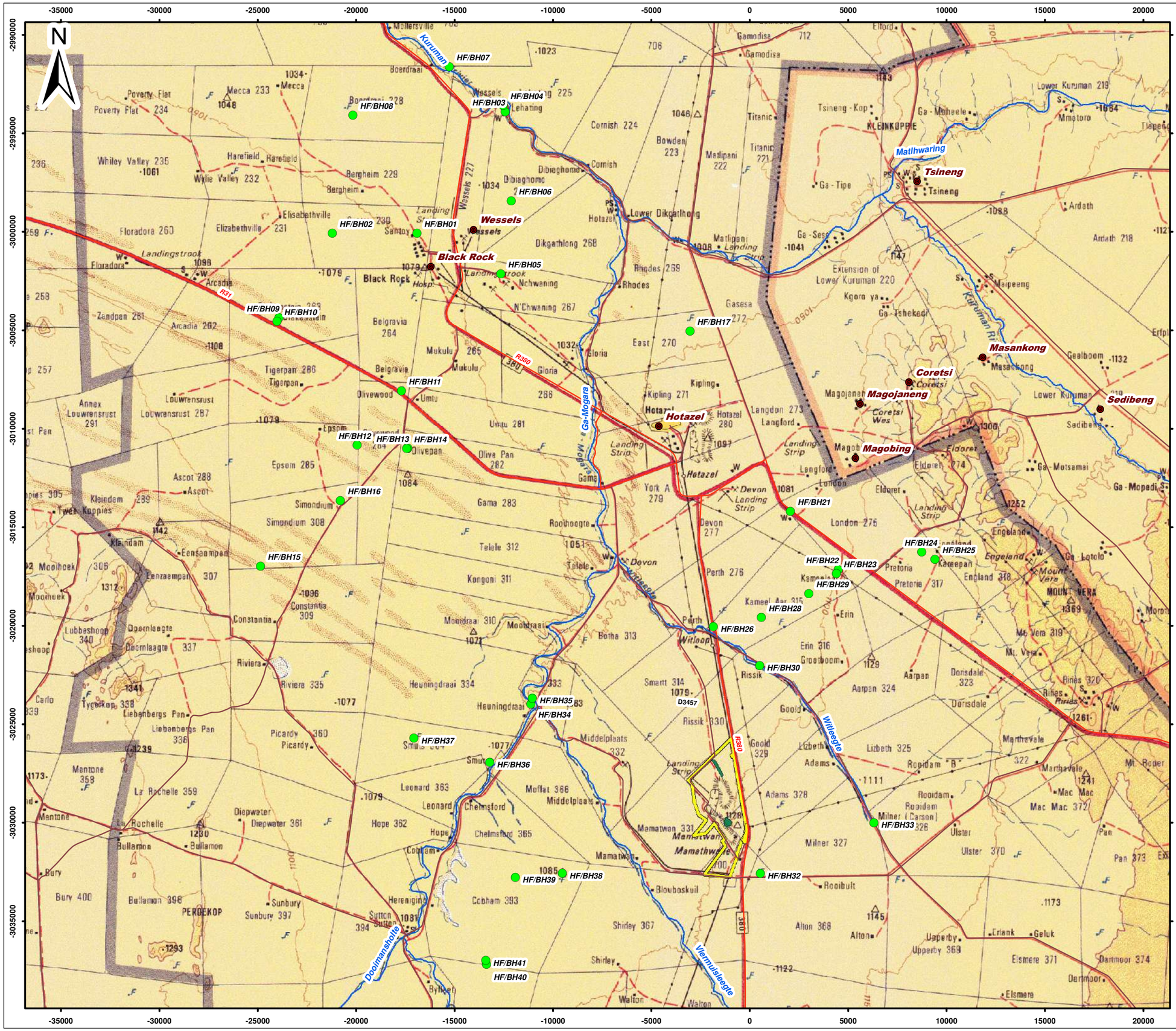

Legend

- Towns / Villages
- Mamatwan Mining Right Area
- Section 24g Activities
- Main Roads
- Secondary Roads
- Rivers and Streams
- Hydrocensus Boreholes

0 2 000 4 000 Meters

Scale: 1:188 000 @ A3

Projection: Transverse Mercator
Datum: WGS1984, Lo23

Mamatwan Mine

Figure 8-8

Boreholes Identified in 2018 Hydrocensus (GHT 2018)

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

720.19136.00002

2020/05/12

8.4.1.7 Air quality

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.

DATA SOURCES

Information in this section was sourced from the Air Quality Study compiled for the MMT (Airshed, September 2019a) included in Appendix I.

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

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 include with 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

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- 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 8-21 below. The activities associated with the project that contribute to ambient air quality are listed in Table 8-22 below.

TABLE 8-21: CURRENT MMT EMISSION SOURCE ACTIVITIES (AIRSHED, SEPTEMBER 2019A)

Activity	Associated pollutants
Mining Operations	
Open Pit: Drilling and blasting	Particulate matter (PM)*, sulphur dioxide (SO_2); oxides of nitrogen (NOx); carbon monoxide (CO); and carbon dioxide (CO_2)[(b)]
Open Pit: Excavation of ore and waste	Mostly PM, gaseous emissions from mining equipment (PM, SO_2; NOx; CO; CO_2)
Open Pit: Removal and stockpiling of topsoil	Mostly PM, gaseous emissions from excavation equipment (PM, SO_2; NOx; CO; CO_2)
Haulage of ore, waste and topsoil	PM from road surfaces, windblown dust from trucks, gaseous emissions from truck exhaust (PM, SO_2; NOx; CO; CO_2)
Construction of access roads using mine residue	mostly PM, gaseous emissions from machinery (PM, SO_2; NOx; CO; CO_2)
WRDs (North Eastern-; Central-; South East-; South- and Sinterfontein WRDs)	PM from tipping, windblown dust, gaseous emissions from truck exhaust (PM, SO_2; NOx; CO; CO_2)
Primary crushing and screening	Mostly PM, gaseous emissions from machinery (PM, SO_2; NOx; CO; CO_2)
Conveyors	Mostly PM from transfer points, windblown dust from conveyor
Adams Pit (waste disposal)	Mostly PM, gaseous emissions from machinery and trucks (PM, SO_2; NOx; CO; CO_2)
Processing Operations	
Secondary crushing and screening	Mostly PM, gaseous emissions from machinery (PM, SO_2; NOx; CO; CO_2)
Sinter plant	PM, SO_2; NOx; CO; and CO_2
Other Activities	
Explosives magazine	Gaseous emissions from open burning (PM, SO_2; NOx; CO; CO_2)

* 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.

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TABLE 8-22: PROJECT EMISSION SOURCES (AIRSHED, SEPTEMBER 2019A)

Location	Project activity description	Potential air pollutants
Adams Pit	Rubble from the DMS and Sinter plant – includes old and used conveyors and metal (general waste (including rubble and used conveyor belts)) mixed in with the Sinter fines.	PM, heavy metals and gaseous emissions (minor – from truck exhaust)
	Sinter dust from the de-dust bags – the sinter dust is regarded as hazardous waste.	
	DMS fines are considered hazardous waste and stockpiled on top of the sinter fines product.	
NE Topsoil Stockpile	Storage of topsoil	PM and gaseous emissions (minor – from truck exhaust.

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 8-23 below. Refer to Figure 30-1 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 8-23: 2018 DUST FALLOUT MONITORING RESULTS (AIRSHED, SEPTEMBER 2019A)

	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 8-24: 2019 DUST FALLOUT MONITORING RESULTS (AIRSHED, SEPTEMBER 2019A)

	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

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	Jan-19	Feb-19	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19
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 PM10 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 Figure 8-9. These sensitive receptors include a combination of neighbouring industrial sites (Adams solar farm) and isolated farmsteads. Further information on these receptors are discussed in Section 8.4.2.

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.

8.4.1.8 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 8.4.2. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

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DATA SOURCE

Information in this section was sourced from the Noise Study Airshed, September 2019b) compiled for the project (included in Appendix J).

Noise sampling was undertaken in July 2019, during normal operating conditions, to determine the daytime and night-time background environmental noise levels in and around the MMT in accordance with the IFC General EHS Guidelines on noise and the SANS 10103 (2008) which is fully aligned with the WHO guidelines for Community Noise (WHO, 1999). The sampling points were located in close proximity to sensitive noise receptors. The noise sampling results were based on a single sampling exercise.

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 8-9. With reference to Table 8-25 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 8-25 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 8-25: DAYTIME AND NIGHT-TIME BASELINE NOISE LEVELS (AIRSHED, SEPTEMBER 2019B)

Site number	Site description	L_{Aeq} (dBA)	Observations
Daytime			
IFC Residential Limits – 55 dBA **SANS 10103 (2008) Rural District Limits – 45 dBA**			

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Site number	Site description	L_{Aeq} (dBA)	Observations
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)

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 8-9. These noise sensitive receptors include a combination of neighbouring industrial sites (Adams Solar Farm and the Eskom substation) and residential sites (isolated farm homesteads). Further information on these receptors are discussed in Section 8.4.2. 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

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are likely to be influenced by the neighbouring Tshipi Borwa Mine given the EIAR proximity to the mine. Based on the prevailing wind field (Section 8.4.1.2), 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.

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 establishment of the NE topsoil stockpile had 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.

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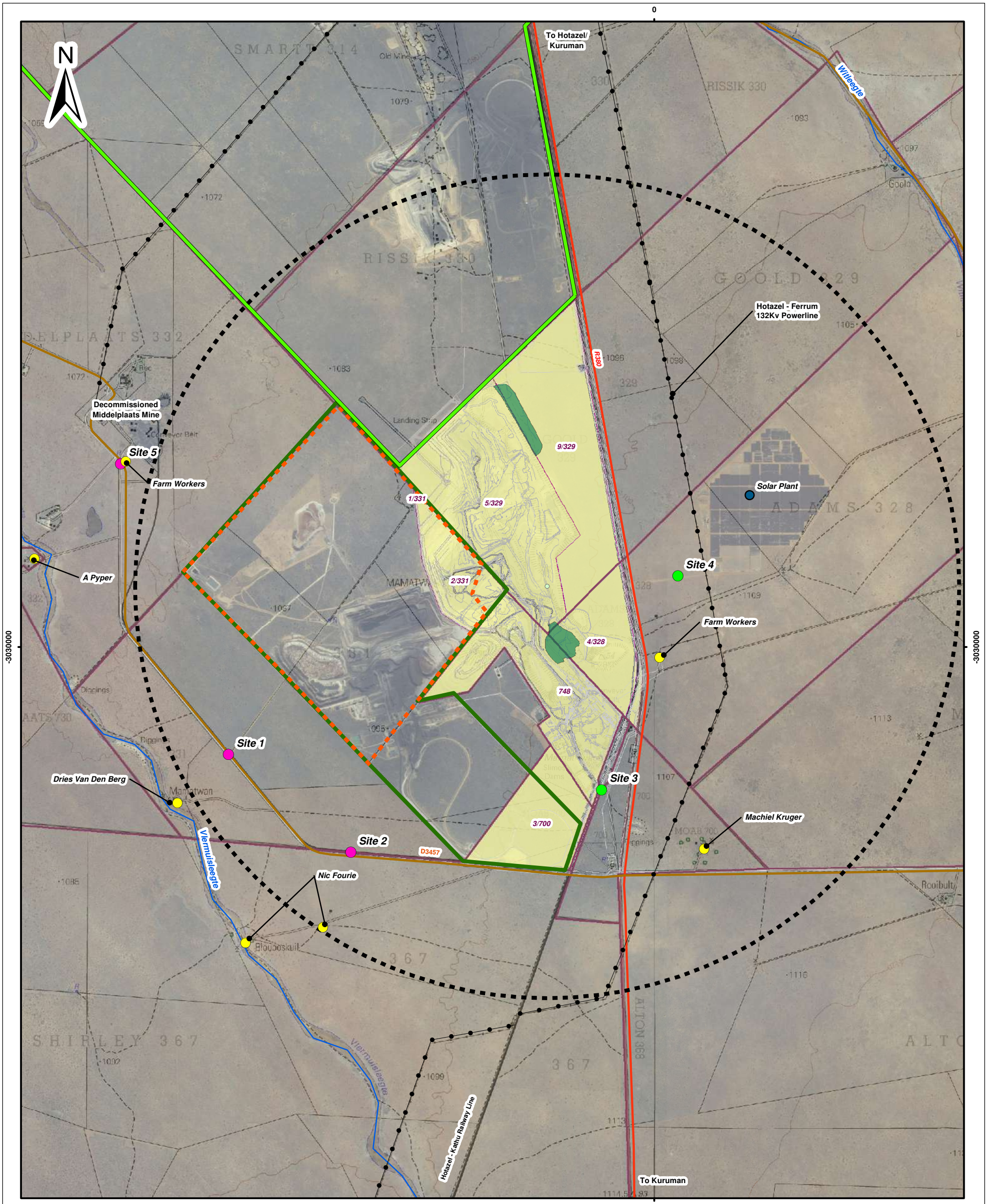

Legend

- Mamatwan Mining Right Area
- Section 24g Activities
- Current Mamatwan Infrastructure
- Farm Boundaries
- portion_boundaries_for_mra_only
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- Tshipi Surface Use Area
- Tshipi Mining Right Area
- UMK Mining Right Area
- 5km Radius
- Solar Plant
- Potential Receptors

Noise Sampling Points

- Industrial
- Residential

0 500 1 000 Meters

Scale: 1:55 500 @ A3
Projection: Transverse Mercator
Datum: WGS1984, Lo23

Mamatwan Mine

Figure 8-9

Location of Noise Sampling Points

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720.19136.00002 | 2020/04/30

8.4.1.9 Visual

INTRODUCTION AND LINK TO IMPACT

Mining related infrastructure and activities has the potential to alter the landscape character in a project area and surrounding area. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

DATA SOURCE

Information in this section was sourced from the Visual Study (SAS, October 2019b) compiled for the project (included in Appendix K).

Information was obtained from the review of available literature and on-site observations.

DESCRIPTION

Landscape character

The landscape character to the immediate east of the NE topsoil stockpile can be described as bushveld, relatively flat terrain with the vegetation composition being homogenous with the surrounding area. The landscape character to the immediate west of the NE topsoil stockpile is characterised by existing WRDs of the MMT (Refer to Figure 1-2). Areas to south are characterised by mining activities associated with the MMT and mining activities associated with the United Manganese of Kalahari (Pty) Ltd (UMK) to the north (Refer to Figure 1-2).

With reference to Figure 1-2, Adams Pit is located centrally within the existing MMT operations. Adams pit is surrounded by WRDs, stockpiles and other mining infrastructure.

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 undisturbed landscape surrounding the NE topsoil stockpile area 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. The NE topsoil stockpile is situated adjacent to existing WRDs and therefore adds little or no visual variety to the area and introduces no discordant elements. Taking this into consideration the overall scenic quality of the areas surrounding the NE topsoil stockpile is considered low.

Adams Pit is located centrally within the existing MMT operations and is surrounded by WRDs, stockpiles and other mining infrastructure. It follows that the scenic quality is very low.

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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, north and south of the project areas. 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.

Visual receptors

When viewed from the perspective of tourists and residences within the area, mining operations could be associated with a sense of dissatisfaction. The MMT is situated in a remote area where a very limited number of sensitive receptors (for example isolated farm homesteads) are present. Refer to Figure 8-12 for the location of the sensitive receptors.

In terms of the NE topsoil stockpile, the adjacent WRDs with its significant heights obscure the views from receptors situated to the west. Since the existing adjacent WRDs are of the same height as the NE topsoil stockpile, the visual intrusion is already present in the area and sensitive receptors to the east thereof have grown accustomed to these intrusions.

Adams Pit is located centrally within the existing MMT operations and is surrounded by WRDs, stockpiles and other mining infrastructure. Adams pit is not visible to any sensitive receptors.

CONCLUSION

When considering landscape character, scenic quality, visual resource, sense of place and visual receptors it is anticipated that prior to the establishment of the NE topsoil stockpile, the project area would have resembled similar landscape characteristics and qualities to that of areas immediately east of the current NE topsoil stockpile. It is however important to note that the visual landscape within the MMT area has been transformed due to the presence of existing and surrounding mining infrastructure and activities. The NE topsoil stockpile would be absorbed into current views of the mining activities and is therefore considered to have a low visual value. This indicates that mining and infrastructure activities impact on the available visual resources and that visual resource management must be considered as part of mine planning.

Adams Pit is located centrally within the existing MMT operations and is surrounded by WRDs, stockpiles and other mining infrastructure and is not visible to any sensitive receptors. Taking this into consideration, the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit is unlikely to generate negative visual views.

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8.4.1.10 Traffic

INTRODUCTION AND LINK TO IMPACT

Traffic from mining projects has the potential to affect the capacity of existing road networks, as well as result in public road safety issues. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

DATA COLLECTION

Information in this section was sourced from previous studies undertaken for MMT (SLR, June 2019) through the review of available literature and traffic counts.

DESCRIPTION

Existing road network

The existing road network comprises:

- The provincial R380 which lies to the east of the MMT and traverses in a south-north direction between Kathu and Hotazel (see Figure 8-10);
- The R31 which crosses the R380 north of MMT and provides access to the UMK and Kudumane Mines (see Figure 8-10); and
- The D3457 which lies to the south of MMT and provides access to both the Tshipi and MMTs. The D3457 traverse in an easterly direction towards Kuruman (see Figure 8-12).

Existing traffic data

Manual 12-hour traffic counts undertaken at intersections along the R380 and at the MMT access road (refer to Figure 8-10) indicate that the peak traffic hours occur between 06h00 and 07h15 in the morning, and 13h00 and 16h30 in the afternoons (Table 8-26). All intersections that were investigated were considered to be operating at a good level of service.

TABLE 8-26: TRAFFIC COUNT INFORMATION (SLR, JUNE 2019)

Point	Intersection	AM peak		PM Peak	
		Time interval	Number of vehicles	Time interval	Number of vehicles
A	R380 and R31	06h00 – 07h00	466	15h30 – 16h30	378
B	R380 and UMK Mine access road	06h15 – 07h15	133	13h15 – 14h15	142
C	R380 and D3457	06h00 – 07h00	258	13h00 – 14h00	193
D	D3457 and MMT access road	06h00 – 07h00	181	13h00 – 14h00	112
E1	D3457 and Tshipi Borwa Mine Access Gate 1	06h00 – 07h00	141	13h00 – 14h00	76
E2	D3457 and Tshipi Borwa Mine Access Gate 2	06h00 – 07h00	53	13h00 – 14h00	43

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CONCLUSION

The existing road network provides a fair level of service. The establishment of the NE topsoil stockpile and disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust into the Adam pit does not alter the level of service, given that the project will not result in an increase in traffic volumes.

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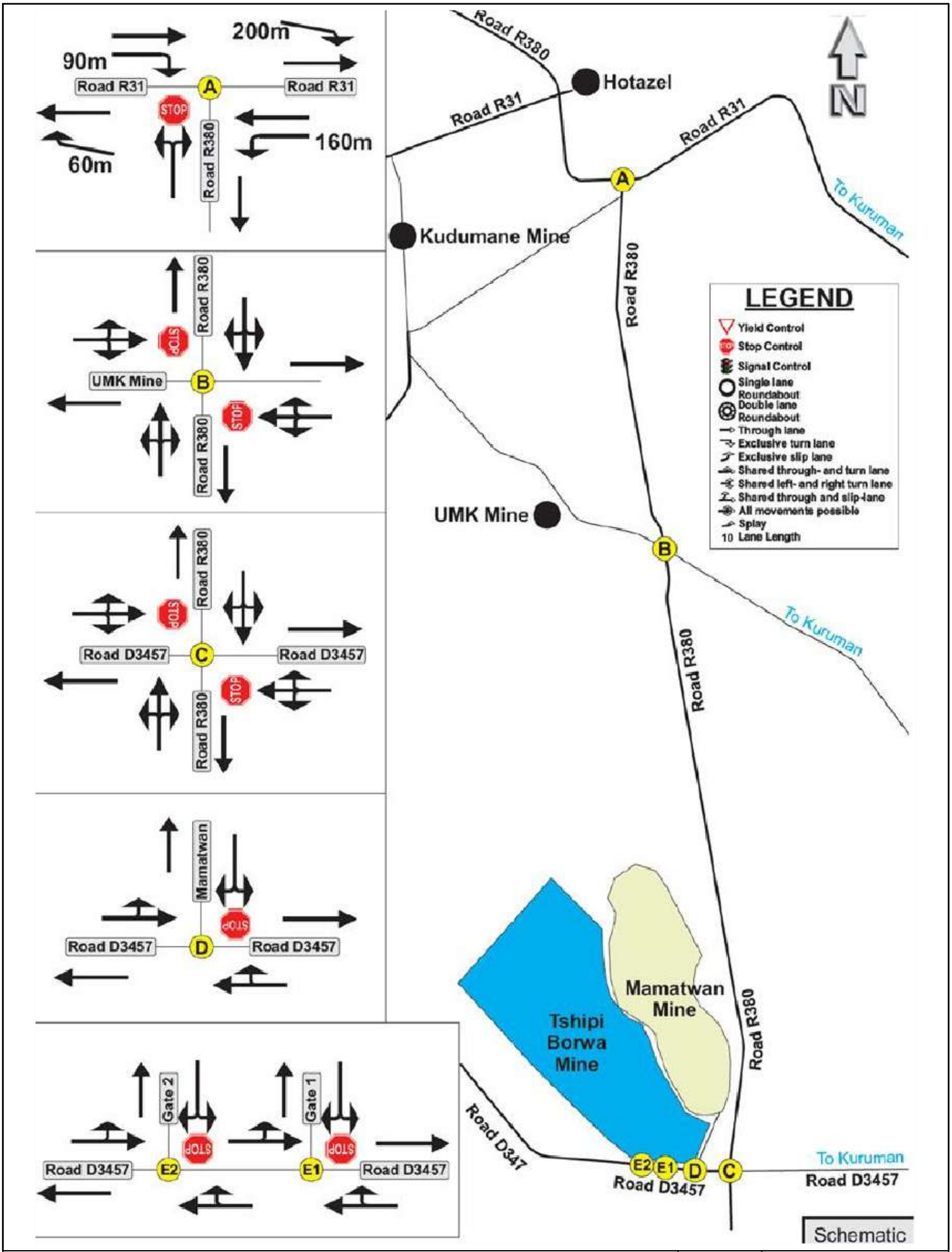

EXISTING ROAD NETWORK AND TRAFFIC COUNT INTERSECTIONS (SIYAZI, 2017)	04/2020 720.19136.00002	FIGURE 8-10

8.4.1.11 Heritage / cultural and palaeontological resources

INTRODUCTION AND LINK TO IMPACT

Heritage (and cultural) resources include all human-made phenomena and intangible products that are the result of the human mind. Natural, technological or industrial features may also be part of heritage resources as places that have made an outstanding contribution to the cultures, traditions and lifestyles of the people or groups of people of South Africa.

