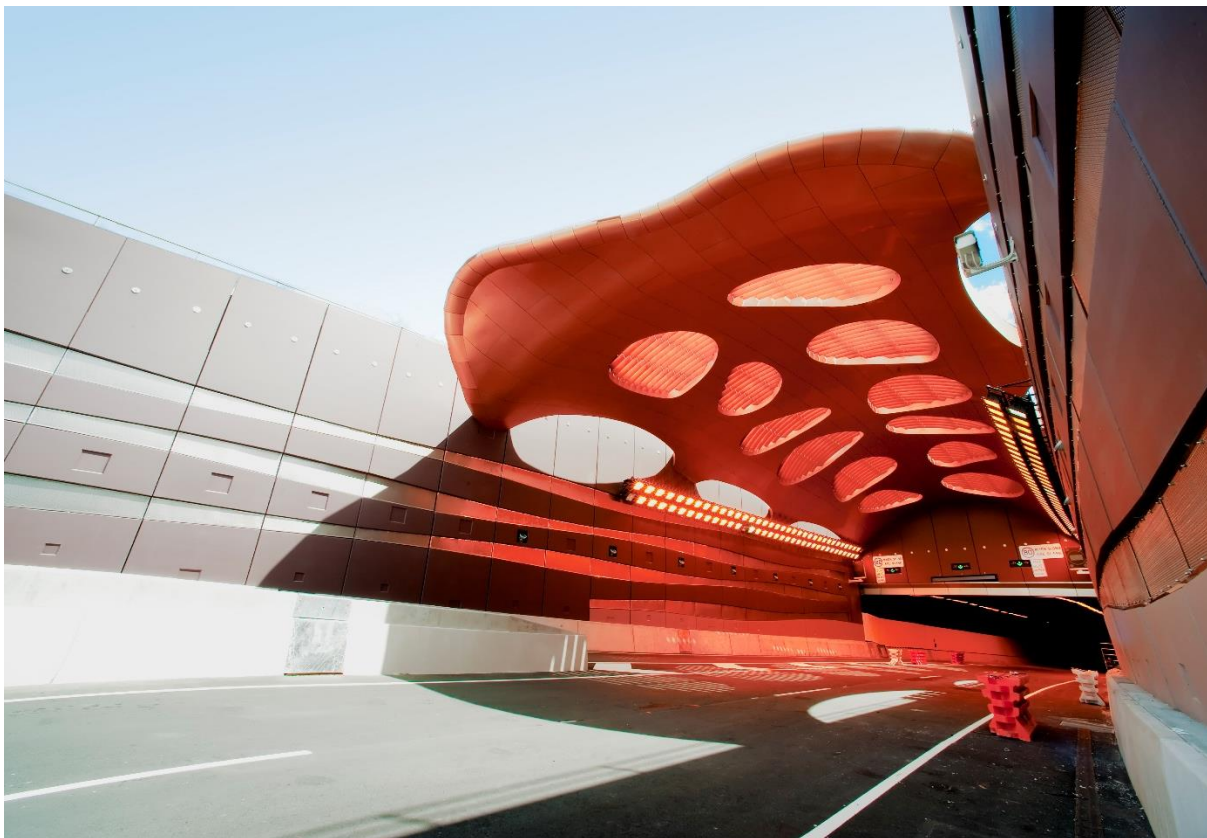


RUSTENBURG PLATINUM MINES LIMITED

# RUSTENBURG PLATINUM MINES LIMITED: MORTIMER SMELTER ENVIRONMENTAL MANAGEMENT PROGRAMME

2021-03

PUBLIC





# RUSTENBURG PLATINUM MINES LIMITED: MORTIMER SMELTER ENVIRONMENTAL MANAGEMENT PROGRAMME

RUSTENBURG PLATINUM MINES LIMITED

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This Environmental Management Programme Report (Report) has been prepared by WSP Environmental (Pty) Ltd (WSP) on behalf and at the request of Rustenburg Platinum Mines (Pty) Ltd (Client), to comply with the requirements provided for in the EIA Regulations, 2014.

Unless otherwise agreed by us in writing, we do not accept responsibility or legal liability to any person other than the Client for the contents of, or any omissions from, this Report.

To prepare this Report, we have reviewed only the documents and information provided to us by the Client or any third parties directed to provide information and documents to us by the Client. We have not reviewed any other documents in relation to this Report, except where otherwise indicated in the Report.

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# ACRONYMS AND ABBREVIATIONS

ABBREVIATION/ACRONYM	DESCRIPTION
AAP	Anglo American Platinum Limited
ABET	Adult Based Education and Training
BBBEE	Broad Based Black Economic Empowerment
BIC	Bushveld Igneous Complex
BMR	Base Metals Refinery
CARA	Conservation of Agricultural Resources Act (No. 43 of 1983)
CBD	Convention on Biological Diversity
Ca	Calcium
DEA	Department of Environmental Affairs
DEAT	Department of Environment Affairs and Tourism (erstwhile)
DME	Department of Minerals and Energy (erstwhile)
DMR	Department of Mineral Resources
DMS	Dense Media Separator
EC	Electrical Conductivity
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMPR	Environmental Management Programme
EMS	Environmental Management System
GNR	Government Notice Regulation
GMV	Ground Mobility Vehicles
HSA	The Hazardous Substances Act (No. 15 of 1973)
ha	Hectares
IEM	Integrated Environmental Management
IWWMP	Integrated Water and Waste Management Plan
I&APs	Interested and Affected Parties
km	Kilometres
ktpm	Kilotons per month
kV	Kilovolts

ABBREVIATION/ACRONYM	DESCRIPTION
K	Potassium
LHD	Load Haul Dump Vehicles
LoM	Life of Mine
LUP	Land Use Plan
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MHSA	The Mine Health and Safety Act (No. 29 of 1996)
ML	Mega litre
ML	Mining License
MQA	Mine Qualifications Authority
MPRDA	Minerals and Petroleum Resources Development Act (No. 28 of 2002)
MR	Mining Right
MW	Megawatt
Mg	Magnesium
m	Meter
mbgl	Meter below ground level
mm	Millimeters
m <sup>3</sup>	Cubic Metres
m <sup>2</sup>	Square Metres
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	The National Environmental Management Air Quality Act (No. 39 of 2004)
NEM:BA	The National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:WA	The National Environmental Management Waste Act (No. 59 of 2002)
NGOs	Non-Governmental Organisation
NHRA	The National Heritage Resources Act (No. 25 of 1999)
NQF	National Qualifications Forum
NWA	The National Water Act (No. 36 of 1998)
Na	Sodium
PGM	Platinum Group Metals
PAIA	The Promotion of Access to Information Act (No. 2 of 2000)
PES	Present Ecological State

ABBREVIATION/ACRONYM	DESCRIPTION
PMR	Precious Metals Refinery
P	Phosphorus
RPM	Rustenburg Platinum Mines Limited
RPM-US	Rustenburg Platinum Mines – Union Section
RWD	Return Water Dams
SANBI	South African National Biodiversity Institute
SANS	South African National Standards
SAHRA	South African Heritage Resources Agency
SAWB	South African Weather Bureau
SDF	Spatial Development Framework
SHEQ	Safety, Health, Environment, and Quality
SLP	Social and Labour Plan
S&EIR	Scoping and Environmental Impact Reporting
SO <sub>2</sub>	Sulphur Dioxide
tpm	Tonnes per month
TSF	Tailings Storage Facility
WQO	Water Quality Objectives
WRD	Waste Rock Dumps
WSP	WSP Environmental (Pty) Ltd

## DEFINITIONS

ABBREVIATION / ACRONYM	DESCRIPTION
Addendum/Amendment	Planned changes to the original Master EMPRs.
Care and Maintenance	An operation which has been mothballed and no longer produces.
Carved Out Operations	Operations removed from the company structure.
Concentrator	Industrial plant that produces concentrates from ores.
Life of Mine	The intended end date of mining operations.
Master EMPR	The original EMPR issued for the Mining Right Area (i.e. no amendments or addendums have taken place).
Operational	An existing operation (post construction) which continues to produce.
Reef	Layer of rock which contains mineral reserves.



ABBREVIATION / ACRONYM	DESCRIPTION
Retained Operations	Operations retained within the company structure.
Shaft	Vertical or near-vertical tunnel from the top down, where there is initially no access to the bottom. Used to extract ore material.
Smelter	A facility used to smelt concentrate matte in order to extract desired metals.
Tailings Storage Facility	Facility used for the storage of materials left over after the process of separating the valuable fraction from the uneconomic fraction of an ore.
Waste Rock Dump	Waste rock dumps are usually the most visual landforms left once mining ceases. The rock removed from shaft sinking and the rock layer above and below the targeted reef, is brought to the surface and stockpiled on a waste rock dump.

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# EXECUTIVE SUMMARY

Anglo American Platinum Limited (AAP) originated out of the unbundling of Johannesburg Consolidated Investment Company Ltd in 1995. During July 1997, the Amplats Group was restructured, which resulted in the renaming of the Rustenburg Platinum Holdings to Anglo Platinum Limited which has subsequently been retitled AAP and became the sole listed entity of the Group.

Market conditions faced by AAP have resulted in a restructuring process aimed at ensuring the long-term sustainability of its' business. This includes the divestment of operations no longer considered to be 'core' to the greater business given performance and the long-term goals of the business. The disinvestment aims to improve the AAP's financial sustainability by reconfiguring its operations to ensure focus on the 'core' business operations.

RPM, in the disposal process sold the Carved-Out Operations to a subsidiary of Siyanda Resources Proprietary Limited. In essence, RPM 'carved out' all RPM-US Mines, Shafts, and Concentrators and retained the Mortimer Smelter. In this regard, RPM re- categorised / restructured its Master EMPRs, and amendments and addenda thereto, and consolidates of all those EMPRs which are relevant to only to the Carved-Out Operations. Such 'carving out' will enable a single EMPR to govern the Carved Out Operations and a further single EMPR to govern the Smelter, and associated infrastructure (Retained Operations).

This report constitutes a consolidation of all those EMPRs which are relevant to only to the Retained Operations. The relevant EMPRs (and addendums/amendments) are listed in the table below.

**Table: RPM-US Retained Operations EMPRs**

NO.	ENVIRONMENTAL MANAGEMENT PROGRAMME	MASTER OR AMENDMENT/ADDENDUM OR CONSOLIDATION
1	Original RPM-US EMPR (EMPR reference RDNW(R)6/2/2/ (1039) EM), approved in January1996.	Master
2	Revised and Consolidated EMPR (EMPR reference RDNW (KL) 6/2/2(1039) EM), approved on 18 December 2007.	Master
3	Mortimer Smelter Furnace Upgrade (EMPR reference RDNW(KL)6/2/2/(1039)EM), approved February 2009.	Amendment/Addendum
4	Amendment of conditions in respect of an addendum to the approved EMP (EMPR reference RDNW(KL)6/2/2/1039), approved June 2010.	Amendment/Addendum
5	Approval of revised (amended) EMP in terms of section 102 of the MPRDA (RDNW(KL)6/2/2/(1039)EM), approved February 2012.	Amendment/Addendum
6	Approval of revised (amended) EMP in terms of section 102 of the MPRDA (RDNW(KL)6/2/2/(1039)EM), approved February 2012.	Amendment/Addendum

No new or amended activities are being accounted for as part of this process and as such no impact assessment was undertaken during the compilation of this report. The report is considered a consolidation of RPM-US's previously approved EMPR's (with specific reference to the Retained Operations). Each EMPR amendment/addendum was approved by the Department of Mineral Resources (DMR) therefore each project met the requirements of the legislation relevant at the time.

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## *APPENDICES*

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<b>A-2</b>	Jared O'Brien
<b>B</b>	CAPABILITY STATEMENT
<b>C</b>	EMERGENCY PREPAREDNESS AND RESPONSE PLAN
<b>D</b>	LATEST REGULATION 34 AUDIT
<b>E</b>	ENVIRONMENTAL AWARENESS PLAN
<b>F</b>	LATEST CLOSURE LIABILITY ASSESSMENT – DMR 2015 CERTIFICATE OF APPROVAL

# 1 INTRODUCTION

## 1.1 BRIEF MINE BACKGROUND

Anglo American Platinum Limited (AAP) originated out of the unbundling of Johannesburg Consolidated Investment Company Ltd in 1995. During July 1997, the Amplats Group was restructured, which resulted in the renaming of the Rustenburg Platinum Holdings to Anglo Platinum Limited which has subsequently been retitled AAP and became the sole listed entity of the Group.

Anglo American Platinum Limited: Rustenburg Platinum Mines – Union Section (RPM-US) was operating in the North West Province since 1949 and was managed by AAP as a joint venture between Rustenburg Platinum Mines (85% owned) and Bakgatla-Ba-Kgafela traditional community (15% owned) until 2017.

Market conditions faced by AAP have resulted in a restructuring process aimed at ensuring the long-term sustainability of its' business. This includes the divestment of operations no longer considered to be 'core' to the greater business given performance and the long-term goals of the business. The disinvestment aims to improve the AAP's financial sustainability by reconfiguring its operations to ensure focus on the 'core' business operations.

RPM, in the disposal process sold the Carved-Out Operations to a subsidiary of Siyanda Resources Proprietary Limited. In essence, RPM 'carved out' all RPM-US Mines, Shafts, and Concentrators and retained the Mortimer Smelter. In this regard, RPM re- categorised / restructured its Master EMPRs, and amendments and addenda thereto, and consolidates of all those EMPRs which are relevant to only to the Carved-Out Operations. Such 'carving out' will enable a single EMPR to govern the Carved Out Operations and a further single EMPR to govern the Smelter, and associated infrastructure (Retained Operations).

The Mining and Concentrator operations (Carved-Out Operations) will be referred to as **Part B** for the purposes of this report, and the Mortimer Smelter (Retained Operations) will be referred to as **Part A** for the purposes of this report. **Table 1-1** lists all carved out and retained operations.

**Table 1-1: RPM-US Operations**

PART A (RETAINED OPERATIONS)	PART B (CARVED OUT OPERATIONS)
<ul style="list-style-type: none"><li>– Mortimer Smelter</li><li>– Mortimer Slag Concentrator (a.k.a. Mortimer C Concentrator)</li><li>– Mortimer Slag Stockpile</li><li>– Fraser Dam and Excess Water Dams</li><li>– Laboratory</li></ul>	<p><b>Mining:</b></p> <ul style="list-style-type: none"><li>– Spud Shaft</li><li>– Richard Shaft</li><li>– Ivan Shaft</li><li>– Decline Shafts (No.1, No.2, and No.3)</li><li>– 4 South Decline Shaft</li><li>– 4 B Decline Shaft</li></ul> <p><b>Waste Rock Dumps:</b></p> <ul style="list-style-type: none"><li>– No.1 and No.2 Decline Shaft WRD</li><li>– No.3 Decline Shaft WRD</li><li>– Spud Shaft WRD</li><li>– Richard Shaft WRD</li><li>– Ivan Shaft WRD</li></ul> <p><b>Concentrators:</b></p> <ul style="list-style-type: none"><li>– Mortimer Concentrator</li><li>– Ivan Concentrator</li></ul>

**PART A (RETAINED OPERATIONS)****PART B (CARVED OUT OPERATIONS)**

	<b>TSF's:</b> <ul style="list-style-type: none"><li>— Ivan TSF (UG2 and Remined Tailings)</li><li>— Mortimer TSF</li><li>— Airfield TSF</li><li>— Old Ivan TSF (Merensky Tailings)</li><li>— Old Ivan TSF (Merensky and UG2 Tailings)</li></ul>
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This report focuses only on **Part A** operations. **Part A** operations are considered retained by RPM. This is a consolidated Environmental Management Programme Report of current commitments from previous EMPRs relevant only to the Retained Operations.

**Figure 1-1** provides a brief schematic diagram of the Mortimer Smelter Process. Only **Part A** of **Table 1-1** is discussed further in the report. **Part B** operations are considered carved out by RPM-US and thus form part of the carved out operations EMPR.

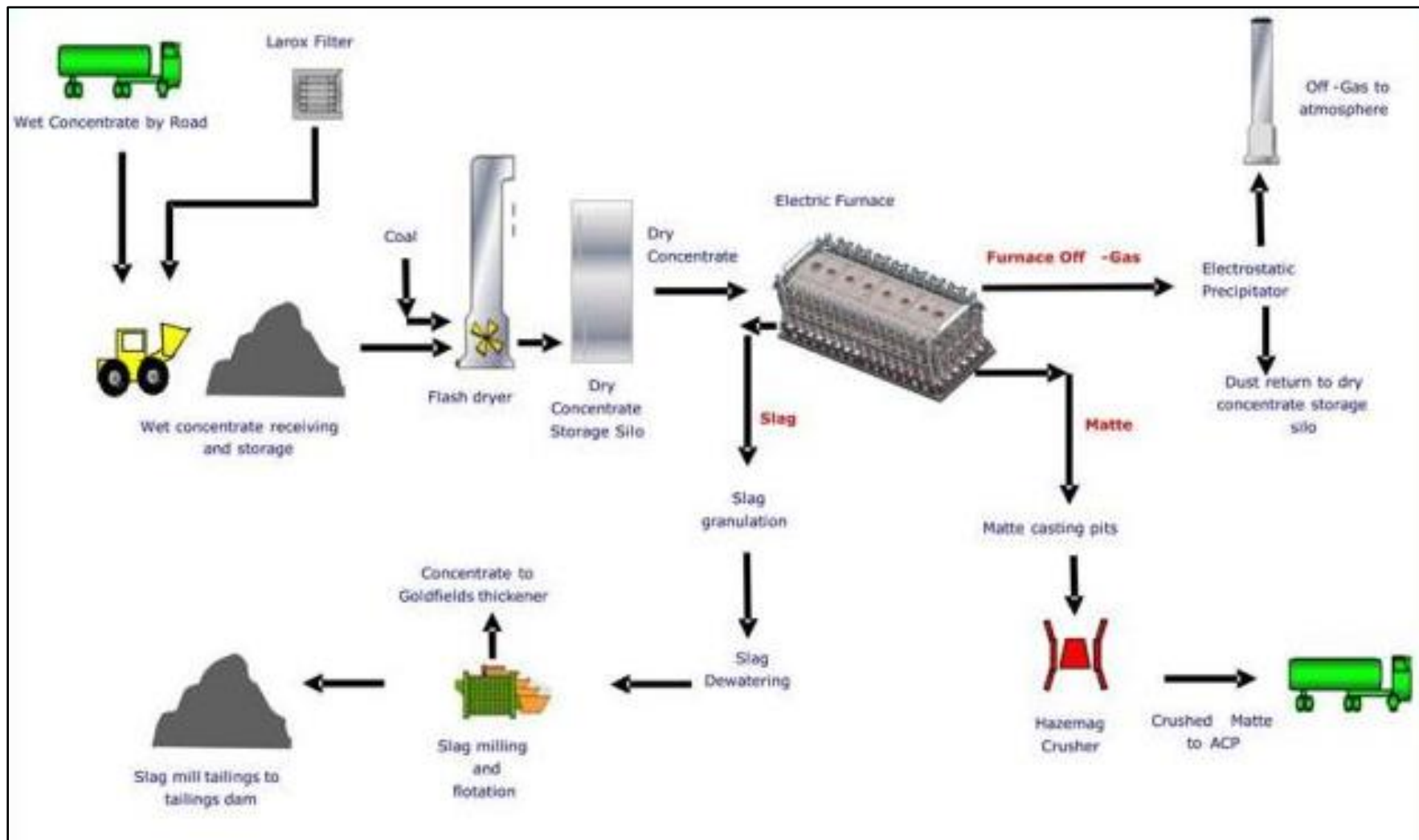


Figure 1-1: AAP Process Flow Chart (Part A)

## 1.2 PROJECT DESCRIPTION

**Table 1-2** outlines all the RPM EMPRs (including amendments and addendums) relevant to the Retained Operations. The table includes details on:

- The Parent Farm within which the project is located;
- The date on which the EMPR and EMPR addendum/amendment were approved.

**Table 1-2: RPM US EMPRs**

NO.	ENVIRONMENTAL MANAGEMENT PROGRAMME TITLE	PROPERTIES AFFECTED
1	Original RPM-US EMPR 1996	<ul style="list-style-type: none"> <li>— Zwartklip 405 KQ (Portion A and B)</li> <li>— Nooitgedacht No. 406 KQ</li> <li>— Portion 14 (a portion of Portion 10) of Portion 8</li> <li>— Remaining extent of Portion 9</li> <li>— Remaining Extent of Portion “A”</li> <li>— Portion 19 (a portion of Portion “A”)</li> <li>— Portion 12 (a portion of Portion 2 of Portion “A”)</li> <li>— Annandale No. 407 KQ</li> <li>— Kameelhoek No. 408 KQ Remaining Extent of Portion 4</li> <li>— Spitskop 410 KQ, Portion 1</li> <li>— Spitskop 410 KQ, Portion 2</li> <li>— Grootkuil 409 KQ</li> <li>— Haakdoorn 6 JQ</li> <li>— Turfbult 404 KQ</li> </ul>
2	Revision and Consolidation of all EMPRs 2007	<ul style="list-style-type: none"> <li>— Zwartklip 405 KQ (Portion A and B)</li> <li>— Nooitgedacht No. 406 KQ</li> <li>— Portion 14 (a portion of Portion 10) of Portion 8</li> <li>— Remaining extent of Portion 9</li> <li>— Remaining Extent of Portion “A”</li> <li>— Portion 19 (a portion of Portion “A”)</li> <li>— Portion 12 (a portion of Portion 2 of Portion “A”)</li> <li>— Annandale No. 407 KQ</li> <li>— Kameelhoek No. 408 KQ Remaining Extent of Portion 4</li> <li>— Spitskop 410 KQ, Portion 1</li> <li>— Spitskop 410 KQ, Portion 2</li> <li>— Grootkuil 409 KQ</li> <li>— Haakdoorn 6 JQ</li> <li>— Turfbult 404 KQ</li> </ul>
3	Mortimer Smelter Furnace Upgrade 2009	<ul style="list-style-type: none"> <li>— Turfbult 404 KQ</li> </ul>
4	Amendment of conditions in respect of an addendum to the approved EMP 2010	<ul style="list-style-type: none"> <li>— Turfbult 404 KQ</li> </ul>
5	Approval of revised (amended) EMP in terms of section 102 of the MPRDA 2012	<ul style="list-style-type: none"> <li>— Turfbult 404 KQ</li> </ul>

NO.	ENVIRONMENTAL MANAGEMENT PROGRAMME TITLE	PROPERTIES AFFECTED
6	Approval of the Retained Consolidated EMPR, 2017	<ul style="list-style-type: none"> <li>— Zwartklip 405 KQ (Portion A and B)</li> <li>— Nooitgedacht No. 406 KQ</li> <li>— Portion 14 (a portion of Portion 10) of Portion 8</li> <li>— Remaining extent of Portion 9</li> <li>— Remaining Extent of Portion “A”</li> <li>— Portion 19 (a portion of Portion “A”)</li> <li>— Portion 12 (a portion of Portion 2 of Portion “A”)</li> <li>— Annandale No. 407 KQ</li> <li>— Kameelhoek No. 408 KQ Remaining Extent of Portion 4</li> <li>— Spitskop 410 KQ, Portion 1</li> <li>— Spitskop 410 KQ, Portion 2</li> <li>— Grootkuil 409 KQ</li> <li>— Haakdoorn 6 JQ</li> </ul> <p>Turfbult 404 KQ</p>

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## 1.3 RPM OPERATION MOTIVATION

This section describes the benefits of each project and operation as defined in the original EMPR and subsequent amendments/addendums.

### MULTIPLIER EFFECT ON THE LOCAL, REGIONAL AND NATIONAL ECONOMY

As a result of the large quantity of jobs that have been created, the housing benefits provided to employees, and the fact that the product is being sold internationally, the local, regional and national economy has improved.

**Table 1-3** demonstrates the overall economic impact of RPM-US's expenditure on labour and intermediate inputs on various levels of the economy. As can be seen, local benefit amounts to only R 246.87 million (16.1 %) while net regional benefit is lower at R 190.10 million (12,4 %). The bulk of the benefit R 1 073.31 million (69.8 %) reports to the national economy while a very minor R26,39 million (1.7 %) benefits neighbouring countries.

### BENEFITS OF THE RPM-US OPERATION

#### ORIGINAL EMPR

The following operations and projects formed part of the original RPM-US EMPR:

- Shafts
  - Spud Shaft
  - Richard Shaft
  - Ivan Shaft
  - Existing Decline Shafts (No.1, No.2, and No.3)
  - 22 Vertical Shaft
  - 2 Vertical Shaft
  - Twane Shaft 4 Decline
- Waste Rock Dumps (WRD's)
  - No.1 and No.2 Decline Shaft WRD
  - No.3 Decline Shaft WRD
  - Spud Shaft WRD
  - Richard Shaft WRD
  - Ivan Shaft WRD
- Drilling and blasting
- Explosives bay and explosives destruction bay
- Grout plant
- Underground sanitation
- Opencast operations
- Mortimer Concentrator
  - Crushing, milling and dense media separator (DMS) plant
  - Floatation, thickening and filtration, reagent mixing and flash drying
- Ivan Concentrator
  - Crushing, milling and DMS plant
  - Floatation, thickening and filtration, reagent mixing and flash drying
- Laboratory



- TSF's
  - Ivan TSF
  - Old Ivan TSF
  - Mortimer TSF
- Building and associated infrastructure
- High-density single accommodation village
- Hospital
- Storage facilities
- Workshops (electrical workshop, mechanical and boiler making workshop)
- Sewage plants
  - No.1 and No.2 sewage plant
  - No.4 sewage plant
- Return water dams
  - Barberspan
  - Fraser Alexander Dam
  - Game Dam
- Solid waste disposal site (general waste landfill site)
- Transport (including hoisting, conveyors, roads and rail)

The benefit of these operations are still visible in the region, South Africa and internationally, although not explained in detail in the original EMPR.

#### **Additional Projects and Operations**

The benefits (of more recent projects and operations) are explained in **Table 1-4**. Note: the information in **Table 1-4** was extracted from the original EMPR amendments and the estimated capital may have already been invested in the project.

**Table 1-3: Aggregated Economic Impact of RPM-US on Different Levels of the Economy**

	SALARIES WAGES	AND PROCUREMENT	BENEFIT GOVERNMENT	TO ROYALTIES (PRIVATE)	SOCIO-ECONOMIC DEVELOPMENT (SED)	TOTAL						
	Actual	*Agg	Actual	Agg	Actual	Agg	Actual	Agg	Actual	Agg	R million	%
SADC	R 26.39	R 346.42	R 0.00	R 969.06	R 0.00	R 216.11	R 0.00	R 1.29	R 0.00	R 3.80	R 26.39	1.7 %
National	R 80.41	R 320.02	R 776.80	R 969.06	R 216.11	R 216.11	R 0.00	R 1.29	R 0.00	R 3.80	R 1 073.31	69.8 %
Regional (North West)	R 34.14	R 239.61	R 155.96	R 192.26	R 0.00	R 0.00	R 0.00	R 1.29	R 0.00	R 3.80	R 190.10	12.4 %
Local (Mine Community)	R 205.48	R 205.48	R 36.30	R 36.30	R 0.00	R 0.00	R 1.29	R 1.29	R 3.80	R 3.80	R 246.87	16.1 %
Total	R 346.42		R 969.06		R 216.11		R 1.29		R 3.80		R 1 536.67	100 %

\*Agg: Aggregated

**Table 1-4: Benefits (of more recent projects and operations)**

PROJECT AREA	PRODUCT MARKET	ESTIMATED EXPENDITURE	PROJECT ANNUAL FULL OPERATION	EXPENDITURE AT LABOUR FORCE AT FULL OPERATION
EMPR Amendment (2009)				
Mortimer Smelter Furnace Upgrade	Upgrade of the 18 megawatt 6-in-line electric furnace to 38 MW, resulting in an increased furnace throughput and an increase in the handling capacity of more than twice as much feed material that was processed (up to 360,000 tonnes).			

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## 1.4 LOCATION AND GENERAL SITE DESCRIPTION

Mortimer Smelter is located on the farm Turfbult 404 KQ in close proximity to the provincial boundary between the North West and Limpopo Provinces. It is located at the boundary between the Thabazimbi Local Municipality in the Limpopo Province and Moses Kotane Local Municipality in the North West Province. The mine areas are approximately 3 kilometres (km) to the north west of the Sifikile Village and 20 km west of Northam.

The distance and direction of RPM-US to neighbouring towns is presented in **Table 1-5**. Refer to **Figure 1-2** and **Figure 1-3** for the location of Mortimer Smelter.