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

The presence of mine infrastructure and activities has the potential to destroy heritage/cultural and palaeontological resources. To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

DATA SOURCE

Information in this section was sourced from the Heritage/cultural Study (PGS, October 2019a) and Palaeontological exemption letter (PGS, October 2019b) compiled for the project (included in Appendix L).

Information pertaining to heritage resources was sourced from the review of available literature and field surveys. Information pertaining to palaeontological sensitivity was obtained from the review of available literature.

DESCRIPTION

The mine is situated in an area that as a whole has a relatively low human presence due to the dryness of the region, and as such if there were human settlements they tended to be located on or near watercourses. Based on the findings of the Heritage/cultural Study (PGS, October 2019a) the establishment of the NE topsoil stockpile is unlikely to have disturbed any heritage/cultural resources. The Adams pit was completely mined out by 1980 and as such Adams pit is extensively disturbed and as such is not associated with any heritage/cultural resources.

The MMT is completely underlain by the Cenozoic Kalahari Group, underlying Griqualand West Basin rocks of the Transvaal Supergroup. According to the PalaeoMap of South African Heritage Resources Information System (SAHRIS), the Palaeontological Sensitivity of the Kalahari Group is low, and the Griqualand West rocks of the Transvaal Supergroup is moderate. It is however important to note that the area has been extensively investigated and the palaeontological sensitivity was rated as low (PGS, October 2019b).

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CONCLUSION

There is a low possibility of palaeontological resources occurring at the MMT. In addition to this, no heritage/cultural resources would have been disturbed during the establishment of the NE topsoil stockpile and given that Adams pit is already disturbed, no heritage/cultural resources could have been disturbed during the disposal of general waste (including rubble and used conveyor belts) and storage sinter de-dust activities.

Palaeontological and heritage resources are important to the history of South Africa and are protected by national legislation. It follows that in the event on any chance finds, South African Heritage Resources Agency (SAHRA) needs to be notified and where necessary permits need to be obtained prior to disturbance.

8.4.1.12 Socio-economic

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). To understand the basis of these potential impacts in the context of the project activities, a baseline situational analysis is described below.

DATA SOURCE

Information in this section was sourced from the Joe Morolong Local Municipality Integrated Development Plan of 2016 and StatsSA.

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.

The Hotazel community has a very low population of 1 755 people when compared to the local municipality population of 89 531 and the Northern Cape Province population of 1 145 861. This provides an indication of the remoteness of the project area.

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. 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. The education profile within Hotazel is more positive in terms of the percentage of the population that have received further education and tertiary education when compared to the province and district and local municipalities.

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Majority of the population within the Northern Cape, John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality are not economically active, while 48% of the Hotazel population is employed. There is a large dependency on subsistence agriculture, the public sector, seasonal workers and employment in the mining sector.

The population profile of the Northern Cape Province, John Taolo Gaetsewe District Municipality and Joe Morolong Local Municipality demonstrates a consistent average household size of four people per household despite the significant decline in population numbers between the regional levels. The local community of Hotazel has an average of three members per household.

These results are relatively typical of rural or semi-rural developing communities, however the low household density within Hotazel may be attributed to the fact that the town is largely a mining community established for and servicing surrounding mines.

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.

In general, 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.

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.

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8.4.2 LAND USES

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.

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.

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 8-12.

DESCRIPTION – SURROUNDING MINING RIGHT AND ENVIRONMENTAL AUTHORISATION HOLDERS

The following applies to properties directly adjacent to the MMT (refer to Figure 8-12):

- 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.

DESCRIPTION – LANDOWNERS WITHIN AND SURROUNDING THE MMT

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 8-27 and Table 8-28 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.

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TABLE 8-27: 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 8-28: 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
Middleplaats 184		
Whole farm	Abraham Johannes De Klerk	T1135/1965
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		

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Portion	Landowner	Title deed number
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

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 C.

DESCRIPTION – LAND USE AT THE PROJECT AREAS

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

DESCRIPTION – IMMEDIATE LAND USES SURROUNDING THE ADAMS PIT PROJECT AREA

With reference to Figure 8-12, Adams pit project area is located in the centre of the MMT Mining Right area and as such is surrounded by existing WRDs, stockpiles and other mining infrastructure.

DESCRIPTION – IMMEDIATE LAND USES SURROUNDING THE NE TOPSOIL STOCKPILE PROJECT AREA

Land uses surrounding the NE topsoil stockpile project area includes a combination of mining activities, open spaces and infrastructure. More detail is provided below.

Mining activities

The existing MMT mining activities are located directly to the west of the NE topsoil stockpile area. The UMK Mine is located immediately north of the NE topsoil stockpile area (Figure 8-12).

Open space

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Open spaces which includes undisturbed natural vegetation is located directly to the east of the NE topsoil stockpile area. These open spaces are currently located within the MMT Mining Right area and is not utilised for any specific purpose.

Infrastructure

A 132 kV powerline and Eskom substation is located to the east of the NE topsoil stockpile project area, alongside the R380 Hotazel to Kathu road (see Figure 8-12). In addition to this, the Transnet railway line that services the mines of the Kalahari Basin, from Black Rock in the north to Mamatwan and Tshipi in the south passes to the east of topsoil project area (see Figure 8-12).

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.

Agriculture

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

Isolated residence/ residential area

With reference to Figure 8-11, 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 and 4.5 km west from the Adams pit and NE topsoil stockpile project areas respectively (see Figure 8-12);
- A permanent farm homestead (A. Pyper) located on the Farm Middelplaats 332 approximately 6.3 km north-west and 6 km south-west from the Adams pit and NE topsoil stockpile project areas respectively (see Figure 8-12);
- A permanent farm homestead (Andries van den Berg) located on the Farm Mamatwan 331 approximately 4.8 km and 6 km south-west from the Adams pit and NE topsoil stockpile project areas respectively (see Figure 8-12);
- Permanent farm homesteads (Nic Fourie) located on the Farm Shirley 367 approximately 5 km and 7 km south from the Adams pit and NE topsoil stockpile project areas respectively (see Figure 8-12); and

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- A permanent farm homestead (Michael Kruger) located on the remaining extent of the farm Moab 700 approximately 2.8 km and 5.6 km south east from the Adams pit and NE topsoil stockpile project areas respectively (see Figure 8-12).

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 and 5.4km south from the Adams pit and NE topsoil stockpile project areas respectively (see Figure 8-12).

Surrounding mines

Mining operations located within a 7km radius of the MMT include the (Figure 8-12):

- 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 (Figure 8-11):

- 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 north west 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 north east from the nearest section of the MMT;
- The old Devon mine (dormant/closed) – Located approximately 14.7 km north east 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.

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 south east and north east from the Adams pit and NE topsoil stockpile project areas respectively 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

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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 Adams pit are located approximately 4 km and 2 km, respectively, north of the new solar farm to be established on the farm Shirley 367.

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.

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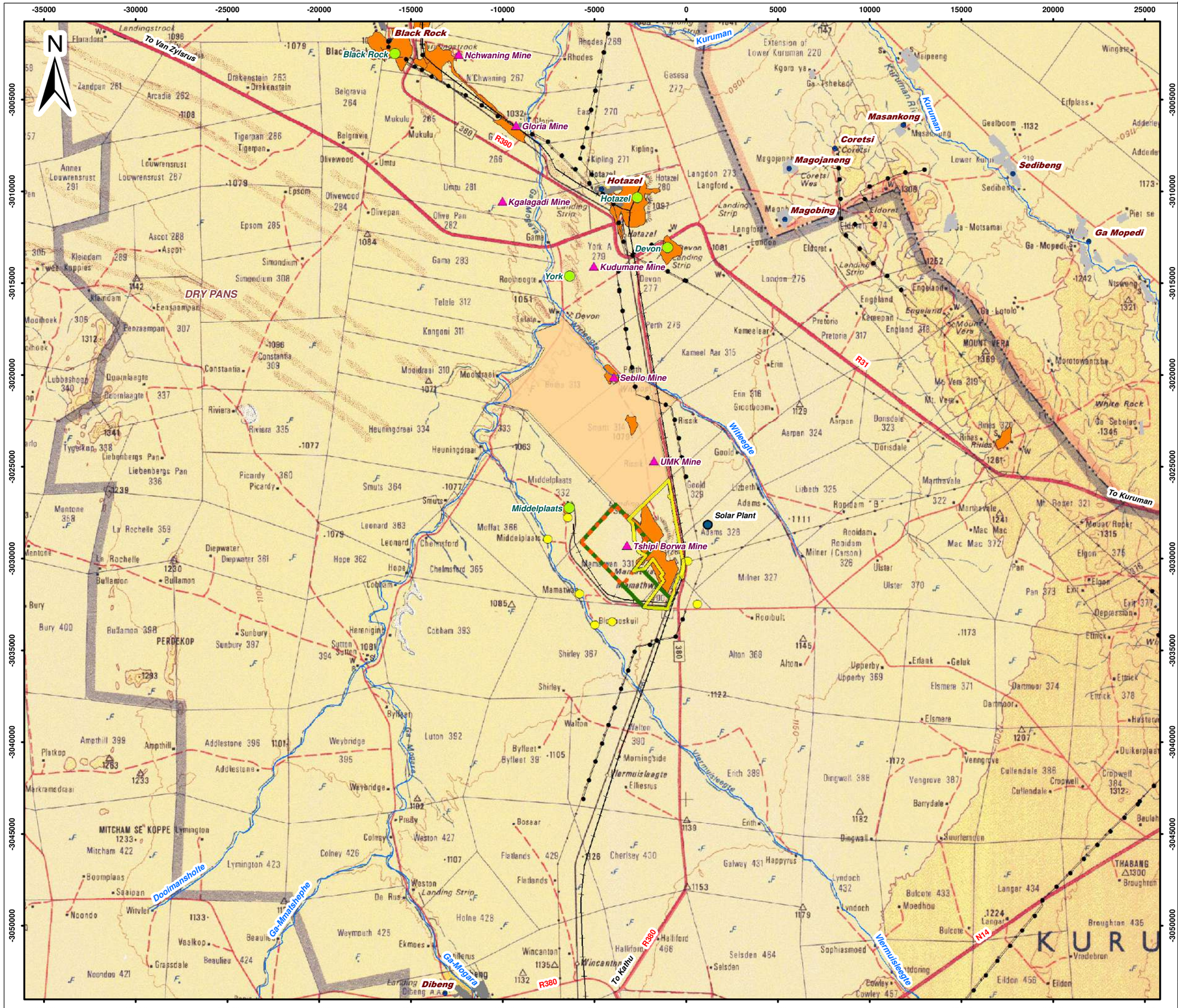


Legend

- Mamatwan Mining Right Area
- Tshipi Surface Use Area
- Tshipi Mining Right Area
- UMK Mining Right Area
- Operating Manganese Mines
- Closed/Dormant Mines
- High Urban Density
- Low Urban Density
- Mines & quarries*
- Main Roads
- Rivers and Streams
- Railway
- Powerlline
- Potential Receptors

Note:
* Sourced from SANBI

0 4 8 Kilometers

Scale: 1:200 000 @ A3

Projection:Transverse Mercator
Datum: Hartebeeshoek, Lo 23

Mamatwan Mine

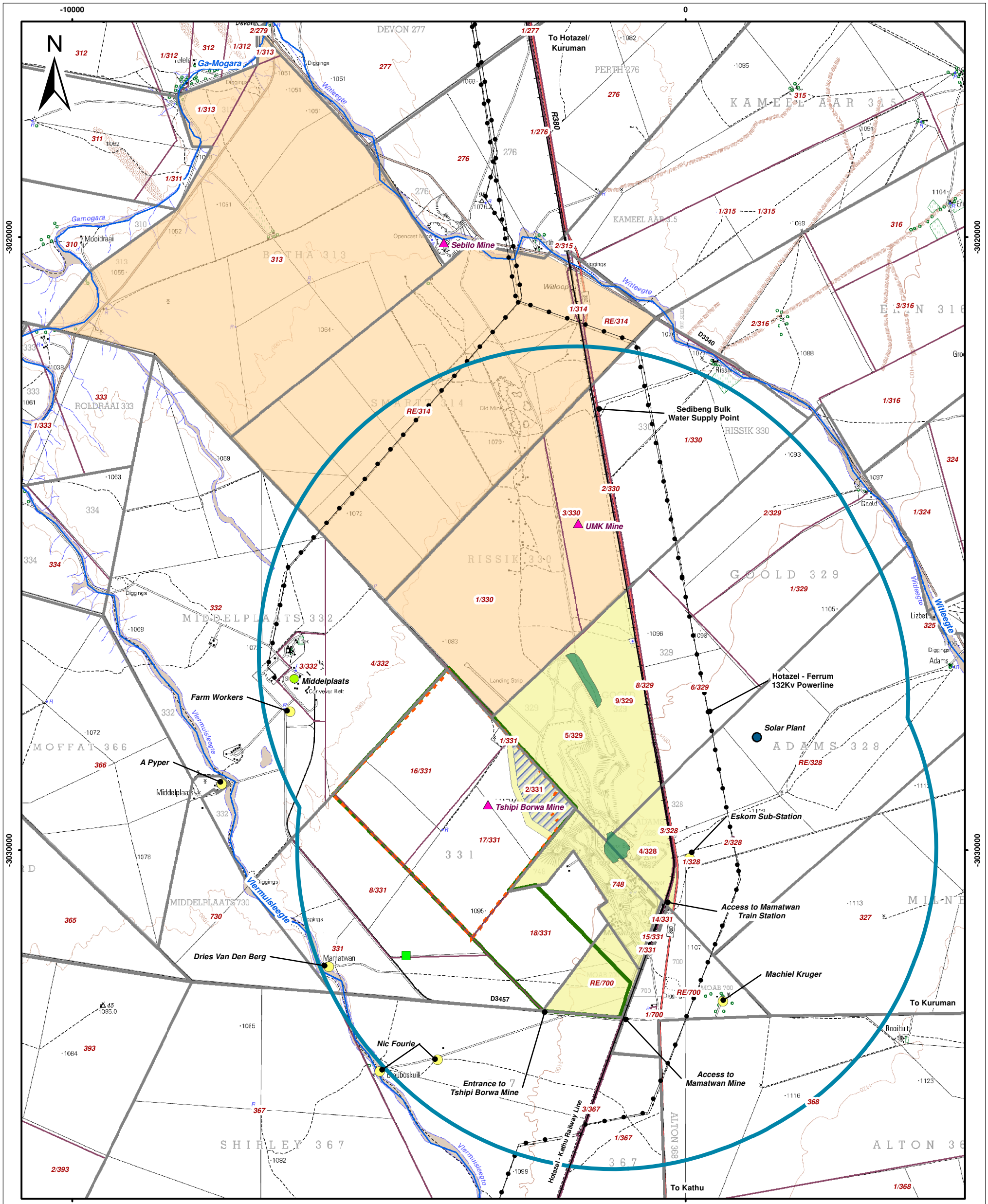
Figure 8-11

Regional Land Use Map

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

720.19136.00002

2020/04/30



Legend

- Mamatwan Mining Right Area
- Section 24g Activities
- UMK Mining Right Area
- Tshipi Surface Use Area
- Tshipi Mining Right Area
- Boundary Pillar
- Operating Manganese Mines
- Closed/Dormant Mines
- Potential Receptors
- 5km Sensitive Receptor Buffer
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams
- Railway
- Farm Boundaries
- Farm Portions
- Approved Eskom 33/11/kV 10mVA Substation

Mamatwan Mine

Figure 8-12

Local Land Use

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

720.19136.00002 | 2020/05/06

8.4.3 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON THE SITE

The environmental features and infrastructure in the project area is described in Section 8.4.1. In summary:

- The project areas are located within the Kathu Thornveld habitat. The NE topsoil stockpile project area was considered to have a moderate biodiversity site sensitivity. The Adams pit project area is considered to have a low biodiversity site sensitivity;
- No watercourses or wetlands are located at the MMT;
- Groundwater quality had been influenced by anthropogenic pollution from farming and surrounding mining activities;
- Air quality, noise and aesthetics within and surrounding the MMT has already been influenced through the presence of mining activities and associated infrastructure;
- Undisturbed areas surrounding the MMT are characterised by bushveld, relatively flat terrain with the vegetation composition being homogenous. The visual landscape within the MMT area has been transformed due to the presence of existing and surrounding mining infrastructure and activities;
- There is a low possibility of palaeontological resources occurring in the project area. No heritage/cultural resources would have been disturbed as part of the project activities/infrastructure;
- The notable infrastructure surrounding the project areas includes roads (R380), a railway line, powerline and a water pipeline (Vaal Gamagara). The existing road network provides a fair level of service. The project activities do not alter the level of service; and
- There area surrounding the project areas is sparsely populated and is characterised by isolated farmsteads located within a 5 km radius of the MMT, with the closes town (Hotazel) located approximately 20 km from the MMT. The areas surrounding the project areas have also been influenced by surrounding dormant and active mines within a 7 km radius. This includes mines such as the Sebilo Mine, the dormant Middelplaats Mine, the UMK mine and the adjacent Tshipi Borwa Mine.

8.4.4 ENVIRONMENT AND CURRENT LAND USE MAP

A conceptual map showing topographical information as well as land uses on and immediately surrounding the MMT is provided in Figure 8-11 and Figure 8-12.

8.5 ENVIRONMENTAL IMPACTS AND RISKS OF THE ALTERNATIVES

This section requires a list of potential impacts on environmental and socio-economic aspects that have been identified in respect of each of the main project actions / activities and processes for each of the project phases in terms of the project alternatives. With reference to Section 8.1 the consideration of project alternatives is not applicable to this project and as such this section is not applicable.

8.6 METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF ENVIRONMENTAL IMPACTS

The method used for the assessment of environmental issues is set out in Table 8-29. This assessment methodology enables the assessment of environmental issues including: cumulative impacts, the severity of

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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 8-29: 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.

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	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**

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	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.

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8.7 POSITIVE AND NEGATIVE IMPACTS OF THE ACTIVITY AND ALTERNATIVES

As noted in Section 8.1, no alternatives were considered for this project as the NE topsoil stockpile has already been established and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust already takes place. It follows that the completion of this section is not applicable to this project.

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

This section requires an indication of the management actions that can be applied to address issues and concerns raised by I&APs and how this has been taken into consideration as part of the development of the EMPr (Part B of this EIAR). Further to this, this section is also required to indicate the level of residual risk after management actions have been implemented. To date, no comments from I&APs that require an indication of management actions to address issues and concerns have been raised.

8.9 MOTIVATION WHERE NO ALTERNATIVE SITES WERE CONSIDERED

Due to the nature of the project, the NE topsoil stockpile has already been established and the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit already takes place. If follows that for the purpose of this project, no alternatives sites can be considered.

8.10 STATEMENT MOTIVATING THE PREFERRED ALTERNATIVE

For the purpose of this project, no alternatives were considered as the NE topsoil stockpile has already been established and the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit already takes place. It follows that this section is not applicable for the purpose of this project.

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9 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

9.1 DESCRIPTION OF THE PROCESS UNDERTAKEN TO IDENTIFY IMPACTS

Biophysical and socio-economic impacts associated with the project were identified through site visits undertaken by SLR, the site layout and specialist input. In addition to this, as part of the public participation process, I&APs and commenting authorities (see Section 8.2) are provided with opportunities to provide input into the process and comment on the project, including the identification of environmental and socio-economic impacts.

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

A description of the assessment methodology use to assess the severity of identified impacts (including the nature of impacts and the degree to which impacts may cause irreplaceable loss of resources), the extent of the impacts, the duration and reversibility of impacts, the probability of the impact occurring, and the degree to which the impacts can be mitigated is provided in Section 8.6.

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

This section provides a description of the impacts on biophysical and socio-economic aspects in respect of each of the main project actions / activities and processes that will be assessed in detail in Appendix D.

TABLE 9-1: LIST OF POTENTIAL IMPACTS AS THEY RELATED TO THE PROJECT

Potential impact	Activity	Project phases
Safety to third parties and animals	• Establishment of the NE topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Operational
Loss of soil resources and land capability through physical disturbance and contamination	• Establishment of the NE topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Operational
Physical destruction of biodiversity	• Establishment of the NE topsoil stockpile	Construction
	• Storage of topsoil	Operational
General disturbance of biodiversity	• Establishment of the NE topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Operational
	• Establishment of the NE topsoil stockpile	Construction

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Potential impact	Activity	Project phases
Alteration of natural drainage patterns	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Operational
Contamination of surface water resources	• Establishment of the NE topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the storage of sinter de-dust	Operational
Contamination of groundwater resources reducing availability to third parties	• Use of Adams pit for the storage of sinter de-dust	Operational
Air pollution	• Establishment of the NE topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Operational
Increase in disturbing noise levels	• Establishment of the NE topsoil stockpile	Construction
	• Use of Adams pit for the storage of sinter de-dust • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Operational
Negative visual views	• Establishment of the topsoil stockpile	Construction
	• Storage of topsoil	Operational
Loss of heritage/cultural and palaeontological resources	• Establishment of the topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Operational
Change in land use	• Establishment of the topsoil stockpile	Construction
	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Operational

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

The assessment of the significance of impacts, including the extent to which impacts can be avoided or mitigated, is included in Section 10 and Appendix D.

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10 ASSESSMENT OF EACH IDENTIFIED POTENTIALLY SIGNIFICANT IMPACT AND RISK

A summary of the assessment of the biophysical and socio-economic impacts associated with the project is provided in Table 10-1 below. A full description of the assessment is included in Appendix D.

TABLE 10-1: 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
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Safety to third parties and animals	Topography	• Construction • Operational	Insignificant	• Manage through continuation of implementing access control. • Manage through emergency response procedures in cases of emergency.	Insignificant	N/A
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Loss of soil resources and land capability through physical disturbance and contamination	Soil and Land Capability	• Construction • Operational	N/A	• Control through continuation of implementing soil conservation management and waste management.	N/A	N/A
• Establishment of the NE topsoil stockpile • Storage of topsoil	Physical destruction of biodiversity	Biodiversity	• Construction • Operational	• Incremental medium significance • Cumulative high significance	• Manage through controlling edge effects. • Control through prohibiting extension of vegetation clearance without authorisation.	• Incremental low significance • Cumulative medium significance	• Unlikely to cause irreplaceable loss of resources, with the implementation of management actions • High degree to which impact can be mitigated • High degree to which impact can be reversed with the implementation of management actions
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	General disturbance of biodiversity	Biodiversity	• Construction • Operational	• Medium incremental significance • High cumulative significance	• Control through limiting disturbance to biodiversity. • Control through appropriate training of personnel. • Control through equipment maintenance.	• Very low incremental significance • Low cumulative significance	• Unlikely to cause irreplaceable loss of resources, with the implementation of management actions. • High degree to which impact can be mitigated • High degree to which impact can be reversed with the implementation of management actions
• Establishment of the NE topsoil stockpile • Storage of topsoil	Alteration of natural drainage patterns	Surface Water	• Construction • Operational	Insignificant	• Control through operating according to GN704 requirements. • Manage through maintaining operational water balance.	Insignificant	N/A

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
• Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust							
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the storage of sinter de-dust	Contamination of surface water resources	Surface Water	• Construction • Operational	Insignificant	• Control through erosion management. • Manage through remaining within boundaries. • Manage through emergency response if incidences arise.	Insignificant	N/A
Use of Adams pit for the storage of sinter de-dust	Contamination of groundwater resources reducing availability to third parties	Groundwater	• Operational	• Very Low incremental significance • High cumulative significance	• Manage through re-running groundwater models as and when additional data becomes available. • Control through continuation of monitoring.	• Very Low incremental significance • Low cumulative significance	• Unlikely to cause irreplaceable loss of resources, with the implementation of management actions that provide an alternative resource for use. • High Degree to which impact can be mitigated • High likely that impact can be reversed.
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Air pollution	Air Quality	• Construction • Operational	• Low incremental significance • Low cumulative significance	• Control through dust suppression. • Control through erosion management.	• Very Low incremental significance • Very Low cumulative significance	• Unlikely to cause irreplaceable loss of resources, with the implementation of management actions • High Degree to which impact can be mitigated • High likely that impact can be reversed with the implementation of management actions
• Establishment of the NE topsoil stockpile • Use of Adams pit for the storage of sinter de-dust • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Increase in disturbing noise levels	Noise	• Construction • Operational	Insignificant	• Control through equipment maintenance. • Control through equipment selection. • Manage through maintaining a complaints' register.	Insignificant	N/A
• Establishment of the topsoil stockpile • Storage of topsoil	Negative visual views	Visual	• Construction • Operational	Insignificant	• Control through limiting disturbance footprint. • Control through retention of vegetation.	Insignificant	N/A
• Establishment of the topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Loss of heritage/cultural and palaeontological resources	Heritage/cultural and palaeontological resources	• Construction • Operational	Insignificant	• Control through implementing emergency response procedure during chance finds. • Manage through consulting with registered professional if chance finds are discovered.	Insignificant	N/A

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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
• Establishment of the topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Change in land use	Land Use	• Construction • Operational	• Low incremental significance • Medium cumulative significance	Manage through communication with land users and neighbouring landowners.	• Very Low incremental significance • Low cumulative significance	• Unlikely to cause irreplaceable loss of resources, with the implementation of management actions • High Degree to which impact can be mitigated • High likely that impact can be reversed with the implementation of management actions

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11 SUMMARY OF SPECIALIST REPORT FINDINGS

The recommendations made by the specialist in support of the project are summarised in Table 11-1 below.

TABLE 11-1: SUMMARY OF SPECIALIST RECOMMENDATIONS

Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
Soil, Land Use and Land Capability Study (SAS, October 2019a)	MMT will continue to implement the soil conservation and waste management procedures which include: • The upper material of topsoil does not have high nutrient values, and the EIAR primary value is due to the presence of the seed bank. Tests will be conducted to determine if nutrients or fertilisers need to be added. These tests will be undertaken as and when required; • Stockpiles will be examined after a reasonable rainy period/season, and then annually to determine whether vegetation has naturally established itself on the stockpiles. In the case of no or sparse vegetation establishment, geo-textiles or other methods will be used on the topsoil stockpiles to prevent wind erosion; • Bare soils must be regularly dampened with water to suppress dust, especially when strong wind conditions are predicted according to the local weather forecast; • The stockpile side slopes should be flat enough to promote vegetation growth and reduce runoff erosion. Should erosion be recorded, and the slopes should be stabilised with geotextiles or other appropriate methods if required; • Equipment movement on top of the NE topsoil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank;	X	• Section 27 (Summary of mitigation measures) • Appendix D (Detailed impact assessment and management measures)

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Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	• No waste material will be placed on the NE topsoil stockpile. Waste material will only be deposited at the designated waste collection points; • All vehicle maintenance will take place within the designated plant area to prevent contamination of soils; • If the stockpiled soil becomes polluted, the first management priority is to treat the pollution by means of in-situ bioremediation. In situ remediation is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in-situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bioremediation at a designated area after which the soils are returned; and • If remediation of the soil in situ is not possible, the soils will be classified as a waste in terms of the Waste Regulations and will be disposed of at an appropriate permitted waste facility.		
Biodiversity Study (STS, October 2019)	Mitigation and management measures include: • The footprint and daily operation activities associated with the project activities must be strictly monitored to ensure that edge effects do not affect the surrounding floral and faunal habitat - specific consideration should be given to erosion control, prevention of soil compaction and alien invasive management; • No further vegetation outside of the NE Topsoil Stockpile is to be cleared and the NE topsoil stockpile cannot be extended without receiving prior authorisation; • No vehicles are to encroach upon or move through the remaining natural habitat surrounding the NE Topsoil stockpile unless moving along designated roads; • As much indigenous vegetation growth as possible should be promoted on the NE Topsoil stockpile in order to protect soils and prevent alien and invasive	X	• Section 8.4.1.4 (Baseline) • Section 10 (Impact summary) • Section 27 (Summary of mitigation measures) • Appendix D (Detailed impact assessment and management measures)

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Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	species from establishing. If this is not feasible then other suitable methods should be employed such as covering with hessian sheets in order to limit erosion activities (wind and water); • Alien and invasive species proliferation, which may affect the adjacent natural habitat within surrounding areas, needs to be strictly managed adjacent to the project footprint areas. Ongoing monitoring and eradication should take place throughout the operational phase of the development, and the footprint perimeters should be regularly checked during the operational phase for alien and invasive species proliferation to prevent spread into surrounding natural areas; and • Edge effect control needs to be implemented to ensure no further degradation and potential loss of floral or faunal SCC outside of the project areas take place.		
Groundwater Study (SLR, April 2020b)	Recommendations include: • Re-run the groundwater model periodically (frequency as specified by the DWS) as and when additional relevant data becomes available, in order to consider potential pollution impacts. Investigate additional management measures in consultation with a qualified specialist should modelling results indicate that groundwater contamination from Adams pit is migrating off-site; • Continue to implement the groundwater monitoring programme as outlined in Section 29; • In the event that the MMT project activities directly results in water being unsuitable for livestock watering purposes, an alternative supply will be investigated;		• Section 8.4.1.6 (Baseline) • Section 10 (Impact summary) • Section 27 (Summary of mitigation measures) • Appendix D (Detailed impact assessment and management measures)

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Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	• Stormwater management measures will be established to redirect runoff water around Adams pit. This can be in the form of earth berms; • MMT strives to identify offtake markets in order to re-process the material located in Adams pit as far as possible; and • Implement the emergency response procedure in Section 30.2.2 in the event of a potentially polluting discharge incident.		
Air Quality Study (Airshed, September 2019b)	The main findings from the qualitative assessment are as follow: • The main pollutant of concern from the project activities is PM, with PM10 and PM2.5 concentrations related to health impacts and dust fallout related to nuisance impacts; • The disposal of general waste (including rubble and used conveyor belts) to Adams Pit and the storage of Sinter de-dust in Adams pit is done using trucks. PM comprising of hazardous substances may arise from the open trucks under windy conditions and when the material is tipped into the pit. The likelihood exists for wind erosion to occur during high wind speeds, which are mostly associated with westerly winds. Under these conditions there is a potential for PM10 and PM2.5 impacts to the east of the plant but these concentrations are likely to be high close to the source and decrease rapidly up to a distance of 250 m with no air quality sensitive receptors within this zone; • Tipping of Sinter de-dust into Adams pit is unlikely to result in significant off-site impacts since dust generation from the tipped material is below surface level (in Adams pit), allowing for pit retention to dilute the concentrations before reaching the surface;		• Section 8.4.1.7 (Baseline) • Section 10 (Impact summary) • Section 27 (Summary of mitigation measures) • Appendix D (Detailed impact assessment and management measures)

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Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	• The potential for windblown dust from the exposed surfaces of the NE topsoil stockpile exists under strong wind conditions. The impacts from windblown topsoil is likely to be high near the NE topsoil stockpile and reduce significantly further away from the stockpile. The significance of the impacts would however depend on the height and footprint of the exposed areas of the stockpile; • Land clearing activities (particularly for the establishment of the NE topsoil stockpile) using dozers and scrapers could have resulted in significant dust generation, but the significance from these activities would have depended on the duration of scraping and grading as well as the size of the area being cleared; and • Cumulatively, the contributions from the various project activities (windblown dust from open trucks, dust from tipping of material into the pit, windblown dust from the topsoil stockpile and land clearing activities for the topsoil stockpile) were/are likely to be concealed by the current mining operations, both from MMT and the neighbouring Tshipi Borwa Mine. The following mitigation measures are recommended: • <u>Trucks transporting material:</u> cover the trucks or spray the material to reduce the potential for windblown dust from the open trucks; • <u>Adams Pit:</u> Materials transfer points could be managed using water sprays at the tip points – this should result in a 50% Control Efficiency (CE). Tipping of the material should be done as far down in the pit as possible, to be below the surface. The drop height of material should be reduced to a minimum; and • <u>NE Topsoil Stockpile</u>: Water sprays should be used to keep surface material moist and wind breaks installed to reduce wind speeds over the exposed areas – this		

Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	should have CE of 50%. The dormant areas should be vegetation and re-vegetated to ensure full cover at all times – this should have CE of 90%.		

Noise Study (Airshed, September 2019b)	The following findings apply to the Noise Study:
	• Noise is currently generated by the open pit surface mining and processing activities at both MMT and the neighbouring Tshipi Borwa Mine;
	• The closest Noise Sensitive Receptors include:
	  ○ The Solar PV Plant, located approximately 2 km to the east and north east from the project areas;
	  ○ A permanent farm homestead (Michael Kruger) located on the remaining extent of the farm Moab 700 approximately 2.8 km and 5.6 km south east from the Adams pit and NE topsoil stockpile project areas respectively; and
	  ○ The Eskom substation is located to the east of Adams pit project area (approximately 1 km), alongside the R380 Hotazel to Kathu road.
	• The other identified farmsteads, further afield are located to the northwest, west and south of the neighbouring Tshipi Borwa Mine are likely to be influenced by both mining operations;
	• Based on the prevailing wind field (2015-2017), noise impacts are expected to be more notable to the east and south during the day and to the north and north-northwest during the night;
	• Ambient baseline night-time and day-time noise levels were below the IFC guideline for all sites;
	• Sites 2 and 5 exceeded the SANS 10103 (2008) night-time rural district limits (35 dBA) and Site 4 exceeded the night-time industrial SANS 10103 (2008) limit;
		X	• Section 8.4.1.8 (Baseline)
			• Section 10 (Impact summary)
			• Section 27 (Summary of mitigation measures)
			• Appendix D (Detailed impact assessment and management measures)

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Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	• The sound from mining operations, trains and vehicles were noted during the noise survey, especially during the night. Natural sounds included birds chirping, shrubs and trees rustling in the wind; and • The Section 24G activities are unlikely to results in significant noise impacts off-site and are likely to be masked by the other mining, train and road noise(s). For general activities, the following good engineering practice should be applied: • All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance; • Equipment with lower sound power levels must be selected. Vendors should be required to guarantee optimised equipment design noise levels; and • A noise complaints register must be kept.		
Visual study (SAS, October 2019b)	• Since the Adams Pit is an existing pit within the MMT boundary, it is surrounded by WRDs, stockpiles and other mining infrastructure, thus the visual impact of the unauthorised activities that have taken place at the Adams Pit is considered negligible and it was deemed unnecessary to formally assess the Adams Pit from a visual perspective with an impact statement being considered acceptable.	X	• Section 8.4.1.9 (Baseline) • Appendix D (Impact assessment)
	• Based on the findings of the visual assessment, the topsoil stockpile has a minimal visual impact on the receiving environment, since the MMT is situated in a remote area where very limited sensitive receptors are present, with the Adams Solar Photovoltaic Power Plant and R380 roadway being the only receptors situated within a 2km radius and all other receptors situated further than 4km from the	X	• Section 8.4.1.9 (Baseline) • Section 10 (Impact summary) • Section 27 (Summary of mitigation measures)

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Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	MMT. Even though the terrain is relatively flat, the bushveld vegetation of the area limits the view of the observer to the immediate vicinity. Additionally, the MMT is situated within the Gamagara Corridor which is the mining belt of the John Taolo Gaetsewe and Siyanda districts and focuses on mining of iron and manganese, thus the NE topsoil stockpile remains within the character and common mining land use of the area; • Based on the impact assessment, it was evident that the NE topsoil stockpile has a low visual impact on the surrounding environment. This is mainly attributed to the limited sensitive receptors within a 4km radius as well as the bushveld vegetation limiting the view and the fact that the topsoil stockpile is situated within the mining belt of the districts, thus it is in keeping with the land use of the area. Since the NE topsoil stockpile does not have any fixed lighting associated with it, there will be no visual impact on the receiving environment. • The mitigation measures outlined below would serve to minimise the visual impacts during the operational and decommissioning and closure phases of the project: ○ The development footprint and disturbed areas surrounding the NE topsoil stockpile should be kept as small as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum; ○ Existing vegetation, with particular reference to tall trees and larger shrubs adjacent to the R380 and in the vicinity of the NE topsoil stockpile area must be retained, in order to partly obscure the view toward the topsoil stockpile; and		• Appendix D (Detailed impact assessment and management measures)

Specialist study	Recommendation of specialist	Specialist recommendations that have been included in the EIAR (mark with an x)	Reference to applicable section in this EIAR
	○ Should it be deemed feasible, the topsoil stockpile should be vegetated with indigenous species to reduce the visual impact of the soil contrast. • Based on the fact that the NE topsoil stockpile is situated within the mining belt of the Northern Cape and the limited visual impact that the NE topsoil stockpile has, it is the opinion of the specialist that the impact is acceptable, from a visual impact perspective, provided that it is ensured that the best long-term management and use of the resources in the impacted area will be made in support of the principle of sustainable development.		
Heritage/cultural study (PGS, October 2019a)	• Palaeontological sensitivity was rated as low for the area; • The existing Adams pit and establishment of the NE topsoil stockpile had no impact on heritage resources; and • Other management measures as listed and required in other heritage impact assessment reports conducted for the MMT project must still be implemented for other heritage features identified in the larger mining area.	X	• Section 8.4.1.9 (Baseline) • Section 10 (Impact summary) • Section 27 (Summary of mitigation measures) • Appendix D (Detailed impact assessment and management measures)

12 ENVIRONMENTAL IMPACT STATEMENT

12.1 SUMMARY OF KEY FINDINGS

This section provides a summary of the findings of identified and assessed potential impacts on the receiving environment in both the unmitigated and mitigated scenarios, including cumulative impacts. A summary of the potential impacts (as per Section 10), associated with the preferred alternative (as per Section 7), in the unmitigated and mitigated scenarios for all project phases is included in Table 12-1 below.

The assessment of the project presents the potential for negative impacts to occur (in the unmitigated scenario in particular) on the biophysical, cultural and socio-economic environments both on the project site and in the surrounding area. With 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 reason the project activities should not be authorised.

TABLE 12-1: SUMMARY OF POTENTIAL IMPACTS

Aspect	Potential impact	Incremental impact significance		Cumulative impact significance of the impact	
		Unmitigated	Mitigated	Unmitigated	Mitigated
Topography	Safety to third parties and animals	Insignificant			
Soils and land capability	Loss of soil resources and land capability through physical disturbances and contamination	Not applicable			
Biodiversity	Destruction of biodiversity	Medium	Low	High	Medium
	General disturbance of biodiversity	Medium	Very low	high	Low
Surface water	Alteration of natural drainage patterns	Insignificant			
	Contamination of surface water resources	Insignificant			
Groundwater	Contamination of groundwater resources reducing availability to third parties	Very low	Very low	High	Low
Air quality	Air pollution	Low	Very low	Low	Very low
Noise	Increase in disturbing noise levels	Insignificant			
Visual	Negative visual views	Insignificant			
Traffic	Road disturbance and traffic safety	Not applicable			
Heritage/cultural and paleontological resources	Loss of heritage/cultural and paleontological resources	Insignificant			
Socio-economic	Inward migration and economic impact	Not applicable			
Land use	Change in land use	Low	Very low	Medium	Low

* The ratings are negative unless otherwise specified

12.2 FINAL SITE MAP

The final layout illustrating the location of the project activities is included in Figure 4-4.

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

With reference to Sections 8.1 no site layout or infrastructure locational alternatives were considered and as such this section is not applicable.

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13 IMPACT MANAGEMENT OBJECTIVES AND OUTCOMES FOR INCLUSION IN THE EMPR

Based on the outcome of the impact assessment and where applicable the recommendations from specialists the management objectives and outcomes specific to the project are outlined in this section. Management outcomes are carried through to the EMPr and define the limit of change against which the EMPr compliance is monitored. A management outcome in an EMPr cannot change without application to the competent authority.

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

Specific environmental objectives to control, remedy or prevent potential impacts emanating from the project are provided in Table 13-1 below.

TABLE 13-1: ENVIRONMENTAL OBJECTIVES AND OUTCOMES

Aspect	Impact objective	Outcome
Topography	To minimise changes to natural topography.	Prevent harm to third parties and/or animals resulting from a change in the natural topography.
Soil and land capability	To minimise the loss of soil resources and related land capability.	Handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-mining land capability where possible.
Biodiversity	To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical and general disturbance.	Limit the area of disturbance as far as practically possible.
Surface water	To prevent unacceptable alteration of drainage patterns and pollution of surface water resources.	Ensure that the reduction of the volume of runoff into the downstream catchment is limited to what is necessary. To ensure that pollution sources do not reach surface water resources.
Groundwater	The objective is to protect groundwater resources and prevent harm to other water users.	The management outcome of the impact assessment is to provide an alternative source of water supply, where MMT's activities directly result in water being unsuitable for livestock watering purposes.
Air	To prevent air pollution health and nuisance dust impacts.	Ensure that pollutants emitted remains within acceptable limits.
Noise	To prevent public exposure to disturbing noise.	Ensure that any noise generated as a result of the project remains within acceptable limits to avoid the disturbance of third parties.
Visual	To limit negative visual impacts.	Limit negative visual views.
Heritage/cultural and palaeontological	To minimise the disturbance of heritage/cultural and palaeontological resources.	Protect heritage/cultural and palaeontological resources where possible. If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements.

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Aspect	Impact objective	Outcome
Land uses	To prevent unacceptable negative impacts on surrounding land uses.	Minimise the impact on land uses as little as possible in order to prevent unacceptable impacts on surrounding land uses and the EIAR economic activity.

13.1.1 Impacts that require monitoring programmes

Outcomes of the environmental objectives are the implementation of monitoring programmes. Impacts that require monitoring include:

- Alteration of natural drainage patterns;
- Groundwater quality;
- Physical destruction and general disturbance of biodiversity;
- Air quality; and
- Noise levels.

Environmental impacts requiring monitoring are discussed future in Section 30.

13.1.2 Activities and infrastructure

The source activities of potential impacts which require management are detailed in Section 4.2 and 4.3.

13.1.3 Management actions

Management actions which will be implemented to control the project activities or processes which have the potential to pollute or result in environmental degradation are detailed in Section 28.

13.1.4 Roles and responsibilities

The key personnel to ensure compliance to this EIAR and EMPr are the operations executive and the Environmental Department Manager and officers. As a minimum, the EIAR 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.

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14 FINAL ALTERNATIVES

This section requires an explanation for the final layout of the infrastructure and activities on the overall project site as shown on the final site layout together with reasons why the layout is the final alternative. The impact management measures, avoidance and mitigation measures identified throughout the assessment are identified for the final layout only.

The final site layout is illustrated in Figure 4-2. The impact management measures, avoidance and mitigation measures identified for the final site layout are included in Section 28. This layout was not informed by an alternative's assessment process as the consideration of alternatives is not applicable for the purpose of this EIAR as the NE topsoil stockpile has already been established and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust already takes place.

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15 ASPECTS FOR INCLUSION AS CONDITIONS OF THE AUTHORISATION

Management actions including monitoring requirements, as outlined in Sections 28, should form part of the conditions of the environmental authorisation. With reference to Regulation 26 of GNR 982 of NEMA, additional conditions that should form part of the environmental authorisation that are not specifically included in the EMPr report include compliance with all applicable environmental legislation whether specifically mentioned in this document or not and which may be amended from time to time.