**Table 1-5: Distance to Neighbouring Towns**

TOWN	DISTANCE (KM)
Northam	16
Dwaalboorn	56
Thabazimbi	66
Rustenburg	107

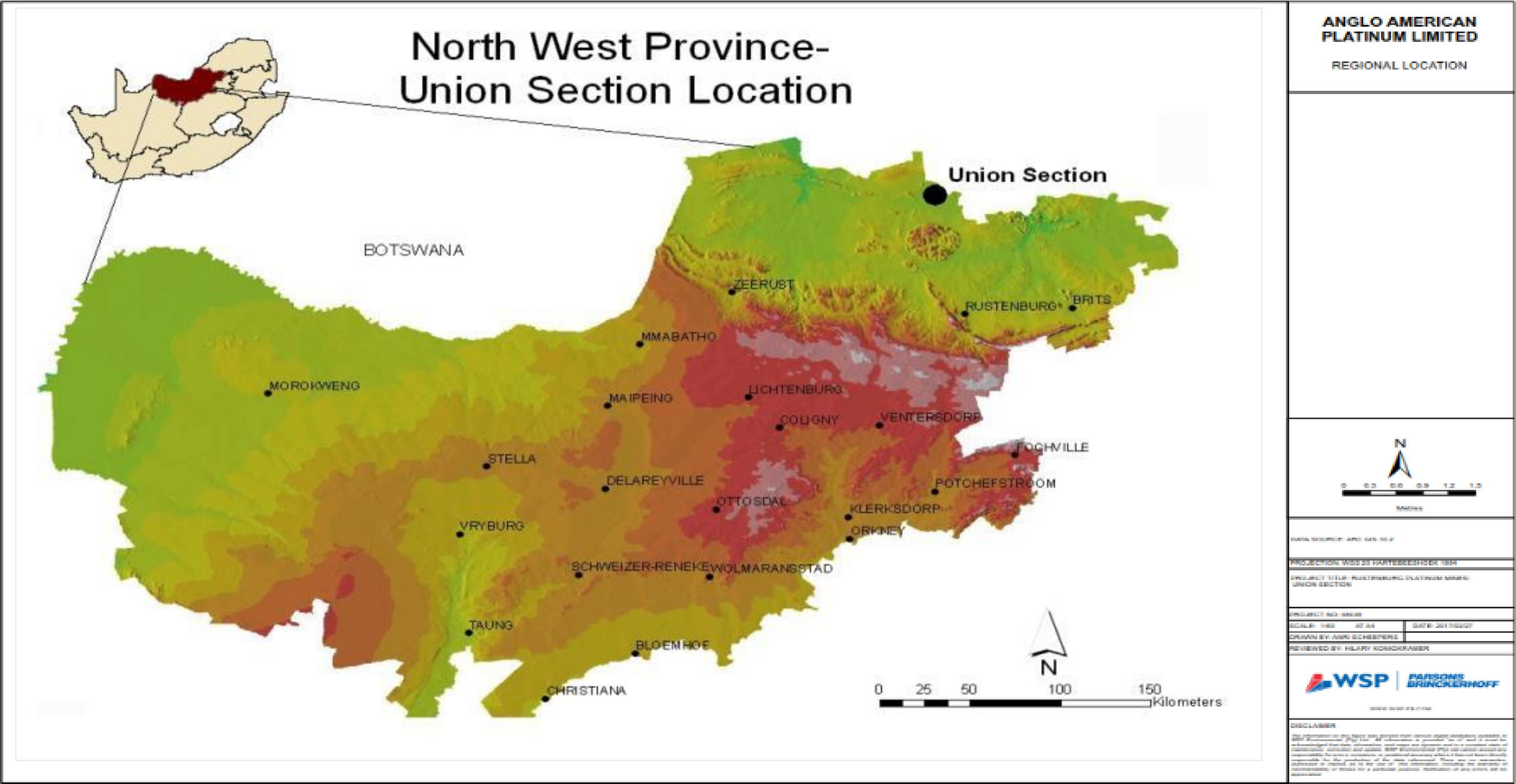










Figure 1-4: Retained Operations



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## 1.5 PURPOSE OF THE REPORT

This report has the purpose of presenting the EMPR commitments relevant to Mortimer Smelter (Retained Operations) in a consolidated manner. The environmental management measures are considered important to the reduction of the Operations environmental/social impacts during all project phases. The report will become the overarching comprehensive management tool/document for managers, co-ordinators and contractors taking responsibility of Mortimer Smelter.

The management measures/recommendations contained, must be applied to the Retained Operations until a closure certificate has been obtained (i.e. the commitments do not cease upon the completion of the operational phase).

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## 1.6 REPORT STRUCTURE

In order to achieve legal compliance as well as ensure the document is user friendly and can be amended relatively easily due to changing legal context or further changes to Mine plans, WSP Environmental (Pty) Ltd (WSP) devised a specific report structure. The structure takes into account the information required by the 2014 NEMA EIA Regulations as far as practically possible. **Table 1-6** and **Table 1-7** provide links between the requirements of the 2015 AAP EIA/EMPR procedure as well as the 2014 NEMA EIA Regulations.

It should be noted that this report categorises/restructures existing approved reports and Departmental authorisations. No material changes to the original Reports/Authorisations can be made. It should be noted that various legislative requirements required as part of the 2014 requirements did not exist during the approval phase of each project/EMPR. In certain cases the information required by the current EIA Regulations thus cannot be provided.

**Table 1-6: APP CTR-SHE-ENV-PRO-003 (Updated 2015) - EIAR/EMPR Report Content**

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
1.	Details of Environmental Assessment Practitioner (EAP).	<b>Section 1.9</b>	-
2.	Location of the activity [including 21 digit Surveyor General (SG) codes, physical address and name of property and coordinates of boundaries of property].	<b>Sections 1.4</b>	The physical address of the owner and operator is provided (not per operation). The name and contact details are provided for the manager of each specified operation. Due to the number of portions involved, only the parent farm names and numbers are provided. The SG codes can be provided upon Department request from the Surveyor General's office. A detailed figure is provided in <b>Section 1.4</b> defining the boundaries of Retained Operations and the locations of various plants and mining shafts.
3.	Plan which locates the proposed activity as well as associated structures and infrastructure.	<b>Sections 1.4</b>	A single consolidated figure is provided. Furthermore, aerial photographs indicating the various infrastructures within the said facility are provided.
4.	Description of the scope of the proposed activity.	<b>Sections 4</b>	The facilities/activities are existing. This report forms a consolidation of those projects completed since 1996.
5.	Description of the legislative and policy context.	<b>Section 3</b>	The legislation section includes reference to all the statutes which may have been applicable to the various projects during the LoM.



NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
6.	Motivation for need and desirability.	<b>Section 1.3</b> <b>Section 5</b>	Note: Current legislation requires a detailed project motivation. Certain of these requirements were not applicable at the time of EMPR approval. The No-go alternative has been briefly described in <b>Section 5</b> and a short motivation provided for this project (i.e. Retained Operations from the current RPM-US operations).
7.	Motivation for the preferred development footprint within approved site.	<b>Section 5</b>	As per <b>Point 6</b> .
8.	Full description of the process followed to reach the proposed development footprint.	-	Not required in legislation relevant at the time of approval.
9.	Assessment of each identified potentially significant impact and risk.	-	Comprehensive assessment undertaken during the environmental authorisation process specific to each project. Impact identification/ratings not provided as part of this report. This report is aimed at providing all management measures relevant to the Retained Operations. These measures address the impacts identified during the process.
10.	Summary of findings and impact management identified in specialist reports.	<b>Section 8</b>	This report forms a consolidated view of all management measures identified by the EAP/specialists.
11.	Environmental impact statement.	-	All impacts identified were presented in the project specific reporting. This report only references the measures required to mitigate those impacts.
12.	Recommendations from specialist reports.	<b>Section 8</b>	This report forms a consolidated view of all management measures identified by the EAP/specialists.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
13.	Final proposed alternatives.	Section 5	Depending on the legislative context at the time of the authorisation process, alternatives may or may not have been assessed. This report briefly touches on the 'No-go' alternative.
14.	Reasoned opinion as to whether the proposed activity should or should not be authorised.	-	Not included as this is a consolidation of already approved projects.

**Table 1-7: 2014 NEMA EIA Regulation EIAR/EMPR Report Content**

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
1.	Details of- <ul style="list-style-type: none"> <li>— The EAP who prepared the report; and</li> <li>— The expertise of the EAP, including curriculum vitae.</li> </ul>	Section 1.9 and Appendix A.	The section only refer to the EAP responsible for carving out the EMPRs (and addendums/amendments) relevant to the Mortimer Smelter. The EAPs responsible for the compilation of each of the project specific EMPRs since 1996, have not been detailed in this report.
2.	The location of the activity, including: <ul style="list-style-type: none"> <li>— The 21 digit Surveyor General code of each cadastral land parcel;</li> <li>— Where available, the physical address and farm name; and</li> <li>— Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties.</li> </ul>	Sections 1.4	The physical address of the owner and operator is provided (not per shaft/operation). The name and contact details are provided for the manager of each specified operation. Due to the number of portions involved, only the parent farm names and numbers are provided. The SG codes can be provided upon Department request from the Surveyor General's office. A detailed figure is provided in <b>Section 1.4</b> defining the boundaries of Mining areas and the locations of various plants and mining shafts.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
3.	<p>A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-</p> <ul style="list-style-type: none"> <li>— A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; and</li> <li>— On land where the property has not been defined, the coordinates within which the activity is to be undertaken.</li> </ul>	<b>Sections 1.4</b>	A single consolidated figure is provided. Furthermore, aerial photographs indicating the various infrastructures within the said facility are provided.
4.	<p>A description of the scope of the proposed activity, including-</p> <ul style="list-style-type: none"> <li>— All listed and specified activities triggered and being applied for; and</li> <li>— A description of the associated structures and infrastructure related to the development.</li> </ul>	<b>Sections 4</b>	The facilities/activities are existing. This report forms a consolidation of those projects completed since 1996.
5.	A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context.	<b>Section 3</b>	The legislation section includes reference to all the statutes which may have been applicable to the various projects during the LoM.
6.	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.	<b>Section 1.3</b> <b>Section 5</b>	Note: Current legislation requires a detailed project motivation. Certain of these requirements were not applicable at the time of EMPR approval. The No-go alternative has been briefly described in <b>Section 5</b> and a short motivation provided for this project (i.e. retained operations from the current RPM-US operations).
7.	A motivation for the preferred development footprint within the approved site.	<b>Section 5</b>	As per <b>Point 6</b> .
	A full description of the process followed to reach the proposed development footprint within the approved site, including:	-	Not required in legislation relevant at the time of approval.
	Details of the development footprint alternatives considered.	-	Not required in legislation relevant at the time of approval.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
	Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs.	<b>Section 7</b>	This report provides a high level understanding of the stakeholder engagement undertaken per project (i.e. the timeframes of each). The detailed process followed at the time of project initiation is included in the respective EMPR report. Legislative requirements at the time may have differed from project to project. It is the reader's responsibility to revert to the original project documents for detailed understanding of the stakeholder engagement process followed (including records of such).
	A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	-	Not provided within this report. The purpose of this report is to be a concise EMPR document relevant to only Retained Operations. Records of project specific stakeholder engagement is not considered core to the aim of this report.
	The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	<b>Section 6</b>	A consolidated baseline environmental/social description is provided which makes use of all the detailed baseline assessments undertaken per project authorisation process. The baseline section was extracted from the consolidated 2014 EMPR report.
	<p>The impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-</p> <ul style="list-style-type: none"> <li>— Can be reversed;</li> <li>— May cause irreplaceable loss of resources; and</li> <li>— Can be avoided, managed or mitigated.</li> </ul>	<b>Section 8</b>	The impact assessment was undertaken for each project specific process. The details in terms of nature, significance, consequence, extent, duration and probability may or may not have been included depending on the legislation applicable at the time of the authorisation. The mitigation measures devised for each project have been included in this report in a consolidated manner.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
	The methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks.	<b>Section 8</b>	This report does not detail the methodology used to rate the significance of the project specific impacts. However, the report does provide an indication as to how this report was devised.
	Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.	<b>Section 8</b>	As discussed above, the baseline description of the area is provided in <b>Section 8</b> .
	The possible mitigation measures that could be applied and level of residual risk.	<b>Section 8</b>	All RPM-US EMPRs and amendments / addendums were aligned and consolidated in 2014. Those mitigation measures relevant to the Retained Operations have been extracted from the 2014 report and inserted into this report in an effort to separate the operations from RPM-US's management.
	If no alternative development locations for the activity were investigated, the motivation for not considering such.	<b>Section 5</b>	This report briefly considers the no-go alternative. Detailed project specific descriptions must be obtained from the project specific reports.
	A concluding statement indicating the preferred alternative development location within the approved site.	-	Not detailed within this report.
8.	<p>A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including-</p> <ul style="list-style-type: none"> <li>— A description of all environmental issues and risks that were identified during the Environmental Impact Assessment process; and</li> <li>— An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.</li> </ul>	<b>Section 8</b>	Detailed impact assessments can be referenced in the original project documents. All relevant mitigation measures are included within this report in a concise manner.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
9.	An assessment of each identified potentially significant impact and risk, including- <ul style="list-style-type: none"> <li>— Cumulative impacts;</li> <li>— The nature, significance and consequences of the impact and risk;</li> <li>— The extent and duration of the impact and risk;</li> <li>— The probability of the impact and risk occurring;</li> <li>— The degree to which the impact and risk can be reversed;</li> <li>— The degree to which the impact and risk may cause irreplaceable loss of resources; and</li> <li>— The degree to which the impact and risk can be mitigated.</li> </ul>	-	No impact assessment detailed in this report. Detailed impact assessments can be referenced in the original project documents.
10.	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	<b>Section 8</b>	All recommendations made by the specialists during project planning, will form part of <b>Section 8</b> management measures.
11.	An environmental impact statement which contains- <ul style="list-style-type: none"> <li>— A summary of the key findings of the environmental impact assessment;</li> <li>— A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and</li> <li>— A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.</li> </ul>	-	All impacts identified were presented in the project specific reporting. This report only references the measures required to mitigate those impacts.
12.	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.	<b>Section 8</b>	All recommendations made by the specialists during project planning, will form part of <b>Section 8</b> management measures.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
13.	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment.	Section 8	The detailed project specific alternative assessments were provided in the project specific reporting. This report provides a detailed consolidated/concise view of all mitigation measures relevant to each Retained operation.
14.	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	Section 8	Section 8 considers all those measures not included in the EMPR authorisation document itself.
15.	A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed.	Section 9	All information regarding the current RPM-US operations was provided by the Applicant. It is assumed that this information is accurate.
16.	A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	-	Authorisation already provided by the authority. All projects relating to the EMPR are operational.
17.	Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised.	Section 8	This report considers operational management measures/aspects.
18.	An undertaking under oath or affirmation by the EAP in relation to: <ul style="list-style-type: none"> <li>— The correctness of the information provided in the reports;</li> <li>— The inclusion of comments and inputs from stakeholders and I&amp;APs;</li> <li>— The inclusion of inputs and recommendations from the specialist reports where relevant; and</li> <li>— Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.</li> </ul>	Section 14	The EAP acknowledges the contents of this report to be accurate to the knowledge of the EAP. This acknowledgement makes reference to the reliance on the correctness of the information contained within the EMPR authorisation processes undertaken since 1996 as well as the compilation of the 2014 Consolidated EMPR.
19.	Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts.	Section 13	In line with NEMA requirements.

NO.	REQUIREMENT	SECTION REFERENCE	COMMENT
20.	An indication of any deviation from the approved scoping report, including the plan of study, including- <ul style="list-style-type: none"> <li>Any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and</li> <li>A motivation for the deviation.</li> </ul>	-	Not relevant to this report.
21.	Any specific information that may be required by the competent authority.	-	Any specific information request was included at the time of the authorisation.
22.	Any other matters required in terms of section 24(4)(a) and (b) of the Act.	-	No other matters considered relevant.



## 1.7 BRIEF LEGAL BACKGROUND

RPM-US's original EMPR was approved in 1996 in terms of the Minerals Act (No. 50 of 1991) (Ref No. RDNW (KL) 6/2/2 (1039) EM). Subsequently, a number of EMPR amendments were developed and approved for mining and processing activities and areas that were not included in the approved 1996 EMPR. **Table 1-8** lists the EMPRs subsequent to the Consolidation.

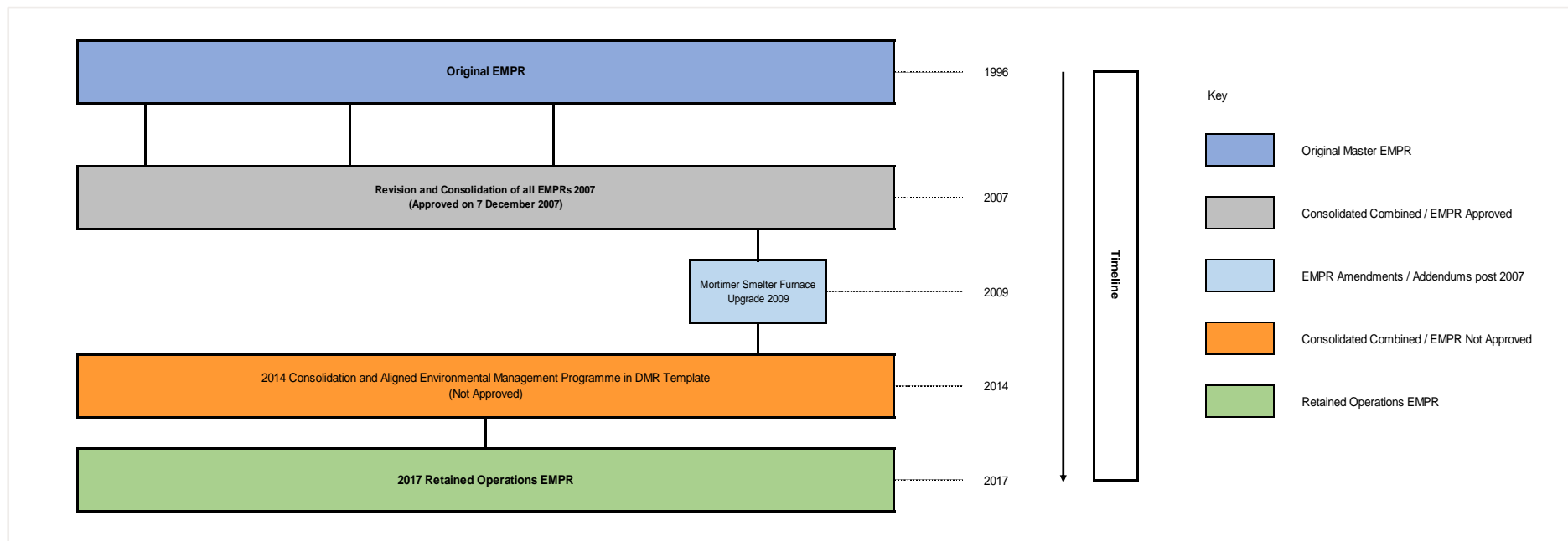
**Table 1-8: PRM-US EMPRs**

EMPR	REFERENCE NUMBER	YEAR APPROVED
Combined 2007 Mining and Concentrator EMPR (Approved on 7 December 2007)	RDNW(KL)5/2/2/1039	December 2007
Mortimer Smelter Furnace Upgrade	RDNW(KL)6/2/2/2/(1039)EM	February 2009
Amendment of conditions in respect of an addendum to the approved EMP	RDNW(KL)6/2/2/1039	June 2010
Approval of revised (amended) EMP in terms of section 102 of the MPRDA	RDNW(KL)6/2/2/1039 EM	February 2012

The MPRDA was promulgated in 2002 and required a more comprehensive stakeholder engagement process and environmental impact assessment for an EMPR / EMPR amendment. A number of separate EMPR amendment processes were undertaken following the promulgation of the MPRDA.

In 2007 the Original RPM-US EMPR and all amendments/addendums were consolidated into a single document. The 2007 consolidation was approved on 7 December 2007 by the DMR. The consolidation was undertaken to assist Mine management. Following the consolidation process, a further three amendments/addendums were completed and authorised. **Figure 1-5** includes a detailed chronological diagram of all relevant Retained EMPRs and amendments/addendums.

As part of the new order mining right conversion process RPM-US received a Directive from the North West DMR on 14 October 2013 requesting the mine to submit an EMPR in line with the requirements of the MPRDA by 31 March 2014. The consolidated and aligned RPM-US EMPR was finalised and submitted to the DMR in 2014. The document included both RPM-US Mining Operations and Processing Operations in a single document.



**Figure 1-5: Master EMPRs and Relevant Amendments / Addendum**

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## 1.8 PROJECT APPLICANT

### NAME AND ADDRESS

**Table 1-9** details the name and address of Mortimer Smelter.

**Table 1-9: Smelter Name and Address**

NAME	ANGLO AMERICAN PLATINUM LIMITED: RUSTENBURG PLATINUM MINES – MORTIMER SMELTER AND ASSOCIATED INFRASTRUCTURE
Postal Address	MORTIMER SMELTER Private Bag X351 Swartklip 0370 South Africa

### OWNER

**Table 1-10** details the name and address of the owner of Mortimer Smelter.

**Table 1-10: Owner of Mortimer Smelter**

NAME	ANGLO AMERICAN PLATINUM LIMITED
Postal Address	P.O. Box 62179, Marshalltown, 2107

### MANAGER/RESPONSIBLE PERSON

**Table 1 11** details the names and contact details of the responsible personnel at Mortimer Smelter.

**Table 1-11: Details of Responsible Persons**

RPM-US MANAGEMENT POSITION	NAME RESPONSIBLE PERSON	OF CONTACT DETAILS
Senior General Manager	Andor Esbach	andor.esbach@angloamerican.com
Head of Mortimer Smelter	Sam Ngaka	sam.ngaka@angloamerican.com
Surface Rights Manager	Jacob Modiba	jacob.modiba@angloamerican.com
Lead Environment	Hermanus Prinsloo	hermanus.prinsloo@angloamerican.com
Environmental Manager: Process operation	Dustin van Helsdingen	dustin.vanhelsdingen@angloamerican.com

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## 1.9 ENVIRONMENTAL ASSESSMENT PRACTITIONER/CONSULTANT

WSP is one of the world's leading professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, architects, planners, surveyors and environmental specialists, as well as other design, program and construction management professionals. We design lasting solutions in the Transportation &

Infrastructure, Property & Buildings, Environment, Power & Energy, Resources and Industry sectors, as well as offering strategic advisory services. Our talented people around the globe engineer projects that will help societies grow for lifetimes to come.

In Africa, WSP, Environment, is a leading environmental consultancy with a broad range of expertise and over 23 years' experience in the regional market. As part of a global business, we provide the marketplace with a dynamic blend of local knowledge and global expertise.

We offer independent, insightful and professional advice to our clients to achieve a balance between environmental protection, social desirability and economic development.

We have a reputation for delivery and excellence and provide a diverse range of integrated and innovative solutions to both public and private sector clients across the industrial, mining, infrastructure and financial sectors.

Refer to **Appendix B** for a copy of WSP's Capability Statement. Curriculum vitae of the consultants have been included in **Appendix A. Table 1-12** contains the consultants contact details.

**Table 1-12: Details of the Consultant/EAP**

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<b>Company</b>	WSP	
<b>Position</b>	Senior Consultant	Project Manager
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## 2 METHODOLOGY

EMPR and associated amendments/addendums are existing authorisations. Each EMPR Amendment/Addendum process was accompanied by an impact assessment during the compilation of each (commencement year of each varies). No new or amended activities are being accounted for as part of this process.

The 2014 EMPR Consolidation process resulted in a combined general environmental commitments section followed by an operation specific environmental commitments section for each operation type (i.e. mining, concentrating, etc). The general environmental commitments section is considered relevant to the Retained Operations. The 2014 consolidated EMPR report general environmental commitments section remains as is in this report (all commitments are considered relevant).

In addition to the general environmental commitments section, the 2014 consolidated EMPR report included commitments tables specific to each type of operation. Each of the relevant tables were transferred to this report, without review.

It should be noted that this process does not require the compilation of a Scoping Report or an EIA Report. The report is considered a consolidation of RPM-US's previously approved EMPR's (with specific reference to the Retained Operations). Each EMPR Amendment/Addendum was approved by the DMR therefore each project met the requirements of the relevant legislation.

This report will not be subject to a round of stakeholder review as the report does not affect any changes to authorised commitments (i.e. not considered an update process). This report only draws out all relevant sections from the RPM-US Consolidated EMPR to generate a Retained Operations specific 'Consolidated EMPR'.

## 3 LEGAL FRAMEWORK

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### 3.1 NATIONAL LEGISLATION

The following environmental, health and safety legislation and guidelines are integrated into the EMPR process to ensure legal compliance and best practice:

- The Constitution of the Republic of South Africa (No. 108 of 1996);
- The National Environmental Management Act (No. 107 of 1998) (NEMA);
- The National Environmental Management Air Quality Act (No. 39 of 2004) (NEM:AQA);
- The National Environmental Management Waste Act (No. 59 of 2002) (NEM:WA);
- The National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA);
- The National Water Act (No. 36 of 1998) (NWA);
- The National Heritage Resources Act (No. 25 of 1999) (NHRA);
- Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA);
- The Hazardous Substances Act (No. 15 of 1973) (HSA);
- The Promotion of Access to Information Act (No. 2 of 2000) (PAIA); and
- Principles of Sustainable Development.

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#### 3.1.1 *Constitution of the Republic of South Africa (No. 108 of 1996)*

In terms of Section 24 of the Constitution of the Republic of South Africa (Act No. 108 of 1996) everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislation and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while prompting justifiable economic and social development.

In terms of Section 7 of the Constitution, a positive obligation is placed on the State to give effect to the environmental right. The environmental right states that:

“Everyone has the right –

- To an environment that is not harmful to their health or well-being; and
- To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
  - Prevent pollution and ecological degradation;
  - Promote conservation; and
  - Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

The needs of the environment, as well as affected parties, must be integrated into the overall project management in order to fulfil the requirements of the Constitution.

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### 3.1.2 NATIONAL ENVIRONMENTAL MANAGEMENT ACT (NO. 107 OF 1998)

The NEMA is South Africa’s overarching environmental legislation and has, as its primary objective, to provide for cooperative governance by establishing principles for decision making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions exercised by organs of state and to provide for matters connected therewith.

The principles of the Act include:

- Environmental management must place people and their needs at the forefront of its concern;
- Development must be socially, environmentally and economically sustainable;
- Environmental management must be integrated, acknowledging that all elements of the environment are linked and interrelated;
- Equitable access to environmental resources to meet basic human needs and ensure human well-being must be pursued;
- Responsibility for environmental health and safety consequences of a project or activity exists throughout its life cycle;
- The participation of all interested and affected parties in environmental governance must be promoted;
- Decisions must take into account the interests, needs and values of all interested and affected parties;
- The social, economic and environmental impacts of activities, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment;
- Decisions must be made in an open and transparent manner, and access to information must be provided in accordance with the law;
- The environment is held in a public trust for the people, the beneficial use of environmental resources must serve the public interest and the environment must be protected as the people’s common heritage;
- The cost of remedying pollution, environmental degradation and consequent adverse health effects must be paid for by the parties responsible for harming the environment; and
- Sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar eco-systems require specific attention in management and planning procedures, specifically where they are subject to significant human resource usage and development pressure.

The NEMA also provides for the right to an environment that is not harmful to the health and well-being of South African citizens; the equitable distribution of natural resources, sustainable development, environmental protection and the formulation of environmental management frameworks.

As per the requirements of Section 24 of the NEMA, specific activities require environmental authorisation. These activities are listed in the EIA Regulations of 2014, with specific reference to Government Notice Regulation (GNR) 983, 984 and 985. Activities listed in GNR. 983 require that a Basic Assessment (BA) process be undertaken, whereas activities listed in GNR. 984 require that a full Scoping and Environmental Impact Reporting (S&EIR) process be undertaken. Activities contained in GNR. 985 are only applicable to specific geographic

locations and require a BA process to be undertaken. Activities that trigger BA processes are perceived to be of lower risk than those activities that trigger an EIA. All NEMA listed activities should be interrogated and assessed with regards to new/amended projects and the required authorisation process adhered to where applicable.

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### **3.1.3 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (NO. 34 OF 2004)**

The NEM:AQA states the following as its primary objective: “To reform the law regulating air quality in order to protect the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management and control by all spheres of government, for specific air quality measures, and for matters incidental thereto.

Whereas the quality of ambient air in many areas of South Africa is not conducive to a healthy environment for the people living in those areas, and does not promote social and economic advancement. Whereas the burden of health impacts associated with polluted ambient air falls most heavily on the poor, whereas air pollution carries a high social, economic and environmental cost that is seldom borne by the polluter, and whereas atmospheric emissions of ozone-depleting substances, greenhouse gases and other substances have deleterious effects on the environment both locally and globally. Everyone has the constitutional right to an environment that is not harmful to their health or well-being, and whereas everyone has the constitutional right to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:

- Prevent pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources.

And whereas minimisation of pollution through vigorous control, cleaner technologies and cleaner production practices is key to ensuring that air quality is improved, and whereas additional legislation is necessary to strengthen the Government’s strategies for the protection of the environment and, more specifically, the enhancement of the quality of ambient air, in order to secure an environment that is not harmful to the health or well-being of people.”

Section 21 of the NEMA:AQA specifies activities which require environmental authorisation, in the form of an Air Emissions License, prior to commencement/operation. These activities are listed in the NEM:AQA Regulations of 2013, with specific reference to GNR 893. Should a new license be required, this will in turn trigger a listed activity under NEMA GNR 983 thus requiring a BA process. Should an amendment to an existing licence be required, this will in turn trigger the NEMA GNR 984 thus requiring a full scale S&EIR process. Therefore, triggering section 21 of the NEM:AQA listed activity automatically requires an authorisation process in terms of the NEMA.

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### **3.1.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT (NO. 59 OF 2008)**

The NEM:WA serves to reform the law regulating waste management in order to protect human health and the environment. This is managed by providing reasonable measures for the prevention of pollution and ecological degradation. The Act aims to secure ecologically sustainable development while promoting justifiable economic and social development. The Act provides national norms and standards for regulating the management of waste by all spheres of government, for specific waste management measures and for matters incidental thereto.

Furthermore, the NEM:WA protects the health, well-being and the environment by:

- Providing reasonable measures for minimisation of consumption of a natural resource;
- Minimising general waste;
- Reducing, re-using, recycling and recovering waste;

- Safely treating or disposing waste;
- Preventing pollution and ecological degradation; and
- Securing ecological sustainable development.

The NEM:WA also promotes:

- Economic and sustainable development;
- Effective delivery of waste services;
- Remediation of contaminated land; and
- Integrated waste management.