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16 ASSUMPTIONS, UNCERTAINTIES, LIMITATIONS AND GAPS IN KNOWLEDGE

Assumptions, uncertainties and limitations associated with the project are included below. It is important to note that no assumptions and limitations were identified for:

- Surface water
- Traffic
- Socio-economic.

16.1 ENVIRONMENTAL ASSESSMENT LIMIT

This EIAR focuses on third parties only and does not assess health and safety impacts on employees and contractors because the assumption is made that these aspects are separately regulated by health and safety legislation, policies and standards, and that MMT adhere to these.

16.2 SOIL, LAND USE AND LAND CAPABILITY STUDY

The following assumptions and limitation apply to the Soil, Land Use and Land Capability Study compiled for the project (SAS, October 2019a):

- The NE topsoil stockpile project area pre-disturbance soil, land use and land capability were extrapolated from the surrounding undisturbed areas where soils are largely unimpacted and habitat is still intact. Historical digital satellite imagery was also considered to assist with understanding the pre-land use conditions prior to the establishment of the NE topsoil stockpile. Some inaccuracies may occur based on the inferences made; however, all effort has been made to ensure that the assessment of the pre-impact conditions is as accurate as possible;
- The data presented in the Soil, Land Use and Land Capability Study is based on a site visit undertaken in July 2019, where other activities associated with the MMT were assessed, and was near the project activities therefore these results were extrapolated for the purpose of this assessment;
- Sampling by definition means that not all areas are assessed, and therefore some aspects of soil and land capability may have been overlooked. It is however the opinion of the professional specialist that this assessment was carried out with sufficient sampling and in sufficient detail to enable regulatory authorities to make an informed decision; and
- 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 as part of rehabilitation.

16.3 BIODIVERSITY STUDY

The following assumptions and limitations apply to the Biodiversity Study compiled for the project (STS, October 2019):

- At the time of the assessment the project activities have already taken place. Previous biodiversity assessments were undertaken for MMT in 2013 and 2018. Presented in the 2018 report (NSS, September 2018) is an updated terrestrial biodiversity (floral and faunal) baseline and impact assessment which builds on the Mine's first biodiversity baseline and impact assessment as completed in 2013. The 2018

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NSS update assessment therefore took place after both unlawful activities occurred. The results of the NSS reports were used by STS to describe the conditions of the affected areas before and after the project activities occurred, therefor allowing for a better-defined assessment of the impacts on the receiving environment as a result of the project activities;

- With ecology being dynamic and complex, some aspects (some of which may be important) may have been overlooked by the previous studies. It is, however, expected that most floral and faunal communities have been accurately assessed and considered. Especially considering that the results of the NSS reports are based on assessments conducted across several seasons, including a winter assessment in June 2018 (update on initial reports), an initial assessment in early April 2012 (autumn), and detailed survey work performed in November 2012 (summer); and
- The data presented in the Biodiversity Study compiled for this project is based on the results of previous studies conducted for MMT by NSS and were therefore not ground-truthed by STS. However, these results were augmented with all available desktop data, as well as specialist experience in the area, and the findings of this assessment are considered to be an accurate reflection of the current and historic ecological characteristics of the area associated with the project activities.

16.4 GROUNDWATER AND GEOCHEMISTY STUDIES

16.4.1 GROUNDWATER STUDY

The following assumptions and limitations apply to the Groundwater Study (SLR, April 2020b) compiled for the project:

- Information from the GHT August 2018 report and modelling exercises completed for MMT was utilised to provide background information;
- The groundwater contamination source specific to this project includes the sinter de-dust. A modelling exercise specific to the storage of sinter de-dust was not undertaken for this project. The GHT modelling exercise (GHT, August 2018), provides sufficient detail pertaining to the contamination plume emanating from Adams pit in order to assess the likely impact of storing sinter de-dust;
- All predictive models are only as accurate as the input data provided to the modellers;
- TDS was selected as the parameter to be modelled, because it was considered representative of all the element concentrations within the aquifer system and emanating from pollution sources. The concentrations or “source terms” assigned to the contamination sources were based on the results of the geochemical modelling conducted by GHT as follows (GHT, August 2018):
  - Pit areas (including product stockpile and affected areas): 1800 mg/L TDS; and
  - Tailings dam: 2200 mg/L TDS.
- It is unclear from the GHT report whether or not the numerical simulations were run in transient mode, however results have been presented at several time steps from 2018 to 2135 (seventeen years of mining and 100 years post-closure);
- Sensitivity analyses were conducted relating to modelled groundwater levels with regards to horizontal conductivity (Kxy), vertical conductivity (Kz), Porosity and Specific Storage (Ss). Sensitivity statistics were obtained via an automated parameter estimation process (called PEST); and

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- Considering the large scale of the area, confidence limits were set in the model calibration process for water levels and TDS Concentrations. Predictions of water levels to within one meter of measured values are considered fair. A regression coefficient of 0.955 with a correlation of 97.7% were obtained between the measured and simulated water levels in the 2017 model. Similarly, the respective values of 0.95 and 97 % were obtained with updated data for the 2018 model.

16.4.2 GEOCHEMICAL MODELLING

The following assumptions and limitations apply to the Geochemical Study (SLR, April 2020a) compiled for the project:

- Numerous different materials are stockpiled in Adams pit. These include tailings, slimes, sinter de-dust, DMS fines and plant spillages (Refer to Section 4.3 for further detail).
- A source term model was developed for the Adams pit stockpile using proportions provided by South32. The following proportions were provided by South32:
  - Tailings (M2FT) – 86%
  - Slimes - 6%
  - Sinter de-dust – 3%
  - DMS grit – 5%
- Geochemical modelling results show a maximum predicted TDS concentration of 2,139 mg/L. However, sinter de-dust only constitutes 3% of the material within Adams pit. Geochemical modelling of the mixture of materials according to the ratios provided by South32 predicts TDS at just over 329 mg/l. This is far below the 1800 mg/L source term used by GHT in the groundwater modelling report dated August 2018. The following was therefore assumed for the purpose of this project (SLR, April 2020b):
  - It is assumed that a TDS source term concentration of 1850 mg/l was assigned to the Adams Pit area in the GHT model, however this was not explicitly stated in the report; and
  - The TDS concentration used in the GHT modelling (GHT, August 2018) is believed to be conservative. The GHT groundwater modelling is therefore also considered to be conservative and could represent a worst-case scenario when modelling potential pollution impacts from the Adams Pit.
- Plant spillages constitutes 1% of the overall Adams pit stockpile and is a mixture of sinter de-dust and product. 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 only 1% it is unlikely that the exclusion of this proportion from the source term model for the Adams pit stockpile would significantly change the results.

16.5 AIR QUALITY STUDY

The following assumptions and limitations apply to the Air Quality Study (Airshed, September 2019a) compiled for the project:

- No onsite meteorological data was available and weather data from the South African Weather Services (SAWS) Kuruman station was obtained for the period January 2015 – December 2017, which falls within the dispersion modelling timeframe criteria (three years of data within the latest five-year period) of the

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Department of Environment, Forestry and Fisheries (DEFF). The weather station is located approximately 42 km to the east-southeast of MMT and is considered to be representative of on-site weather conditions. This is the nearest weather station that records wind speed, wind direction, temperature, solar radiation and pressure);

- MMT operates a dustfall network comprising of eight single dustfall units (of which one has been decommissioned) and three (3) directional dustfall units. Since results from the directional units cannot be compared to the NDCR limits, only results from the single dustfall units are reported on. Results from the annual report for 2018 is reported on;
- The Tshipi Borwa Mine is not considered a sensitive air receptor given that occupational risks are managed under the Occupational Health and Safety Act and Regulations (No. 85 of 1993);
- The current mining and processing operations were not assessed – this forms part of the wider EIA that is currently underway. The Air Impact Report (AIR) conducted in 2019 as part of the Sinter Plant AEL renewal was used as an indication for air quality impacts together with the dustfall results;
- Only the project activities are assessed in this EIAR to understand the contribution of these activities to the overall impact of the mine;
- MMT does not undertake ambient air quality monitoring of PM concentration levels at sensitive air receptors. In support of a minimum emission's standard postponement application for the Sinter plant stack emissions, Golder Associates undertook dispersion modelling. In the absence of ambient air quality PM monitoring data, the results of the Golders Associates dispersion modelling were used to inform the impact assessment for the project. The PM dispersion modelling undertaken by Golders Associates is based on the emission rates measured in 2016 and 2017 and not the MES. It is therefore assumed that as long as the emission rates currently are not significantly higher than those previously measured, the impact at sensitive receptors will be very low;
- The CE percentages specified in the Air Study are based on literature references and are deemed achievable; and
- MMT is not committed to undertake ambient particulate concentration monitoring at sensitive receptors. Based on the very low dust fallout rates it is assumed that ambient particulate concentrations are similarly low, and likely in compliance with the NAAQS at sensitive receptor locations for MMT sources.

16.6 NOISE STUDY

The following assumptions and limitations apply to the Noise Study (Airshed, September 2019b) compiled for the project:

- The study assumes that activities during the survey on 18 July 2019 are representative of normal operational activities at the MMT;
- The Tshipi Borwa Mine is not considered a sensitive noise receptor given that occupational risks are managed under the Occupational Health and Safety Act and Regulations (No. 85 of 1993);
- No on-site meteorological data was available and weather data from the Kuruman SAWS station was obtained for the period January 2015 – December 2017, which falls within the dispersion modelling timeframe criteria (three years of data within the latest five-year period) of the DEFF. The weather

station is located approximately 42 km to the east-southeast of MMT and regarded representative of on-site weather conditions. This is the nearest weather station that records wind speed, wind direction, temperature, solar radiation and pressure); and

- The current mining and processing operations were not assessed. Only the impacts from the NE topsoil stockpile and the disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust into Adams pit are assessed to understand the contribution of these activities to the overall impact of the mine.

16.7 VISUAL STUDY

The following assumptions and limitation apply to the Visual Study compiled for the project (SAS, October 2019b):

- To assess visual impacts that the project activities had on the receiving visual environment, assumptions of landscape and habitat that was present before disturbances occurred were drawn from the surrounding undisturbed landscape and areas where remaining intact habitat were, as well as the consideration of historical digital satellite imagery. Some inaccuracies may occur based on the inferences made; however all effort has been made to ensure that the assessment of the pre-impact conditions is as accurate as possible;
- The data presented in the Visual Study is based on a site visit undertaken in July 2019, where other proposed activities associated with the MMT were assessed, and was in close proximity to the project activities, therefore these results were extrapolated for the purpose of this assessment;
- No specific national legal requirements for visual impact assessment 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 project indicate that visibility and aesthetics are likely to be significant issues and that visual input is required;
- Due to a lack of visual impact assessment specialist study guidelines within the Northern Cape Province, the “Guidelines for Involving Visual and Aesthetic Specialists in the EIA Process”, prepared for the Western Cape Department of Environmental Affairs and Development Planning, was used;
- All information relating to the project as referred to in this EIAR 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; and
- 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.

16.8 HERITAGE/CULTURAL RESOURCES STUDY

The NE topsoil stockpile has already been established and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of Sinter de-dust has already taken place. It follows that as part of the heritage/cultural study (PGS, October 2019a) findings were based on knowledge and background information related to the larger Hotazel area.

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

17.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORIZED OR NOT

The assessment of the project activities presents the potential for negative impacts to occur (in the unmitigated scenario in particular) on the biophysical and socio-economic environments both on the project sites and in the surrounding area. With 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 reason the project activities should not be authorised.

17.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

17.2.1 SPECIFIC CONDITIONS FOR INCLUSION IN THE EMPR

Refer to Section 15.

17.2.2 REHABILITATION REQUIREMENTS

Refer to Section 29.

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18 PERIOD FOR WHICH AUTHORISATION IS REQUIRED

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

TABLE 18-1:ENVIRONMENTAL AUTHORISATION PERIOD ASSOCIATED WITH EACH LISTED ACTIVITY

Listed activity number, applicable listing notice and activity description	Period of authorisation
NEMA EIA Regulations (GNR 983 of 2014): Listing Notice 1: Activity 27: The clearance of an area of 1 ha or more, but less than 20 ha of indigenous vegetation	The clearance of indigenous vegetation would have required environmental authorisation for a period of one to two years during site preparation for the NE topsoil stockpile. MMT will continue to access the NE topsoil stockpile to ensure that management actions set out in Section 28 for the conservation of soil resources are undertaken for the remaining life of mine until closure when topsoil will be required as part of rehabilitation. The clearance of indigenous vegetation is however unlikely to be required for the remaining life of mine.
NEM:WA GNR 921 of 2013: Category A, Activity 10: The disposal of general waste (including rubble and used conveyor belts) to land covering an area of more than 50m^2 but less than 200m^2 and with a total capacity not exceeding 25 000 tons.	The disposal of general waste (including rubble and used conveyor belts) in Adams it requires a WML in terms of NEM:WA. MMT is proposing on re-processing the material in Adams pit. While general waste (including rubble and used conveyor belts) will no longer be disposed into Adams pit as part of on-going mining activities, a WML will be required to authorise the general waste (including rubble and used conveyor belts) that is currently located in the pit until such time as the material has been removed as part of re-processing activities. Re-processing will be undertaken within the remaining life of mine.
NEMA EIA Regulations (GNR 983 of 2914): 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 NEM:WA in which case the NEM:WA 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 m^3 per day; or	The storage of sinter de-dust into the Adams pit requires a WUL in terms of the NWA. MMT is proposing on re-processing the material in Adams pit. While sinter de-dust will no longer be stockpiled in Adams pit as part of on-going mining activities, a WUL will be required to authorise the material that is currently stockpiled in the pit until such time as the material has been removed as part of re-processing activities. Re-processing will be undertaken within the remaining life of mine.

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Listed activity number, applicable listing notice and activity description	Period of authorisation
iii) The expansion is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will be increased by 50 m^3 or less per day.	

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19 UNDERTAKING

I, Natasha Smyth and Alex Pheiffer, the EAP's 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.

Signature of EAP (Natasha Smyth)	03 August 2020 Date

Signature of Registered EAP (Alex Pheiffer)	03 August 2020 Date

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20 FINANCIAL PROVISION

20.1 METHOD TO DERIVE THE FINANCIAL PROVISION

The project activities/infrastructure already exist at the MMT. It follows that these activities/infrastructure form part of the annual financial provision updates for the MMT. 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 20.

20.2 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.

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21 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

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

The impacts associated with socio-economic conditions are discussed in Appendix D. Management and management actions identified to address any socio-economic impacts are included in Section 28.

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 negligible**); and
- Employment and procurement of goods and services (**expected to be negligible**).

Indirect socio-economic impacts include:

- Alteration of drainage patterns by reducing the volume of runoff into the downstream catchments (**INSIGNIFICANT**);
- Contamination of groundwater through long term seepage and/or runoff (**VERY LOW** incremental significance with and without mitigation);
- Contamination of surface water resources through long term seepage and/or runoff (**INSIGNIFICANT**);
- Air pollution sources that can have a negative impact on ambient air quality (**LOW** incremental significance without mitigation and **VERY LOW** incremental significance with mitigation);
- Increase in disturbing noise levels (**INSIGNIFICANT**); and
- Visual impacts on this receiving environment may be caused by activities and infrastructure (**INSIGNIFICANT**).

21.2 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.

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21.3 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 C. 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 21-1: FINDINGS OF THE DEA SCREENING TOOL

Theme	Sensitivity	Requirements
Agriculture	Low	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 F.
Landscape/visual	Not specified in screening tool report	A Visual study was undertaken for the project and is included in Appendix K. 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 L. This study was informed by site work.
Hydrology Assessment		The Section 24G activities are not located near any water resources and as such a Hydrology study is not applicable to this project.
Noise Impact Assessment		A Noise study was undertaken for the project and included in Appendix J. This study will be informed by site work.
Traffic Assessment		The Section 24G 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 Section 24G 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 I. This study will be informed by site work.
Ambient Air Quality Assessment		
Health Impact Assessment		The need for a health assessment associated with the Section 24G activities is not deemed necessary based on the findings of the Air Quality study.
Aquatic Biodiversity	Low	An Aquatic assessment was not applicable to this project.
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 L. This study will be informed by site work.

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Theme	Sensitivity	Requirements
Plant Species Assessment	Low	A terrestrial biodiversity study was undertaken for the project and is included in Appendix G. There is no specific protocol for this theme. The terrestrial biodiversity study complies with NEMA Appendix 6 requirements for specialist reports.
Animal Species Assessment	Not specified in screening tool report	A terrestrial biodiversity study will be undertaken for the project and is included in Appendix G. 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.

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

Section 24(4)(A) of NEMA specifies requirements for the investigation, assessment and communication of the potential impacts of activities on the environment that must be included, with respect to every application for an environmental authorisation (Table 22-1). With reference to the table below, all matters outlined in terms of Section 24(4)(A) of NEMA are addressed in this EIAR.

TABLE 22-1: OTHER MATTERS REQUIRED IN TERMS OF SECTIONS 24(4)(A) AND (B) OF NEMA

Section 24(4) of NEMA	Relevant section where this is addressed in this EIAR
Section 24(4)(A) of NEMA	
Coordination and cooperation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state.	Section 8.2.2
That a description of the environment likely to be significantly affected by the proposed activity is contained in such application.	Section 8.4.1
Investigation of the potential consequences for or impacts on the environment of the activity and assessment of the significance of those potential consequences or impacts.	Appendix D
Public information and participation procedures which provide all interested and affected parties, including all organs of state in all spheres of government that may have jurisdiction over any aspect of the activity, with a reasonable opportunity to participate in those information and participation procedures.	Section 8.2.2
Section 24(4)(B) of NEMA	
Investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity.8.1	Section 8.1
Investigation of mitigation measures to keep adverse consequences or impacts to a minimum.	Appendix D
Investigation, assessment and evaluation of the impact of any proposed listed or specified activity on any national estate referred to in section 3(2) of the NHRA, excluding the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act.	Section 8.4.1.11
Reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information.	Section 16
Investigation and formulation of arrangements for the monitoring and management of consequences for or impacts on the environment, and the assessment of the effectiveness of such arrangements after the EIAR implementation.	Section 30 and Appendix D
Consideration of environmental attributes identified in the compilation of information and maps.	Section 8.4.1
Provision for the adherence to requirements that are prescribed in a specific environmental management Act (eg. NWA, NEM:WA etc.) relevant to the listed or specified activity in question.	Section 5

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PART B - ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

23 DETAILS OF THE EAP

The details of the EAPs who undertook the Section 24G rectification process and prepared this EIAR are provided in Part A, Section 2.

24 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

The requirements to describe the aspects of the activities that are covered in this EMPr are included in Part A, Section 8.

25 COMPOSITE MAP

A composite map superimposed on the environmental sensitive areas is included in Appendix M.

26 DESCRIPTION OF THE IMPACT MANAGEMENT OBJECTIVES INCLUDING MANAGEMENT STATEMENT

26.1 DETERMINATION OF CLOSURE OBJECTIVES

The closure objectives for the MMT were determined taking into account the existing type of environment as described in Section 8.4.1, in order to ensure that the closure objectives strive to achieve a condition approximating its natural state as far as possible. Further information pertaining to the closure objectives identified for the project is provided in Section 29.1.1.

26.2 THE PROCESS FOR MANAGING ANY ENVIRONMENTAL DAMAGE, POLLUTION, PUMPING AND TREATMENT OF EXTRANEOUS WATER OR ECOLOGICAL DEGRADATION AS A RESULT OF UNDERTAKING A LISTED ACTIVITY

The management actions outlined in Section 28 have been identified in order to manage and reduce impacts associated with the project in order to prevent unnecessary damage to the environment as a result of the project activities. If incidents occur that may result in environmental damages the emergency response procedure as outlined in Section 31.2.2 will be implemented to avoid pollution or degradation.

26.3 POTENTIAL RISK OF ACID MINE DRAINAGE

With reference to Section 8.4.1.6 there is a low risk of acid mine drainage associated with the sinter de-dust.

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

With reference to Section 8.4.1.6 there is a low risk of acid mine drainage associated with the sinter de-dust. It follows that the completion of this section is not required.

26.5 ENGINEERING OR MINE DESIGN SOLUTIONS TO BE IMPLEMENTED TO AVOID OR REMEDY ACID MINE DRAINAGE

With reference to Section 8.4.1.6 there is a low risk of acid mine drainage associated with the sinter de-dust. It follows that the completion of this section is not required.

26.6 MEASURES THAT WILL BE PUT IN PLACE TO REMEDY ANY RESIDUAL OR CUMULATIVE IMPACT THAT MAY RESULT FROM ACID MINE DRAINAGE

With reference to Section 8.4.1.6 there is a low risk of acid mine drainage associated with the sinter de-dust. It follows that the completion of this section is not required.

26.7 VOLUMES AND RATE OF WATER USE FOR MINING

This section is not applicable as the project activities do not require the use of water.

26.8 HAS A WUL BEEN APPLIED FOR?

South32 holds an amended IWUL (License number: 10/D41K/KAGJ/1537) issued by the DWS in 2017. An amendment to the existing IWUL is required for the storage of sinter de-dust in Adams pit in accordance with the NWA, Section 21(g): *Disposal of waste in a manner that may detrimentally impact on the environment.* This will be managed as part of a separate process with the DWS.

26.9 IMPACTS TO BE MITIGATED IN THE EIAR RESPECTIVE PHASES

The assessment of impacts is summarised in Section 10 and detailed in Appendix D. Management actions which will be implemented to avoid and minimise potential impacts are detailed in Section 28. The section below focuses on mitigation measures that are specific to **listed activities** based on the actions outlined in Section 28.