Section 20 of the NEM:WA states that no person may commence, undertake or conduct a waste management activity except in accordance with a Waste Management License (WML). A list of waste management activities that require a WML was published in GNR. 921 (29 November 2013). GNR. 921 states that a person who wishes to commence, undertake or conduct a waste management activity listed under Category A and/or B of the GNR. 921 must undertake the required BA or S&EIR process in accordance with the GNR. 893 stipulated in terms of the NEMA.

Focus should be applied to the amendments to the Act and its regulations during future project planning processes. Especially during the consideration of legal triggers for mining residue stockpiles and/or the storage of other wastes. A new list of pre-defined waste is provided in the Amended Act. The list should be applied to the material intended for storage on the Mine lease area. Should the material not appear, a classification of the material may need to follow in order to scientifically classify the material to define the requirements for future management of the material/waste. Furthermore, the Norms and Standards for the storage of wastes should be applied to each scenario to determine applicability.

Part 8 of the NEM:WA details remediation of contaminated land requirements. Part 8 was recently enacted and must be taken into account during site decommissioning and closure planning.

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### **3.1.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT (NO. 10 OF 2004)**

In line with the Convention on Biological Diversity, the NEM:BA aims to legally provide for biodiversity conservation, sustainable use and equitable access and benefit sharing. The Act establishes the South African National Biodiversity Institute. The NEM:BA creates a basic legal framework for the formation of a national biodiversity strategy and action plan and the identification of biodiversity hotspots and bio-regions which will then be given legal recognition. It imposes obligations on landowners (state or private) governing alien invasive species as well as regulates the introduction of genetically modified organisms. Furthermore, the Act serves to regulate bio-prospecting, making provision for communities to share the profits of any exploitation of natural materials involving indigenous knowledge.

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### **3.1.6 NATIONAL WATER ACT (NO. 36 OF 1998)**

The NWA provides for fundamental reformation of legislation relating to water resources and use. The Act recognises that the ultimate aim of water resource management is to achieve sustainable use of water for the benefit of all users and that the protection of the quality of water resources is necessary to ensure sustainability of the nation's water resources in the interests of all water users. The purpose of the Act is stated as, inter alia:

- Promoting the efficient, sustainable and beneficial use of water in the public interest;
- Facilitate social and economic development;
- Protecting aquatic and associated ecosystems and their biological diversity;
- Reducing and preventing pollution and degradation of water resources; and



- Meeting international obligations.

Section 19 of the Act makes provision for the prevention of pollution. A landowner or occupier is responsible for the prevention, control and clean-up of water pollution occurring because of activities on his land. If the responsible person fails to undertake remediation (prevention, containment, clean-up), the catchment management agency may take the measures it considers necessary, and recover the costs from the responsible person.

Part 5 of the Act governs the pollution of water resources following an emergency incident, such as an accident involving the spill of a harmful substance that enters into a water resource. In terms of Section 30 of NEMA and Section 20 of the NWA, the responsibility for remedying the situation rests with the person responsible for the incident or the substance involved. If there is a failure to act, the relevant catchment management agency may take the necessary steps and recover the costs from every responsible person.

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### **3.1.7 THE NATIONAL HERITAGE RESOURCES ACT (NO. 25 OF 1999)**

The NHRA provides for an integrated and interactive system for the management of the national heritage resources and empowers civil society to nurture and conserve their heritage resources so that they may be bequeathed to future generations. Furthermore, the Act established the South African Heritage Resources Agency (SAHRA) in 1999. The SAHRA is tasked with protecting heritage resources of national significance.

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### **3.1.8 Conservation of Agricultural Resources Act (No. 43 of 1983)**

The CARA aims to provide for control over the utilisation of natural agricultural resources in order to promote the conservation of soil, water resources and vegetation and to combat weeds and invader plants. The Act makes provision for control measures to be applied in order to achieve the objectives of the Act, these measures relate to inter alia:

- Cultivation of virgin soil;
- Utilisation/protection of wetlands, marshes, water sponges, water courses/sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of vegetation;
- The grazing capacity of veld and the number and type of animals;
- The control of weeds and invader plants; and
- The restoration or reclamation of eroded land or land which is disturbed or denuded.

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### **3.1.9 HAZARDOUS SUBSTANCE ACT (NO. 15 OF 1973)**

The object of the HSA is inter alia to ‘provide for the control of substances, which may cause injury or ill health to or death of human beings by reason of their toxic, corrosive, irritant, strongly sensitising or flammable nature or the generation of pressure thereby in certain circumstances; for the control of electronic products; for the division of such substances or products into groups in relations to the degree of danger; for the prohibition and control of such substances.’

In terms of the Act, substances are divided into schedules based on their relative degree of toxicity, and the Act provides for the control of importation, manufacture, sale, use, operation, application, modification, disposal and dumping of substances in each schedule.

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### 3.1.10 PROMOTION OF ACCESS TO INFORMATION ACT (NO. 2 OF 2000)

The PAIA recognises that everyone has a right of access to any information held by the state and by another person when that information is required to exercise or protect any right. The purpose of the Act is to promote transparency and accountability in public and private bodies and to promote a society in which people have access to information that enables them to exercise and protect their right.

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### 3.1.11 PRINCIPLES OF SUSTAINABLE DEVELOPMENT

The principles of Sustainable Development have been established in the Constitution of the Republic of South Africa and given effect by NEMA. Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations.

Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied;
- The disturbance of landscapes and sites that constitute the nation's cultural heritage is avoided, or, where it cannot be altogether avoided, is minimised and remedied;
- Waste is avoided, or, where it cannot be altogether avoided, minimised and re-used or recycled where possible or otherwise disposed of in a responsible manner;
- A risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions; and
- Negative impacts on the environment and on people's environmental rights be anticipated; and, prevented and where they cannot altogether be prevented, are minimised and remedied.

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## 3.2 LOCAL LEGISLATION

### **BOJANALA PLATINUM DISTRICT MUNICIPALITY BY-LAWS**

The Bojanala Platinum District Municipality by-laws should be adhered to where/if applicable.

### **MOSES KOTANE LOCAL MUNICIPALITY BY-LAWS**

Moses Kotane Local Municipality by-laws should be adhered to where/if applicable.

### **THABAZIMBI LOCAL MUNICIPALITY BY-LAWS**

Thabazimbi Local Municipality by-laws should be adhered to where/if applicable.

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# 4 OPERATIONS

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## 4.1 INTRODUCTION

The Retained Operations are listed in **Table 4-1**. Figure 4-1 provides an illustration of the primary operations applicable to this report.

**Table 4-1: RPM-US Operation and Activity Areas**

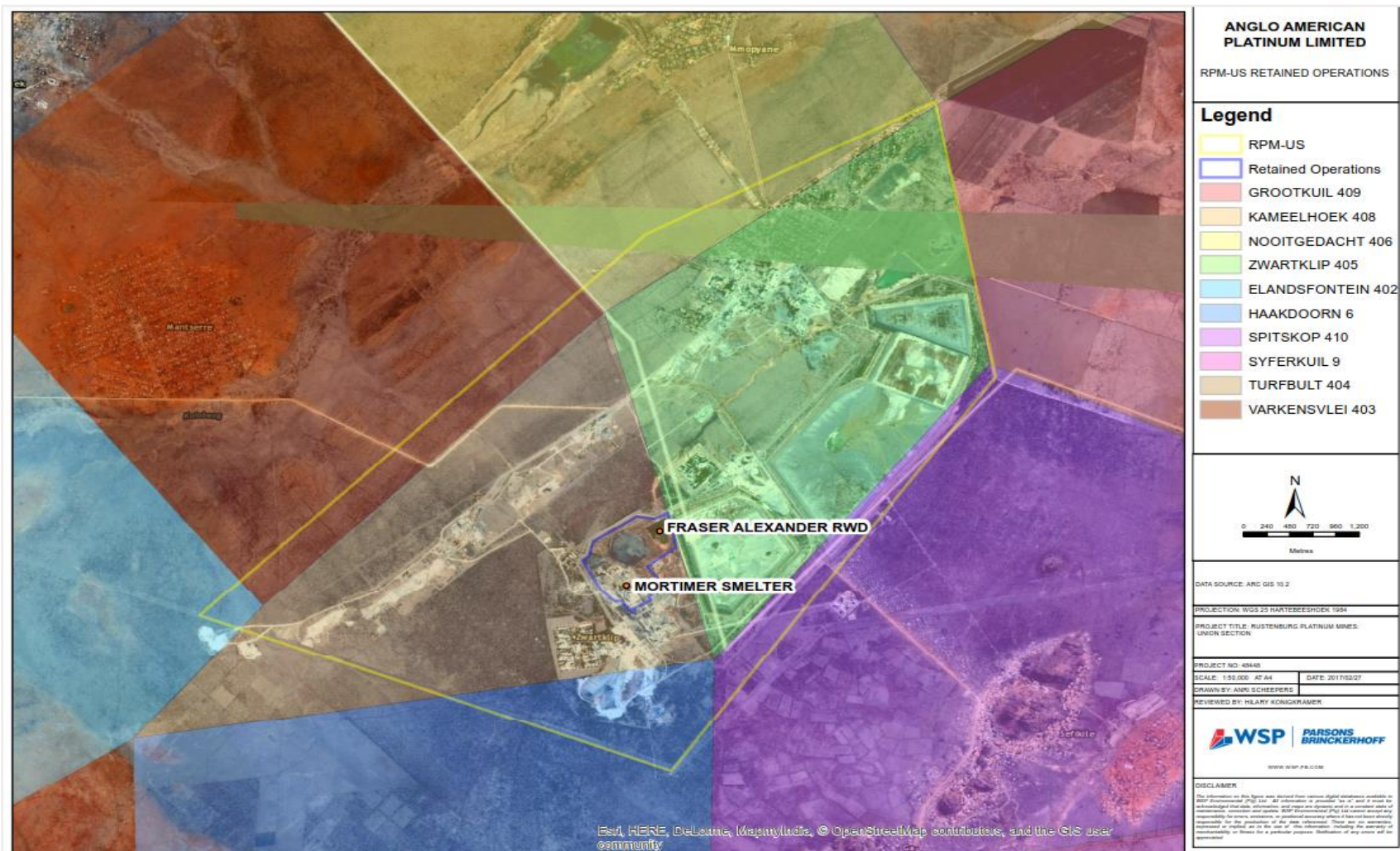
<b>OPERATION</b>	<b>ACTIVITY AREA</b>
Process Operations	Mortimer Smelter, Assay Laboratory and Slag Mill
Central Services	Fraser Alexander Return Water Dam & Excess water dams

## 4.2 OVERVIEW OF RETAINED OPERATIONS

The Retained Operations, only include activities associated with the Mortimer Smelter, and the Fraser Alexander Return Water Dam and Excess Water Dam, Laboratory and Slag Mill. The following sub-sections describe each of the Retained Operations.

### SMELTING OPERATIONS

The wet concentrate from the concentrators is delivered to the Mortimer Smelter where it is dried, melted and crushed to form a dry furnace matte. Slag generated from the smelting process is sent to the Mortimer Slag Concentrator where it is reprocessed before being reintroduced into the Mortimer Smelter. Slag that cannot be utilised is deposited onto a slag stockpile.



**Figure 4-1: RPM-US Retained Operations**





## MORTIMER SMELTER

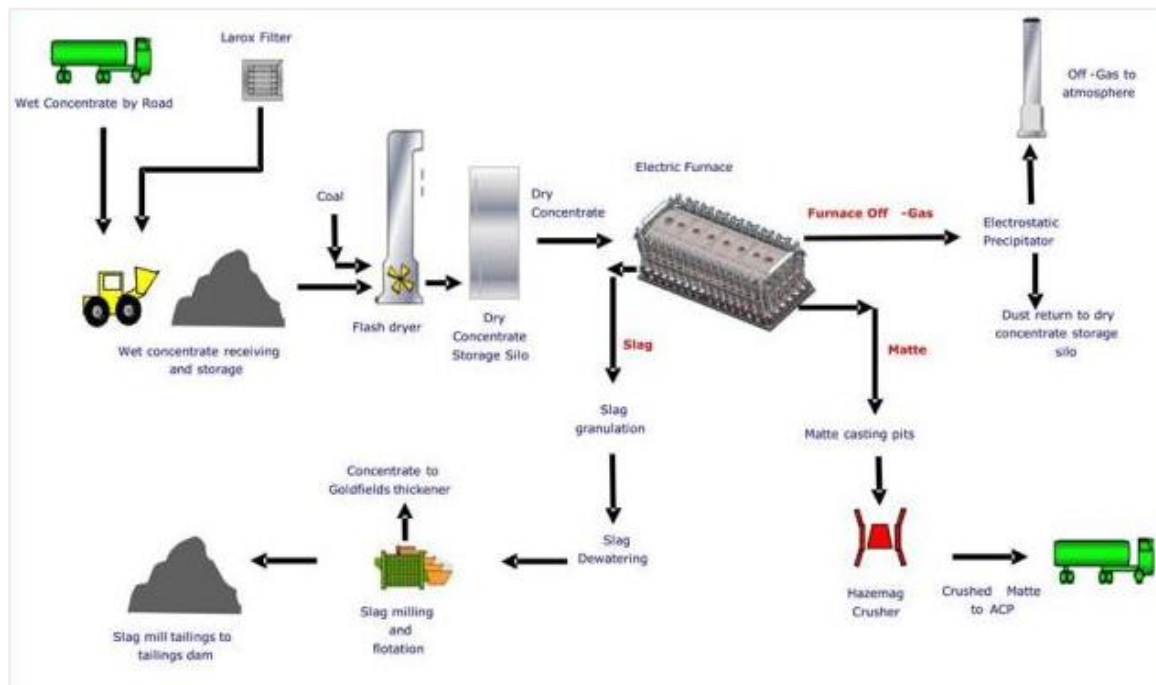
The Mortimer Smelter comprises the RPM-US and is located within the north western limb of the Bushveld Complex. The objective of Mortimer Smelter is to process wet concentrate from the Ivan and Mortimer Concentrators to produce crushed, slow-cooled, sulphur-deficient nickel-copper matte rich in PGMs, gold, and base metals for despatch to RPM-US for further processing within the RBMR and PMR.

The smelter comprises 6-in-line electric 38 MWa furnaces with the smelting capacity of 360 000 tons per annum. Dry material from the concentrators is transferred pneumatically from 1 000 ton silos into two 18 ton furnace feed bins from where it is fed to the furnaces for smelting. The furnace produces a sulphide matte, which is tapped into 19 ton matte ladles, cast into silica moulds, cooled and then crushed.

The following products are produced from the Mortimer Smelter:

- The matte, which has a high concentration of metal values (Nickel, Copper, Cobalt and PGMs) all in sulphide and/or alloy form, has a relatively high density and collects at the bottom of the furnace
- The slag, which consists mainly of gangue such as Silica, Magnesium oxide and Iron oxides, is less dense and floats on top of the matte
- Typical pay base metal elements <0.2% with PGMs less than 1.5 grams per tonne (g/t) slag
- The off-gas consists of process gasses, dilution air and flue dust

The matte produced by the furnace is tapped periodically, cast to silica sand moulds and crushed to produce a fine product that is suitable for lance injection into the ACP converters as per current operation at the Mortimer Smelter. This fine matte is transferred to the ACP location at the Waterval site in bulk tankers and off-loaded at that site into the RPM-US Furnace Matte (FM) storage facility. The furnace slag is tapped from the furnace, granulated, de-watered and transferred to the slag mill. If the slag mill is not available, slag is stored on the slag dump. This process is illustrated in **Figure 4-3**.



**Figure 4-3: Process flow of the Mortimer Smelter**

The Mortimer Smelter includes a furnace off-gas dust cleaning section with electrostatic precipitators (ESPs) after which the off-gas is routed to the stack. **Figure 4-4** illustrate the structures and infrastructure associated with the Mortimer Smelter. **Table 4-2** details the processing description in detail, as well as site infrastructure, structures and bulk services associated with the Mortimer Smelter.



**Table 4-2: Site-Infrastructure, Structures and Bulk Services Associated with Mortimer Smelter**

ASPECT	DETAILS
Mortimer smelting process	<ul style="list-style-type: none"> <li>— Concentrate Off-loading and Storage</li> </ul> <p>The wet concentrate handling section conveys the concentrate to the flash dryer. The throughput is approximately 30 000 tons per month (tpm) on average. Wet concentrate feed from the shed to the flash dryer is fed by a triple screw feeder. The wet concentrate is transferred to the screw feeder hopper by existing grabs.</p> <ul style="list-style-type: none"> <li>— Flash Dryer</li> </ul> <p>The flash dryer has the capacity of 1 300 ton per day (tpd) of wet concentrate. This includes a hot gas generator, upgraded fluidising fan, exhaust fan and modified back mixer, bag house, bag house screw and transfer system as well as the coal storage and feed system.</p> <ul style="list-style-type: none"> <li>— Dry Concentrate Storage Silo and Transfer System</li> </ul> <p>A dry concentrate storage silo (1 000 ton) provides buffer capacity between the flash dryer and the furnace. The dry concentrate storage silo accommodates approximately one day's dry concentrate storage buffer together with a 250 ton dryer storage bin when full. The dried concentrate from the flash dryer cyclones is gravity fed to the dry concentrate storage silo that is located west of the dryer and supported by the dryer structure.</p> <ul style="list-style-type: none"> <li>— Electric Furnace</li> </ul> <p>Plate coolers and refractory have been installed in the sidewalls and endwalls of the furnace. The furnace design minimises exposure of the furnace walls to the major reaction zones of the furnace thereby safeguarding equipment.</p> <ul style="list-style-type: none"> <li>— Furnace Heath</li> </ul> <p>Refractories have been installed that manages the power from the 38 MWa furnaces. The long-term objective is to minimise refractory spares between the furnaces.</p> <ul style="list-style-type: none"> <li>— Furnace Feed</li> </ul> <p>Dry concentrate is transferred to two 18 ton furnace feed bins on demand from the 1 000 ton silo transfer vessel or directly from the flash dryer. As soon as a request is received from a particular furnace feed bin, the required top-up mass is measured using the silo transfer vessels load-cells and the transfer is completed as per the request. The addition of bone dry concentrate to the furnace is recorded in the storage silo pneumatic transfer vessels. A Clyde Bergemann rotafeeder has been installed to feed the concentrate to the furnace. This enables the 18 tonne furnace feed bins to be filled and emptied simultaneously.</p> <p>An advanced furnace control system, with on-line mass and energy balance, has been installed. Although the furnace will be automatically fed, a manual fall back system is also available.</p> <ul style="list-style-type: none"> <li>— Dust Collection Filters</li> </ul> <p>The capacity of furnace feed bins dust collection filters accommodate the feed rate. The design hourly flow rates are based on an annual operating factor of 85 %, which includes furnace availability and utilisation. There is a central bag filter for pneumatic vent air. The central filter has been designed for 100% redundancy with dual fans/ filter sections.</p> <ul style="list-style-type: none"> <li>— Furnace Operation</li> </ul> <p>The electrodes (6-off) are used to introduce power into the furnace predominantly by the resistance of the slag to the flow of electrical current. As a consequence heat is generated which in turn melts the incoming concentrate. The depth of immersion of the electrodes</p>

**ASPECT****DETAILS**

	<p>(Söderberg type) into the slag is important. An electrode regulator is installed in order to maintain optimal power input, affect desired matte temperature while simultaneously assisting matte disengagement from the slag to be able achieve adequate recovery. To protect the off-gas cleaning plant, pneumatically controlled temperature dampers, similar to the Polokwane Smelter, are installed.</p> <p>— Plate Cooler Water System</p> <p>Plate coolers have been installed as part of the matte end wall and at the refractory on sidewalls and slag end wall. Three cooling towers and two pumping systems are supplied. Under normal operating procedures, electric pumps supply cooling water to the furnace. There are operating and standby electric pumps and a standby diesel pump for the furnace sidewall cooling. In addition to the diesel pump, installation of an emergency power supply generator has been complete.</p> <p>— Transformers</p> <p>Three 17 MVA furnace transformers have been installed. The furnace sidewalls have been upgraded to incorporate water-cooled copper plate coolers to facilitate the higher furnace power rating. One spare furnace transformer is stored for emergency purposes. The furnace feeding system has been upgraded for more accurate feed control. The furnace process control system has also been upgraded to allow for better automated control. Along with the installation of the transformers, a water cooled Low Voltage (LV) bus has been installed, in order to transfer the higher power to the electrodes.</p> <p>Furnace Transformer Rating: A nearby Eskom substation supplies 88 kV electrical power to the Mortimer Concentrator where it is stepped down to 6.6 kV and fed to the Mortimer Smelter. The system is fed by 3x17 MVA transformers.</p> <p>— Slag Granulation</p> <p>The furnace slag is tapped using the three slag tap holes installed in the slag endwall of the furnace. Typical slag tapping rates are approximately 1 050 tpd (continuous operation) of furnace slag at an average of about 44 tph, which is equivalent to 0.7 ton per minute of continuous tapping. The furnace slag is tapped intermittently from two furnace slag tapholes at a maximum rate of two tpm per taphole. Slag is handled and disposed as at the existing slag stockpile within the Mortimer Smelter premises. Granulated slag is milled and floated in the concentrator and flotation tailings are disposed to the TSF's.</p> <p>— Pump</p> <p>A slag granulation hot water return pump and hot water return line have been installed to the rake classifiers' overflow to the tank pump station. Three granulation water supply pumps and a suitably sized granulation water supply line from the thickeners have been installed to accommodate the water volume required for the process. An emergency electric pump located separate to the supply pumps manifold has been installed. The supply and return lines have been fitted with flow and temperature measurement instruments.</p> <p>— Reverts Handling</p> <p>The reverts material in the smelter is generated mainly from the matte ladles and tapping launders. An upset condition such as a furnace runaway would also cause reverts. There is no reverts feed system in the current furnace but addition ports located above the matte and slag tapholes have been installed. Very little reverts are generated at the plant, therefore a reverts handling system has not been installed.</p> <p>— Fire Protection</p>
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**ASPECT****DETAILS**

	<p>The firewater is fed from the potable water storage tank. The circuit has been extended to include the location of the transformers.</p> <p>— Limestone Storage and Transfer</p> <p>Limestone is delivered in bulk tankers and pneumatically transported into the limestone storage silo. The silo is fitted with a bag filter to prevent over-pressurisation of the silo and minimise dust losses and contamination. There are two pneumatic pressure transfer vessels with dedicated transfer lines located beneath the limestone storage silo. The limestone is pneumatically transferred to the limestone bin in the dryer on automated demand where it is blended with the dry concentrate by delivering a batch of limestone with each batch of concentrate.</p> <p>— Plant and Instrument Air</p> <p>Compressed air is a major requirement due to the additional pneumatic transfers associated with the smelting capacity. A system of Demag Marathon 350 A air compressors has been installed.</p> <p>— Sampling</p> <p>Sampling is one of the major process activities to control and optimise the plant performance as well as metal accounting. The wet concentrate Auger sampler system is managed with the Smelter Laboratory Sampling Programme.</p> <p>— Weighbridge and Evaluation</p> <p>A weighbridge is available and all shipments are weighed, either into or out of the Smelter Security Area. Concentrate arrivals are sampled using one of two auger samplers in the concentrate off-loading area. Matte is sampled, per shipment, using a rotary sampler followed by a 12-way rotary divider to obtain a representative sample. It is weighed on the weighbridge. Nitrogen, oxygen, coal and limestone are also weighed on this weighbridge.</p> <p>— Laboratory</p> <p>A Sample Preparation area for concentrate is available as part of Smelter Laboratory Sampling Area.</p> <p>— Emergency Power</p> <p>Currently, emergency power (diesel generators) is provided for emergency lighting and specific drives so that the plant is maintained safely during a power failure. The generators also serve furnace cooling water pumps for the plate coolers, furnace hearth cooling fans and other critical electrical and instrumentation equipment.</p>
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**Figure 4-4: Structures and Infrastructure Associated with the Moritmer Smelter**

## 5 ALTERNATIVES – ‘NO PROJECT’

### 5.1 ORIGINAL EMPR

The original mining activities commenced before the relevant legislation was in place and the ‘no project’ option was never considered.

### 5.2 RECENT PROJECTS AND OPERATIONS

Operations and projects listed in **Table 5-1** correlate to those listed in **Table 1-4** (subsequent to the 2007 consolidation) and the no project option is discussed for each.

**Table 5-1: ‘No Project’ Operation Drawbacks**

OPERATION	STATUS	‘NO PROJECT’ OPTION
Mortimer Smelter Furnace Upgrades	This project is currently operational.	<p>If the proposed Phase 2 furnace upgrade were not to proceed, AAP’s smelting capacity will be exceeded as a result of the Mortimer Smelter receiving feed material (concentrate) from different concentrator plants within AAP’s portfolio as well as other concentrators in the region. This will lead to the accumulation of stockpiles as a result of exceeding the current capacity, which has consequential negative environmental impacts. Exceeding the capacity of Mortimer Smelter will not only limit flexibility in the event of unplanned furnace shutdown due to power outages, but also compromise on continuous growth.</p> <p>The growth hindered by the limited smelting capacity may have repercussions on similar or related projects, including mines and concentrators, throughout the processing of precious metals. This may also damage AAP’s reputation and credibility amongst investors and shareholders alike.</p> <p>Other consequences of the no-go option include the reduction in sustainable employment opportunities and economic input into the area, both on a regional and national scale.</p> <p>The current decline in excess smelting capacity translates into loss of productivity of the mine which could lead to losses in production and potentially the overall stability and growth of Union Section and surrounding PGM mines.</p>

# 6 DESCRIPTION OF THE BASELINE ENVIRONMENT

Note: **Sub-sections 6.1 to 6.12** were compiled using the 2014 Consolidated RPM-US report.

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## 6.1 GEOLOGY

South Africa's PGM reserves are located in one of the largest layered mafic intrusions in the world, namely the Bushveld Igneous Complex (BIC) (**Figure 6-1**). The BIC is divided into an eastern and western limb with a further northern extension. It is believed that all three sections of the BIC were formed around the same time, approximately 2 billion years ago, and are remarkably similar. BIC contains some of the richest ore deposits on earth. The reserves of PGMs, Platinum, Palladium, Osmium, Iridium, Rhodium, and Ruthenium are the world's largest, and there are vast quantities of Iron, Tin, Chromium, Titanium and Vanadium. It is intruded into the Transvaal Supergroup of sedimentary and volcanic rocks.

The BIC is extensive in size, covering an area of 65 000 km<sup>2</sup>; stretching approximately 350 km east to west and 250 km north to south. It is roughly saucer-shaped with the edges dipping inwards towards the centre. At the rim of the 'saucer', Pyroxenites, Norites, Gabbros and Chromitites are found inter-layered in a variety of combinations (Mulder, 2009).

The BIC comprises a suite of layered ultramafic / mafic rock, up to 9 km thick (known as the Rustenburg Layered Suite), roofed by Rooiberg Group Felsic volcanics and granophyres and a suite of late Bushveld Granites. This layered suite is preserved in 5 lobes: the far western, western, eastern, northern, and the south-eastern lobe. The Rustenburg Layered Suite, which ranges in composition from dunite to ferrodiorite, is subdivided into 5 composite zones, as indicated below:

- Marginal zone (this is not always present, comprises up to 880 m of heterogeneous noritic rocks along the basal contact of the BIC)
- Lower zone (this comprises of dunites, harzburgites and pyroxenites)
- Critical zone (this is characterised by spectacular layering and hosts world-class chromite and platinum deposits in several reefs)
- Main zone (this is the thickest zone, comprising of a succession of gabbronorites in which olivine and chromite are absent and anorthosites are rare)
- Upper zone (this is 200 m thick and is characterised by lithologies of anorthosite, tractolite and ferrogabbro to diorite) (**Figure 6-2**) (Mulder, 2009).



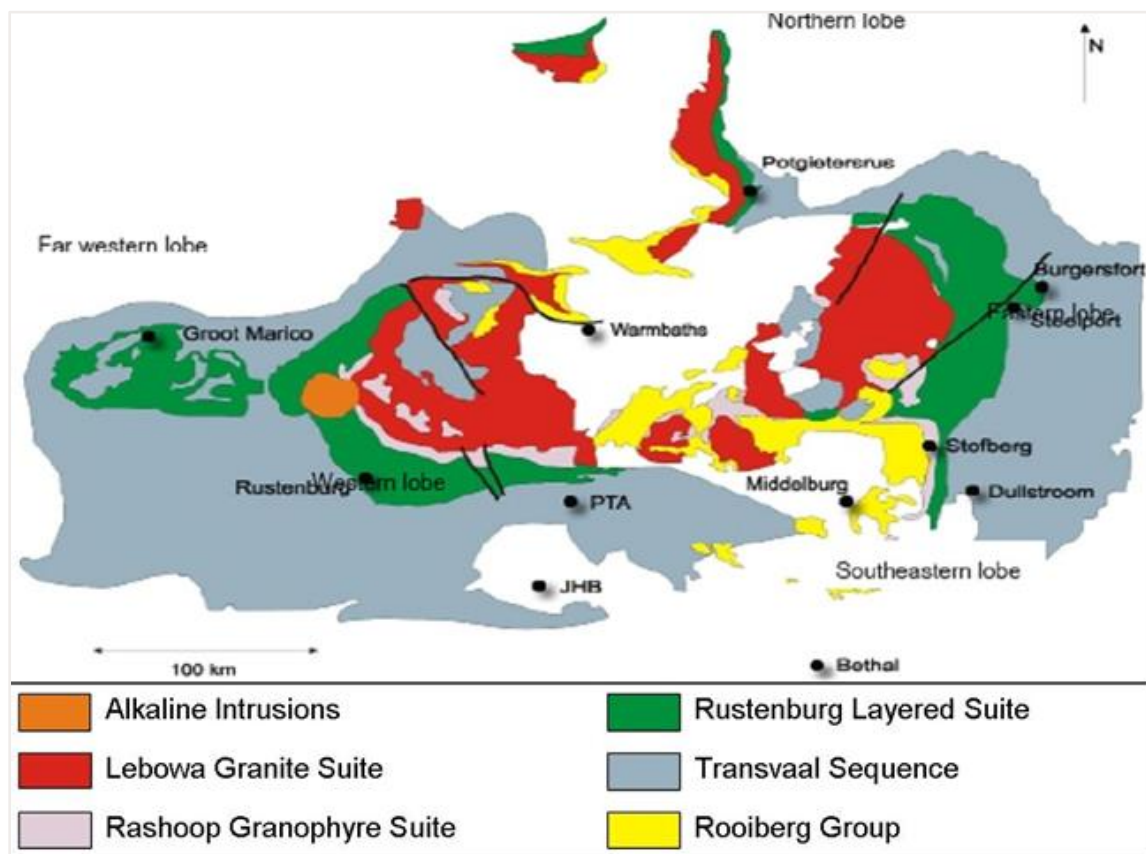
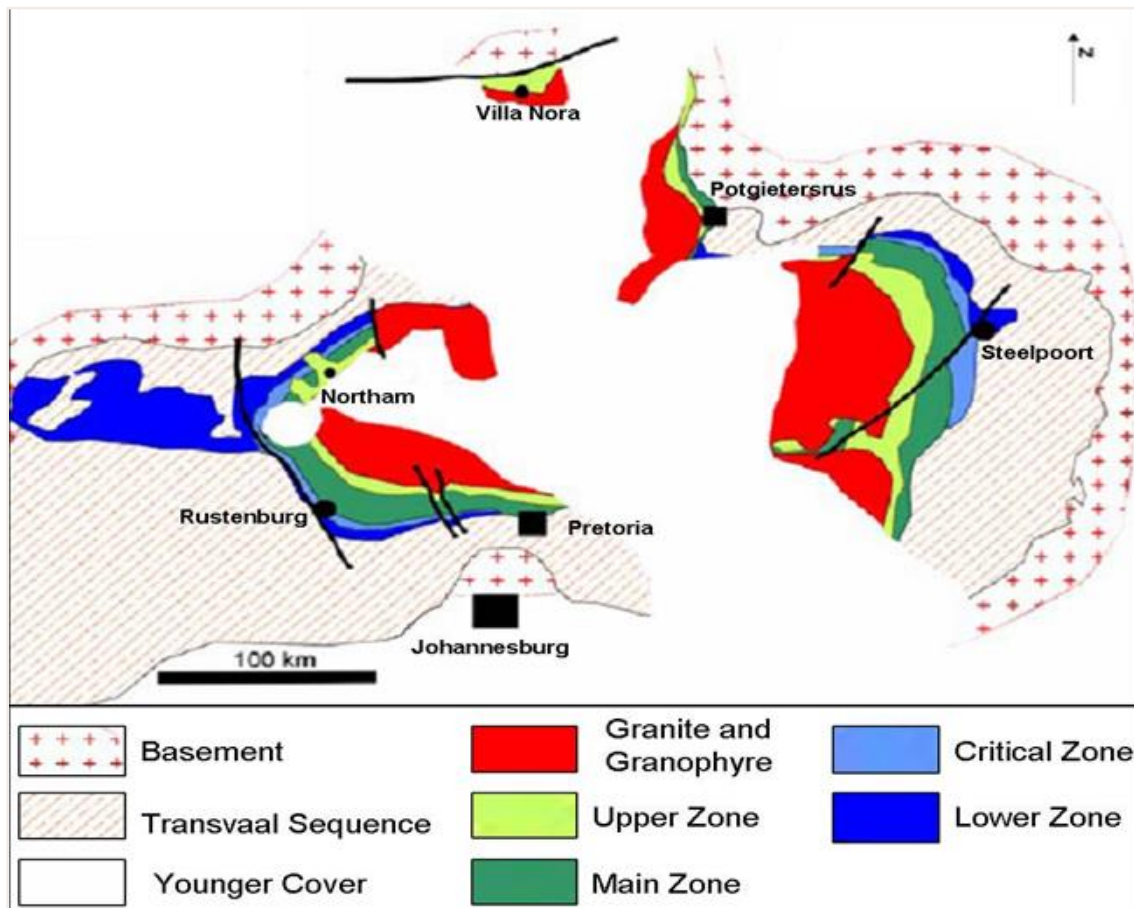


Figure 6-1: Generalised Geological Map of the BIC (Mulder, 2009)



**Figure 6-2: Subdivision of Rustenburg Layered Suite (Mulder, 2009)**

RPM-US is situated in the north-eastern sector of the BIC. The geology of the area is mainly made up of gabbro, anorthosites, norite and pyroxenite rocks. The two platinum bearing ore bodies currently being exploited are the Merensky reef and the UG2 reef.

The Merensky reef and the UG2 reef outcrop approximately 9 km from the north-eastern boundary of the RPM-US lease area. The Merensky reef comprises felspathic pyroxenite, is approximately 1 m thick and is underlain by the UG2 reef comprising of chromitite with a thickness of approximately 1.5 m. These reefs have a regional dip of about 18° to the south-east.

A typical section through a borehole on RPM-US is presented in **Figure 6-3**. Most of the site is overlain by residual neritic black clay (black turf) and underlain by a weathered zone varying from 5 m to 15 m in thickness.

### 6.1.1 PRESENCE OF DYKES, SILLS AND FAULTS

A number of south-west to north-east trending dykes and north-north-east trending faults have been observed in the underground workings. Most of the structural discontinuities are on dip and occur mainly in the south-eastern part of RPM-US (i.e. Spud Shaft and Mortimer TSF).

A number of south-west to north-east trending dykes and north-north-east trending faults are present, especially in the southern portion of RPM-US (Stevens, et al, 2007).

AREA R.P.M. UNION SECTION

# PLAN 3C

FARM ZWARTKLIP 405 KG

SURVEY POSITION

X=60 650 Y=14 789

COLLAR ELEVATION

+1019,8

FROM (M)	TO (M)	DESCRIPTION OF GEOLOGY	
0	1,9	CLAYEY BLACK TURF SOIL	1,9
1,9	23,0	NORITE. WEATHERED UP TO 9,8m	
23,0	30,0	BASTARD REEF: FELDSPATHIC PYROXENITE	
30,0	34,0	MOTTLED ANORTHOSITE	23,0
34,0	36,0	SPOTTED ANORTHOSITE	30,0
36,0	50,9	LEUCONORITE	
50,9	57,0	NORITE	
57,0	58,9	MELANORITE	
58,9	63,1	FELDSPATHIC PYROXENITE	
63,1	69,9	MERENSKY MAIN	63,1
		63,1 - 68,0 PEGMATOIDAL FELDSPATHIC PYROXENITE	69,9
		2cm TOP CHROME SEAM. TOP 1,3m HAS VISIBLE SULPHIDES	
		68,0 - 69,6 FELDSPATHIC PYROXENITE	
		69,6 - 69,9 PEGMATOIDAL FELDSPATHIC PYROXENITE	
		1cm BOTTOM CHROME SEAM	
69,9	76,5	MOTTLED ANORTHOSITE	87,6
76,5	83,8	LEUCONORITE	
83,8	87,7	NORITE	93,3
87,7	87,8	PSEUDO MARKER: FELDSPATHIC PYROXENITE	
87,8	92,2	TARENTAAL: FELDSPATHIC HARZBURGITE. 2cm CHROME SEAM	
		ON TOP CONTACT.	
92,2	93,3	COARSE PSEUDO: PEGMATOIDAL PYROXENITE. 1cm CHROME SEAM	110,9
		ON TOP CONTACT.	112,5
93,3	110,9	FELDSPATHIC PYROXENITE	
110,9	112,5	UG2 REEF:	
		110,9 - 111,1 CHROME LEADER SEAM	
		111,1 - 111,3 FELDSPATHIC PYROXENITE	
		111,3 - 111,5 CHROME LEADER SEAM	126,6
		111,5 - 111,6 FELDSPATHIC PYROXENITE	
		111,6 - 112,5 MAIN CHROME SEAM	129,1
112,5	112,8	PEGMATOIDAL FELDSPATHIC PYROXENITE	131,6
112,8	126,6	FELDSPATHIC PYROXENITE	
126,6	129,1	UG1 CHROMITITE	134,8
		PYROXENITE LAMINATION FROM 127,6 - 128	
129,1	131,6	MOTTLED ANORTHOSITE	
131,6	134,8	LEUCO NORITE - BANDED	
		END OF HOLE	

Figure 6-3: Typical Section Through a Borehole on RPM-US (Stevens, et al, 2007)

## 6.2 TOPOGRAPHY

The topography of the RPM-US lease area and surroundings can generally be described as flat to gently undulating, lying at an altitude between 1 000 and 1 020 metres above mean sea level (mamsl) and sloping gently to the north.

Between 10 and 15 km north of RPM-US the topography becomes more hilly with the dierantjies and witfonteinrant ridges running in a north-east / south-west direction.

To the north-west ( $\pm 10$  km) of RPM-US there is a low ridge which runs in a roughly north-south direction. The closest vantage point to the RPM-US is the Spitskop located on the farm Spitskop 110 KQ within the south-east section of the RPM-US lease area (approximately 4 km to the south east).

The topography is fairly flat with the Spitskop and a low ridge 7 km to the north-west being the only points of significant elevation within a 10 km radius of RPM-US (Mulder, 2009).

RPM-US's lease area is located on a gentle sloping watershed that divides the Bierspruit and Brakspruit catchments. The Bierspruit flows into the Brakspruit about 10 km north-east of RPM-US and then into the Crocodile river (refer to **Figure 6-4**).

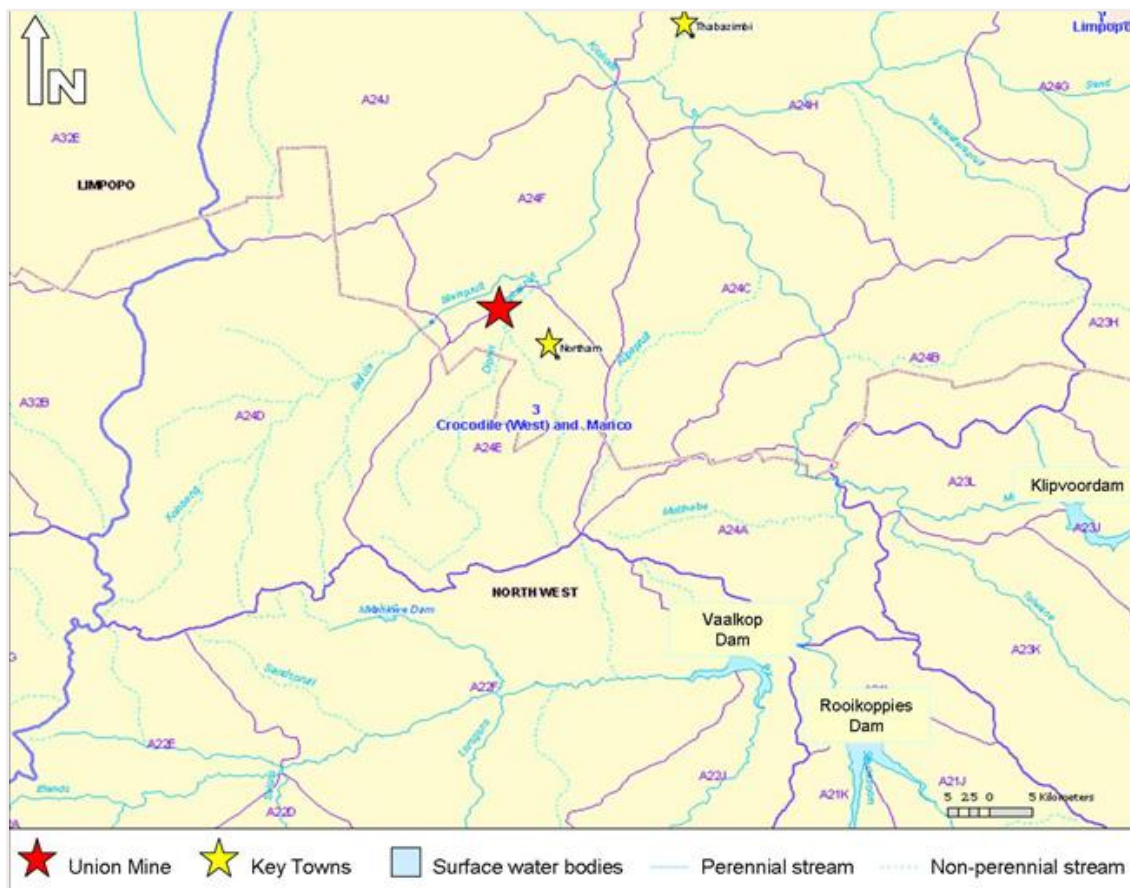


Figure 6-4: The Crocodile (West) and Marico Catchments (Mulder, 2009)



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## 6.3 CLIMATE

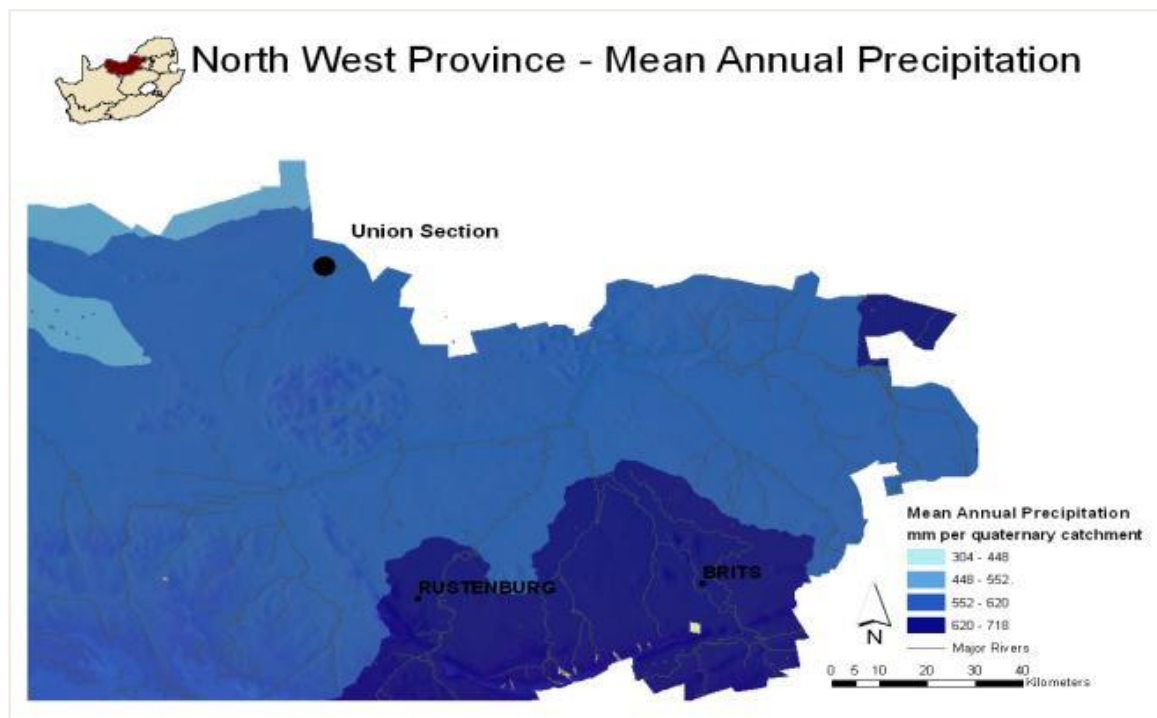
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### 6.3.1 RAINFALL

RPM-US falls within the summer rainfall climatic zone. The area is characteristically warm with erratic and extremely variable rainfall, ranging from 450 to 750 mm per year, with an average of 620 mm. The rainfall in the area is almost exclusively due to thunderstorms that occur during the summer months (October to March); whilst winter months are normally dry. Hail, which is often associated with thunderstorms, occurs during the hot summer months. The mean annual rainfall for RPM-US is 620 mm. During the rainy season a maximum of 8 to 12 rain days per month can be expected, whilst in the dry season a maximum of 1 rain day can be expected per month. Frost occurs at certain times during late June. Fog occurrence is rare. Refer to **Figure 6-5** (Mulder, 2009).

Mean annual precipitation (MAP) for RPM-US has been obtained from the South African Weather Bureau (SAWB) for station No. W0587139-Middelkop (**Table 6-1**). The annual average number of rain days with rainfall in excess of 0.25 mm is 64 (Stevens, et al, 2007).

The mean Simons-Pan evaporation in the vicinity of RPM-US is 1800 mm / annum. However, evaporation data obtained from station A2E021 (1971 -1986) shows the Simons-Pan evaporation values to be around 1 540 mm / annum whilst the A-Pan evaporation data amount to 1 977 mm / annum. Rainfall and evaporation data for the 10 wettest years are presented in **Table 6-2**. The mean monthly evaporation exceeds the mean monthly rainfall (IWWMP, 2011).



**Figure 6-5: Mean Annual Precipitation (North West Province) (Mulder, 2009)**

**Table 6-1: Weather Station No. W0587139-Middelkop (rainfall data) (Stevens, et al, 2007)**

MONTH	RAINFALL (MM) (1904 TO 2000)			EVAPORATION	
	AVERAGE	MAXIMUM	MINIMUM	A-PAN	S-PAN
October	54	118	4.4	219	179
November	93	209	3.5	221	180
December	101	249	0	227	186
January	137	388	0	210	170
February	91	256	0	171	134
March	93	282	0	171	134
April	40	133	0	132	98
May	10	59	0	117	84
June	5	99	0	99	68
July	4	81	0	100	69
August	2	23	0	134	100
September	12	108	0	176	138
Totals	643	2 003	7.9	1977	1 540

**Table 6-2: Rainfall and Evaporation Data for the Ten Wettest Years (IWWMP, 2011)**

THE WETTEST YEARS DURING THE PAST 89 YEARS WERE	YEAR	TOTAL RAINFALL FOR 6 MONTHS (MM)	YEAR (HIGHEST EVAPORATION (MM)) FROM 1971-1986	TOTAL EVAPORATION FOR 6 MONTHS (STATION A2E021)
Wettest Year	1967	1019	1981	2 062.1
2 <sup>nd</sup> wettest	1939	990.3	1984	1 753.5
3 <sup>rd</sup> wettest	1956	964.1	1979	1 689.8
4 <sup>th</sup> wettest	1961	949.5	1983	1 647.9
5 <sup>th</sup> wettest	1943	945.8	1982	1 613.9
6 <sup>th</sup> wettest	1957	923.7	1977	1 595.7
7 <sup>th</sup> wettest	1944	905.9	1972	1 483.9
8 <sup>th</sup> wettest	1940	865.4	1980	1 474.3
9 <sup>th</sup> wettest	1925	855.8	1978	1 422.8
10 <sup>th</sup> wettest	1974	854.2	1973	1 375.4

### 6.3.2 MEAN MONTHLY EVAPORATION

The mean annual S-pan evaporation at RPM-US is 1 800 mm. Mean monthly evaporation values are shown in **Table 6-3** (Stevens, et al, 2007).

### 6.3.3 TEMPERATURE

Temperatures vary between the extremes of 0°C and 34°C, with an average of 19°C. Summer days are hot with temperatures varying between 28 - 34°C from October to March. Summer night temperatures are hot to mild varying between 16 - 21°C. Winter day temperatures are mild to warm varying between 19.6 - 25.2°C in April to

September. Winter nights are cold with temperatures of  $< 0 - 12.1^{\circ}\text{C}$ . The extreme high temperature that has been recorded is  $39.7^{\circ}\text{C}$  and extreme low  $-2.8^{\circ}\text{C}$  (Mulder, 2009). Temperatures are shown in **Table 6-3**.

**Table 6-3: Meteorological Data for RPM-US (Stevens, et al, 2007)**

MONTHS	MEAN DAILY TEMPERATURE ( $^{\circ}\text{C}$ )	AVERAGE MAXIMUM TEMPERATURE ( $^{\circ}\text{C}$ )	AVERAGE MINIMUM TEMPERATURE ( $^{\circ}\text{C}$ )	S PAN EVAP. – (MM)
Jan	25.2	31.8	18.6	199.8
Feb	24.3	30.7	17.9	162.5
Mar	23.1	30.0	16.2	155.0
Apr	19.5	27.3	11.6	118.3
May	15.4	25.3	5.5	97.9
Jun	12.0	22.1	1.9	82.1
Jul	12.5	22.5	2.4	90.9
Aug	15.7	25.4	6.0	124.7
Sep	20.0	28.4	11.6	165.6
Oct	22.7	29.8	15.7	200.7
Nov	23.9	30.6	17.1	198.18
Dec	24.3	30.5	18.2	204.3
Average Total T=Total M=Mean	19.9 (M)	27.9 (M)	11.9 (M)	1 800 (T)

### 6.3.4 ATMOSPHERIC CONDITIONS

The mean circulation of the atmosphere is predominantly anti-cyclonic throughout the year, except near the surface where meso-scale circulations prevail. Fine conditions with little or no rainfall, and light variable winds with a northerly component occur over the region. Elevated inversions, which occur as a result of the anticyclonic subsidence, suppress the diffusion and vertical dispersion of pollutants by reducing the depth of the mixing layer.

Seasonal variations in the position and the intensity of the high pressure cells determine the extent to which the tropical easterly circulation and the circumpolar westerlies are able to impact on the atmosphere over the region. The tropical easterlies, and the occurrence of easterly waves and lows, affect the region throughout the year resulting in airflow with a north-easterly to north-westerly component, but their influence is generally weaker during the winter months.

The winter weather is dominated by perturbations in the westerly circulation as a result of the succession of cold fronts moving over the region. The passage of a cold front is characterised by pronounced variations in wind direction, wind speed, temperature, humidity and surface pressure.

Airflow ahead of the cold front has a distinct north north-westerly to north-easterly component. Following the cold front, the northerly wind is replaced by winds with a distinct southerly component.

During the summer months, the anti-cyclonic belt weakens and shifts southwards, allowing the tropical easterly flow to resume its influence over the region (Mulder, 2009).

### 6.3.5 WIND

The prevailing wind direction at RPM-US is north-easterly and on a broad vector from southerly through to westerly. There is no distinct seasonal wind pattern, however a diurnal pattern was observed with southerly winds dominating during the winter months and south-westerly to westerly winds dominating during the summer months. During the day the winds are predominately north- westerly, while southerly winds dominate at night (Stevens, et al, 2007).

Calm conditions occur on average 38 % of the time. There is a distinct diurnal pattern, with over 62 % calm winds recorded during the night hours compared to 21 % during daytime hours. This observation has significance when assessing potential migratory measures. The average surface wind speed is 2.1 m/s with a maximum observed wind speed of 8.3 m/s. Winds are generally light to moderate with over 90 % of the hourly average wind speeds being < 3.5 m/s. This can be observed from the wind roses in **Table 6-6** to **Table 6-8** (Stevens, et al, 2007).

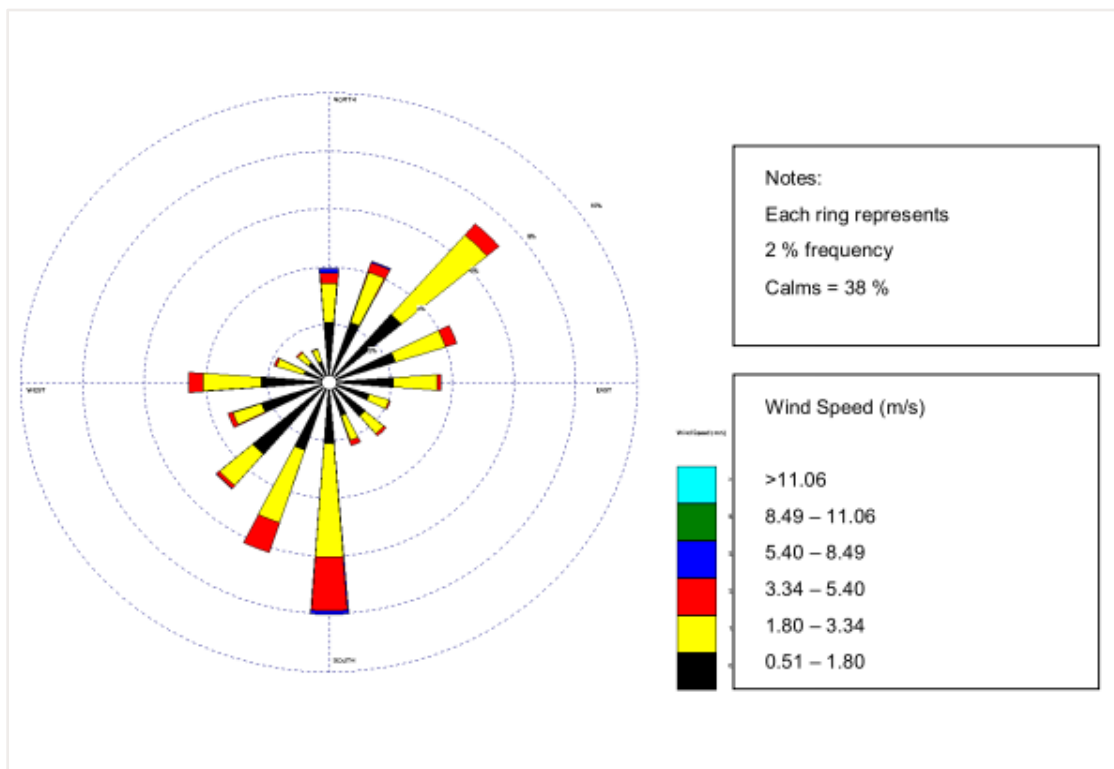


Figure 6-6: All Hours Wind Rose (Thabazimbi) (Stevens, et al, 2007)

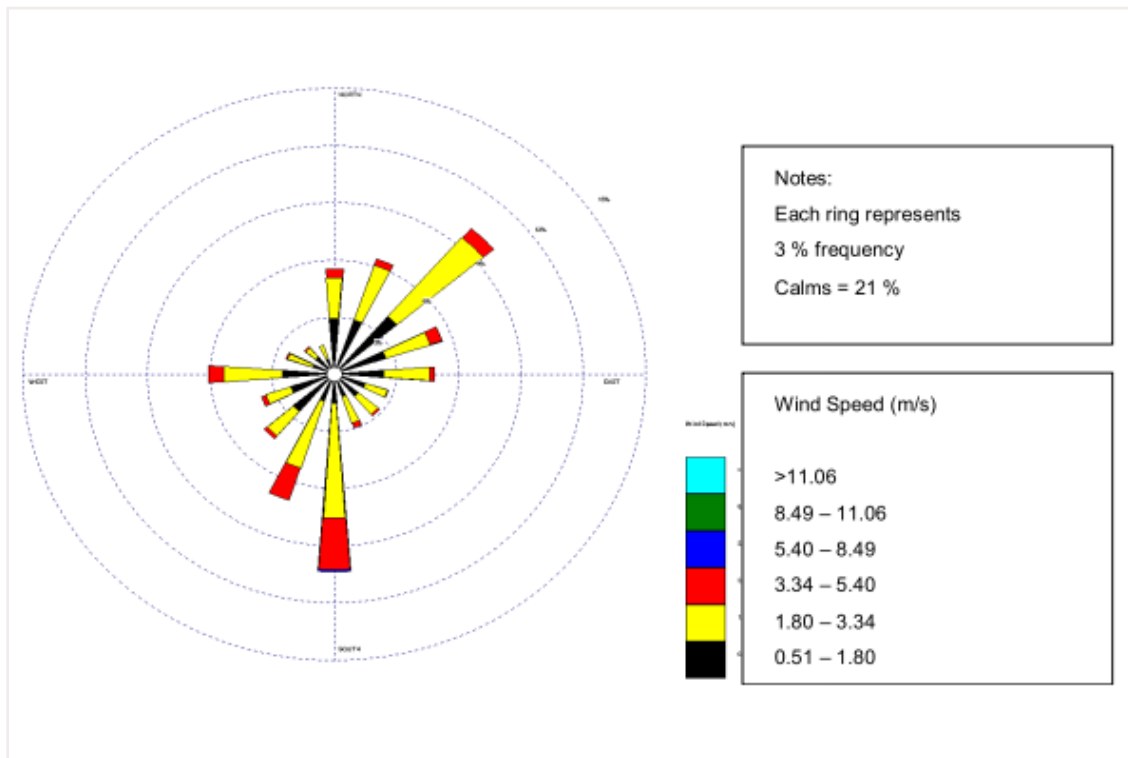


Figure 6-7: Day Time Wind Rose (Thabazimbi) (Stevens, et al, 2007)

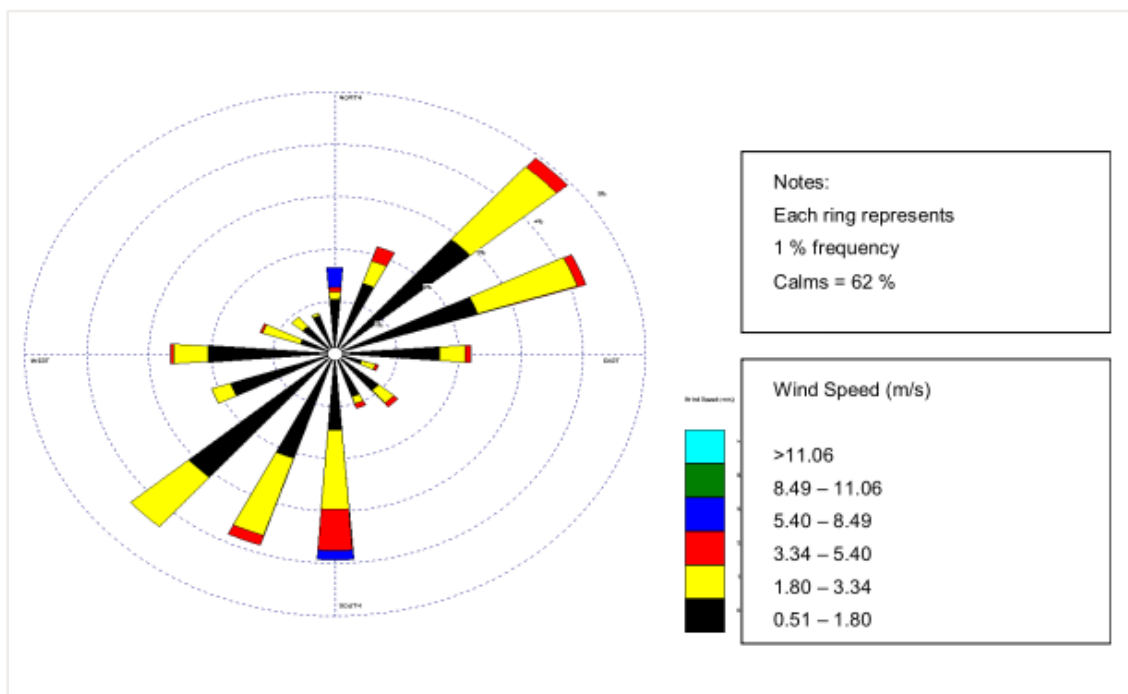


Figure 6-8: Night Time Wind Rose (Thabazimbi) (Stevens, et al, 2007)

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### 6.3.6 EXTREME WEATHER CONDITIONS

Rainfall conditions are highly variable and droughts and floods do occur. The extreme 24-hour rainfall amounts are typical for thunderstorm rainfall areas. Thunderstorm events account for the majority of the annual rainfall and are sometimes accompanied by hail. Snow has not been recorded in the area (Stevens, et al, 2007).