TABLE 26-1: MEASURES TO REHABILITATE THE ENVIRONMENT AFFECTED BY THE UNDERTAKING OF ANY LISTED ACTIVITY

Activity (Listed: NEMA and NEM:WA)		Phase	Size and scale of disturbance	Mitigation measures	Compliance with standards	Time period for implementation
Number	Description					
GNR 983 of 2014: Listing Notice 1, Activity 27	Establishment of the NE topsoil stockpile	Construction Operational	14 ha	Refer to Table 27-2 for the mitigation measures.	Refer to Table 27-2.	Refer to Table 27-2.
GNR 983 of 2014: Listing Notice 1, Activity 34	Storage of Sinter de-dust (inclusive of material that forms part of the plant spillages) into Adams pit	Construction Operational	14 ha (Full extent of Adams pit). The disposal of Sinter de-dust takes place within this overall extent.	Refer to Table 27-2 for the mitigation measures.	Refer to Table 27-2.	Refer to Table 27-2.
GNR 921 of 2013: Category A, Activity 10	Disposal of general waste (including rubble and used conveyor belts) into Adams pit	Construction Operational	14 ha (Full extent of Adams pit). The disposal of general waste (including rubble and used conveyor belts) takes place within this overall extent.	Refer to Table 27-2 for the mitigation measures.	Refer to Table 27-2.	Refer to Table 27-2.

27 IMPACT MANAGEMENT OUTCOMES

Table 27-1below provides a description of the outcomes and objective of management actions in order to manage, remedy, control or modify potential impacts. The management actions identified to achieve these outcomes and objectives are described in Section 28. Since the activities are already occurring on site, the construction phase is not applicable for management actions and thus only the operational phase is included in the table below. Refer to Appendix D for further detail.

TABLE 27-1: DESCRIPTION OF IMPACT MANAGEMENT OUTCOMES

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management outcome/objectives)
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Safety to third parties and animals	Topography	Operational	• Manage through continuation of implementing access control. • Manage through emergency response procedures in cases of emergency.	• **Objective:** To minimise changes to natural topography. • **Outcome:** Prevent harm to third parties and/or animals resulting from a change in the natural topography
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Loss of soil resources and land capability through physical disturbance and contamination	Soil and Land Capability	Operational	Control through continuation of implementing soil conservation management and waste management.	• **Objective:** To minimise the loss of soil resources and related land capability. • **Outcome:** Handle, manage and conserve soil resources to be used as part of rehabilitation and re-establishment of the pre-mining land capability where possible.
• Establishment of the NE topsoil stockpile • Storage of topsoil	Physical destruction of biodiversity	Biodiversity	Operational	• Manage through controlling edge effects. • Control through prohibiting extension of vegetation clearance without authorisation.	• **Objective:** To prevent the unacceptable disturbance and loss of biodiversity and related ecosystem functionality through physical and general disturbance. • **Outcome:** Limit the area of disturbance as far as practically possible.
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	General disturbance of biodiversity	Biodiversity	Operational	• Control through limiting disturbance to biodiversity. • Control through appropriate training of personnel. Control through equipment maintenance.	
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Alteration of natural drainage patterns	Surface Water	Operational	• Control through operating according to GN704 requirements. Manage through maintaining operational water balance.	• **Objective:** To prevent unacceptable alteration of drainage patterns and pollution of surface water resources. • **Outcome:** Ensure that the reduction of the volume of runoff into the downstream catchment is limited to what is necessary. To ensure that pollution sources do not reach surface water resources.
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the storage of sinter de-dust	Contamination of surface water resources	Surface Water	Operational	• Control through erosion management. • Manage through remaining within boundaries. Manage through emergency response if incidences arise.	
• Use of Adams pit for the storage of sinter de-dust	Contamination of groundwater resources reducing availability to third parties	Groundwater	Operational	• Manage through re-running groundwater models as and when additional data becomes available. Control through continuation of monitoring.	• **Objective:** The objective is to protect groundwater resources and prevent harm to other water users. • **Outcome:** The management outcome of the impact assessment is to provide an alternative source of water supply, where MMT's activities directly result in water being unsuitable for livestock watering purposes.
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Air pollution	Air Quality	Operational	• Control through dust suppression. Control through erosion management.	• **Objective:** To prevent air pollution health and nuisance dust impacts. • **Outcome:** Ensure that pollutants emitted remains within acceptable limits

Activity	Potential Impact	Affected Aspect	Phase	Management actions Type	Standard to be Achieved (Impact management outcome/objectives)
• Establishment of the NE topsoil stockpile • Use of Adams pit for the storage of sinter de-dust • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Increase in disturbing noise levels	Noise	Operational	• Control through equipment maintenance. • Control through equipment selection. Manage through maintaining a complaints' register.	• **Objective:** To prevent public exposure to disturbing noise. • **Outcome:** Ensure that any noise generated as a result of the project remains within acceptable limits to avoid the disturbance of third parties.
• Establishment of the topsoil stockpile • Storage of topsoil	Negative visual views	Visual	Operational	• Control through limiting disturbance footprint. • Control through retention of vegetation.	• **Objective:** To limit negative visual impacts. • **Outcome:** Limit negative visual views.
• Establishment of the topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Loss of heritage/cultural and palaeontological resources	Heritage/cultural and palaeontological resources	Operational	• Control through implementing emergency response procedure during chance finds. • Manage through consulting with registered professional if chance finds are discovered.	• **Objective:** To minimise the disturbance of heritage/cultural and palaeontological resources. • **Outcome:** Protect heritage/cultural and palaeontological resources where possible. If disturbance is unavoidable, then mitigate impact in consultation with a specialist and the SAHRA and in line with regulatory requirements.
• Establishment of the topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Change in land use	Land Use	Operational	• Manage through communication with land users and neighbouring landowners.	• **Objective:** To prevent unacceptable negative impacts on surrounding land uses. • **Outcome:** Minimise the impact on land uses as little as possible in order to prevent unacceptable impacts on surrounding land uses and the EIAR economic activity.

28 IMPACT MANAGEMENT ACTIONS

Management actions identified to prevent, reduce, control or remedy the assessed impacts are presented in Table 28-1 below. The action plans include the timeframes for implementing the management actions together with a description of how management actions comply with relevant standards. Management actions and recommendations identified by specialists have been summarised and are included in the table below.

TABLE 28-1: DESCRIPTION OF IMPACT MANAGEMENT ACTIONS

Activity	Potential Impact	Management actions	Time Period for Implementation	Compliance with Standards
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Safety to third parties and animals	Implement the following management actions during the operational phase: • Continue to implement existing access control protocol at the MMT that prevents uncontrolled access to the mine site by third parties and/or animals; and • In case of incident or death due to hazardous infrastructure, the emergency response procedure in Section 31.2.2 will be followed.	On-going As required	N/A
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Loss of soil resources and land capability through physical disturbance and contamination	MMT will continue to implement the following soil conservation management and waste management procedure for the remainder of the operational phase of the project as outlined in Table 34-1.	On-going	N/A
• Establishment of the NE topsoil stockpile • Storage of topsoil	Physical destruction of biodiversity	Implement the following management actions during the operational phase: • No further vegetation outside of the NE Topsoil Stockpile is to be cleared and the NE topsoil stockpile cannot be extended without receiving prior authorisation; and • Edge effect control needs to be implemented to ensure no further degradation and potential loss of floral or faunal SCC outside of the project areas take place.	On-going On-going	N/A
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	General disturbance of biodiversity	Implement the following management actions during the operational phase: • The footprint and daily operation activities associated with the project activities must be strictly monitored to ensure that edge effects do not affect the surrounding floral and faunal habitat - specific consideration should be given to erosion control, prevention of soil compaction and alien invasive management; • No vehicles are to encroach upon or move through the remaining natural habitat surrounding the NE Topsoil stockpile unless moving along designated roads; • As much indigenous vegetation growth as possible should be promoted on the NE Topsoil stockpile in order to protect soils and prevent alien and invasive species from establishing. If this is not feasible then other suitable methods should be employed such as covering with hessian sheets in order to limit erosion activities (wind and water); and • Alien and invasive species proliferation, which may affect the adjacent natural habitat within surrounding areas, needs to be strictly managed adjacent to the project footprint areas. Ongoing monitoring and eradication should take place throughout the operational phase of the development, and the footprint perimeters should be regularly checked during the operational phase for alien and invasive species proliferation to prevent spread into surrounding natural areas. • There is training for workers on the value of biodiversity and the need to conserve the species and systems that occur at the MMT;	On-going	The management action to implement an alien invasive species programme is in accordance with the NEM:BA Alien and Invasive Species Regulations (2014) that requires the control of invasive species.

Activity	Potential Impact	Management actions	Time Period for Implementation	Compliance with Standards
		• Noisy and/or vibrating equipment will be well maintained to control noise and vibration emission levels; • Dust control measures will be implemented as discussed under the air quality section in this appendix; and • Pollution and litter prevention measures will be implemented as outlined in Table 34-1.		
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Alteration of natural drainage patterns	Implement the following management actions during the operational phase: • Operate and maintain mine infrastructure in a manner that ensures compliance with the provisions of the Regulation 704 of 1999 in terms of the NWA. These include: ○ Separate clean and dirty water systems; ○ Minimise the size and extent of dirty water areas; and ○ Divert clean water (run-off and rainfall) around the mine/dirty areas and back into its normal flow paths in the environment. • Maintain the operational water balance for the mine in order to monitor water used at the MMT.	On-going	Operate and maintain storm water management practices in in a manner that ensures compliance with Regulation 704 of 1999 in terms of the NWA.
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the storage of sinter de-dust	Contamination of surface water resources	Implement the following management actions during all mine phases: • The NE topsoil stockpile side slopes should be flat enough to promote vegetation growth and reduce runoff related erosion. Should erosion be noted, the slopes should be stabilised with geotextiles or other appropriate methods; • All project related activities will remain within the boundary of the MMT Mining Right area; and • Implement the emergency response procedure in Section 31.2.2 in the unlikely event of a potentially polluting discharge incident.	On-going On-going As required	N/A
• Use of Adams pit for the storage of sinter de-dust	Contamination of groundwater resources reducing availability to third parties	Implement the following management actions during the operational phase: • Re-run the groundwater model periodically (frequency as specified by the DWS) as and when additional relevant data becomes available, in order to consider potential pollution impacts. Investigate additional management measures in consultation with a qualified specialist should modelling results indicate that groundwater contamination from Adams pit is migrating off-site; • Continue to implement the groundwater monitoring programme as outlined in Section 30; • In the event that the MMT project activities directly results in water being unsuitable for livestock watering purposes, an alternative supply will be investigated; • Stormwater management measures will be established to redirect runoff water around Adams pit. This can be in the form of earth berms; • MMT strives to identify offtake markets in order to re-process the material located in Adams pit as far as possible; and • Implement the emergency response procedure in Section 31.2.2 in the event of a potentially polluting discharge incident.	As required On-going As required On-going As required As required	N/A
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Air pollution	Implement the following management actions during the operational phase:	As required	National Atmospheric Emission Reporting Regulations in terms of the National Environmental

Activity	Potential Impact	Management actions	Time Period for Implementation	Compliance with Standards
• Use of Adams pit for the storage of sinter de-dust		• Water sprays should be used to keep surface material moist and wind breaks installed to reduce wind speeds over the area. Even though high wind speeds are limited, given that this is a dry environment, wind breaks are advised; and • Any binding properties would reduce the potential for wind erosion from the NE topsoil stockpile. One of the most effective measures of minimizing wind erosion emissions is to vegetate the exposed areas and to re-vegetate when required to ensure full vegetation cover at all times. The control efficiency of vegetation is given as 40% for non-sustaining vegetation and 90% for re-vegetation. Secondary rehabilitation would up the control efficiency to 60% for non-sustaining vegetation.		Management: Air Quality Act (No. 39 of 2004) requires that holders of Mining Rights register on the National Atmospheric Emissions Inventory System (NAEIS) and to ensure that annual monitoring reports are uploaded onto the NAEIS.
• Establishment of the NE topsoil stockpile • Use of Adams pit for the storage of sinter de-dust • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Increase in disturbing noise levels	Implement the following management actions during all operational phase • All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance; • Equipment with lower sound power levels must be selected and MMT is required to guarantee optimised equipment design noise levels; and • A noise complaints register must be kept on site.	On-going	N/A
• Establishment of the topsoil stockpile • Storage of topsoil	Negative visual views	Implement the following management actions during the operational phase: • The development footprint and disturbed areas surrounding the NE topsoil stockpile should be kept as small as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum; • Existing vegetation, with particular reference to tall trees and larger shrubs adjacent to the R380 and in the vicinity of the topsoil stockpile area must be retained, in order to partly obscure the view toward the NE topsoil stockpile; and • Should it be deemed feasible, the NE topsoil stockpile should be vegetated with indigenous species to reduce the visual impact of the soil contrast.	As required	N/A
• Establishment of the topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust	Loss of heritage/cultural and palaeontological resources	Implement the following management actions during the operational and decommissioning phases of the activity: • Consult a professionally registered heritage and/or palaeontological specialist to make associated recommendations that will be complied with prior to the removal or destruction of any heritage/cultural and palaeontological resources that may be discovered by chance; and • Implement the emergency response procedure (Section 31.2.2) if there are any chance finds of heritage/ cultural or paleontological sites.	As required	Compliance with the National Heritage Resource Act, 1999 (No. 25 of 1999) in the event of any chance finds.
• Establishment of the topsoil stockpile • Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	Change in land use	Communicate with neighbouring landowners and users as required to facilitate information sharing and management of environmental impacts associated with the project activities.	On-going	N/A

29 FINANCIAL PROVISION

29.1 DETERMINATION OF THE AMOUNT OF THE FINANCIAL PROVISION

29.1.1 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 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;
- The Adams open pit will be backfilled to 25m below original surface level; 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 to 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.

29.1.2 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 8.2).

To date no comments regarding the closure objectives (see Section 29.1.1) have been received from I&APs, including landowners (see Section 8.2).

29.1.3 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; and
- Rehabilitation monitoring and auditing will be implemented to ensure conformance to this objective and the rehabilitation plan.

The approach to rehabilitating Adams pit is not specifically documented in the approved 2005 EMPr. The planned re-processing of material within Adams pit is however in line with the approved 2005 EMPr strategy which specifies the need for concurrent rehabilitation during on-going mining activities.

29.1.4 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.

29.1.5 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 30 June 2019, provides for an amount of **R 876 189 524.00** exclusive of VAT. The project activities/infrastructure (The use of Adams pit and the NE topsoil stockpile) already exist at the MMT. It follows that these activities/infrastructure form part of the annual financial provision updates for the MMT. The financial calculations are detailed in the financial provision report that is included in Appendix O.

29.1.6 Confirmation that the financial provision will be provided

The funding of the financial provision is a combination of trust fund and bank guarantees.

30 MECHANISMS FOR MONITORING COMPLIANCE AND PERFORMANCE AGAINST THE EMPR

Environmental impacts requiring monitoring are listed in Table 30-1 below.

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

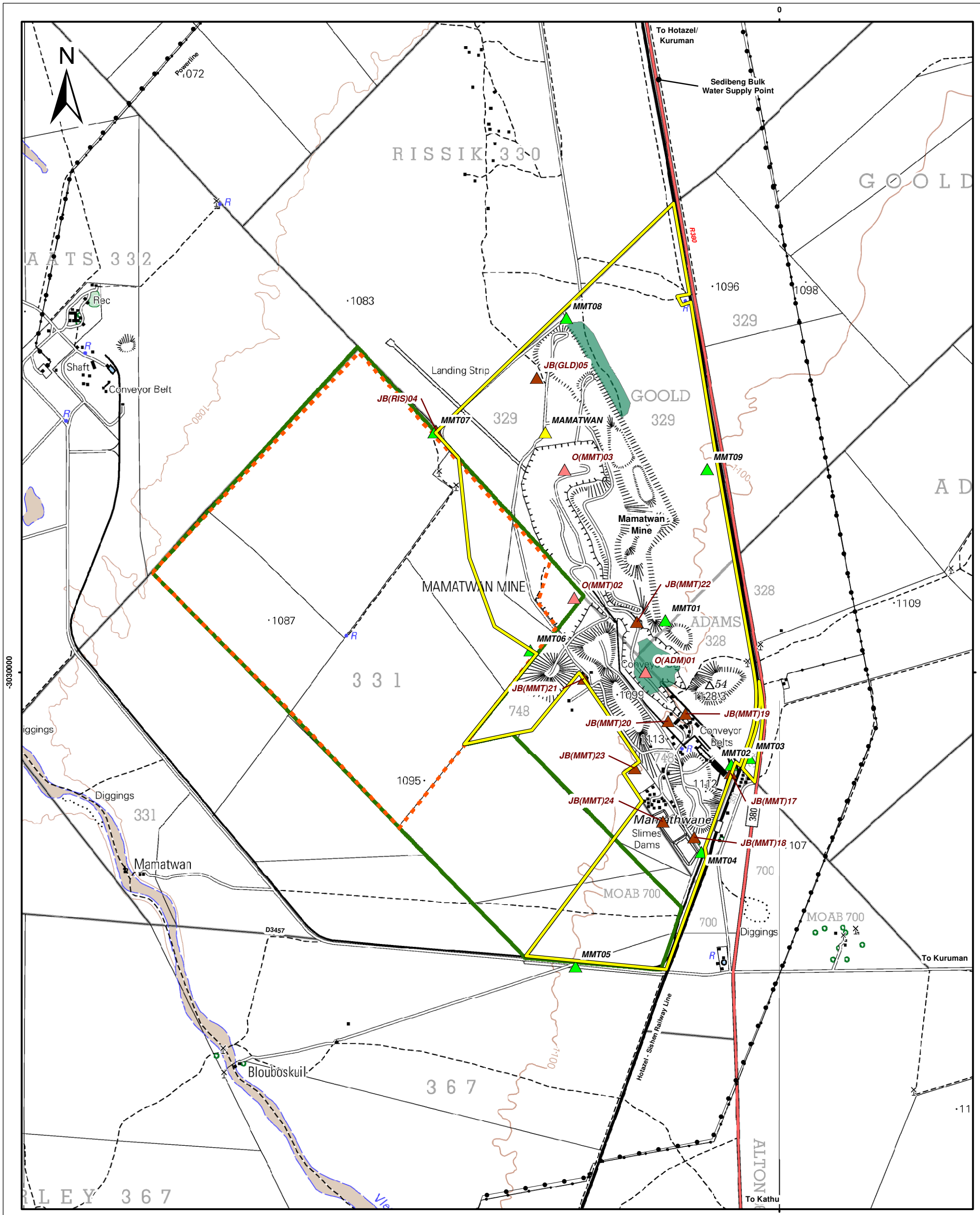
- Adherence to a formal monitoring procedure;
- Use of appropriately calibrated equipment by personnel trained to use the equipment;
- The preservation of samples according to laboratory specifications by personnel trained to use the equipment, where samples require analysis;
- The identification of 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 30-1: 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 the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the storage of Sinter de-dust • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)	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 DWS on an annual basis.
• Use of Adams pit for the storage of Sinter de-dust	Contamination of groundwater resources	Refer Figure 30-1 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. pH	Environmental Department	The MMT groundwater water quality monitoring to be undertaken on a quarterly basis. Monitoring reports need to be submitted to the DWS as per the conditions of the IWUL, on an annual basis. Monitoring reports need to cater for any reporting requirements stipulated in the IWUL.

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
		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 the NE topsoil stockpile • Storage of topsoil	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	Environmental Department	Monitoring will take place on an annual basis.

Activity	Impacts requiring monitoring	Functional requirements for monitoring	Roles and responsibilities	Monitoring and reporting frequency and time period for management actions
		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.		
• Establishment of the NE topsoil stockpile • Storage of topsoil • Use of Adams pit for the storage of Sinter de-dust	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 30-1.	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.



Legend

- Mamatwan Mining Right Area
- Tshipi Mining Right Area
- Tshipi Surface Use Area
- Section 24g Activities
- Main Roads
- Secondary Roads
- Power Line
- Rivers and Streams

Mamatwan Monitoring Points

- Groundwater Monitoring Points
- Pit Water Monitoring Points
- Single Bucket Monitoring Stations
- Dustwatch Monitoring Stations

0 500 1 000 Meters

Scale: 1:34 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mining

Figure 30-1

Monitoring Programme

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

720.19136.00002

2020/05/04

30.1 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 DMR.

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.

30.2 CLOSURE COST REPORTING

The financial provision for the mine will be updated on an annual basis and submitted to the DMR for the duration of the operation in accordance of the relevant legislation.

31 ENVIRONMENTAL AWARENESS PLAN

31.1 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.

31.1.1 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."

31.1.2 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 DMR;

  - 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.

31.1.3 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.

31.1.3.1 General contents of the environmental awareness plan

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

- 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.

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

31.2.1 ON-GOING MONITORING AND MANAGEMENT ACTIONS

The monitoring programme as described in Section 30 will be undertaken to provide early warning systems necessary to avoid environmental emergencies.

31.2.2 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 (see Appendix N). In addition, MMT will implement and the general and activity-specific procedures described in the sections below.

31.2.2.1 General 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 (DWS, DMR and Inspectorate of Mines, as appropriate), the South African Police Services, the relevant fire prevention service, the provincial head of DMR, the head of the local municipality, the head of the regional DWS office and any persons whose health may be affected of:
    - the nature of the incident;
    - any risks posed to public health, safety and property;
    - the toxicity of the substances or by-products released by the incident; and
    - any steps taken to avoid or minimise the effects of the incident on public health and the environment.
  - the 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 DWS and DEA, the provincial head of DMR, the regional manager of the DMR, the head of the local and district municipality, the head of the regional DWS office such information as is available to enable an initial evaluation of the incident, including:
    - The nature of the incident;
    - The substances involved and an estimation of the quantity released;
    - The possible acute effects of the substances on the persons and the environment (including the data needed to assess these effects);
    - Initial measures taken to minimise the impacts;
    - Causes of the incident, whether direct or indirect, including equipment, technology, system or management failure; and
    - Measures taken to avoid a recurrence of the incident.

31.2.2.2 Identification 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 31-1: 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; ○ 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.

Item	Emergency situation	Response in addition to general procedures
		• The exhumation process will comply with the requirements of the relevant Ordinance on Exhumations and the Human Tissues Act, 1983 (No. 65 of 1983).