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## 6.4 SOIL, LAND USE AND LAND CAPABILITY

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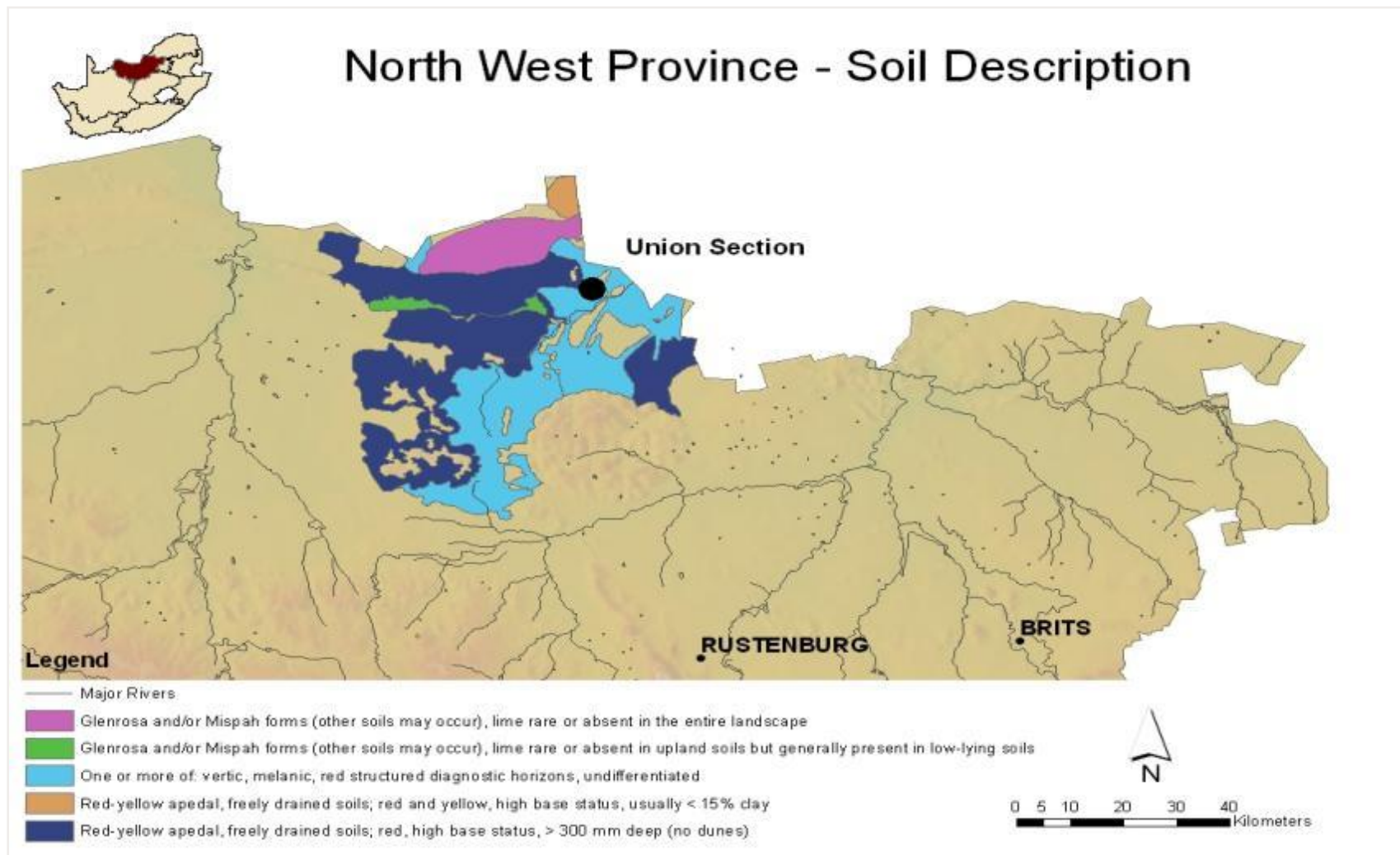
### 6.4.1 SOIL

Most of the land type in the area (68 %) consists of dark, strongly structured, usually calcareous, swelling clay soils of the Arcadia soil form with either a crusting or self-mulching (crumbly) soil surface. The texture of these soils is 40 – 60 % of clay. Refer to **Table 6-9** for the regional soil description (Mulder, 2009).

Substantial variation in depth to the underlying rock or saprolite (weathered rock) is present. There is 5 % exposed rock on average in the land type. The remaining 27 % of the land type consists of either shallow (<250 mm) soils on rock belonging to the mispah or glenrosa form (7 %), dark reddish-brown, weakly to moderately structured, non-calcareous, sandy clay to clay soils, generally belonging to the hutton and shortlands forms (12 %) or various brown to black non-swelling sandy clay loam to clay soils. The clay content of the soil results in limitations on agricultural production potential.

Analysis results show the clay-rich nature of the Arcadia soils, with a slight (though not significant) increase down the profile. The pH values derived mainly from the basic parent material and high clay content, show slightly alkaline soils. Due to the homogenous nature of the soils around RPM-US, the soil conditions are expected to be relatively uniform.

The soil mapping unit (Ar) covers an area of 285 ha (within which the majority of the RPM-US forms falls in). **Table 6-10** indicates the location of the soil map units for the study area (Stevens, et al, 2007).



**Figure 6-9: Soil Description of the Region (Mulder, 2009)**



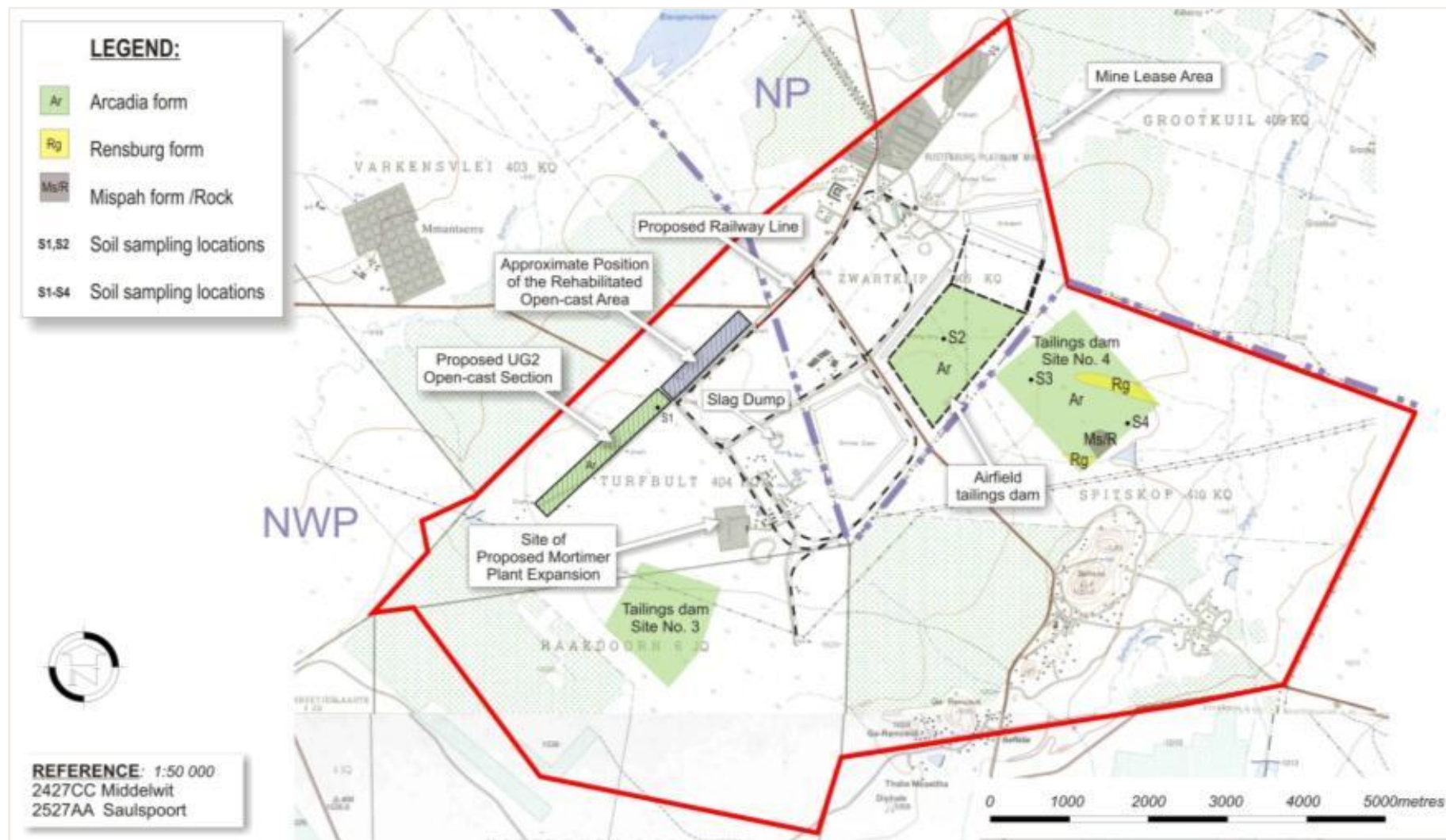


Figure 6-10: RPM-US - Soil Series Map (Stevens, et al, 2007)



The main properties of the soil encountered in the RPM-US area are provided in **Table 6-4**.

**Table 6-4: Soil Mapping Unit (Stevens, et al, 2007)**

MAPPING UNIT	DOMINANT SOIL FORM/FAMILY	SUBDOMINANT SOIL FORM/FAMILY	EFFECTIVE DEPTH (MM)	DESCRIPTION OF MAPPING UNIT	GENERAL DRYLAND AGRICULTURAL POTENTIAL
Ar	Arcadia 1200	Arcadia 1100	750 - 1 200+	Deep; very dark, grey to black, strongly structured, swelling clay soils, usually calcareous	Arable, moderate potential
Rg	Rensburg 2000	Arcadia 1200	500 – 1 000	Moderately deep, dark grey to black, strongly structured, swelling clay soils, on grey to dark grey, dark clay, found in depressions and along watercourses	Pasture
Ms/R	Rock	<ul style="list-style-type: none"> <li>– Mispah 1 100</li> <li>– Mikwood 2000</li> <li>– Arcadia 1 200</li> </ul>	50 - 400	Rocky to very rocky area, found around koppie in the south of site 4, with shallow, dark brown to black, often structured, sandy clay loam to clay soils on hard rock	Wilderness

*Note: The structure of the Arcadia soils is most strongly seen when the soils are dry. When they are moist or wet, the structure appears weaker.*

According to **Figure 6-10**, samples were taken at four locations within the RPM-US lease area (marked as SI, S2, S3 and S4) at varying depths. All of these locations comprise deep Arcadia soils. The samples were analysed and the analysis results are provided in **Table 6-5**.

**Table 6-5: Soil Analysis Results (Stevens, et al, 2007)**

SAMPLE NO. (RUM)	SL	S2		S3		S4	
	0-250	500-800	0-300	300-700	0-300	300-900	0-300 300-800
Sand (%)	25	18	18	15	20	15	15 14
Silt (%)	27	24	26	25	28	25	27 24
Clay (%)	48	58	56	60	52	60	58 62
Organic Carbon (%)	1.54	0.71	1.30	0.64	1.27	0.82	1.00 0.69
pH (H2O)	7.76	8.11	7.70	8.54	7.90	8.01	8.27 8.47
Na (cmol (+)kg <sup>-1</sup> )	0.05	0.89	0.46	2.67	0.13	1.19	0.75 2.48
K (cmol (+)kg <sup>-1</sup> )	1.12	0.75	1.44	0.51	1.51	0.89	0.90 0.81
Ca (cmol (+)kg <sup>-1</sup> )	36.48	33.01	45.60	43.81	48.62	49.11	53.52 51.47

SAMPLE NO. (RUM)	SL	S2		S3		S4	
	0-250	500-800	0-300	300-700	0-300	300-900	0-300 300-800
Mg (cmol (+)kg <sup>-1</sup> )	18.26	29.37	17.36	22.13	7.63	14.83	17.76 18.37
CEC* (cmol (+)kg <sup>-1</sup> )	57.78	61.40	62.06	64.20	55.59	58.36	61.50 65.67
P <sup>#</sup> (ppm)	2.56	2.36	2.36	2.21	2.72	2.11	2.51 2.21

\*- Cation Exchange Capacity Na- Sodium, K- Potassium, Ca- Calcium, Mg- Magnesium, P- Phosphorus, cmol -1kg Concentration of exchange cation, # = Bray No. Method

The results in **Table 6-5** show the clay-rich nature of the Arcadia soils, with a slight (though not significant) increase down the profile. The pH values, derived mainly from the basic parent material and high clay content, show slightly alkaline soils.

The cation exchange capacity levels, especially the calcium and magnesium component (lime nodules are observed in virtually all the soil exposures), are high, indicating the inherent fertility of the soils. The phosphorus values are moderately low, reflecting the lack of dense grass cover on the tuft soils (Stevens, et al, 2007).

## 6.4.2 LAND USE

Approximately 40 % of the land situated within the municipal area is utilised for game farming, 5 % for towns, roads and other infrastructure, 3 % for dry-land farming, 2 % for irrigation and 0.4 % for mining. The remainder of the area is utilised for extensive cattle farming (refer to **Figure 6-11**) (Mulder, 2009).

The area's local economy depends largely on the mining, agriculture, and tourism sectors. The location of mining areas, agricultural land and tourism facilities (such as nature reserves) in relation to existing development and service networks also influence future development initiatives (Mulder, 2009).

Historically, agricultural production and cattle farming were undertaken in the area where RPM-US is now situated. The agriculture production included sunflowers and mealies. Currently mealies are still being grown on Grootkuil 409 KQ. Due to low rainfall and low underground water reserves, cattle farming was reportedly predominant in the area (Stevens, et al, 2007).

The current land uses at each area of RPM-US are summarised in **Table 6-6**.

**Table 6-6: Summary of the Pre-Development Land Use (Stevens, et al, 2007)**

AREA: SHAFT	AREA: PROCESS	AREA: SUPPORT
<ul style="list-style-type: none"> <li>— Grazing</li> <li>— Previously mined UG2 reef using declines</li> <li>— Abandoned shafts and other small areas of infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>— Storage area of materials e.g. Pipes and cable</li> <li>— Natural bush enclosed as RPM-US game park</li> </ul>	<ul style="list-style-type: none"> <li>— Grazing</li> </ul>

The existing mine infrastructure relative to the various land-use areas are depicted in **Figure 6-12**. RPM-US rehabilitates disturbed areas within their lease area on an ongoing basis (Stevens, et al, 2007).

### 6.4.3 LAND CAPABILITY

Land capability on Arcadia soil is arable with moderate material. These soils cover the majority of the disturbed area (a land capability map is depicted in **Figure 6-12**). **Table 6-7** indicates the soil potential per sampling area as well as the relevant land use mapping unit.

The shrinking and swelling properties, of the black Arcadia (turf) soils means that there is a narrower moisture range for cultivation than other agricultural soils. If the swelling clay soils become wet, the pores fill up, they saturate easily and drain slowly, causing anaerobic conditions (especially under irrigation) and a deficit of oxygen in the root zone. If allowed to dry out, however, these soils can crack, damaging roots. Surface crusting is also a potential problem, due to the swelling and sealing nature of the soils, which can lead to increased infiltration rates. However, the black clay soils are naturally fertile, with high cation exchange capacities and high organic carbon contents. If well managed, these soils could potentially be productive soils.

Crops, which would do well on these soils, include sunflowers, soya beans, wheat, cotton and some vegetables. However, the climate of the area is marginal for dry land crop production, mainly due to the insufficient and variable long-term rainfall. For optimal production, supplementary irrigation would be required (Mulder, 2009).

**Table 6-7: Soil Potential**

SITE	SOIL POTENTIAL (CLASS)	MAP UNIT
S1	Arable, moderate	Ar
S2	Arable, moderate	Ar
S3 and S4	-	Ar
	-	Rg
	-	Ms / R

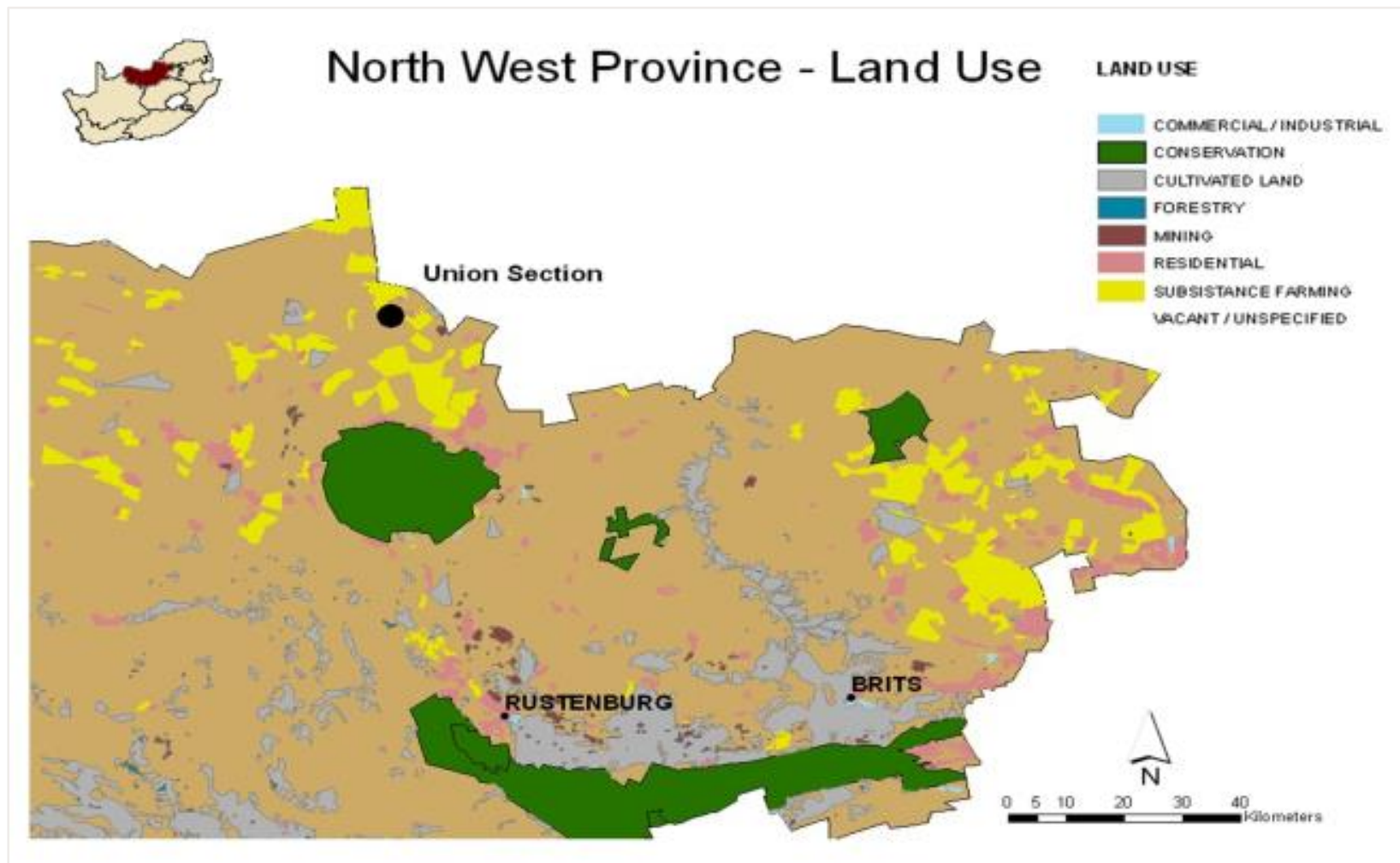


Figure 6-11: North West Province - Land use (Mulder, 2009)

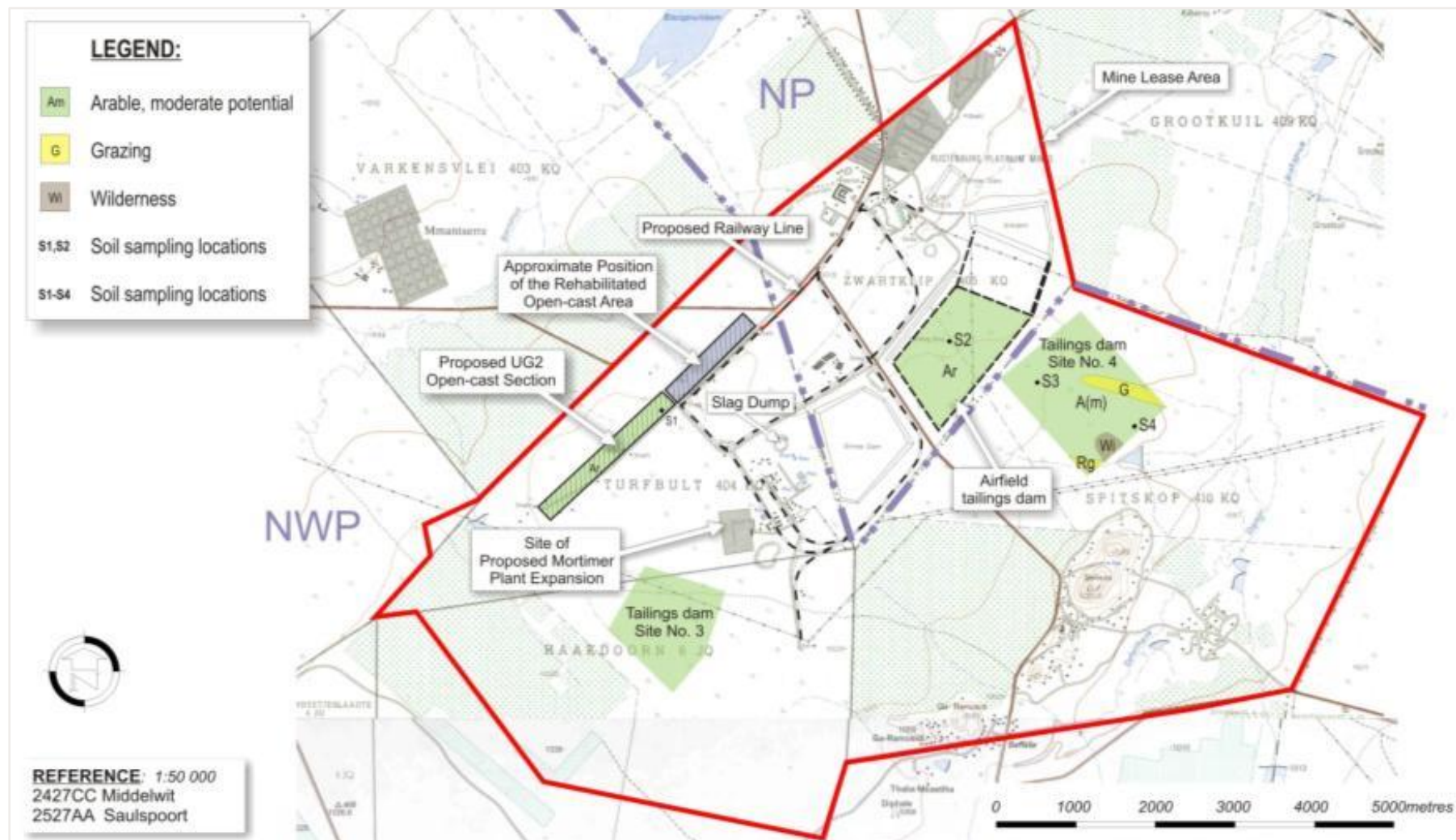


Figure 6-12: RPM-US Land Capability (Stevens, et al, 2007)



## 6.5 BIODIVERSITY

### 6.5.1 FLORA

RPM-US lies within the Savanna biome, the largest biome in Southern Africa, occupying over one-third of the geographical area of South Africa. Only 5 % of the area covered by this biome is conserved in nature reserves. The general vegetation type of the area surrounding RPM-US is classified as Clay Thorn Bushveld. With over 60 % of its' former range being converted to agriculture, Clay Thorn Bushveld has become the most-threatened habitat within the eco-region and only 0.93 % is currently formally conserved. The occurrence of clay thorn bushveld is characterised by exceptionally fertile black or red vertic clay soils. The key environmental parameters determining the distribution of this bushveld vegetation type are extremely clayey soils. Most commonly occurring vegetation within the RPM-US lease area is presented in **Table 6-8** (Stevens, *et al*, 2007).

**Table 6-8: Dominant Vegetation Species found in the RPM--US Lease Area (Mulder, 2009)**

TREES	GRASSES / REEDS	HERBS, SHRUBS & WILD FLOWERS
<i>Acacia nilotica</i> (Scented thorn)	<i>Cymbopogon plurinodis</i> (Turpentine grass)	<i>Boophane disticha</i> (Poison Bulb/ Tumbleweed)
<i>Ziziphus mucronata</i> (Buffalo-thorn)	<i>Elionurus muticus</i> (Wire grass)	<i>Tithonia rotundifolia</i> (Red sunflower)
<i>Dichrostachys cinerea</i> (Sickle bush)	<i>Cynodon dactylon</i> (Couch grass)	<i>Datura stramonium</i> (Common Thorn apple)
<i>Acacia caffra</i> (Common hook-thorn)	<i>Phragmites australis</i> (Common reed)	<i>Geigeria burkei</i> var. <i>elata</i> (Vermeersiektebossie)
<i>Rhus lancea</i> (Karree)	<i>Typha capensis</i> (Common bulrush)	<i>Dicoma anomala</i> (Tummy bitterroot/Doll's protea)
<i>Melia azedarach</i> (Syringa)	<i>Setaria incrassate</i> (Vlei bristle grass)	<i>Diospyros lycioides</i> (Blue bush)
<i>Tamarix spp.</i> (Tamarisk)	<i>Diheteropogon amplexans</i> (Broad-leaved bluestem)	<i>Buddleja salviifolia</i> (Sagewood)
<i>Tipuana tipu</i> (Tipu tree)	<i>Cenchrus ciliaris</i> (Blue buffalo grass)	<i>Zinnia peruviana</i> (Redstar/wild zinnia)
<i>Sclerocarya birrea</i> subsp. <i>caffra</i> (Marula)	<i>Aristida bipartita</i> (Rolling grass)	<i>Helichrysum kraussii</i> (Straw Everlasting)
<i>Rhus pyroides</i> (Common Wild Current)	<i>Setaria pallide-fusca</i> (Garden setaria/bristle grass)	<i>Achyranthes aspera</i> (Burweed)
<i>Acacia mellifera</i> (Black Thorn)	<i>Diheteropogon amplexans</i> (Broad-leaved bluestem)	<i>Tagetes minuta</i> (Khaki weed)
<i>Acacia karroo</i> (Sweet thorn)	<i>Bothriochloa insculpta</i> (Pinhole grass)	<i>Rhus pyroides</i> (Common taaibos/wild currant)
<i>Acacia tortilis</i> (Umbrella thorn)	<i>Setaria verticillata</i> (Bur / Sticky bristle grass)	<i>Grewia occidentalis</i> (Cross- berry)
	<i>Urochloa mosambicensis</i> (Bushveld signal grass)	<i>Leonotis leonurus</i> (Wild Dagga)
	<i>Typha capensis</i> (Common bulrush)	
	<i>Chloris virgata</i> (Feathered chloris)	

Thornveld is a bush habitat or woodland, dominated by *Acacia* spp., *Albizia* spp. and *Dichrostachys cinerea* trees, all woody and thorny. Below the distinct upper layer of woody plants, there is a grassy ground layer, dominated by Turf Grass (*Ischaemum afrum*), Deck Grass (*Sehima galpinii*), Canary Millet (*Setaria incrassata*) and White Buffalo Grass (*Panicum coloratum*). Overgrazing and deterioration of the grass causes an increase in cover of the woody species, with an associated dominance of Pinhole Grass (*Bothriochloa insculpta*), Three-awn Rolling Grass (*Aristida bipartita*), Sweet signal-grass (*Brachiaria eruciformis*) and Black-seed Wild Sorghum (*Sorghum versicolor*).

## 6.5.2 DOMINANT SPECIES

The dominant (most commonly occurring) vegetation species found in the RPM-US lease area are summarised per operational area and component in **Table 6-9** (Stevens, *et al*, 2007).

**Table 6-9: Dominant Vegetation Species found in the RPM-US Lease Area (Stevens, *et al*, 2007)**

BUSINESS AREA	TREES	GRASSES/REEDS	HERBS, SHRUBS & WILD FLOWERS
Mining operations			
Decline shaft	<i>Acacia nilotica</i> (Scented thorn) <i>Cymbopogon plurinodis</i> (Turpentine grass) <i>Ziziphus mucronata</i> (Buffalo-thorn) <i>Dichrostachys cinerea</i> (Sickle bush) <i>Acacia caffra</i> (Common hook-thorn) <i>Rhus iancea</i> (KatTee) <i>Melia azedarach</i> (Syringa)	<i>Cymbopogon plurinodis</i> (Turpentine grass) <i>Elionurus muticus</i> (Wire grass) <i>Cynodon dactylon</i> (Couch grass)	-
No. 4 South Decline Shaft (area cleared for surrounding vegetation - see Support section below)			
Richard Shaft	<i>Melia azedarach</i> (Syringa) <i>Tamarix</i> sp. (Tamarisk) <i>Tipuana tipu</i> (Tipu tree) <i>Sclerocarya birrea</i> subsp. <i>caffra</i> (Marula)	<i>Phragmites australis</i> (Common reed) <i>Typha capensis</i> (Common bulrush)	<i>Boophane disticla</i> (Poison Bulb / Tumbleweed) <i>Tithonia rotundifolia</i> (Red sunflower)
No. 22 Vertical shaft	<i>Melia azedarach</i> (Syringa)	-	-
WRD for No. 4 South Decline shaft	<i>Melia azedarach</i> (Syringa)	<i>Cynodon dactylon</i> (Couch grass)	-
Water stream alongside the WRD for No. 4 South Decline shaft	-	<i>Typha capensis</i> (Common bulrush) <i>Chloris virgate</i> (Feathered chloris) <i>Urochloa mosambicensis</i> (Bushveld signal grass)	<i>Datura stramonium</i> (Common Thorn apple) <i>Geigeria burkei</i> var. <i>elata</i> (Venneersiektebossie) <i>Dicoma anomala</i> (Tummy bitterroot/Doll's protea)
Open cast section and railway line	<i>Ziziphus mucronata</i> (Buffalo- thorn) <i>Acacia tortilis</i> (Umbrella thorn) <i>Acacia nilotica</i> (Scented thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Dichrostachys cinerea</i> (Sickle bush)	<i>Cymbopogon plurinodis</i> (Turpentine grass) <i>Setaria verticillata</i> (Bur / Sticky bristle grass) <i>Bothriochloa insculpta</i> (Pinhole grass) <i>Cynodon dactylon</i> (Couch grass) <i>Diheteropogon amplexans</i> (Broad-leaved bluestem) <i>Setaria incrassata</i> (Vlei bristle grass)	-



BUSINESS AREA	TREES	GRASSES/REEDS	HERBS, SHRUBS & WILD FLOWERS
Processing operations			
No. 3 TSF	<i>Acacia nilotica</i> (Scented thorn) <i>Acacia caffra</i> (Common Hook-thorn) <i>Ziziphus mucronata</i> (Buffalo-thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Acacia mellifera</i> (Black thorn) <i>Dichrostachys cinerea</i> (Sickle bush) <i>Rhus pyroides</i> (Common wild current)	<i>Setaria verticillata</i> (Bur bristle grass) <i>Setaria pallide-fusca</i> (Garden setaria/bristle grass) <i>Aristida bipartite</i> (Rolling grass)	<i>Diospyros lycioides</i> (Blue bush) <i>Buddleja salviifolia</i> (Sagewood) <i>Zinnia penlviana</i> (Redstar/wild zinnia) <i>Boophane disticha</i> (Poison bulb / Tumbleweed) <i>Helichrysum kraussii</i> (Straw Everlasting) <i>Achyranthes aspera</i> (Burweed) <i>Tagetes minuta</i> (Khaki weed)
No. 4 TSF	<i>Acacia caffra</i> (Common Hook - thorn) <i>Acacia nilotica</i> (Scented Thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Ziziphus mucronata</i> (Buffalo-thorn)	<i>Cymbopogon plurinodis</i> (Turpentine grass)	-
Airfield TSF	<i>Ziziphus mucronata</i> (Buffalo- thorn) <i>Acacia tortilis</i> (Umbrella thorn) <i>Acacia nilotica</i> (Scented thorn) <i>Acacia mellifera</i> (Black thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Dichrostachys cinerea</i> (Sickle bush)	<i>Cymbopogon plurinodis</i> (Turpentine grass) <i>Setaria verticillata</i> (Bur / Sticky Bristle grass) <i>Bothriochloa insculpta</i> (Pinhole grass) <i>Cynodon dactylon</i> (Couch grass) <i>Cenchrus ciliaris</i> (Blue buffalo grass) <i>Diheteropogon amplexans</i> (Broad-leaved bluestem) <i>Setaria incrassata</i> (Vlei bristle grass)	<i>Rhus pyroides</i> (Common taaibos / wild currant) <i>Grewia occidentalis</i> (Cross-berry) <i>Buddleja salviifolia</i> (Sagewood)
Surrounding the Airfield TSF	<i>Melia azedarach</i> (Syringa) <i>Tamarix</i> sp. (Tamarisk) <i>Acacia mellifera</i> (Black thorn)	<i>Phragmites australis</i> (Common reed) <i>Typha capensis</i> (Common bulrush)	-
Slag Dump	<i>Tamarix</i> sp. (Tamarisk)	<i>Phragmites australis</i> (Common reed)	<i>Leonotis leonurus</i> (Wild dagga)
Central services			
Road leading to No. 4B and No. 4 South Decline Shafts	<i>Melia azedarach</i> (Syringa)	<i>Cynodon dactylon</i> (Couch grass)	-
Water furrow across the road leading to No. 4B and No. 4 South Decline Shafts	-	<i>Phragmites australis</i> (Common reed) <i>Typha capensis</i> (Common bulrush)	-

No rare or endangered species were found in any of the mining, process or support areas which have been surveyed.

### 6.5.3 INVADERS / WEEDS, ALIEN SPECIES AND INDICATORS OF BUSH ENCROACHMENT

Alien and invasive species provide ecological, economic and aesthetic threats to ecosystems. They can interrupt the regeneration processes of indigenous species and reduce the biodiversity of natural ecosystems. Their abundant and prolific growth at the expense of the native flora and fauna could have serious consequences for the preservation of biodiversity (Stevens, *et al*, 2007).

Large tracts of the RPM-US lease area are already dominated by alien and / or invasive plants. The extent of alien and invasive species in the area is an indication of the high level of disturbance and human interference in the natural ecosystem. Alien invasive species such as *Melia azedarach* (Syringa), *Tipuana tipu* (Tipu tree), *Datura stramonium* (Common thorn apple), *Achyranthes aspera* (Burweed) and *Lantana camara* have all been documented within the lease area. While general clearing and mining activities destroy natural vegetation, invasive plants that become established may cause an impact beyond the boundaries of RPM-US.

These alien and invasive species are thus a threat to the surrounding natural vegetation and can result in a severe decrease in biodiversity and ecosystem functioning of the area as a whole. There is a high probability (as has already been reported in some rehabilitated and disturbed areas) that these plant species become even more abundant and out-compete the natural vegetation if not managed (Mulder, 2009).

Details of the categories of alien, invaders and bush encroachers are provided in **Table 6-10**.

**Table 6-10: Categories of Aliens, Invaders and Bush Encroachers (Stevens D, et al, 2007)**

CATEGORIES	EXPLANATION
Category 1: Declared weeds	— Prohibited plants, which must be controlled, or eradicated where possible (except in bio-control reserves, which are areas designated for the breeding of bio-control agents)
Category 2: Declared invader plants	— Mainly commercial plantation species but also plants for woodlots, animal fodder, soil stabilisation etc. Allowed only in demarcated areas under controlled conditions and in bio-control reserves
Category 3: Declared invader plants	<ul style="list-style-type: none"> <li>— Mainly ornamental species</li> <li>— No further planting allowed (except with special permission)</li> <li>— No trade in propagative material</li> <li>— Existing plants may remain but must be prevented from spreading</li> <li>— Prohibited within 30 m of the 1:50 year floodline of watercourses or wetlands, or as directed by the executive officer</li> </ul>
Indicators of bush encroachment	— Indigenous wood spp., which requires sound management practices to prevent them from becoming a problem

Category 1 describes declared weeds and Category 2 and 3, declared invaders. Indicators of bush encroachment are also described. Plants from each of the categories are found in all of the surveyed areas at RPM-US. A summary of the invaders, weeds and indicators of bush encroachment per operational area are contained in **Table 6-11** (Stevens, *et al*, 2007).

**Table 6-11: Invaders weeds and indicators of bush encroachment (Stevens, et al, 2007)**

BUSINESS AREA ACTIVITY	CATEGORY 1	CATEGORY 2	CATEGORY 3	INDICATOR OF BUSH ENCROACHMENT	WEED / EXOTIC
Mining operations					
No 4B & 5 South Decline Shaft	-	-	<i>Melia azedarach</i> (Syringa)	<i>Acacia nilotica</i> (Scented thorn) <i>Dichrostachys cinerea</i> (Sickle bush) <i>Acacia caffra</i> (Common hook-thorn)	-
Richard Shaft	<i>Tithonia rotundifolia</i> (Red sunflower)	-	<i>Melia azedarach</i> (Syringa) <i>Tipuana tipu</i> (Tipu tree) <i>Tamarix Chinensis</i> or <i>Tamarix ramosissima</i>	-	<i>Phragmites australis</i> (Common reed) <i>Tamarix</i> sp (Tamarisk)
No 22 Vertical Shaft	-	-	<i>Melia azedarach</i> (Syringa)	-	-
WRD for No. 4 South Decline Shaft	-	-	<i>Melia azedarach</i> (Syringa)	-	-
Stream Alongside WRD	<i>Datura stramonium</i> (Common thorn apple)	-	-	-	<i>Tagetes minuta</i> (Khaki weed)
UG2 Open Cast Section and railway line	-	-	-	<i>Acacia tortilis</i> (Umbrella thorn) <i>Acacia nilotica</i> (Scented thorn)	-
Processing operations					
No. 3 TSF	<i>Achyranthes aspera</i> (Burweed) <i>Datura stramonium</i> (Common thorn apple)	-	-	<i>Acacia nilotica</i> (Scented Thorn) <i>Acacia caffra</i> (Common Hook-thorn) <i>Diospyros lycioides</i> (Blue bush) <i>Acacia mellifera</i> (Black Thorn) <i>Dichrostachys cinerea</i> (Sickle bush)	<i>Tagetes minuta</i> (Khaki weed) <i>Zinnia peruviana</i> (Redstar / wild zinnia)
No.4 TSF	-	-	-	<i>Acacia caffra</i> (Common Hook-thorn) <i>Acacia nilotica</i> (Scented Thorn) <i>Acacia karroo</i> (Sweet Thorn)	-

BUSINESS AREA ACTIVITY	CATEGORY 1	CATEGORY 2	CATEGORY 3	INDICATOR OF BUSH ENCROACHMENT	WEED / EXOTIC
Airfield TSF (June 2001)	<i>Lantana camara</i> (Lantana)	-	<i>Melia azedarach</i> (Syringa) <i>Tipuana tipu</i> (Tipu tree)	<i>Acacia tortilis</i> (Umbrella thorn) <i>Acacia nilotica</i> (Scented thorn) <i>Acacia mellifera</i> (Black thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Dichrostachys cinerea</i> (Sickle bush)	-
Surrounding Airfield TSF	-	-	<i>Melia azedarach</i> (Syringa) <i>Tamarix chinensis</i> <i>Tamarix ramosissima</i>	<i>Acacia mellifera</i> (Black thorn)	<i>Tamarix</i> sp. (Tamarisk) <i>Phragmites australis</i> (Common reed)
Slag Dump	-	-	* <i>Tamarix chinensis</i> or * <i>Tamarix ramosissima</i>	-	<i>Phragmites australis</i> (Common reed) * <i>Tamarix</i> sp. (Tamarisk)
Central services					
Rehabilitated Area At No 4 S Decline Shaft	<i>Datura stramonium</i> (Common thorn apple) <i>Xanthium strumarium</i> (Large Cocklebur)	-	-	-	<i>Sonchus oleraceus</i> (Sowthistle) <i>Solanum panduriforme</i> (Poison / bitter apple) <i>Flaveria bidentis</i> (Smelter's bush) <i>Tagetes minuta</i> (Khaki weed) <i>Zinnia Peruviana</i> (Redstar/wild zinnia)
Road Leading To No 4b, 4 South And 5 South Decline Shafts	-	-	<i>Melia azedarach</i> (Syringa)	-	-
Water Furrow Across This Road	-	-	-	-	<i>Phragmites australis</i> (Common reed)

#### 6.5.4 PLANTS OF MEDICINAL VALUE

Plants of medicinal value found in and around RPM-US are presented in **Table 6-12** (Stevens, *et al*, 2007).

**Table 6-12: Plants of Medicinal Value (Stevens, et al, 2007)**

AREA	SPECIES
<b>Mining operations</b>	
Open cast section and Railway line	<i>Ziziphus mucronata</i> (Buffalo-thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Dichroctachys cinerea</i> (Sickle bush)
<b>Processing operations</b>	
No.3 TSF	<i>Ziziphus mucronata</i> (Buffalo-thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Dichroctachys cinerea</i> (Sickle bush) <i>Boophane disticha</i> (Tumbleweed / Poison bulb) <i>Helichrysum kraussii</i> (an aromatic herb known as impepho in Zulu which is widely burnt as an incense in Natal. Diviners are careful not to rip the plant out by its roots). <i>Leonotis leonurus</i> (Wild dagga)
No. 4 TSF	<i>Ziziphus mucronata</i> (Buffalo-thorn) <i>Acacia karroo</i> (Sweet thorn)
Airfield TSF	<i>Ziziphus mucronata</i> (Buffalo-thorn) <i>Acacia karroo</i> (Sweet thorn) <i>Dichroctachys cinerea</i> (Sickle bush) <i>Grewia occidentalis</i> (Cross-berry) <i>Buddleja salviifolia</i> (Sagewood)
Slag Dump	<i>Leonotis leonurus</i> (Wild dagga)
<b>Central services</b>	
Rehabilitated area at No.4 South Decline Shaft	<i>Buddleja salviifolia</i>

## 6.6 FAUNA

### 6.6.1 TERRESTRIAL FAUNA

**Table 6-13** summarises the commonly occurring animal species in the surveyed areas at RPM-US. It should be noted that although animals have been grouped according to where they are mostly found, there are cross movements between the areas through migration boundaries or pathways (Mulder, 2009).

**Table 6-13: Commodity Occurring Animal Species (Multer, 2009)**

MAMMALS	BIRDS	OTHER
<i>Canis mesomelas</i> (Black-backed jackal) <b><i>Aepyceros melampus</i> (Impala)</b> <b><i>Felis caracal</i> (Caracal)</b> <i>Tragelaphus strepsiceros</i> (Kudu) <i>Connochaetes taurinus</i> (Blue wildebeest) <i>Alcelaphus buselaphus</i> (Red hartebeest) <i>Sylvicapra grimmia</i> (Common duiker) <i>Taurotragus oryx livingstonei</i> (Livingstone eland) <i>Redunca arundinum</i> (Southern reedbuck) <i>Raphicerus campestris</i> (Steenbok) <i>Tragelaphus angasii</i> (Nyala) <i>Civettictis civetta</i> (Civet ) <i>Mugos mungo</i> (Banded mongoose) <i>Cynictis pencilata</i> (Yellow mongoose) <i>Hystrix africaeaustralis</i> (Porcupine) <i>Phacochoerus aethiopicus</i> (Warthog)	<i>Numida meleagris</i> (Helmeted Guinea fowl) <i>Uraeginthus angolensis</i> (Blue waxbill) <i>Spermestes cucullatus</i> (Bronze mannikin) <i>Motacilla capensis</i> (Cape wagtail) <i>Quelea quelea</i> (Redbilled quelea) <i>Ploceus velatus</i> (Southern masked weaver) <i>Streptopelia senegalensis</i> (Laughing dove) <i>Columba guinea</i> (Rock pigeon) <i>Cossypha humeralis</i> (African white-throated robin) <i>Merops albicollis</i> (White-throated bee-eater) <i>Bubulcus ibis</i> (Cattle egret) <i>Corvus albus</i> (White-breasted crow) <i>Laniarius atrococcineus</i> (Crimson-breasted shrike)	<i>Termitidae</i> spp. (termites)

## 6.6.2 ENDANGERED OR RARE SPECIES

A few lower risk red data species were found in the surveyed areas. They are either conservation dependant or of least concern, and are given in **Table 6-14** (Stevens, *et al*, 2007).

There are, to the north of the existing TSF's, 19 rare Livingstone Eland (*Taurotragus oryx livingstonei*) roaming the area (does not have red data status). The game farm contains one of the Skeerbekmuis (*Shrew*) species (unknown which specific species). Both the Sclater's tiny mouse shrew (*Myosorex sclateri*) and the Thin mouse shrew (*Myosorex tenius*) are vulnerable.

**Table 6-14: Rare or Endangered Species (Stevens, et al, 2007)**

BUSINESS AREA	LOWER RISK (CONSERVATION DEPARTMENT)	LOWER RISK (LEAST CONCERN)
<b>Mining operations</b>		
Open cast section	<i>Redunca arundium</i> (Southern Reedbuck)	<i>Sylvicapra grimmia</i> (Common duiker) <i>Canis mesomelas</i> (Black- backed jackal)
<b>Processing operations</b>		
No. 3 TSF	<i>Aepyceros melampus</i> (Impala)	<i>Sylvicapra grimmia</i> (Common duiker)
No. 4 TSF	<i>Aepyceros melampus</i> (Impala)	<i>Sylvicapra grimmia</i> (Common duiker)



BUSINESS AREA	LOWER RISK (CONSERVATION DEPARTMENT)	LOWER RISK (LEAST CONCERN)
Airfield TSF	<i>Tragelaphus strepsiceros</i> (Kudu) <i>Connochaetes taurinus</i> (Blue wildebeest) <i>Alcelaphus buselaphus</i> (Red hartebeest) <i>Aepyceros Melampus</i> (Impala) <i>Redunca arundinum</i> (Southern reedbuck) <i>Tragelaphus angasii</i> (Nyala)	<i>Sylvicapra grimmia</i> (Common Duiker) <i>Raphicerus campestris</i> (Steenbok)
<b>Central services</b>		
No rare or endangered species were found in any of the other surveyed mining components		

### 6.6.3 RIVER HEALTH

The ecological importance and sensitivity (EIS) of the surface water resource is low marginal with the Bierspruit considered a resilient system. The present ecological state (PES) of the Bierspruit has been defined as class B, largely natural with the EIS (desired state) also a class B (Kleynhans, 2000). The current biomonitoring surveys are not undertaken on the Bierspruit but on the Mortimer Spruit, Sefathlane River and Brakspruit.

The Farmer's Dam in the Mortimer Spruit located downstream of the Game Farm Flood Storage Dam indicated an aquatic faunal assemblage that is considered diverse and healthy, with a number of taxa regarded as moderately sensitive being present. Discharge from the Game Farm Flood Storage Dam should be prevented to maintain the diverse and healthy state of the Mortimer Spruit downstream of RPM-US.

The Mortimer Spruit upstream of the Game Farm Flood Storage Dam indicates impacts from RPM-US. These include elevated salinity levels contributed by ammonia, nitrate, chloride and sulphate, and organic pollution. The salinity levels can be attributed to the mining operation while the organic pollution is likely the result of discharges from the sewage treatment works. Excessive plant growth and occasional, seasonal mass fish mortalities (last occurrence in 2007) have been observed at Fraser Alexander Return Water Dam which can be attributed to the addition of organically-enriched effluent from the sewage treatment plant and the relatively shallow nature of the impoundments due to siltation. Fraser Alexander and Barbers Return Water Dams presented limited toxicity towards the aquatic invertebrates and fish.

The Mortimer Spruit and Sefathlane River have been determined to be class E / F (highly / critically modified) based on the 2010 biomonitoring surveys. The PES of class E / F applies both upstream and downstream of RPM-US and can be attributed to a combination of water quality, habitat and flow availability with flow and habitat related to the ephemeral nature of the watercourses (Burke, 2011).

## 6.7 AIR QUALITY

### 6.7.1 POLLUTION SOURCES

**Table 6-15** indicates the mines within the Thabazimbi Local Municipality, which are likely sources of air pollutants in the region other than RPM-US.

**Table 6-15: Mines in the Thabazimbi Local Municipality**

Mines in the Thabazimbi Local Municipality			
Group	Company	Mine	Mineral
Anglo Platinum	Rustenburg Platinum Mines	Amandelbult Section	Platinum
Goldfields	Northam Platinum Mine	Platinum Mine Platinum	Platinum
Kumba Resources	Thabazimbi Iron Ore Mine	Thabazimbi	Iron Ore
PPC	-	Dwaalboom	Cement
Trollope Mining Services	Rhino Andalusite Mine	Rhino Andalusite Mine	Andalusite

### 6.7.2 EXISTING SOURCES OF POLLUTION AT RPM-US

**Table 6-16** describes the processes and activities associated with the existing operations at RPM-US that are considered potential sources of air pollution (Stevens, *et al*, 2007).

**Table 6-16: Existing Sources of Pollution (Stevens, et al, 2007)**

Source	Description
<b>Mining Operations</b>	
Open cast mining	Fugitive dust emissions from the overburden stockpiles are a potential source from the existing open cast operations. Vehicles will be a potential source of fugitive dust as they will be travelling on unpaved roads for a section of the journey to the concentrator.
Crushing and concentrator plants	The crushing plants are not considered a significant source of fugitive dust emissions since the process is enclosed. The concentrator plants are not considered a significant source of air emissions since it is a wet process.
<b>Processing Operations</b>	
Transfer of ore from shaft to the concentrator plant	The ore is currently being transferred to the concentrator plants by rail. The ore is brought to the surface by an incline conveyor and stored in a silo. The ore is loaded into rail cars and shunted to the concentrator plants. The loading and unloading of the rail cars has the potential to generate fugitive dust emissions. The conveyor belt system is not considered to be a significant source of air emissions since the material being transported is relatively large (particles - 85 mm in diameter).

Source	Description
WRD	The waste rock removed from the underground shafts and declines during the shaft sinking process and level development will be dumped in designated areas in close proximity to the shafts. Although dust emissions are anticipated during the dumping of the waste rock, the dumps are not anticipated to be significant sources of windblown dust due to the coarse nature of the material (particles - 300 mm in diameter).
Smelter	The concentrate from the Ivan and Mortimer plants is transported to the Mortimer smelter, along with concentrate produced at other mines in the vicinity. The concentrate slurry is processed through a series of furnaces, resulting in the recovery of PGM's and other minerals i.e. chrome. The emissions from the furnaces are vented to the atmosphere through a 100 m high stack. The emissions are pre-treated prior to discharge. The smelter is a significant source of particulates, SO <sub>2</sub> and other combustion gases.
Slag dump	A stockpile of slag is located in an area to the north of the smelter. Until 2007 the rehabilitation plan for the slag dump was to reprocess the entire dump through the slag mill and furnace to recover the contained PGM ounces and then to co-dispose the slag tailings onto the existing TSF's. Due to the economic recoverable PGM grades from the slag dump being too low and due to better smelter efficiencies, the cost of milling and reprocessing the slag has become uneconomic. The reprocessing of the slag dump has thus been stopped and the rehabilitation programme was initiated. The slag is not considered a significant source of fugitive dust due to the high specific gravity and crusted nature of the material.
TSF	The tailings from the concentrator plants are deposited onto the Mortimer and Airfields TSF's. Wind erosion from these TSF's is a potential source of fugitive dust emissions. During the operational life of the TSF's the material deposited is generally wet / damp. Under normal operating conditions the TSF's will typically comprise approximately 10 % pond, 35 % wet beach area and 55 % dry beach area and as such the TSF's are a significant source of windblown dust. The dry beach area and sidewalls will be susceptible to wind erosion, however the progressive vegetation of the sidewalls, vamping and vegetation of the dry beach area, along with the slag capping of the crests, minimises fugitive dust emissions. The Ivan TSF has been decommissioned and rehabilitated, and as such it was not considered a source of windblown dust. Re-processing of Ivan's TSF has recently been undertaken. The re-processing activity involves the generation of a slurry and as such is not a source of dust emission.
<b>Central Services</b>	
Road Infrastructure	Fugitive dust emissions from vehicles travelling on the paved and unpaved road network and is considered a significant source of dust.

### 6.7.3 AIR QUALITY MONITORING AT RPM-US

Quarterly dust fallout monitoring was carried out, for a limited period (pre-2007), at 12 locations in the vicinity of the Mortimer Concentrator and Smelter. The sampling equipment comprised a 1 m<sup>2</sup> plate covered with an adhesive. The plates were left for a period of 1 month before they were collected and sent to the Assay Laboratory for weighing and chemical analysis. The dust was found to have traces of PGM's, indicating RPM-US was the probable source (Stevens, *et al*, 2007).

Between January and December 2010, RPM-US undertook further ambient air quality monitoring as part of an air quality impact assessment for planned upgrades to the Mortimer Smelter. **Table 6-17** indicates the names of each of the dust fallout monitoring locations, while **Figure 6-13** indicates the locations of each of the monitoring points.

**Table 6-17: Dust Fallout Monitoring**

Dust fallout monitoring activities					
Site code	Name	Classification	Site code	Name	Classification
UNS 01	Main offices	Residential	UNS 08	Mortimer smelter	Industrial
UNS 02	ER Manager'shouse	Residential	UNS 10	New opencast	Industrial
UNS 04	House No. 1 Kanana Village	Residential	UNS 11	Vanshaft	Industrial
UNS 05	Sewage plant	Industrial	UNS 12	Old Ivan TSF	Industrial
UNS 07	C Hostel	Residential	UNS 13	Mortimer TSF	Industrial

The following bullet points indicate the conclusions determined based on the monitoring results provided in **Table 6-18**:

- All the sites at RPM-US recorded “Residential” levels in 2010
- The highest dust fallout rate measured was 464 mg/m<sup>2</sup>/day for October 2010 at the Mortimer Smelter (UNS 08) dust fallout location
- The Mortimer Smelter (UNS 08) dust fallout location also has the highest average dust fallout rate for 2010
- The annual average dust fallout rates are all below 300 mg/m<sup>2</sup>/day



Figure 6-13: Dust Fallout Monitoring Locations (Potgieter, 2011)

**Table 6-18: Dust Fallout Monitoring Rates**

Reported 2010 dfo rates															
SITE COD E	NAME	CLASSIFICATION	JAN-10	FEB-10	MAR-10	APR-10	MAY-10	JUN-10	JUL-10	AUG-10	SEP-10	OCT-10	NOV-10	DEC-10	AVERAG E
			mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /da y	mg/m <sup>2</sup> /day
UNS0 1	Main offices	Residential	59	91	168	54	78	41	67	59	97	319	225	61	109.9
UNS0 2	ER Manager' s house	Residential	26	56	65	101	38	116	92	84	116	130	223	129	98.0
UNS0 4	House No. 1 Kanana Village	Residential	38	68	202	21	35	67	75	65	217	329	193	47	113.1
UNS0 5	Sewage plant	Industrial	69	31	171	19	23	20	65	6	186	160	221	29	83.3
UNS0 7	C Hostel	Residential	79	92	162	44	34	65	92	82	54	329	230	130	116.1
UNS0 8	Mortimer smelter	Industrial	68	192	194	141	22	175	236	276	401	464	162	383	226.2



Reported 2010 dfo rates

SITE COD E	NAME	CLASSIFICATION	JAN-10	FEB-10	MAR-10	APR-10	MAY-10	JUN-10	JUL-10	AUG-10	SEP-10	OCT-10	NOV-10	DEC-10	AVERAG E
UNS1 0	New opencast	Industrial	56	43	107	21	18	31	87	63	170	252	102	24	81.2
UNS1 1	Vanshaft	Industrial	387	157	58	19	12	48	45	68	94	283	87	68	110.5
UNS1 2	Old Ivan TSF	Industrial	133	113	208	7	46	25	34	108	24	246	129	127	100.0
UNS1 3	Mortimer TSF	Industrial	63	ND	395	47	ND	ND	ND	ND	ND	ND	ND	ND	168.3

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#### 6.7.4 SENSITIVE RECEPTORS

Seven sensitive areas (sensitive receptors) have been identified for RPM-US as indicated in **Table 6-19** and **Figure 6-14** (Potgieter, 2011).