31.2.3 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.

32 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

The following documents will be submitted to the DMR until mine closure:

- As noted in Section 30.1, an environmental audit report, prepared by an independent person, will be submitted to the DMR at intervals indicated in the environmental authorisation. The purpose of the environmental audit report is to ensure compliance with the conditions of the environmental authorisation and the EMPr; and
- The financial provision will be updated on an annual basis and submitted to the DMR.

33 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.

Signature of EAP

03 August 2020

Date

34 REFERENCES

Airshed Planning Professionals, Mamatwan Mine Environmental Management Plan Amendment: Air Quality Specialist Opinion as part of the Section 24G requirements, September 2019a.

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GHT Consulting, Hotazel Manganese Mines Geohydrological Report for Mamatwan Mine, August 2018.

GHT Consulting, Hotazel Manganese Mines, Mamatwan Mine, Phase 49, 4th Quarter 2019: Routine Groundwater and Surface Water Monitoring, 2020.

Golder Associates Africa (Pty) Ltd, South32 Hotazel Manganese Mines (Pty) Limited, Atmospheric Emissions Impact Report for Mamatwan Sinter Plant Application for Postponement of Compliance Timeframes, February 2019.

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Scientific Aquatic Services CC, Soil, Land Use and Land Capability Assessment as part of the Section 24G rectification process for the unauthorised activities at the Mamatwan Mine, near Hotazel, Northern Cape Province, October 2019a.

Scientific Aquatic Services CC, Visual Impact Assessment as part of the Section 24G rectification process for the unauthorised activities at the Mamatwan Mine, near Hotazel, Northern Cape Province, October 2019b.

Scientific Terrestrial Services (STS), Biodiversity Assessment as part of the Section 24G rectification process for the unauthorised activities at the Mamatwan Mine, near Hotazel, Northern Cape Province, October 2019.

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SLR Consulting (South Africa) (Pty) Ltd, Hydrogeological study in support of the Section 24G rectification process, April 2020b.

SLR Consulting (South Africa) (Pty) Ltd, Waste Assessment and Geochemical Characterisation for the Mamatwan Mine, April 2020a.

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Natural Scientific Services, Biodiversity Update Assessment for the Mamatwan Mine, Northern Cape, October 2018.

PGS Heritage, Mamatwan Mine Section 24G Rectification Application, Near Hotazel, Northern Cape Province, October 2019a.

PGS Heritage, Palaeontological Exemption Letter of the proposed Mamatwan Mine, Section 24G Rectification Application, Near Hotazel, Northern Cape Province, October 2019b.

APPENDIX A: EXISTING AUTHORISATIONS

APPENDIX B: EAP CURRICULUM VITAE AND REGISTRATION

APPENDIX C: PUBLIC PARTICIATION DOCUMENTATION

- Copy of the Integrated Section 24G rectification application form.
- Correspondence with the Land Claims Commissioner.
- BID in English, Afrikaans and Setswana and proof of distribution.
- Copy of site notice including photographic record and map illustrating the location of the site notices.
- Advertisements placed in the Kalahari Bulletin and the Kathu Gazette.
- Public database.

APPENDIX D: DETAILED ASSESSMENT OF POTENTIAL IMPACTS

DETAILED ASSESSMENT OF POTENTIAL IMPACTS

Potential biophysical and socio-economic impacts were identified by SLR, specialists (where relevant) and stakeholders. All identified impacts were considered both incrementally and cumulatively in the context of the existing and approved MMT mining infrastructure and activities. The criteria used to rate each impact is outlined in Section 8.6.

The establishment of the NE topsoil stockpile and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and storage of sinter de-dust has commenced. The aim of a Section 24G rectification process is to understand the impact that occurred due to undertaking an unlawful activity. For the purpose of this EIAR the assessment below only focusses on the project construction and operational phases. Impacts in the construction phase are limited to the NE topsoil stockpile only as this is when the stockpile was established. Adams pit existed prior to being used for the disposal and general waste (including rubble and used conveyor belts) and storage of sinter de-dust and as such is limited to the project operational phase.

While the mine has a remaining life of mine of 17 years, the section below does not assess impacts in the decommissioning and closure phases for the following reasons:

- During the decommissioning phase topsoil will be removed for rehabilitation purposes. Rehabilitation will be undertaken in accordance with an approved mine closure plan that ensures a suitable post-closure land use is achieved; and
- MMT is proposing on re-processing material located in Adams pit as part of rehabilitation. With reference to Section 4.3.2, this will require environmental authorisation from the DMR. The re-processing of the material in Adams pit cannot be authorised as part of this Section 24G rectification process. A separate process will need to be undertaken to authorise these activities, which will assess impacts in the decommissioning and closure phases.

The impacts are rated with the assumption that no management actions are applied and then again with management actions. A summary of the impact assessment is provided in Section 10 of this EIAR. Management actions identified to prevent, reduce, control or remedy the assessed impacts are provided under the relevant impact discussions sections below. A summary of the management actions is provided in Section 28 of this EIAR.

TOPOGRAPHY

ISSUE: SAFETY TO THIRD PARTIES AND ANIMALS

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

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

DISCUSSION

The project activities present infrastructure that has altered the natural topography and in turn has the potential risk of injury and/or death to both third parties (people) and animals (livestock and wild animals) from falling off steep slopes. The project does not present new safety risks in the context of the existing MMT operations. It follows that the impact associated with the safety to third parties and animals is expected to be negligible for the project. This impact has therefore been rated as being **INSIGNIFICANT**; however, the management actions outlined below are required to ensure this rating is maintained.

MANAGEMENT OBJECTIVES AND OUTCOMES

The objective is to minimise changes to the natural topography. The outcome from the impact assessment is to prevent harm to third parties and/or animals resulting from a change in the natural topography.

MANAGEMENT ACTIONS

Implement the following management actions during the operational phase:

- Continue to implement existing access control protocol at the MMT that prevents uncontrolled access to the mine site by third parties and/or animals; and
- In case of incident or death due to hazardous infrastructure, the emergency response procedure in Section 31.2.2 will be followed.

SOIL AND LAND CAPABILITY

ISSUE: LOSS OF SOIL RESOURCES AND LAND CAPABILITY THROUGH PHYSICAL DISTURBANCE AND CONTAMINATION

Information in this section was sourced from the Soil, Land Use and Land Capability Study undertaken for the project (SAS, October 2019a) and included in Appendix F.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

DISCUSSION

Soil is a valuable resource that supports a variety of ecological functions. Mining activities can result in a loss of soil resources as an ecological driver through contamination and physical disturbance, particularly in the unmitigated scenario. The contamination of soil can result in a loss of soils because it can create a toxic environment for vegetation and ecosystems that rely on the soil. Physical soil disturbance can result in a loss of soil functionality. In the case of erosion, the soils will be lost to the area of disturbance. In the case of compaction the soils functionality will firstly be compromised through a lack of rooting ability and aeration, and secondly the compacted soils are likely to erode because with less inherent functionality there will be little chance for the establishment of vegetation and other matters that naturally protects the soils from erosion. The loss of soil resources has a direct impact on the potential loss of the natural capability of the land.

With reference to Section 8.4.1.3, Adams pit was completely mined out by 1980. The Cullinan soil form (Little to no soil material) is associated with Adams pit. Sinter de-dust and general waste (including rubble and used conveyor belts) is stored/stockpiled on the existing tailings material, which forms the base of the Adams pit stockpile. It follows that the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust could not have influenced soil resources and related land capability and as the assessment of the loss of soil resources is not applicable to this project activity.

The establishment of the NE topsoil stockpile cannot be assessed in the terms of losing soil resources as stockpiling topsoil is a management action identified to manage and conserve soil resources that need to be stripped as part of clearing land for mining infrastructure. In this regard, MMT is committed to stockpile all topsoil in areas clearly demarcated on the infrastructure layout and these areas should be defined as no-go areas. For completeness purposes, management actions required to conserve soil resources for the duration of the project operational phase is outlined below.

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to minimise the loss of soil resources and related land capability. The management 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.

MANAGEMENT ACTIONS

MMT will continue to implement the following soil conservation management and waste management procedure for the remainder of the operational phase of the project.

TABLE 34-1: SOIL CONSERVATION AND WASTE MANAGEMENT PROCEDURES

Steps	Factors to consider	Detail
Soil conservation procedures		
Stockpile management	Vegetation establishment and erosion control	The upper material of topsoil does not have high nutrient values, and the EIAR primary value is due to the presence of the seed bank. Tests will be conducted to determine if nutrients or fertilisers need to be added. These tests will be undertaken as and when required. Stockpiles will be examined after a reasonable rainy period/season, and then annually to determine whether vegetation has naturally established itself on the stockpiles. If necessary, other methods will be used on the topsoil stockpiles to prevent wind erosion. Bare soils must be regularly dampened with water to suppress dust, especially when strong wind conditions are predicted according to the local weather forecast.
	Slope	The stockpile side slopes should be flat enough to promote vegetation growth and reduce runoff related erosion. Should erosion be noted, the slopes should be stabilised with geotextiles or other appropriate methods.
	Vehicles	Equipment movement on top of the NE topsoil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.
Waste Management procedures		
Waste management	Collection points	No waste material will be placed on the NE topsoil stockpile. Waste material will only be deposited at the designated waste collection points.
	Vehicle maintenance	All vehicle maintenance will take place within the designated plant area.
	Any soil polluted by a spill	If the stockpiled soil is polluted, the first management priority is to treat the pollution by means of in-situ bioremediation. In situ remediation is generally considered to be the preferred option because with successful in situ remediation the soil resource will be retained in the correct place. The in-situ options include bioremediation at the point of pollution, or removal of soils for washing and/or bioremediation at a designated area after which the soils are returned.
		If remediation of the soil in situ is not possible, the soils will be classified as a waste in terms of the Waste Regulations and will be disposed of at an appropriate permitted waste facility.

BIODIVERSITY

ISSUE: PHYSICAL DESTRUCTION OF BIODIVERSITY

Information in this section was sourced from Biodiversity Study compiled for the project (STS, October 2019) and included in Appendix G.

DESCRIPTION OF IMPACT

Areas of ecological sensitivity include functioning biodiversity areas with species diversity (including protected species) and associated intrinsic value. Linkages between these areas have value because of the role they play in allowing the migration or movement of flora and fauna between the areas, which is a key function for the broader ecosystem. The transformation of land for any purpose increases the destruction of the site-specific biodiversity, the fragmentation of habitats, reduces its intrinsic functionality and reduces the linkage role that undeveloped

land fulfils between different areas of biodiversity importance. The project activities have the potential to destroy biodiversity in the broadest sense, particularly in the unmitigated scenario. The assessment below relates to the physical destruction of habitat and related species because of the EIAR status, and/or the role that they play in the ecosystem.

Adams pit was historically mined out by 1980. General waste (including rubble and used conveyor belts) and sinter de-dust is deposited/ stockpiled on the existing tailings material located in Adams pit. It follows that this project activity is unlikely to have destroyed any site-specific biodiversity. The section below focusses only on the NE topsoil stockpile.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil

IMPACT ASSESSMENT

Prior to the establishment of the NE topsoil stockpile, the project site would have had a moderate biodiversity sensitivity. This is attributed to the pre-project habitat unit being the *Acacia* Thornveld habitat unit. This habitat unit is considered largely natural and is associated with several floral species of concern in terms of the NCNA (*Babiana hypogaea, Boophone disticha* and *Ruschia* cf. *griquensis)* and NFA (*Vachellia erioloba* and *Vachellia haematoxylon).* This habitat unit does however have a decreased floral diversity due to edge effects from the existing MMT operations. This habitat may have been utilised by faunal species for foraging as well as intermediary habitat by species moving through the area but is unlikely to have provided a habitat for permanent residing faunal species.

It is highly likely that the establishment of the NE topsoil stockpile, destroyed protected floral species as part of vegetation clearing activities. This would have subsequently resulted in the loss of species habitat and diversity within the project footprint area. When considered incrementally, the establishment of the NE topsoil stockpile would not have resulted in a material change in the exiting MMT footprint, nor changed the type of habitat or species currently influenced. Any loss of biodiversity is expected to be long-term and will continue after the life of the project. With management actions, biodiversity and related functionality may be partially restored. Given that biodiversity processes are not confined to the project site, the impact will extend beyond the MMT Mining Right area. Without management actions the probability of the impact occurring is probable. With management actions, the probability of the impact can be reduced with the implementation of correct management actions. Without management actions the significance of the incremental impact is expected to be **MEDIUM**. With management actions, the significance reduces to **LOW** (see table below).

When considered cumulatively, the establishment of the NE topsoil stockpile has increased the mines overall disturbance footprint and as such is a **HIGH** significance in unmitigated scenario due to the mine falling within the Griqualand 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. The cumulative significance rating can be reduced to **MEDIUM** with management actions (see table below).

IMPACT SUMMARY

Issue: Physical destruction of biodiversity		
Phases: Planning and Design, Construction		
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	• Incremental moderate change (Medium) • Cumulative substantial consequences (High)	• Incremental minor change (Low) • Cumulative moderate consequence (Medium)
Duration	Long-term (High)	Long-term (High)
Extent	• Incremental extent beyond the site boundary (Medium) • Cumulative extent far beyond the site boundary	• Incremental extent beyond the site boundary (Medium) • Cumulative extent far beyond the site boundary
Consequence	• Medium incremental consequence • High cumulative consequence	• Medium incremental consequence • High cumulative consequence
Probability	Probable (High)	Possible (Medium)
Significance	• Incremental medium significance • Cumulative high significance	• Incremental low significance • Cumulative medium significance
Nature of cumulative impacts	The project activities form part of the MMT on-going mining activities. The net result is that the on-going expansion of the mine will result in large areas of natural vegetation and SCC being lost within the area. This will result in further disturbance and potential loss of favourable habitat for faunal and floral populations within the area.	
Degree to which impact may cause irreplaceable loss of resources	Unlikely, with the implementation of management actions.	
Degree to which impact can be mitigated	High	
Degree to which impact can be reversed	High with the implementation of management actions.	

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to prevent the unacceptable loss of biodiversity and related ecosystem functionality through physical disturbance. The management outcome of the impact assessment is to limit the disturbance of biodiversity as far as possible.

MANAGEMENT ACTIONS

Implement the following management actions during the operational phase:

- No further vegetation outside of the NE Topsoil Stockpile is to be cleared and the NE topsoil stockpile cannot be extended without receiving prior authorisation; and
- Edge effect control needs to be implemented to ensure no further degradation and potential loss of floral or faunal SCC outside of the project areas take place.

ISSUE: GENERAL DISTURBANCE OF BIODIVERSITY

Information in this section was sourced from Biodiversity Study compiled for the project (STS, October 2019) and included in Appendix G.

DESCRIPTION OF IMPACT

Mining activities can generally disturb biodiversity which in turn effects the success of rehabilitation. The project activities have the potential to directly disturb vegetation, vertebrates and invertebrates particularly in the unmitigated scenario. These activities are typically temporary in nature. Although these activities are temporary in nature, the associated disturbance can be long term.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

IMPACT ASSESSMENT

The project activities have the potential to disturb biodiversity in the following ways:

- Excessive dust fallout from various dust sources (exposed sinter de-dust and soil stockpiles) may have adverse effects on the growth of some vegetation, and it may cause varying stress on the teeth of vertebrates that have to graze soiled vegetation;
- Noise and vibration pollution (from vehicle movement and materials handling) may scare off vertebrates and invertebrates. In some instances, the animals may be deterred from passing close to noisy activities which can effectively block some of the EIAR migration paths. In other instances, vertebrates and invertebrates that rely on vibration and noise senses to locate for, and hunt, prey may be forced to leave the vicinity of noisy, vibrating activities;
- An increase in pollution emissions and general litter may directly impact on the survival of individual plants, vertebrates and invertebrates; and
- Ground disturbances often leads to the dominance of alien species that dominate the area.

The project activities have not changed the expected disturbances to biodiversity at the MMT. The disturbance of biodiversity is long-term because where biodiversity is compromised, killed or removed from the area this impact is likely to exist beyond the life of the project. With management actions, most of these disturbances are short-term in nature and can be prevented/minimised and will cease at the end of the project life; however, any imbalances caused by disturbances will take some time to restore. Given that biodiversity processes are not confined to the MMT, the general disturbances will extend beyond the site boundary effecting floral and faunal habitats. Key related issues are the migration of species and linkages between biodiversity areas. Without any management actions, negatively impacting on biodiversity through multiple disturbance events is probable. With management actions, the probability can be reduced because most of the disturbances can be controlled through implementation and enforcement of practices, policies and procedures. Without management actions the significance of the incremental impact is expected to be **MEDIUM**. With management actions, the significance reduces to **VERY LOW** (see table below).

When considered cumulatively, the significance impact rating is **HIGH** in the unmitigated scenario, where the project results in an increase in the number of disturbances already present at the MMT. This contributes to further disturbances and loss of favourable habitat for faunal and floral populations. The severity can be reduced to **LOW** with management actions (see table below).

IMPACT SUMMARY

Issue: General disturbance of biodiversity		
Phases: Construction and operational phases		
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	• Incremental minor change (Low) • Cumulative prominent disturbance (High)	• Incremental (Very Low) • Cumulative minor disturbance (Low)
Duration	Long-term (High)	Short-term (Low)
Extent	Beyond the site boundary (Medium)	Beyond the site boundary (Medium)
Consequence	• Medium incremental consequence • High cumulative consequence	• Low incremental consequence • Medium cumulative consequence
Probability	Probable (High)	Possible (Medium)
Significance	• Medium incremental significance • High cumulative significance	• Very low incremental significance • Low cumulative significance
Nature of cumulative impacts	The project activities form part of the MMT on-going mining activities. On-going mining activities results in further disturbances and loss of favourable habitat for faunal and floral populations.	
Degree to which impact may cause irreplaceable loss of resources	Unlikely, with the implementation of management actions.	
Degree to which impact can be mitigated	High.	
Degree to which impact can be reversed	High with the implementation of management actions.	

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to prevent the unacceptable disturbance of biodiversity and related ecosystem functionality through general disturbance. The management outcome of the impact assessment is to limit the disturbance of biodiversity as far as possible.

MANAGEMENT ACTIONS

Implement the following management actions during the operational phase:

- The footprint and daily operation activities associated with the project activities must be strictly monitored to ensure that edge effects do not affect the surrounding floral and faunal habitat - specific consideration should be given to erosion control, prevention of soil compaction and alien invasive management;
- No vehicles are to encroach upon or move through the remaining natural habitat surrounding the NE Topsoil stockpile unless moving along designated roads;
- As much indigenous vegetation growth as possible should be promoted on the NE Topsoil stockpile in order to protect soils and prevent alien and invasive species from establishing. If this is not feasible then other suitable methods should be employed such as covering with hessian sheets in order to limit erosion activities (wind and water); and
- Alien and invasive species proliferation, which may affect the adjacent natural habitat within surrounding areas, needs to be strictly managed adjacent to the project footprint areas. Ongoing monitoring and eradication should take place throughout the operational phase of the development, and the footprint perimeters should be regularly checked during the operational phase for alien and invasive species proliferation to prevent spread into surrounding natural areas.
- There is training for workers on the value of biodiversity and the need to conserve the species and systems that occur at the MMT;
- Noisy and/or vibrating equipment will be well maintained to control noise and vibration emission levels;
- Dust control measures will be implemented as discussed under the air quality section in this appendix; and
- Pollution and litter prevention measures will be implemented as outlined in Table 34-1.

SURFACE WATER

ISSUES: ALTERATION OF NATURAL DRAINAGE PATTERNS

Information in this section was sourced from a review of available literature (SLR, June 2019).

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

DISCUSSION

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 mcm. Natural drainage across the MMT is via sheet flow. The project infrastructure has the potential to alter drainage patterns by reducing the volume of run-off into the downstream catchments. The runoff loss to the catchment as a result of the MMT (inclusive of project areas) is 0.4%. This is attributed to the high evaporation rates of the area. Any potential loss of runoff to the catchment associated with the project areas are therefore expected to be negligible. This impact has therefore been rated as being **INSIGNIFICANT**; however, the management actions outlined below are required to ensure this rating is achieved.

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to prevent unacceptable alteration of drainage patterns. The management outcome of the impact assessment is to ensure that the reduction of the volume of runoff into the downstream catchment is limited to what is necessary.

MANAGEMENT ACTIONS

Implement the following management actions during the operational phase:

- Operate and maintain mine infrastructure in a manner that ensures compliance with the provisions of the Regulation 704 of 1999 in terms of the NWA. These include:
  - *Separate clean and dirty water systems;*
  - *Minimise the size and extent of dirty water areas; and*
  - *Divert clean water (run-off and rainfall) around the mine/dirty areas and back into its normal flow paths in the environment.*
- Maintain the operational water balance for the mine in order to monitor water used at the MMT.

ISSUE: CONTAMINATION OF SURFACE WATER RESOURCES

Information in this section was sourced from a review of available literature (SLR, June 2019).

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil • Use of Adams pit for the storage of sinter de-dust

DISCUSSION

The project presents the potential for contamination sources to reach the nearest watercourses through:

- Sedimentation through erosion and runoff from the side slopes of the NE topsoil stockpile; and
- Run-off from the side slopes of the Adams pit stockpile containing the sinter de-dust.

The nearest watercourses to the project infrastructure include the ephemeral Vlermuisleegte River (located approximately 3 km west of MMT) and the ephemeral Witleegte River (located approximately 4 km northeast of

the MMT). Given the distance, ephemeral nature and that natural flow is in a north to north west direction away from these watercourses, it is highly unlikely that any potential contaminates would reach the nearest watercourses. In addition to this, any run-off from the Adams pit stockpile containing the sinter de-dust would be contained within the Adams pit. The potential for the project activities to contribute to the contamination of surface water resources is therefore negligible. This impact has therefore been rated as being **INSIGNIFICANT**; however, the management actions outlined below are required to ensure this rating is achieved.

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to prevent pollution of surface water resources. The outcome of the impact assessment is to ensure that pollution sources do not reach surface water resources.