**Table 6-19: Sensitive Receptors Identified (Potgieter, J. 2011)**

Sensitive receptors identified			
Number	Sensitive receptor	Number	Sensitive receptor
1	Mantsere Community	5	Hlatini Single Accommodation Village
2	Swartklip - Bierspruit section	6	Sfikile
3	Swartklip town	7	Sfikile - Atamelang
4	Etafeni Single Accommodation Village		

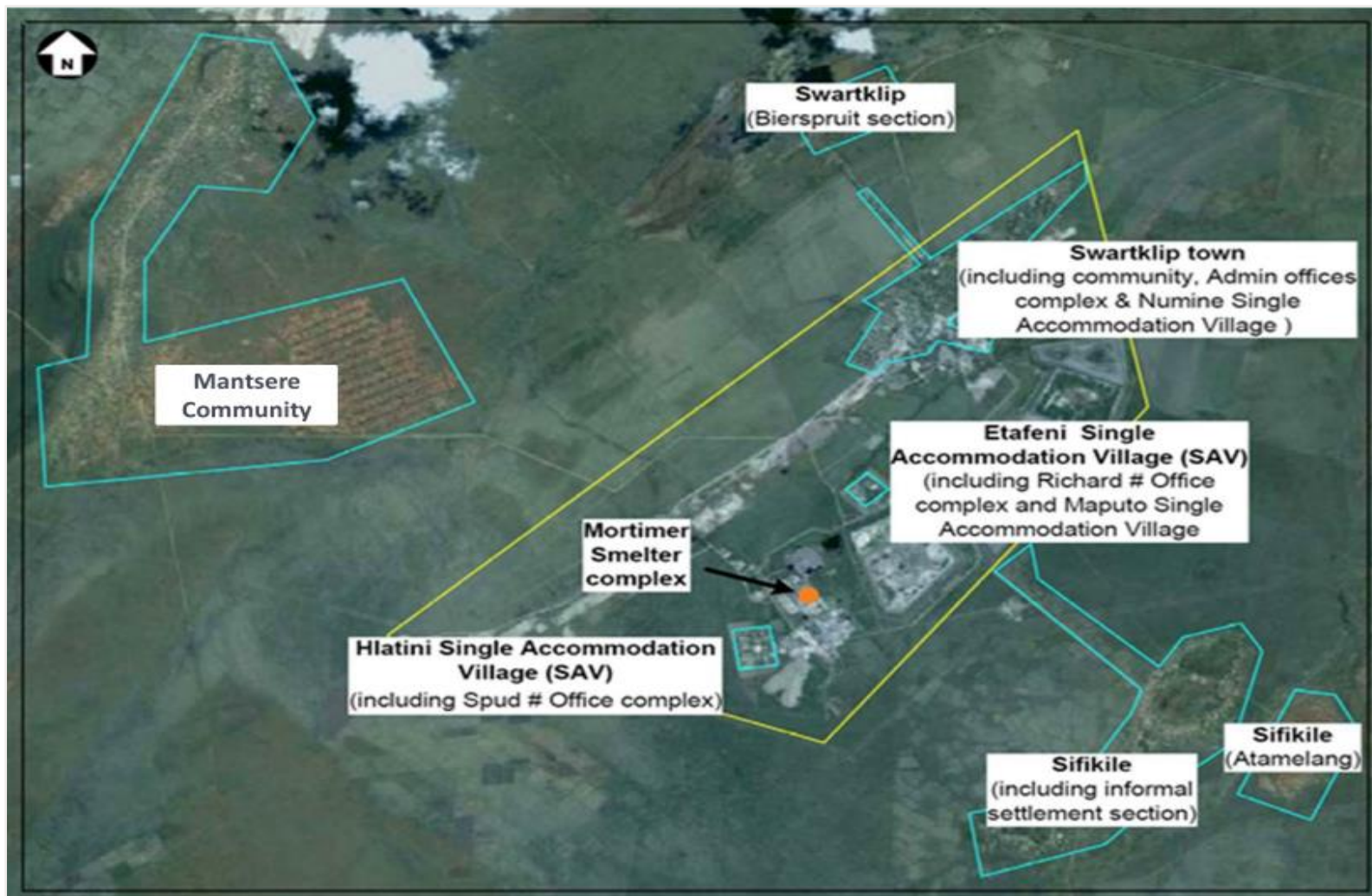


Figure 6-14: RPM-US with Identified Sensitive Receptors (Potgieter, 2011)

## 6.8 HYDROLOGY

### 6.8.1 WATER MANAGEMENT AREA

The RPM-US lease area straddles the A24D, A24E and A24F quaternary catchments within Water Management Area 2 as shown in **Figure 6-15**. Most of the operations take place along the watershed between the Bierspruit and the ephemeral Brakspruit. An ephemeral unnamed tributary of the Brakspruit, runs through the RPM-US lease area and is referred to as Mortimer Spruit (or Union Stream). The Mortimer Spruit and the Sefathlane River confluence to form the Brakspruit downstream of the RPM-US boundary (IWWMP, 2011).

The Brakspruit has its confluence with the Bierspruit about 10 km downstream (to the north-west) of the RPM-US boundary. The Bierspruit flows into the Crocodile River approximately 50 km from the RPM-US boundary. The Bierspruit Dam, which is located within the Bierspruit catchment to the west of the RPM-US lease area, is used for recreational purposes by surrounding communities. Riparian zones along drainage lines can also be classified as wetlands. Due to the ephemeral nature of the spruits, these riparian wetlands are not considered significant. Residential areas around RPM-US use water from Vaalkop Dam (51 km south east of RPM-US) which is supplied by Magalies Water (Mulder, 2009).

The catchments are presented in **Figure 6-15** and the catchment characteristics are provided in **Table 6-20**.

**Table 6-20: Summary of Catchment Characteristics (IWWMP, 2011)**

Summary of catchment characteristics				
Catchment Name	Area (km <sup>2</sup> )	Longest Watercourse (m)	10:85 slope (m/m)	Tc (hours)
Mortimer Spruit	10.7	6 600	0.004	2.98
Bierspruit	1 262	51 730	0.002	9.20
Sefathlane/Brakspruit	732	39 000	0.003	7.52

Note: 10-85 slopes denote the slope of the catchment from a point 10 % from the end point and 85 % of the distance to the furthest point.

Tc: Time of concentration denotes the length of time it takes for a raindrop to travel from the furthest point of the catchment to the outlet point.

### FLOOD PEAKS AND VOLUMES

Flood peaks and volumes were calculated for each of the sub catchments illustrated in **Figure 6-15** and are presented in **Table 6-21**. The method used (SCS) calculates the flood peaks according to the 'time of concentration', 'lag equation' and Schmidt-Schulze methods and is particularly suited to small rural catchments. It takes into account most of the factors that affect runoff, such as quantity, time distribution and duration of rainfall, land use, soil type and size and characteristics of the generating catchment and is based on the principle that runoff is caused by the rainfall that exceeds the cumulative infiltration capacity of the soil. Soil types are divided into four hydrological groups ranging from soils with low runoff potential (well-drained with high infiltration ability and permeability such as sand and gravel) to soils with high runoff potential (very low infiltration rates and permeability such as shallow soils with clay, peat or rock) (IWWMP, 2011).

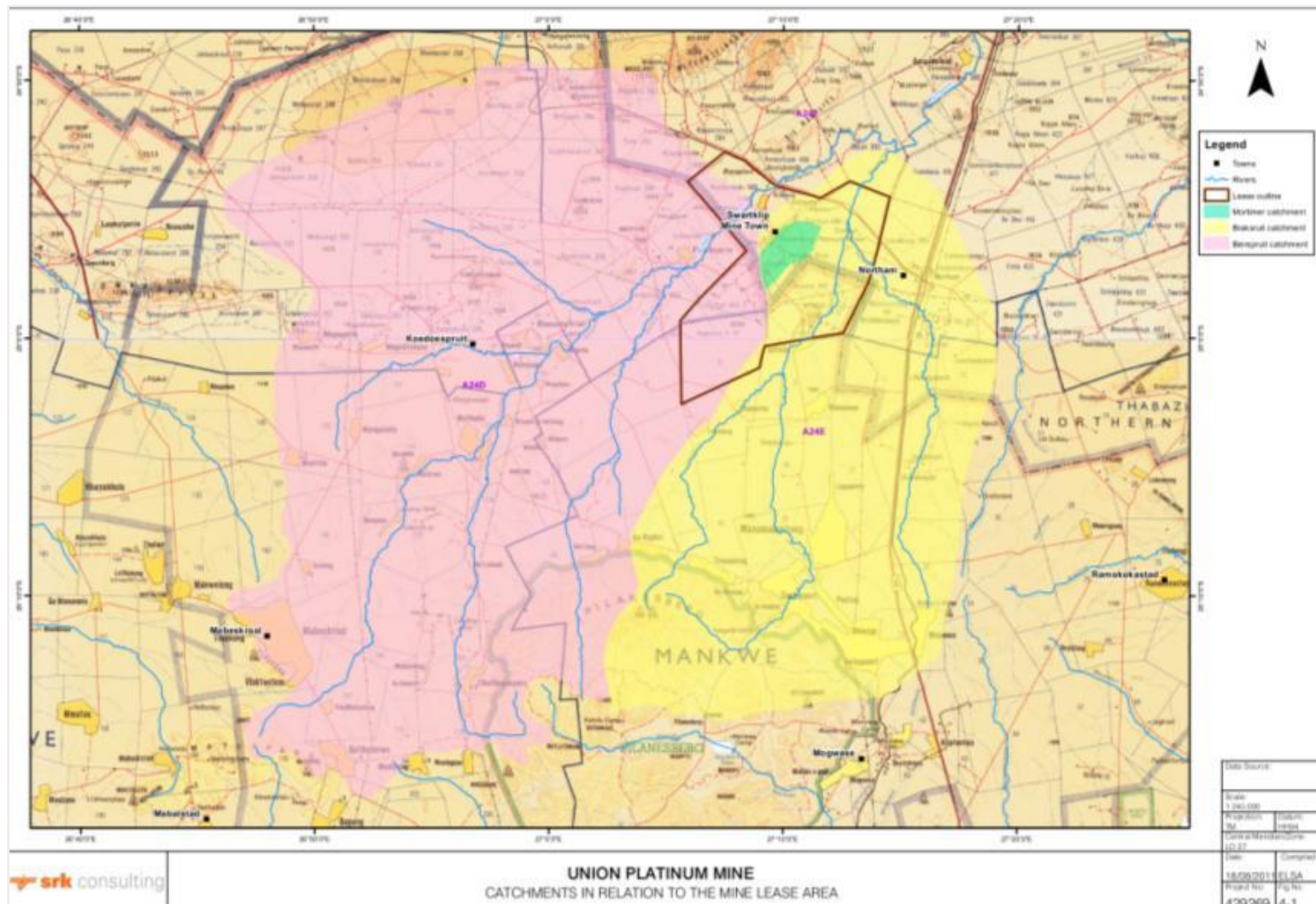


Figure 6-15: Quaternary Catchments in Relation to RPM-US (IWWMP, 2011)



**Table 6-21: Peak Flow and Volume Data (IWMMP, 2011)**

Peak flow and volume		Return period						
		2	5	10	20	50	100	200
<b>Mortimer Spruit Catchment: 10.7 km<sup>2</sup></b>								
<b>Peak Flows (m<sup>3</sup>/s)</b>	<b>Rational Method</b>	<b>15</b>	<b>21</b>	<b>27</b>	<b>35</b>	<b>48</b>	<b>61</b>	<b>-</b>
	SCS (Tc) <sup>1</sup>	9.0	20.2	29.9	41.8	60.3	76.8	95.2
<b>Flow Volume (million m<sup>3</sup>)</b>		0.1	0.2	0.3	0.4	0.5	0.7	0.8
<b>Bierspruit Catchment: 1 262 km<sup>2</sup></b>								
<b>Peak Flows (m<sup>3</sup>/s)</b>	Unit Hydrograph	387	562	756	988	1 356	1 757	-
	SCS (Tc)	Not applicable as catchment greater than 30km <sup>2</sup>						
<b>Flow Volume (million m<sup>3</sup>)</b>		13.2	25.3	35.2	47.0	64.8	80.2	97.4
<b>Brakspruit /Sefathlane Catchment: 732 km<sup>2</sup></b>								
<b>Peak Flows (m<sup>3</sup>/s)</b>	Unit Hydrograph	449	635	833	106	1 417	1 786	-
	SCS (Tc)	Not applicable as catchment greater than 30km <sup>2</sup>						
<b>Flow Volume (million m<sup>3</sup>)</b>		7.6	14.7	20.4	27.2	37.6	46.5	56.5

Note that the Rational method was used for catchments greater than 30km<sup>2</sup> and the SCS (Tc) method was used for catchments less than 30 km<sup>2</sup>.

## 6.8.2 MEAN ANNUAL RUNOFF

As flow measurements are limited in the RPM-US lease area, the mean annual runoff (MAR) was determined using the assumption that the rainfall-runoff response of the majority of the catchment is the same as that of the regional rainfall-runoff. Catchment areas and the MAR for each river are provided in **Table 6-22**.

**Table 6-22: Natural MAR (IWMMP, 2011)**

River name	Area (km <sup>2</sup> )	Mar (ml/m <sup>3</sup> )	Infrastructure area (km <sup>2</sup> )	Loss of mar (%)
Mortimer Spruit	10.7	0.16	10.7	100 %
Brakspruit/Sefathlane	732	1.36	10.1	13 %
Bierspruit	1 262	0.41	26.7	2 %



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### 6.8.3 NORMAL DRY WEATHER FLOW

The normal dry weather flow is defined as the flow that occurs 70 % of the time in the three driest months (June, July and August). Due to the arid nature of the catchments, no normal dry weather flow occurs in the Bierspruit and Brakspruit tributaries (Stevens, *et al*, 2007).

#### FLOOD LINES

The floodline analysis has shown that several areas have a potential risk of flooding infrastructure, which could adversely impact on production, plant and personnel safety (Stevens. D, *et al*, 2007).

#### RIVER DIVERSIONS

No streams, natural drainage lines or rivers have been diverted from its natural route. The planned diversion around the open cast section was abandoned in favour of an alteration of the Bierspruit tributary, which has been channelised and lined with Arnriflex. This alteration has been approved by the DWA and incorporated into Exemption 1872B (Stevens. D, *et al*, 2007).

#### WETLANDS

Riparian zones along drainage lines can also be classified as wetlands. Due to the ephemeral nature of the watercourses in the RPM-US lease area, these riparian wetlands are not considered significant. A wetland has been identified at one of the Northam sewage effluent pipeline crossings, Barberspan and in the Richard Shaft area (IWWMP, 2011).

#### SURFACE WATER USER SURVEY

##### DOMESTIC

RPM-US and surrounding residential areas receive their water supply from Magalies Water via Vaalkop Dam. No surface water within the RPM-US lease area or immediate surrounds is used for domestic purposes (IWWMP, 2011).

##### INDUSTRIAL

Industrial use in the immediate area is limited to mining operations. RPM-US supplements water received from Magalies Water with water from the in-stream RWD's

##### RECREATIONAL USE

The Bierspruit Dam is used for recreational purposes such as water sports (IWWMP, 2011).

##### LIVESTOCK WATERING

Game, previously in the area, has been relocated and the number of cattle farmed has reduced. The remaining cattle may drink from waterholes where they exist, especially in the rainy season. Access to Barberspan, Barbers Return Water Dam and Game Farm Flood Storage Dams is restricted by security fencing and it is unlikely that cattle would drink from Fraser Alexander Return Water Dam as the dam is surrounded by mining infrastructure (IWWMP, 2011).

##### IRRIGATION

There are no known irrigated areas or large dams along the main watercourse downstream of RPM-US, up to Amandelbult Section (IWWMP, 2011).

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### 6.8.4 AQUATIC ECOSYSTEMS

The spruits are ephemeral and therefore aquatic ecosystems in the natural watercourses are limited (IWWMP, 2011).

## 6.8.5 SURFACE WATER QUANTITY

Surface water is monitored on a monthly or bimonthly basis. The Bierspruit Dam, which is situated outside of the RPM-US lease boundary, is monitored as a background site. Monitoring of the Brakspruit and Bierspruit tributaries has proved difficult due to the ephemeral nature of the spruits with the Bierspruit Dam being the only consistently available natural surface water monitoring point. The data are compared to the water quality objectives (WQO) in Exemption 1872B and the DWA water quality guidelines (DWAf, 1996) for the water uses within and immediately downstream of the RPM-US lease area. Bierspruit Dam water quality complies with the applicable limits for the parameters tested and has a mean electrical conductivity (EC) value of 31 mS/m over the period 2007-2011 indicating negligible impacts due to either mining or other anthropogenic activities (DWA domestic water guideline is 70 mS/m).

Process water quality monitoring includes major cations and anions and selected trace heavy metals in the return water and flood storage dams and treated sewage effluent and faecal coliforms in the shaft water dams. Data for selected parameters in the return water and flood storage dams are provided in **Table 6-23** (IWWMP, 2011).

**Table 6-23: Water Quality for Selected Variable over the Period 2007-2011 (IWWMP, 2011)**

Dam	EC mean	EC (mS/m)	range	Sulphate (mg/l)	mean	Chloride (mg/l)	mean	Nitrate (mg/l as N)	mean
Barbers Return Water Dam	322	115-418		479		683		8.8	
Fraser Alexander Return Water Dam	376	311-446		384		823		33	
Game Farm Flood Storage Dam	268	159-324		379		639		2.4	

Increasing EC trends are evident in Fraser Alexander and Game Farm Flood Storage Dam but there is no trend indicated for Barbers Return Water Dam, possibly due to dilution from stormwater runoff. Seasonality of data is apparent in Barbers Return Water Dam and Game Farm Flood Storage Dam which receive more stormwater runoff than Fraser Alexander Return Water Dam. Fraser Alexander Return Water Dam, however, receives more mining water than Barbers Return Water Dam as indicated by the higher nitrate values. Although the Game Farm Flood Storage Dam is of better quality than the RWDs, the water is not suitable for discharge and all effort must be made to prevent overflows from the Game Farm Flood Storage Dam.

Treated sewage effluent complies with the general limit and general standard for most of the parameters tested but has frequent non-compliances for suspended solids (values > 25 mg/l) and less frequent non-compliances for chemical oxygen demand, ammonia and nitrate (IWWMP, 2011).

## 6.9 GROUNDWATER

RPM-US is covered with black turf, its thickness generally limited to less than 1 m. As black turf is well known for its swelling and movement properties this is generally suboptimal for permanent constructions of roads or buildings, requiring either stripping, or construction with solid foundations.

The underlying regolith consists of weathered mafic and basic rocks. The weathering zone in isolated areas (for example, open pit area) may extend to as much as 30 m below surface but is generally limited to less than 20 m. The geology of the area impacts upon the nature of the groundwater (IWWMP, 2011).

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### 6.9.1 AQUIFER CHARACTERISATION

Groundwater at RPM-US occurs within the weathered zone and confined fractured aquifers. The regional groundwater flow direction is to the north-west towards the Bierspruit from the northern RPM-US boundary and to the north-east towards the Brakspruit from the southern RPM-US boundary.

Groundwater occurrence in the RPM-US lease area is variable, with many boreholes reported to be dry. Borehole locations at RPM-US are represented in **Figure 6-16**. The rest water levels on site range from 38 m below ground level (mbgl) to 0.78 mbgl with the average rest water level approximately 7 mbgl. Higher rest water levels, especially in the vicinity of the Mortimer TSF, could be attributed to seepage from surface facilities.

Rest water levels have remained, for the most part, constant or have increased indicating that pumping of underground water at Spud and Richard Shafts seems to have had no or little impact on the groundwater zone since September 1995. Dry holes observed in the vicinity of Richard Shaft could, however, be due to historical dewatering prior to 1995. Boreholes used for groundwater supply (in Mantserre and Nooitgedacht) are located upgradient of the ore body and over 1.5 km away from the mining operations area.

In addition, Mantserre boreholes are located on the other side of the Bierspruit River. These boreholes are therefore unlikely to be affected by dewatering in the mining operational area or by any quality impacts from the mining area. Blow yields vary from dry and less than 0.01 m<sup>3</sup>/hr to 5m<sup>3</sup>/hr. Higher water strikes, associated with fracturing and faults, have been reported to the south-west of RPM-US in the vicinity of Spud Shaft and Mortimer TSF. Blow yields included 13.5 m<sup>3</sup>/hr at WM9 and WM32, 20 m<sup>3</sup>/hr at WM 26 and 35 m<sup>3</sup>/hr at WM36.

The high yields in WM26 and WM36 could be associated with higher recharge from the mine discharge, which is released in this area. A localized high blow yield of 13.5 m<sup>3</sup>/hr was also reported north of Ivan TSF in WM13. The weathered zone overlying most of the RPM-US area may extend to as much as 30 m below surface in isolated areas but is generally limited to less than 20 m. The weathered zone is likely to have a low development potential but this zone and alluvium in the streams probably provide storage and recharge to the underlying groundwater system. The degree of weathering varies with rock type, with the greatest depth of weathering in the pyroxenites and less intensive weathering in the gabbro-norites.

Permeabilities in the area are generally very low. Literature values and test pumping results from similar geological areas indicate that average permeability in the weathered zone for gabbro-norites and pyroxenites of the BIC to be in the order of 10<sup>-4</sup> m/s.

The groundwater potential in the mining area is low and the water quality in the general area marginal to poor quality. This aquifer is therefore classified as a minor to non-aquifer system, (Parsons, 1995). It should be noted, however, that the Mantserre community relies on the groundwater as their sole source of water. Despite the poor quality of this water, this aquifer is therefore classified as a sole source aquifer in this area (IWWMP, 2011).

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### 6.9.2 GROUNDWATER FLOW DIRECTIONS

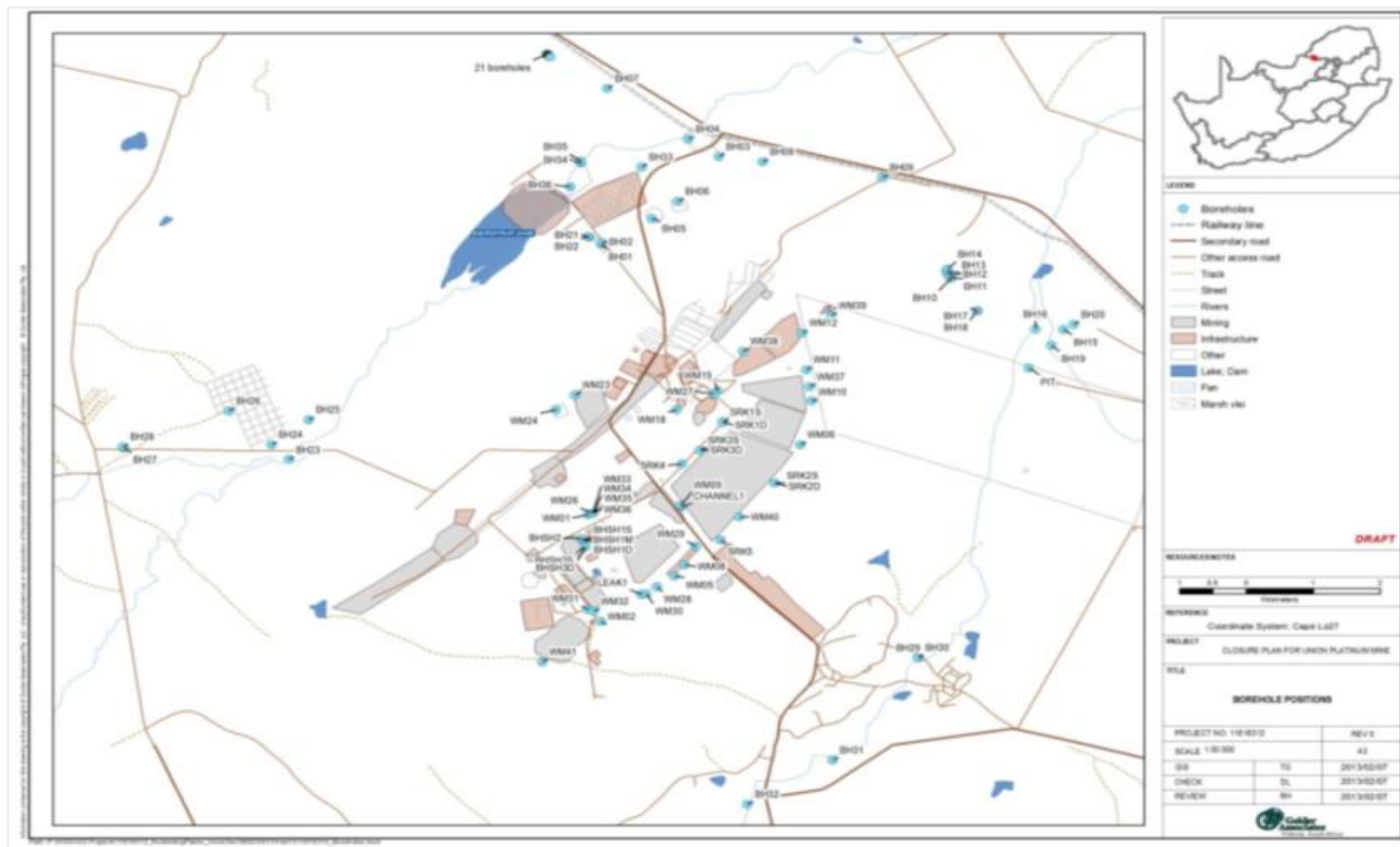
Groundwater flow directions were inferred from rest water levels monitored in the mining area in 2001. Although many of the boreholes in the Airfields TSF and Mortimer Spruit area are dry, the dominant flow direction appears to be to the north-east following the Mortimer Spruit towards the Game Farm Flood Storage Dam. Localised heads in the Mortimer TSF and Ivan TSF appear to have resulted in higher rest water levels especially south of these dams.

The regional flow direction is from north of the RPM-US lease area to the north-west towards the Brakspruit (Refer to **Figure 6-17**) (Stevens, *et al*, 2007).

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### 6.9.3 PRESENCE OF SPRINGS

There are no springs reported in the area (Stevens, *et al*, 2007).



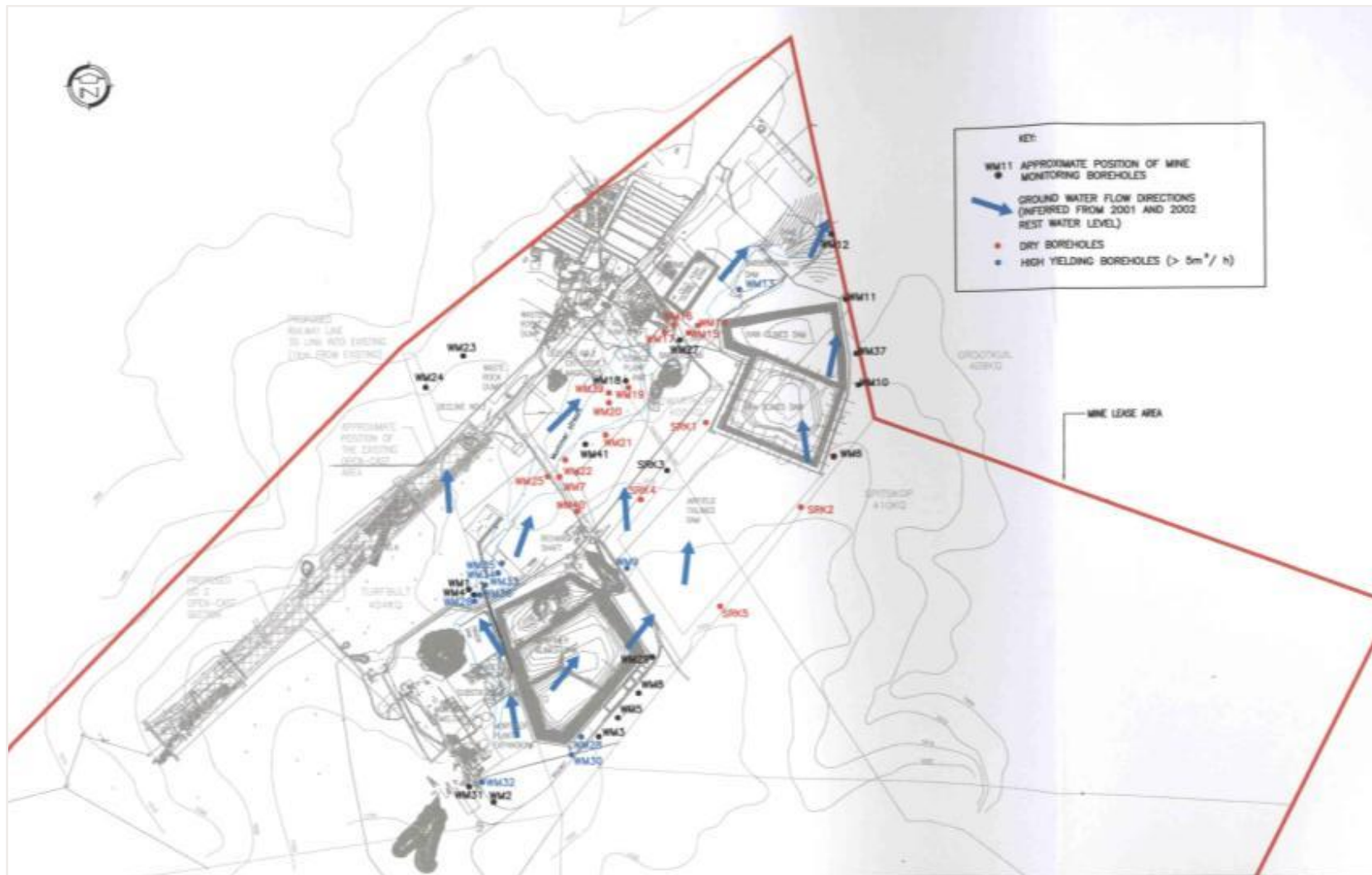


Figure 6-17: Groundwater Flow Directions (Stevens, et al, 2007)

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#### 6.9.4 GROUNDWATER QUALITY

Baseline data (2001-2002) indicated that most of the boreholes at RPM-US, with the exception of BH3GK (Grootkuil), had elevated to high concentrations of magnesium with localised high concentrations of nitrate, fluoride, sodium and calcium. None of the community boreholes sampled in the May 2002 hydrocensus indicated sulphate or chloride levels which would be considered to constitute contamination from the RPM-US operations. Groundwater quality is generally marginal (class 2) in terms of one or more constituents, but varies from ideal (class 0 in BH3GK) to poor (class 3, Mantserre and Grootkuil-Kilkenny boreholes) (classes based on DWA water quality guidelines).