MANAGEMENT ACTIONS

Implement the following management actions during all mine phases:

- The NE topsoil stockpile side slopes should be flat enough to promote vegetation growth and reduce runoff related erosion. Should erosion be noted, the slopes should be stabilised with geotextiles or other appropriate methods;
- All project related activities will remain within the boundary of the MMT Mining Right area; and
- Implement the emergency response procedure in Section 31.2.2 in the unlikely event of a potentially polluting discharge incident.

GROUNDWATER

ISSUE: CONTAMINATION OF GROUNDWATER RESOURCES REDUCING AVAILABILITY TO THIRD PARTIES

Information in this section was sourced from previous studies undertaken for MMT (SLR, June 2019), the Geochemistry Study (SLR, April 2020a) (included in Appendix E) and the Groundwater Study (SLR, April 2020b) compiled for the project (included in Appendix H).

DESCRIPTION OF IMPACT

The storage of sinter de-dust in Adams Pit presents a pollution source that may have the potential to pollute water resources through long term seepage of contaminants into the groundwater system. This in turn influences the use of groundwater resources by third parties for domestic and/or livestock watering purpose.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
N/A	
-	• Use of Adams pit for the storage of sinter de-dust

IMPACT ASSESSMENT

MMT and surrounding mines all contribute to the contamination of groundwater. This is demonstrated through the hydrocensus undertaken in 2002, 2005 and 2018 within a 15 km radius of the MMT. The hydrocensus water quality data shows elevated concentrations of EC, Na, Cl, SO_4, and NO3-N being unfit for lifetime human

consumption in terms of SANS241:2015. TDS and NO3-N concentrations exceed the DWS Livestock Watering Limits.

Chemicals of concern at the MMT include EC, Ca, Mg, C, Cl, SO_4, NO_3-N, Mn and B in terms of SANS 241:2015 drinking water standards. The water quality results also 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 concentrations of parameters that exceed the SANS 241:2015 and DWS Livestock Watering Limits are higher at the MMT than at third party boreholes.

Based on the results of the leach tests, chemicals of concern likely to leach from the sinter de-dust include B, TDS, EC, Cl and SO_4. With reference to the above, while similar chemicals of concern are noted at the MMT, not all the sinter de-dust chemicals of concern have been detected at elevated concentrations at third party boreholes off-site. This particularly applies to B.

The extent of the pollution plume emanating from Adams pit, modelled by GHT (GHT, August 2018) is illustrated in Figure 34-1. When considered incrementally, the project presents an additional contamination source, but does not present new chemicals of concern that already exceed domestic and livestock watering standards at the MMT. Groundwater contamination, is long-term in nature, occurring for periods longer than the life of the project (refer to Figure 34-2). Groundwater contamination can reach the groundwater resources underneath the MMT Mining Right area. This is confirmed through the GHT modelling (GHT, August 2018), which illustrates a pollution plume emanating from Adams pit. The pollution plume is however expected to remain within the MMT Mining Right area. This is verified where all the sinter de-dust chemicals of concern, in particular B, are not detected at elevated concentrations at third party boreholes. Third parties are unlikely to access water within the zone of the pollution plume. The incremental significance rating is expected to be **VERY LOW** with and without management actions (see table below).

When considered cumulatively, the storage of sinter de-dust further deteriorates the groundwater quality within the MMT footprint and as such is a **HIGH** significance in the unmitigated scenario. This high rating is linked to MMT and surrounding mines influencing the regional groundwater quality. This is demonstrated through the hydrocensus that indicates that groundwater is unsuitable for lifetime human consumption and may influence livestock depending on the duration of exposure to chemicals of concern and livestock condition. MMT's contribution to reducing the significance rating to **LOW** is through the implementation of the management actions outlined below.

IMPACT SUMMARY

Issue: Contamination of groundwater reducing availability to third parties		
Phases: Operational phase		
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	• Incremental minor change (Low) • Continuous exceedance of concentration limits (Very High)	• Incremental minor change (Low) • Continuous exceedance of concentration limits (Very High)

Issue: Contamination of groundwater reducing availability to third parties		
Phases: Operational phase		
Duration	Long-term (Very High)	Long-term (Very High)
Extent	• Incremental extent part of site (Very Low) • Cumulative extent far beyond site (Low)	• Incremental extent as part of site (Very Low) • Cumulative whole site extent (Low)
Consequence	• Medium incremental consequence • High cumulative consequence	• Medium incremental consequence • Medium cumulative consequence
Probability	• Unlikely incremental probability (Low) • Probable cumulative probability (High)	• Unlikely incremental probability (Very Low) • Conceivable cumulative probability (Low)
Significance	• Very Low incremental significance • High cumulative significance	• Very Low incremental significance • Low cumulative significance
Nature of cumulative impacts	MMT has the potential to contribute to the regional groundwater contamination impacts.	
Degree to which impact may cause irreplaceable loss of resources	Unlikely, with the implementation of management actions that provide an alternative resource for use.	
Degree to which impact can be mitigated	High	
Degree to which impact can be reversed	High likely. Post closure contaminants will continue to be drawn towards the pits up to the year 2085 (refer to Figure 34-2). While this EIAR focusses on the impacts limited to the operational phase only, these results have been mentioned for completeness purposes, given that MMT plans to remove the material from Adams Pit over time for re-processing, thereby eventually removing this contamination source.	
Residual impacts		

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to protect groundwater resources and prevent harm to other water users. The management outcome of the impact assessment is to provide an alternative source of water supply, where MMT's activities directly result in water being unsuitable for livestock watering purposes.

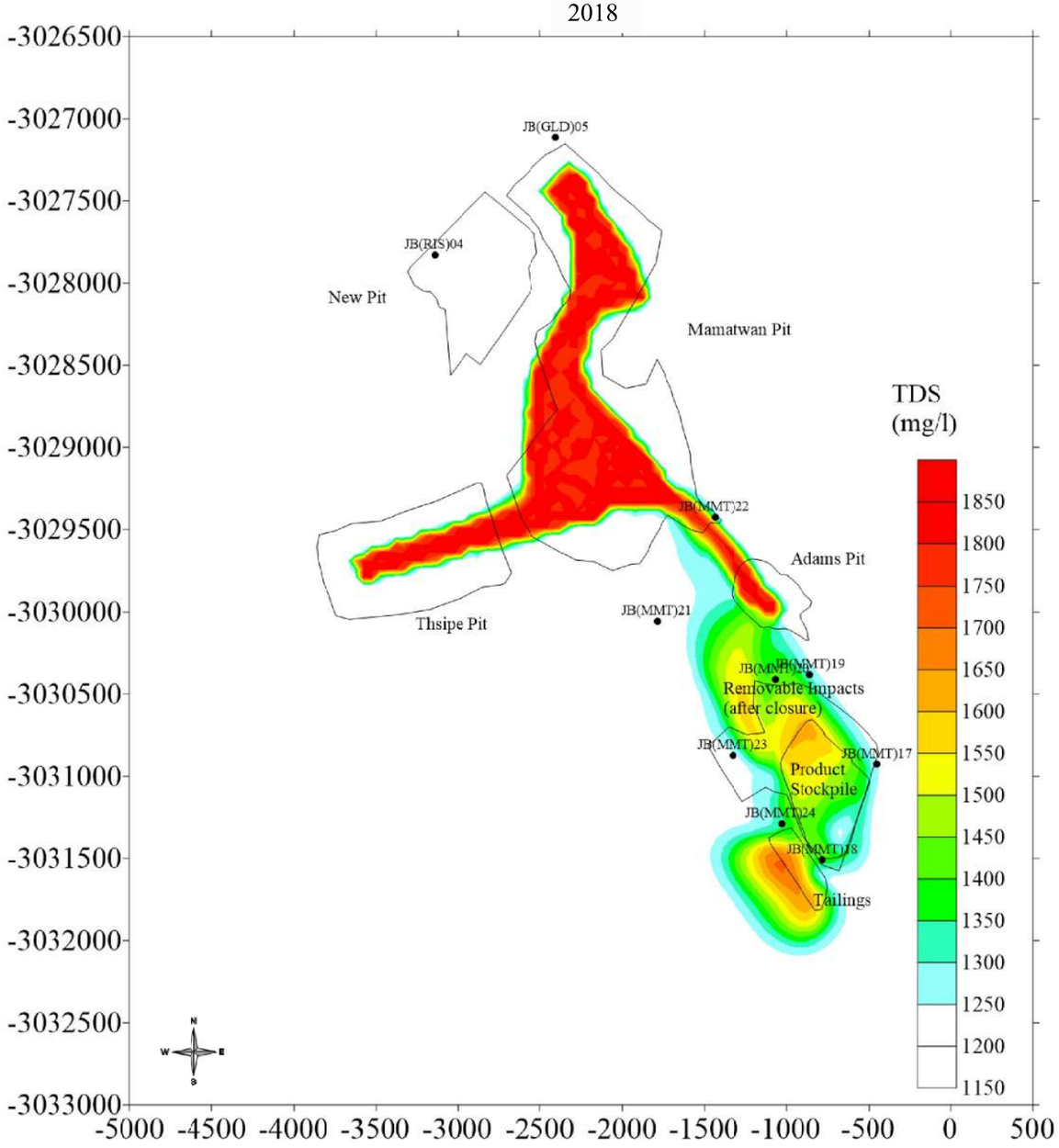
MANAGEMENT ACTIONS

Implement the following management actions during the operational phase:

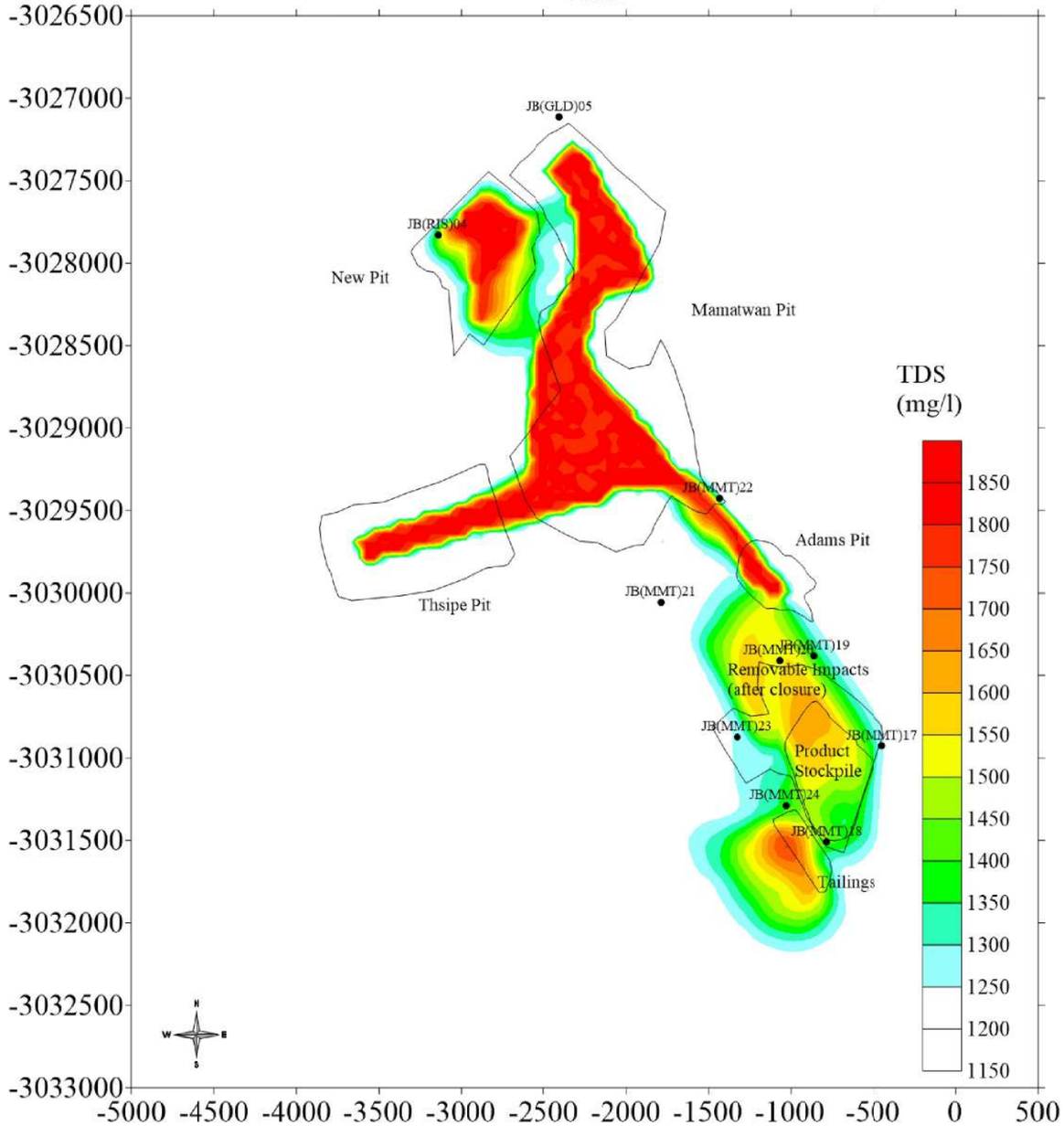
- Re-run the groundwater model periodically (frequency as specified by the DWS) as and when additional relevant data becomes available, in order to consider potential pollution impacts. Investigate additional management measures in consultation with a qualified specialist should modelling results indicate that groundwater contamination from Adams pit is migrating off-site;
- Continue to implement the groundwater monitoring programme as outlined in Section 30;
- In the event that the MMT project activities directly results in water being unsuitable for livestock watering purposes, an alternative supply will be investigated;

- Stormwater management measures will be established to redirect runoff water around Adams pit. This can be in the form of earth berms;
- MMT strives to identify offtake markets in order to re-process the material located in Adams pit as far as possible; and
- Implement the emergency response procedure in Section 31.2.2 in the event of a potentially polluting discharge incident.

2018

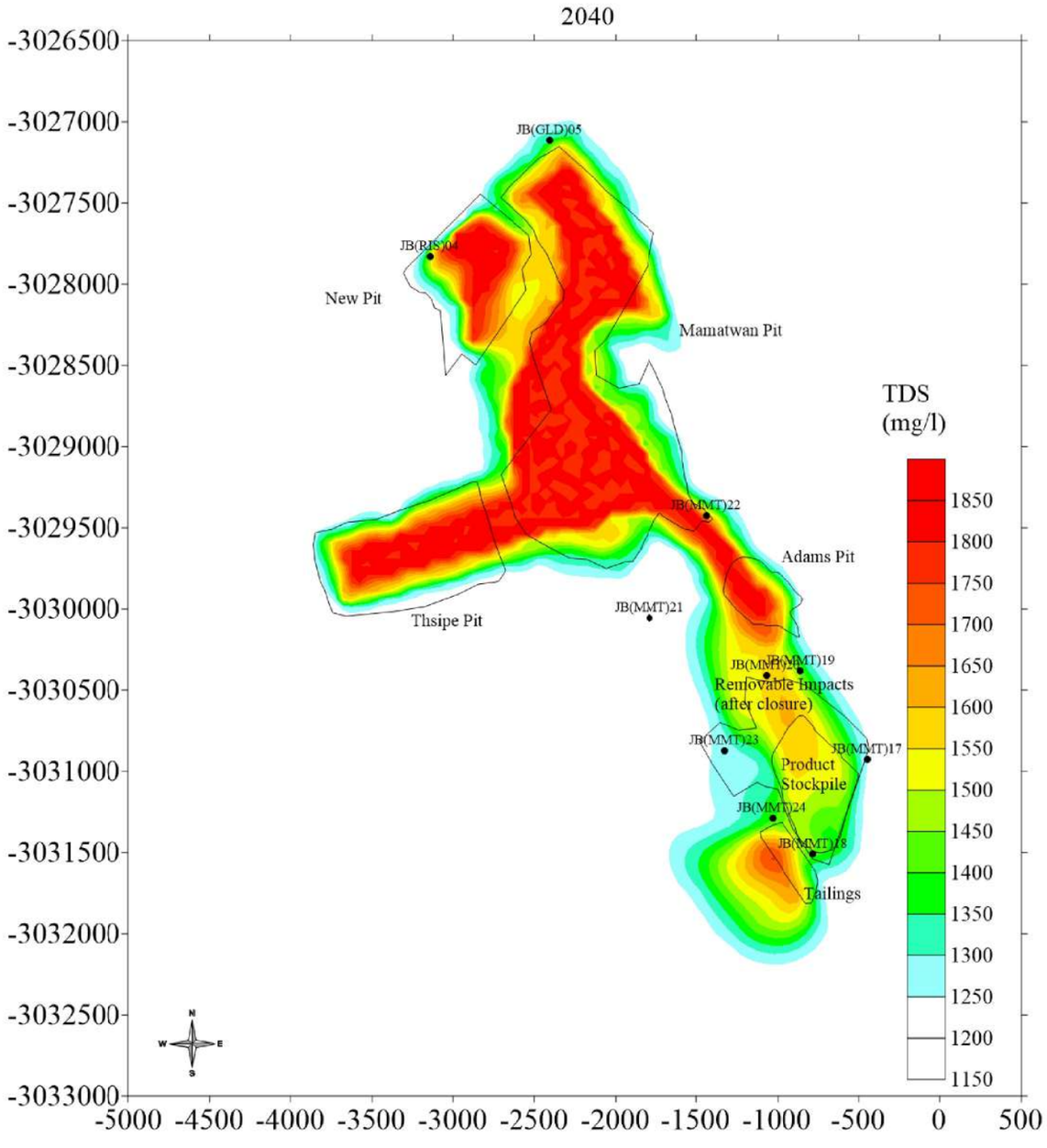


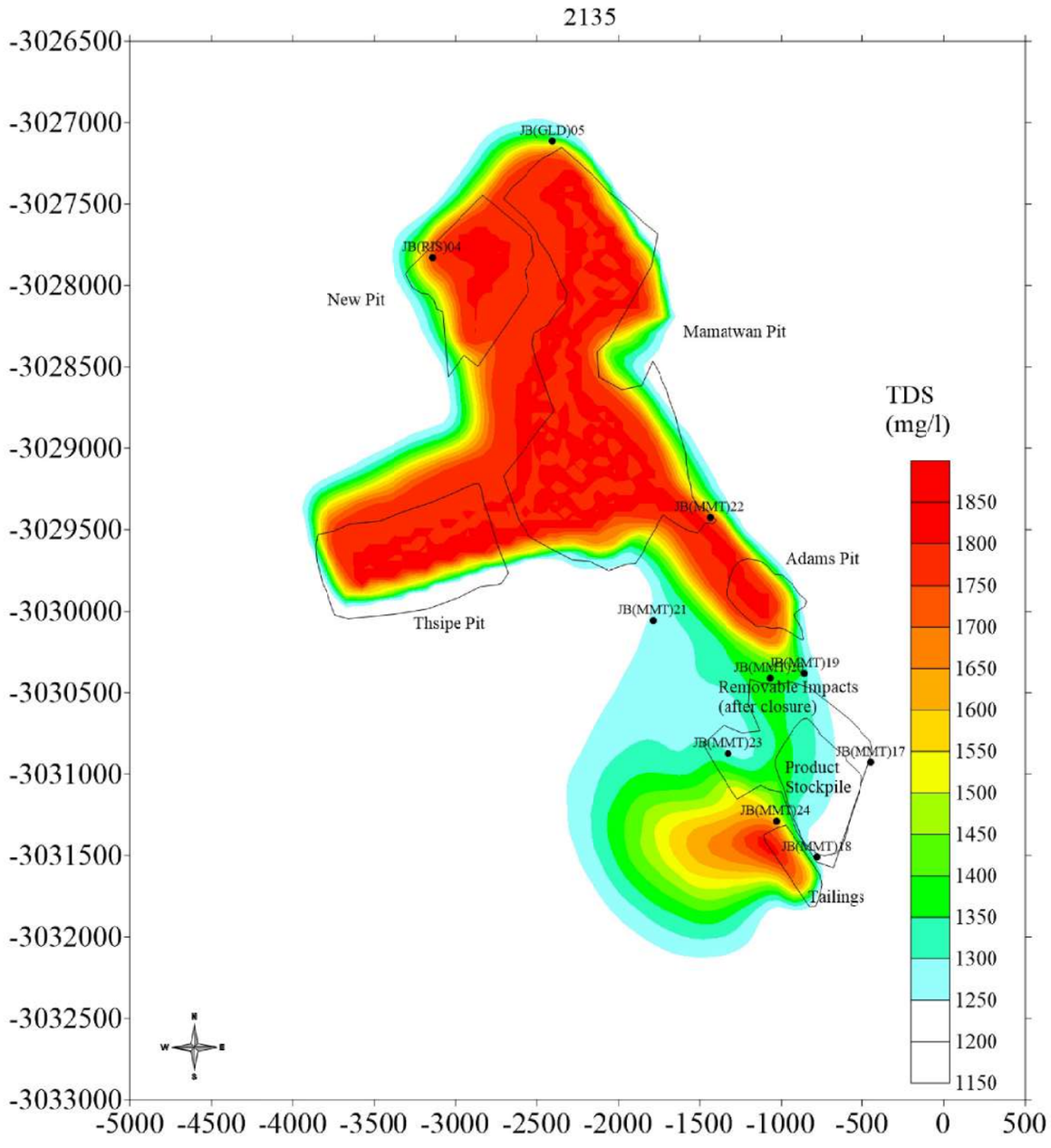
2035



CONTAMINATION PLUME
Year 2018 vs. Year 2035 (SLR, April 2018)

Date :	04/2020	Scale :	N.T.S
Project No :	720.19136.00002		FIGURE 34-1





CONTAMINATION PLUME
Year 2040 - Year 2135 (SLR, April 2018)

Date : 04/2020	Scale : N.T.S
Project No : 720.19136.00002	FIGURE 34-2

AIR QUALITY

ISSUE: AIR POLLUTION

Information in this section was sourced from the Air Quality Study compiled for the MMT (Airshed, September 2019a) included in Appendix I.

DESCRIPTION OF IMPACT

The project activities present emission sources that can have a negative impact on ambient air quality and surrounding land uses. One of these emission sources is dust fallout that has the potential to be a nuisance factor to sensitive air quality receptors. Dust fallout represents the coarse fraction >10µm of total suspended particles that can visually be seen by third parties. PM has the potential to contribute to health concerns as particulate matter with an aerodynamic diameter of less than 10µm (PM_{10}) and an aerodynamic diameter of less than 2.5µm ($PM_{2.5}$) is the finer inhalable fraction. Air pollution related impacts on biodiversity are discussed in the biodiversity section of this appendix.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

IMPACT ASSESSMENT

The following contributes to the generation of dust fallout and PM_{10} and $PM_{2.5}$ particularly during periods of high wind speeds when the wind speeds exceed at least 5.4 m/s:

- The transportation sinter-de dust and general waste (including rubble and used conveyor belts) to Adams pit;
- Tipping material into Adams pit;
- The exposed sinter de-dust material (associated with ripped de-dust bags) currently stockpiled in Adams pit and the stockpiled;
- The establishment of the NE topsoil stockpiled through vegetation clearing activities; and
- Windblown dust from exposed surfaces on the NE topsoil stockpile.

When considered incrementally, the generation of dust is limited to the life of the project activities after which the sources will be removed. Without management actions, the potential impact can extend beyond the MMT mine boundary. The dust fallout impact probability is linked to the probability of ambient concentrations exceeding the NDCR limits at potential air quality receptors off-site. The dust fallout monitoring results measured at MMT for the period 2018 to 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). It follows it is highly unlikely that exceedances of the NDCR would have been/are experienced at potential air quality receptors due to the project activities. Due to the temporary nature of land clearance activities it is unlikely that there would have been substantial dust generation that

exceeded the NDCR limits on a continuous basis. In the absence of dust fallout monitoring data for the period 2015 and 2016, when the NE topsoil stockpile was established, the probability of dust fallout exceeding NDCR limits is expected to be possible as a precautionary approach. With the implementation of management actions the probability of the impact reduces.

The prevailing wind direction is from the south-southwest and south. Under these conditions there is a potential for PM_{10} and $PM_{2.5}$ impacts to the north and north-northwest of the MMT. The low wind speeds associated with the prevailing winds, reduces the likelihood for windblown dust most of the time. The likelihood exists for wind erosion to occur when the wind speed exceeds at least 5.4 m/s, and this occurred only for 2% over the last three years (2015 -2017). Under these westerly high wind speed conditions, the potential exist for PM_{10} and $PM_{2.5}$ impacts to the east of MMT. Without management actions, the potential impacts can therefore extend beyond the MMT mine boundary. The health impact probability is linked to the probability of ambient concentrations exceeding the evaluation criteria at potential air quality receptors off-site. PM ambient concentrations are not monitored at air quality receptors off-site. The PM concentrations are likely to be high close to the source and decrease rapidly up to a distance of 250 m with no air quality sensitive receptors within this zone. This is informed by the very low dust fallout rates. However the ambient particulate concentrations are assumed to be higher with the potential to exceed the NAAQSs at the nearby AQSRs, but with mitigation measures in place these impacts should be limited to the MMT site resulting in compliance with the NAAQS at sensitive receptor locations. Further to this, exposed sinter de-dust within Adams pit is mostly expected to be contained within the pit given that the pit depth of tip-point is about 23 m below surface level allowing for pit retention. With the implementation of management actions the probability further reduces.

The incremental significance rating is expected to be **LOW** without management actions and **VERY LOW** with management actions (see table below).

When considered cumulatively, the project activities present additional emission sources that generate dust fallout when considered in the context of existing sources at the MMT. Dust fallout monitoring results measured at MMT for the period 2018 to 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).

Modelled results from the 2019 AIR indicated very low PM_{10} concentrations from the Sinter plant operations (Golder Associates Africa, 2019), but these results excluded the mining sources. Thus, the contribution from the mining operations, both from MMT and the neighbouring Tshipi Borwa Mine, are likely to result in significant off-site PM_{10} and $PM_{2.5}$ concentrations. The contributions from the various Section 24G activities (windblown dust from the open trucks, dust from tipping of material into the pit, windblown dust from the north-eastern topsoil stockpile and land clearing activities for the north-eastern topsoil stockpile) are likely to be concealed by the mining operations contribution. With mitigation in place at these activities, the contribution is likely to be low.

The cumulative rating remains **LOW** without management actions and **VERY LOW** with management actions (see table below).

IMPACT SUMMARY

Issue: Air quality		
Phases: Construction and operational phase		
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	• Incremental moderate change (Medium) • Moderate cumulative change (Medium)	• Incremental minor change (Low) • Cumulative minor change (Low)
Duration	Life of the project (Medium)	Life of the project (Medium)
Extent	• Incremental extent beyond the site (Medium) • Cumulative extent beyond site (Medium)	• Incremental extent part of site (Low) • Cumulative extent beyond site (Medium)
Consequence	• Medium incremental consequence • Medium cumulative consequence	• Low incremental consequence • Low cumulative consequence
Probability	• Possible incremental probability (Medium) • Possible cumulative probability (Medium)	• Conceivable incremental probability (Low) • Conceivable cumulative probability (Low)
Significance	• Low incremental significance • Low cumulative significance	• Very Low incremental significance • Very Low cumulative significance
Nature of cumulative impacts	The project activities present additional sources of emissions to the existing MMT operational activities and infrastructure.	
Degree to which impact may cause irreplaceable loss of resources	Unlikely, with the implementation of management actions.	
Degree to which impact can be mitigated	High	
Degree to which impact can be reversed	High likely with the implementation of management actions.	

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to prevent air pollution health and nuisance dust impacts. The management outcome of the impact assessment is to ensure that pollutants emitted remains within acceptable limits at sensitive receptors.

MANAGEMENT ACTION

Implement the following management actions during the operational phase:

- Water sprays should be used to keep surface material moist and wind breaks installed to reduce wind speeds over the area. Even though high wind speeds are limited, given that this is a dry environment, wind breaks are advised; and
- Any binding properties would reduce the potential for wind erosion from the NE topsoil stockpile. One of the most effective measures of minimizing wind erosion emissions is to vegetate the exposed areas and to re-vegetate when required to ensure full vegetation cover at all times. The control efficiency of vegetation

is given as 40% for non-sustaining vegetation and 90% for re-vegetation. Secondary rehabilitation would up the control efficiency to 60% for non-sustaining vegetation.

NOISE

ISSUES: INCREASE IN DISTURBING NOISE LEVELS

Information in this section was sourced from the Noise Study compiled for the project (Airshed, September 2019b) and included in Appendix J.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the NE topsoil stockpile	• Use of Adams pit for the storage of sinter de-dust • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts)

DISCUSSION

Noise generating activities/ equipment associated with the project activities include:

- The tipping of the material using trucks into Adams Pit; and
- Land clearing equipment and trucks as part of establishing the NE topsoil stockpile area.

Results of the background noise sampling undertaken in July 2019, at a time when mining operations were active and included noise generated as part of tipping material into Adams pit, indicate:

- Ambient baseline night-time and day-time noise levels were below the IFC guidelines for all sampled sites;
- Site 2 (Near farm homestead: Nic Fourie) and Site 5 (Farm workers residing near decommissioned Middelplaats Mine) exceeded the SANS 10103 (2008) night-time rural district limits and Site 4 (Adams Solar Farm) exceeded the night-time industrial SANS 10103 (2008) limit; and
- IFC night-time noise levels were below the IFC guidelines for all sampled sites.

Project activities associated with Adams pit were limited to day-time periods only. It follows that the above exceedances are unlikely to have been attributed to tipping material into Adams pit and were rather a result of the existing MMT and neighbouring mines (Tshipi Borwa Mine), night-time mining and processing activities. In terms of the NE topsoil stockpile, it is highly unlikely that land clearing activities would have resulted in a notable increase in ambient noise levels at noise sensitive receptors, when considered in the context of existing noise generated from MMT and neighbouring mines. The increase in noise levels at nearby noise sensitive receptors is expected to be negligible. This impact has therefore been rated as being **INSIGNIFICANT**; however, the management actions outlined below are required to ensure this rating is achieved.

MANAGEMENT OBJECTIVE AND OUTCOME

To prevent public exposure to disturbing noise. The management outcome of the impact assessment is to ensure that any noise generated as a result of the project remains within acceptable limits to avoid the disturbance of third parties.

MANAGEMENT ACTIONS

Implement the following management actions during all operational phase

- All diesel-powered equipment and plant vehicles should be kept at a high level of maintenance. This should particularly include the regular inspection and, if necessary, replacement of intake and exhaust silencers. Any change in the noise emission characteristics of equipment should serve as trigger for withdrawing it for maintenance;
- Equipment with lower sound power levels must be selected and MMT is required to guarantee optimised equipment design noise levels; and
- A noise complaints register must be kept on site.

VISUAL

ISSUE: NEGATIVE VISUAL VIEWS

Information in this section was sourced from the visual study undertaken for the project (SAS, October 2019b).

Adams Pit is located centrally within the existing MMT operations and is surrounded by WRDs, stockpiles and other mining infrastructure and is not visible to any sensitive receptors. Taking this into consideration, the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit is unlikely to generate negative visual views. It follows that the discussion below only focusses on the impact associated with the establishment of the NE topsoil stockpile.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the topsoil stockpile	• Storage of topsoil

DISCUSSION

The establishment of the NE topsoil stockpile altered the landscape character of the project footprint, which in turn presents additional infrastructure that generates negative visual views. It is, however, important to note that the visual landscape within the MMT area has been transformed due to the presence of approved mining infrastructure and activities. It follows that the NE topsoil stockpile is absorbed into current views of the MMT mining activities. In addition to this, sensitive receptors that reside in the area, such as farmers and farm workers, are accustomed to mining infrastructure given that the MMT is one of numerous mining operations located within the Gamagara Mining corridor. The potential to generate negative visual views is expected to be negligible. This impact has therefore been rated as being **INSIGNIFICANT**; however, the management actions outlined below are required to ensure this rating is maintained.

MANAGEMENT OBJECTIVE AND OUTCOME

The objective is to limit negative visual impacts. The management outcome of the impact assessment is to limit the generation of negative visual views.

MANAGEMENT ACTIONS

Implement the following management actions during the operational phase:

- The development footprint and disturbed areas surrounding the NE topsoil stockpile should be kept as small as possible and the areas cleared of natural vegetation and topsoil must be kept to a minimum;
- Existing vegetation, with particular reference to tall trees and larger shrubs adjacent to the R380 and in the vicinity of the topsoil stockpile area must be retained, in order to partly obscure the view toward the NE topsoil stockpile; and
- Should it be deemed feasible, the NE topsoil stockpile should be vegetated with indigenous species to reduce the visual impact of the soil contrast.

TRAFFIC

ISSUE: ROAD DISTURBANCE AND TRAFFIC SAFETY

The establishment of the NE topsoil stockpile and the use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust would not have generated additional traffic as these activities would have formed part of existing practices and as such project-related road disturbance and traffic safety impacts are not expected to occur. This issue is therefore not assessed further in this EIAR.

HERITAGE/CULTURAL AND PALEONTOLOGICAL RESOURCES

ISSUE: LOSS OF HERITAGE/CULTURAL AND PALAEONTOLOGICAL RESOURCES

Information in this section was sourced from the heritage/cultural study (PGS, October 2019a) and palaeontological exemption letter (PGS, October 2019b) compiled for the project and included in Appendix L.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

DISCUSSION

The activities associated with the project had the potential to destroy heritage/cultural and palaeontological resources, if present. With reference to Section 8.4.1.11, it is unlikely that any heritage/cultural resources would have been disturbed as part of the establishment of the NE topsoil stockpile. Adams pit was completely mined out by 1980. It follows that the disposal of general waste (including rubble and used conveyor belts) and the storage of sinter de-dust into Adams pit took place in an area that was extensively disturbed as part of historical operations and as such could not have impacted on heritage/cultural resources. In addition, there is a low possibility of

palaeontological resources occurring in the area. The potential of the project activities to destroy these resources is therefore negligible. This impact has therefore been rated as being **INSIGNIFICANT**; however, the management actions outlined below cover the steps to be taken in the unlikely event of a chance find.

MANAGEMENT OBJECTIVE AND OUTCOMES

To minimize the disturbance of heritage/cultural and paleontological resources. The outcome of the impact assessment is to protect heritage/cultural and paleontological resources where possible.

MANAGEMENT ACTIONS

Implement the following management actions during the operational and decommissioning phases of the activity:

- Consult a professionally registered heritage and/or palaeontological specialist to make associated recommendations that will be complied with prior to the removal or destruction of any heritage/cultural and palaeontological resources that may be discovered by chance; and
- Implement the emergency response procedure (Section 31.2.2) if there are any chance finds of heritage/ cultural or paleontological sites.

SOCIO-ECONOMIC

ISSUE: INWARD MIGRATION AND ECONOMIC IMPACT

The project activities/infrastructure forms part of existing approved operations and would not have generated any additional employment opportunities, and as such an increase in economic benefits due to project activities/infrastructure is expected to have been negligible. In addition to this, if no additional employment opportunities were created; negative project-related socio-economic impacts including inward migration are not expected to have occurred. This issue is therefore not assessed further in this EIAR.

LAND USE

ISSUE: CHANGE IN LAND USE

Information in this section was sourced from MMT and on-site observations and the project team.

IMPACT DISCUSSION

The project activities have the potential to affect land uses both within the MMT and in the surrounding areas. This can be caused by physical land transformation and through direct or secondary impacts.

PROJECT PHASE AND LINK TO PROJECT SPECIFIC ACTIVITIES/INFRASTRUCTURE

Construction	Operational
• Establishment of the topsoil stockpile	• Storage of topsoil • Use of Adams pit for the disposal of general waste (including rubble and used conveyor belts) • Use of Adams pit for the storage of sinter de-dust

IMPACT ASSESSMENT

The project activities are located within the existing MMT Mining Right Area and will not change the current land use. Surrounding land uses includes existing mining operations, agriculture (grazing), infrastructure (road, rail network, powerlines, water pipeline), solar plant and isolated farm homesteads. When considered incrementally, potential impacts on surrounding land uses and users is limited to the potential groundwater, biodiversity and air quality impacts. The impacts on surrounding land users do not differ from the existing MMT operations. Without management actions impacts would extend beyond the life of the project. These impacts extend beyond the site boundary. In the unmitigated and mitigated scenarios the probability of a change in surrounding land uses due to the project activities is possible and reduces with the implementation of management actions. The incremental significance rating is expected to be **LOW** without management actions and **VERY LOW** with management actions (see table below).

When considered cumulatively, the significance rating of the impact is **MEDIUM** without management actions given that the project results in an increase in the number of land use disturbances already present at the MMT. This contributes to further disturbances and change in land use when considered in the context that MMT is one of many mining operations located within the Gamagara Mining Corridor. The severity can be reduced to **LOW** with management actions (see table below).

IMPACT SUMMARY

Issue: Change in land use		
Phases: Construction and operational phase		
Criteria	**Without Mitigation**	**With Mitigation**
Intensity	• Incremental moderate change (Medium) • High prominent cumulative change (High)	• Incremental minor change (Low) • Cumulative moderate change (Medium)
Duration	Life of the project (Medium)	Life of the project (Medium)
Extent	• Incremental extent beyond the site (Medium) • Cumulative extent far beyond site (Medium)	• Incremental extent part of site (Low) • Cumulative extent far beyond site (Medium)
Consequence	• Medium incremental consequence • High cumulative consequence	• Low incremental consequence • Medium cumulative consequence
Probability	• Possible incremental probability (Medium) • Possible cumulative probability (Medium)	• Conceivable incremental probability (Low) • Conceivable cumulative probability (Low)
Significance	• Low incremental significance • Medium cumulative significance	• Very Low incremental significance • Low cumulative significance
Nature of cumulative impacts	The project activities present additional sources of emissions to the existing MMT operational activities and infrastructure.	

Issue: Change in land use	
Phases: Construction and operational phase	
Degree to which impact may cause irreplaceable loss of resources	Unlikely, with the implementation of management actions.
Degree to which impact can be mitigated	High
Degree to which impact can be reversed	High likely with the implementation of management actions.

MANAGEMENT OBJECTIVE AND OUTCOME

The objective of is to prevent unacceptable negative impacts on surrounding land uses. The management outcome of the impact assessment is minimising the impact on land uses as little as possible in order to prevent unacceptable impacts on surrounding land uses and the EIAR economic activity

MANAGEMENT ACTIONS

Communicate with neighbouring landowners and users as required to facilitate information sharing and management of environmental impacts associated with the project activities.

APPENDIX E: GEOCHEMICAL STUDY (SLR, APRIL 2020A)

APPENDIX F: SOILS AND LAND USE AND LAND CAPABILITY STUDY (SAS, OCTOBER 2019A)

APPENDIX G: TERRESTRIAL BIODIVERSITY STUDY (STS, OCTOBER 2019)

APPENDIX H: GROUNDWATER STUDY (SLR, APRIL 2020B)

APPENDIX I: AIR QUALITY STUDY (AIRSHED, SEPTEMBER 2019A)

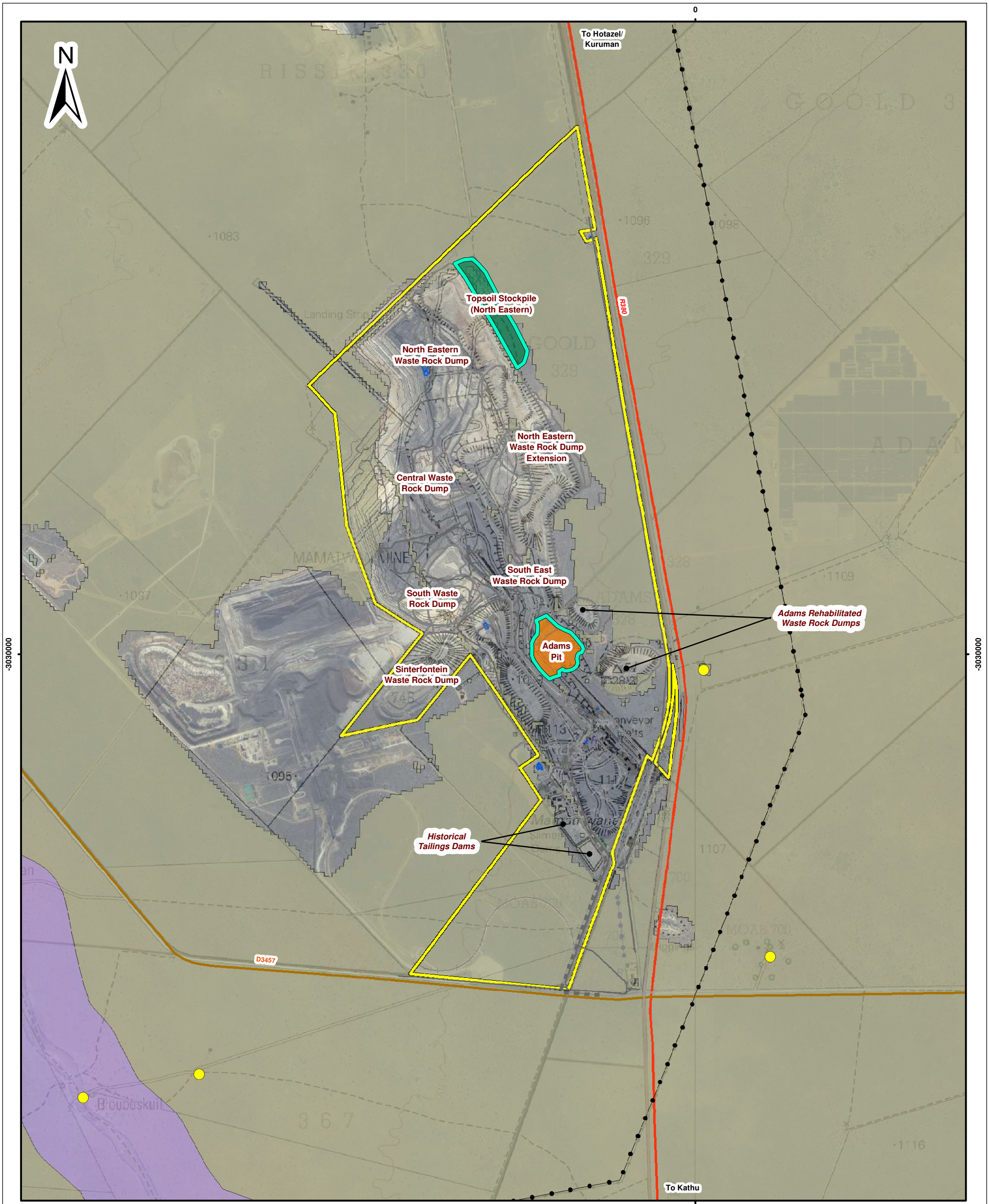
APPENDIX J: NOISE STUDY (AIRSHED, SEPTERMBER 2019B)

APPENDIX K: VISUAL STUDY (SAS, OCTOBER 2019B)

APPENDIX L: HERITAGE STUDY AND PALAEONTOLOGICAL EXEMPTION LETTER (PGS, OCTOBER 2019)

APPENDIX M: COMPOSITE MAP

Figure 34-3: Composite map



Legend

- Mamatwan Mining Right Area
- Current Infrastructure
- Section 24g Activities
- Main Roads
- Secondary Roads
- Power Line
- Potential Receptors

Sensitivity

- Intermediate
- Low

Critical Biodiversity Areas

- Ecological Support Area
- Other Natural Areas

0 300 600 Meters

Scale: 1:30 000 @ A3

Projection: Transverse Mercator

Datum: WGS1984, Lo23

Mamatwan Mine

Figure 34-3

Composite Map

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APPENDIX N: SOUTH32 CRISIS AND EMERGENCY MANAGEMENT PROCEDURES

APPENDIX O: FINANCIAL PROVISION (MMT, DECEMBER 2019)

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