Recent data (2006-2010) indicates groundwater contamination (elevated sulphate and chloride) in the vicinity of the WRD's and TSF's with a general deterioration in groundwater quality associated with the residue deposits since 2006. This impact is, however, likely to be localised due to the low permeability of the weathered zone and variable groundwater occurrence in the area.

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#### 6.9.5 GROUNDWATER USE

There are residential, industrial and limited agricultural areas within close proximity to RPM-US (within 2 km). Groundwater in the area of the RPM-US is used for domestic, industrial and agricultural purposes.

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#### 6.9.6 DOMESTIC

Borehole water is used for drinking purposes by:

- RPM-US under emergency conditions when Magalies Water cannot supply the required quantity (supply from Annandale 407 KQ)
- Communities on the Spitskop 410 KQ farm (No 4 site for the planned TSF is located on this farm and could impact on groundwater quality, limiting its use as drinking water, though the communities are south of the area targeted)
- The Mantserre community (there have been complaints of ill health within the community though no cases have been reported to the local clinic)
- Possibly other communities in the areas surrounding RPM-US although this needs to be confirmed

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#### 6.9.7 INDUSTRIAL (EXEMPTION 1872B)

- Mining: A combination of potable and recycled water is used for drilling, blasting, cleaning activities, in grout plant, timber yard and at the WRD. Recycled water is used at the explosives bay and for underground sanitation. The recycled water is underground mine water from fissures ( $\pm 1.1$  million m<sup>3</sup>/annurn) that is used underground after treatment for drilling and washing
- Processes: Mineral processing water is obtained from groundwater inflows into the underground workings, decant and drainage water from the TSF's, WRD's and ore stockpiles which drains to the return water dams. This process water is used in chrome loading, thickeners, filtration, flotation, at TSF's and slag dump. Process water is used with potable water for crushing, milling, dense media separation, flash dryer and smelter
- Support: The sewage treatment plant uses treated recycled water with potable water. The compressed air and refrigeration plant uses treated recycled water. The return water dam uses recycled process water

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#### 6.9.8 IRRIGATION

- Borehole water is used for the irrigation of the RPM-US golf course
- The farm Nooitgedacht 406 KQ uses borehole water to irrigate its own winter cattle fodder



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### 6.9.9 LIVESTOCK WATERING

- The potential exists for game and cattle to drink from groundwater resources (Stevens, *et al*, 2007).
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## 6.10 NOISE

The noise within the RPM-US lease area may generally be described as quiet. Even though there are a number of intruding noise sources (main roads and considerable level of mechanisation in the area), these are not perceived to be particularly disturbing. There are no interfering noise levels except within certain buildings and working areas.

The noise levels measured by RPM-US are presented in **Table 6-24**. Noise measurements are not taken at the mining areas (Stevens, *et al*, 2007).

**Table 6-24: Noise Measurements (Stevens, *et al*, 2007)**

Area	Measurement (dba) – contribution in output to ambient noise level
Processing operations	
Assay Laboratory	-
Furnace	2
Sample preparation area	9
Mortimer Concentrator	-
Crusher section	18
Milling section	10
Floating and reagent mixing section	12
Engineering workshops	12
Ivan Concentrator	-
Crusher section	16
Milling section	7
Smelter	-
Smelter building	22
Central services	
Engineering workshops at Ivan concentrator	10
Central engineering workshops	-
Boilermaker	5
Fitter	5
Blacksmith	3
Winch renewal	6
Carpenter	5
Garage	10
Salvage yard	12
Rockdrill	10

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## 6.11 ARCHAEOLOGY AND CULTURAL HERITAGE

There are no archaeological sites that are known to occur at the locations where new developments are planned at RPM-US. There are no known records of archaeological sites that were available at the existing infrastructure areas (Stevens, *et al*, 2007).

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### 6.11.1 SENSITIVE LANDSCAPES

In terms of the Department of Environment Affairs and Tourism (DEAT) guidelines for integrated environmental management (IEM) (DEAT, 1992), 'sensitive landscapes' is a broad term applying to:

- Nature conservation or ecologically sensitive areas - indigenous plant communities (particularly rare communities or forests), wetlands, rivers, river banks, islands, lagoons, estuaries, reefs, intertidal zones, beaches and habitats of rare animal species
- Unstable physical environments- such as unstable soils and geotechnically unstable areas
- Important nature reserves- river systems, groundwater systems, high potential agricultural land
- Sites of special scientific interest
- Sites of social significance or interest - including archaeological, historic, cultural, spiritual or religious importance and burial sites
- Green belts or public open space in municipal areas

None of the development sites at RPM-US are considered to be sensitive areas in terms of the DEAT guidelines for integrated environmental management, 1992 definition (Stevens, *et al*, 2007).

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### 6.11.2 VISUAL ASPECTS

Key visual characteristics are provided for the area surrounding RPM-US:

- The topography is fairly flat with the Spitskop (4 km) to the south east and a low ridge to the north west (7 km) being the only vantage points within a 10 km radius of RPM-US
- Vegetation is a mosaic of dense woody vegetation and grasses interspersed with tracts of grazing land and subsistence farming outside the perimeter of the surface infrastructure area. The vegetation in combination with the topography provides visual screening of RPM-US over distance
- Land uses in the area include game farming, subsistence agriculture, grazing and settlements
- The nearest settlements to RPM-US include the RPM-US village on Zwartklip 405 KQ to the north of the Ivan concentrator, Spitskop community, 4 km to the south east of the proposed Airfield TSF on the farm Spitskop 410 KQ, and Mantserre village on the farm Varkensvlei 403 KQ, 5 km north west of the open cast section (Stevens, *et al*, 2007)

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## 6.12 SOCIO-ECONOMIC

RPM-US straddles the borders of both the Limpopo and the North-West Provinces and as such a regional overview will be provided for both provinces.

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### 6.12.1 SOCIO-ECONOMIC PROFILE OF LIMPOPO PROVINCE

The Limpopo Province is geographically the fourth largest province of South Africa and has the fifth largest population (4.9 million people). Approximately 89 % of the population live in rural areas and the province has an unemployment rate of 46 %. The Limpopo Province is rich in minerals such as copper, asbestos, coal, iron-ore, platinum, chrome, diamonds and phosphates. The provincial economy is growing, with primary products and manufactured goods being marketed both locally and for export. The economy of the northern region of the Limpopo Province is based on trading, tourism, game farming and cattle farming, while mining is the major economic activity in the low veld region. The greatest potential for employment occurs in the mining, agriculture

and tourism sectors. RPM-US falls under the jurisdiction of the Thabazimbi Local Municipality (and the Moses Kotane Local Municipality – North West Province) (Social and Labour Plan (SLP), 2009).

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### **6.12.2 THABAZIMBI LOCAL MUNICIPALITY**

The town of Thabazimbi is located about 320 km west of the provincial capital of Polokwane. Established in 1932 as a coal mining town, it has subsequently supported two platinum mines and an andalusite mine.

#### **– Demographics**

The Thabazimbi Local Municipality includes the towns of Rooiberg, Northam, Leeupoort, Thabazimbi and Dwaalboom. In the 2001 census, Thabazimbi Local Municipality had a population of 63 921, with 82 % being black. The gender profile for the municipality is 53 % male and 47 % female. The economically active section represents 52 % of the total population, of which 79 % are currently employed (SLP, 2009).

#### **– Infrastructure**

Infrastructure is generally well developed in terms of roads, electricity supply, water and sanitation, but the informal settlements including those adjacent to RPM-US require urgent attention. Thabazimbi Local Municipality has a very low adult literacy rate of 18 %, with the majority of the population having only primary education. Schools in Thabazimbi itself are generally in good order, but those in rural areas lack facilities (SLP, 2009).

#### **– Key economic activities**

Mining is the main economic activity in the Thabazimbi Local Municipality primarily in platinum, iron-ore, andalusite and limestone. Agriculture and hunting are also significant economic sectors, although cattle farming are declining in favour of game farming, which is proving to be a more viable enterprise. Mining employment comprises 36.3 % of formal sector employment and agriculture 21.7 %. Platinum mining plays a major role in the area and further development of platinum mining is likely. The commerce, retail and manufacturing sectors contribute very little to the economy, although there is significant potential for tourism development (SLP, 2009).

Profiles of towns and villages where labour is sourced from within the Thabazimbi Local Municipality, are presented below:

- Northam: The town of Northam is situated 16 km from RPM-US and has 4 000 residents and 233 are employees of RPM-US.
  - Swartklip: A major labour-sending area in the RPM-US community is Swartklip, which is located around RPM-US and 1 228 employees are living in this area (SLP, 2009).
- 

### **6.12.3 SOCIO-ECONOMIC PROFILE OF NORTH WEST PROVINCE**

North West Province is one of the smaller provinces of South Africa, with a population of 3.4 million people in an area of 116 320 km<sup>2</sup>. The province has strong economic links with Gauteng Province. The provincial capital is Mafikeng, and the larger towns are Klerksdorp, Orkney, Potchefstroom, Rustenburg and Brits. Mining plays a dominant role in the economy of North West Province, employing a quarter of the labour force and contributing some 55 % of its gross geographic product (GGP). A wide variety of minerals are mined, including:

- Platinum in Rustenburg and Brits
- Gold in Orkney and Klerksdorp
- Diamonds in Lichtenburg, Koster, Christiana and Bloemhof
- Marble in Taung
- Granite in Rustenburg
- Fluorspar in Zeerust

In addition to mining, agriculture is one of the most important sectors in the province with maize, sunflower and groundnuts being the biggest crops. RPM-US falls under the jurisdiction of the Moses Kotane Local Municipality (and the Thabazimbi Local Municipality – Limpopo Province) (SLP, 2009).

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#### 6.12.4 MOSES KOTANE LOCAL MUNICIPALITY

Moses Kotane Local Municipality comprises of mainly isolated and dispersed settlements, which are characterised by poor accessibility and low density. Madikwe and Mogwase are the only two towns in the municipality. Both are residential in nature and provide some services to local communities.

The population of the municipality was estimated at 236 845 in the 2001 Census. The Municipality has a predominantly African population with fewer Indian, Coloured and Caucasians who are mostly residing in Sun City residence and Mogwase Unit 2 (SLP, 2009).

##### — Infrastructure

Moses Kotane Local Municipality is relatively underdeveloped in terms of roads, health facilities and the supply of water and electricity. The conditions of the roads can be generally described as being good particularly in and around the main employment centres. The major challenge has to do with gravel roads that provide access from the main roads into the rural settlements. These access roads are generally badly maintained, making them largely impassable particularly during the wet seasons. This problem has resulted in taxi operators avoiding these roads, thereby leaving buses as the main mode of transport for associated rural villages (SLP, 2009).

##### — Economic Activity

The total economic output from the mining sector in the Moses Kotane Local Municipality increased significantly from approximately R 146 million in 1996 to R 464 million by 2005. This strong growth could be associated with the significant growth of PGM mining in the Bojanala Platinum District. The known mineral deposits are mostly concentrated in the central parts of the Moses Kotane Local Municipality, specifically in the areas west of the Pilanesberg National Park. The most notable and well known deposits within these areas include chromium and platinum. Other known mineral deposits include manganese, nickel, uranium, magnesite and vanadium.

Industrial activities include heavy, light and service industries, and the area still holds potential for further industrial development. Gold, chrome and diamonds are mined mainly around the Pilanesberg Mountains, while PGM are mined in the vicinity of Sefikile. Farming activity in Moses Kotane Local Municipality is primarily of a subsistence nature. Maize, sorghum and sunflowers are the predominant crops, while cattle and goats are the major livestock.

The Pilanesberg Nature Reserve and the Sun City Complex constitute the main tourist attractions, along with a variety of game reserves, nature reserves, dams and holiday resorts.

Profiles of towns and villages where labour is sourced from within the Moses Kotane Local Municipality, are presented below:

- Saulspoort: The village of Saulspoort, estimated at 23 km from RPM-US has 19 000 residents. It is the main labour-sending village in the RPM-US community with RPM-US employing 1 271 of the residents.
- Mogwase: The town of Mogwase, 32 km from RPM-US has approximately 2 100 residents. 122 residents are employed by RPM-US.

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#### 6.12.5 DEMOGRAPHICS OF RPM-US

##### RPM-US COMMUNITY

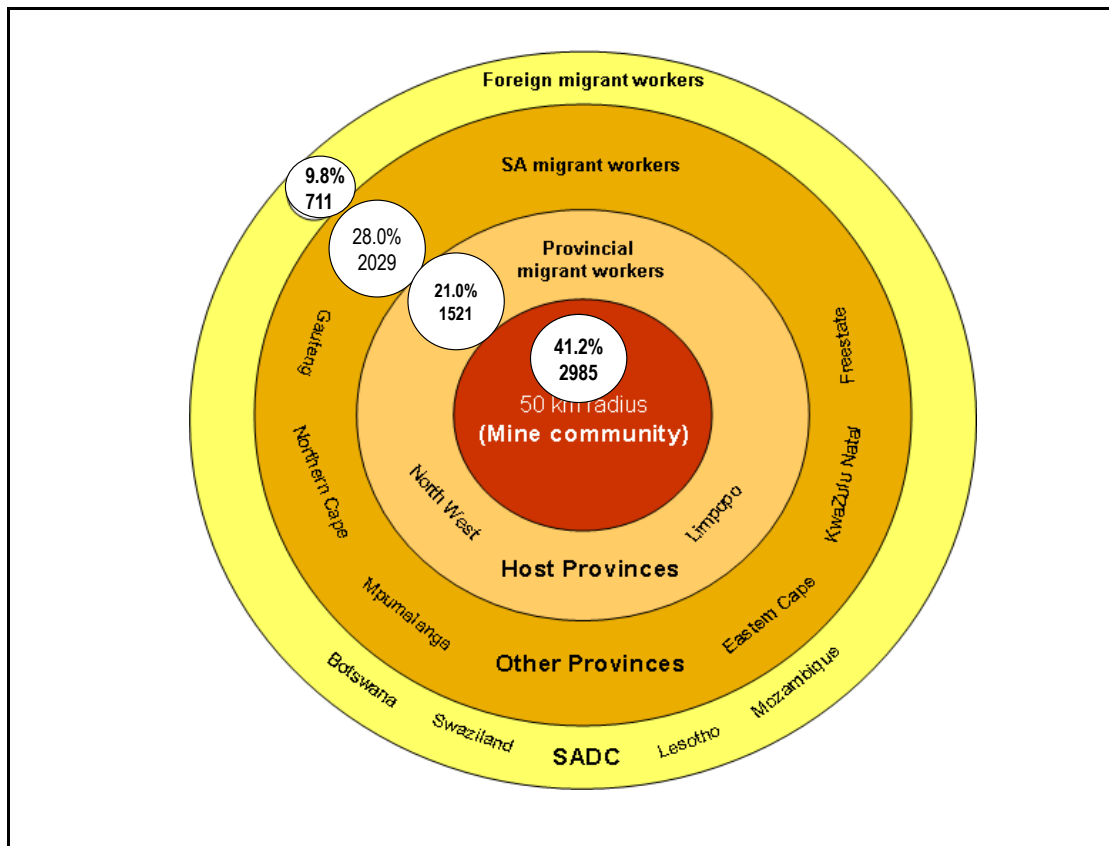
The RPM-US community is defined as those towns, villages and settlements that fall within a 50 km radius or greater, if appropriate to RPM-US. RPM-US's 50 km radius straddles two municipalities (Thabazimbi Local Municipality and Moses Kotane Local Municipality) (SLP, 2009).

##### RPM-US LABOUR

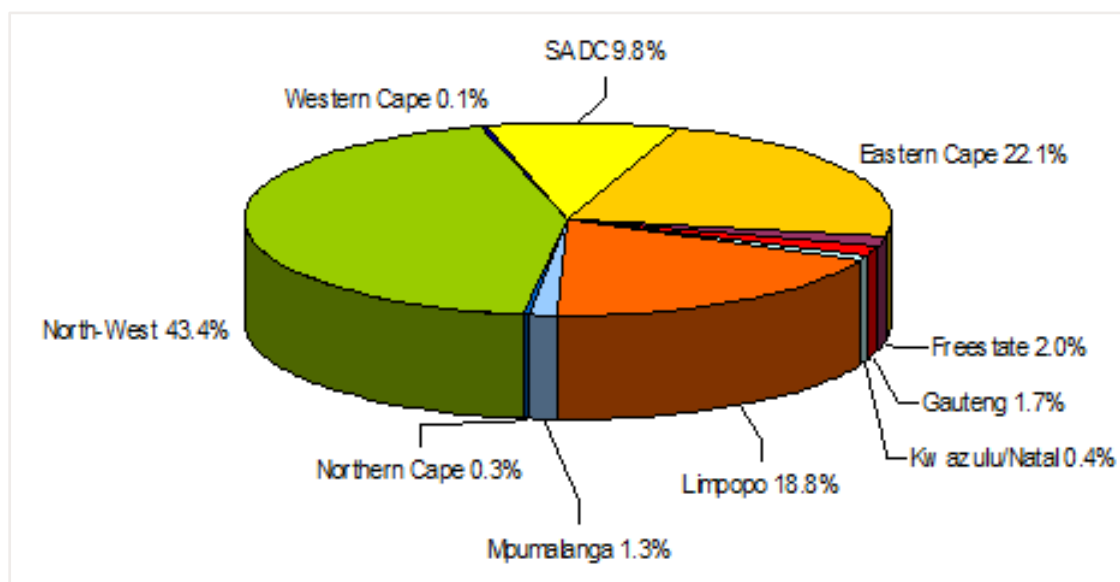
In the context of the SLP (2009), labour is defined as those employees who are employed directly by RPM-US and not by other suppliers of goods and services.

The geographical sourcing of RPM-US's workforce is shown in **Figure 6-18** and **Figure 6-19** and indicates that 41.2 % of the employees originate from the RPM-US community. Furthermore, the demographic analysis of

RPM-US's permanent workforce shows that (43.4 %) of the workforce come from the North West Province, followed by Limpopo Province (18.8 %) and the Eastern Cape Province (22.1 %) (SLP, 2009).



**Figure 6-18: Source of RPM-US's Permanent Employees (SLP, 2009)**



**Figure 6-19: Provincial Sources of RPM-US's Labour (permanent employees) (SLP, 2009)**

**Figure 6-20** and **Figure 6-21** illustrate the geographical sourcing of RPM-US's contract workers. The demographic analysis of RPM-US's contractor workforce shows that 35 % of the workforce comes from the North West Province, followed by Limpopo Province (17.9 %) and the Eastern Cape Province (17.9 %) (SLP, 2009).

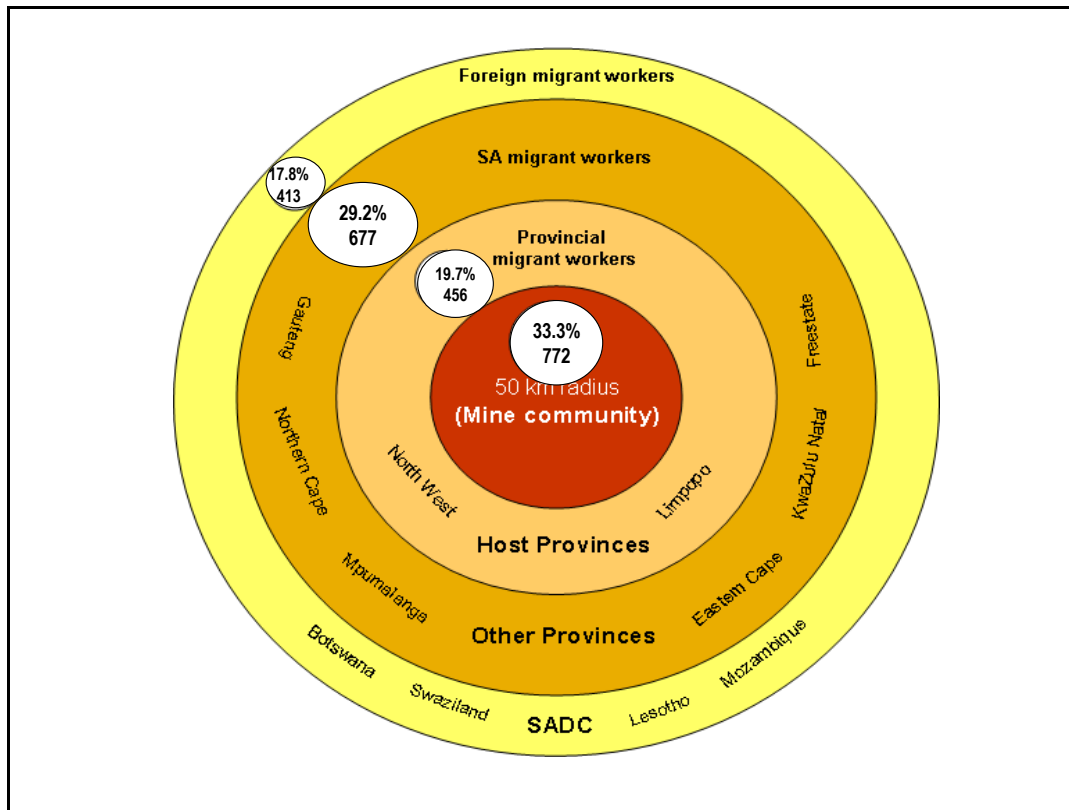


Figure 6-20: Sources of RPM-US's Contractor Employees (SLP, 2009)

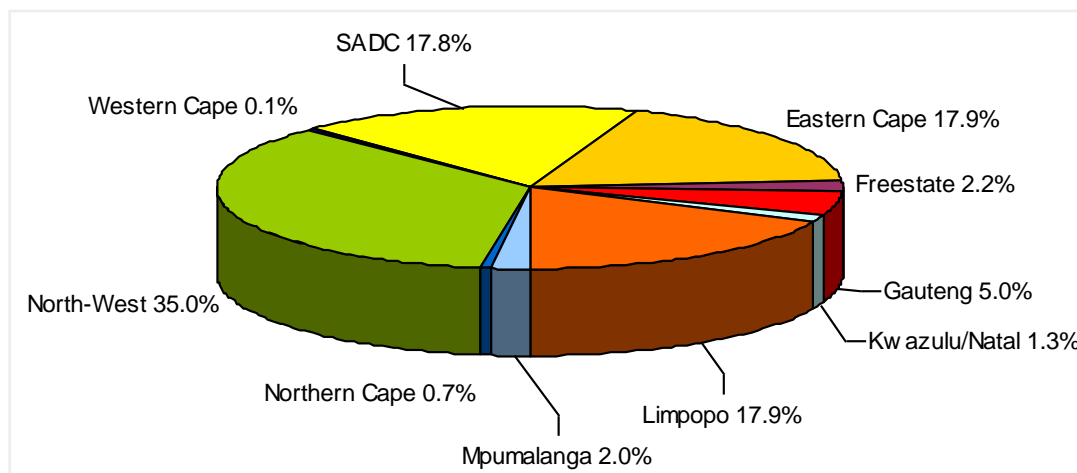


Figure 6-21: Provincial Sources of RPM-US's Labour (contractors) (SLP, 2009)

## MUNICIPAL DISTRIBUTION

RPM-US's labour complement of 9 564 employees, inclusive of 2 318 contractor employees (2009 baseline) is sourced mostly from some 114 local municipalities across South Africa's nine provinces. Of these local municipalities, only 11 contribute more than 1 % (refer to **Figure 6-18** to **Figure 6-21**).

RPM-US recognises that a broad based approach needs to be followed to ensure that critical socio-economic needs are addressed in all employee communities as indicated in **Table 6-25** and **Table 6-26** (SLP, 2009).



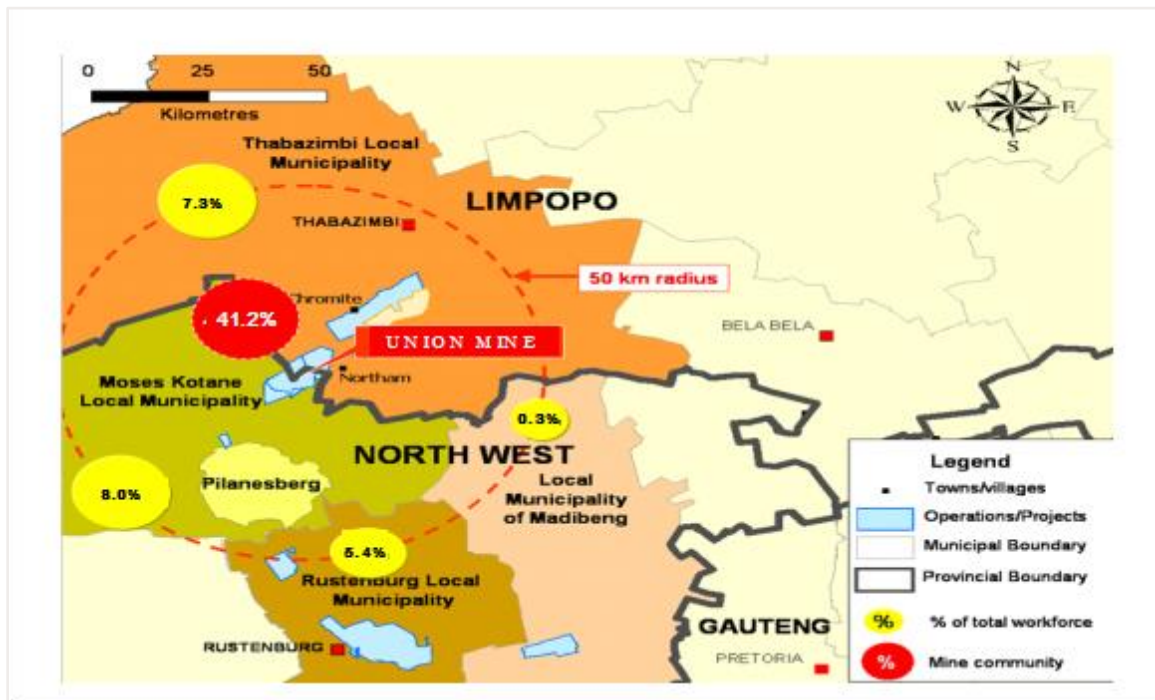
**Table 6-25: Labour Sending Areas: Permanent Employees (SLP, 2009)**

Municipalities from which over 1 % of employees originate	Province	Number of employees	% of total workforce
Moses Kotane Local Municipality	North West	2 153	29.7 %
Thabazimbi Local Municipality	Limpopo	832	11.5 %
King Sabata Dalindyebo Local Municipality	Eastern Cape	493	6.8 %
Rustenburg Local Municipality	North West	390	5.4 %
Nyandeni Local Municipality	Eastern Cape	594	8.2 %
Mbhashe Local Municipality	Eastern Cape	572	7.8 %
Ramotshere Moiloa Local Municipality	North West	191	2.6 %
Greater Giyani Local Municipality	Limpopo	165	2.3 %
Ntabankulu Local Municipality	Eastern Cape	318	1.8 %
Mafikeng Local Municipality	North West	136	4.4 %
Senqu Local Municipality	Eastern Cape	119	1.6 %

**Table 6-26: Labour Sending Areas: Contractor Employees (SLP, 2009)**

Municipalities from which over 1 % of employees originate	Province	Number of employees	% of total workforce
Moses Kotane Local Municipality	North West	520	22.4 %
Thabazimbi Local Municipality	Limpopo	252	10.9 %
King Sabata Dalindyebo Local Municipality	Eastern Cape	159	6.9 %
Rustenburg Local Municipality	North West	75	3.2 %
Nyandeni Local Municipality	Eastern Cape	136	5.9 %
Mbhashe Local Municipalit	Eastern Cape	79	3.4 %
Ramotshere Moiloa Local Municipality	North West	34	1.2 %
Greater Giyani Local Municipality	Limpopo	93	4.0 %
Ntabankulu Local Municipality	Eastern Cape	89	3.8 %
Mafikeng Local Municipality	North West	19	0.8 %
Senqu Local Municipality	Eastern Cape	31	1.3 %

The statistics in **Table 6-25** and **Table 6-26** are further portrayed in **Figure 6-22** and **Figure 6-23** indicating the RPM-US community's 50 km radius straddling the main labour-sending areas.



**Figure 6-22: Labour Sending Areas within the RPM-US Community (permanent employees) (SLP, 2009)**

The number in the red circle indicates the percentage of the permanent workforce resident in municipalities falling within the RPM-US community.



**Figure 6-23: Labour Sending Areas within PRM-US Community (contractor employees) (SLP, 2009)**

An analysis of the RPM-US personnel records locates those workers who live in local communities to be distributed as scheduled in **Table 6-27** and **Table 6-28**. It is these villages and towns that stand to be most affected by the curtailment of wages in the event of retrenchments or downscaling at RPM-US (SLP, 2009).

**Table 6-27: Demography of the RPM-US Community for Permanent Employees (SLP, 2009)**

Local municipality	Towns within 50 km radius	Number of employees
Thabazimbi Local Municipality	Swartklip	674
	Northam	126
	Thabazimbi	20
	Regorogile	9
	Chromite	3
	Witfontein	0
<b>Subtotal</b>	-	<b>832</b>
Moses Kotane Local Municipality:	Saulspoort	592
	Mogwase	122
	Ramokokastad	128
	Kraalhoek	166
	Rhenosterkraal	69
	Modderkuil	277
	Mabeskraal	24
	Kameelboom	15
	Mononono	68
	Mokgalwana	187
	Mantserre	191
	Mopyane	77
	Sefikele / Spitskop	190
	Molatedi	4
	Lesetlheng	36
	Molorwe	7
<b>Subtotal</b>	-	<b>2153</b>
<b>RPM-US community total</b>	-	<b>2985</b>

**Table 6-28: Demography of the RPM-US Community for Contractors (SLP, 2009)**

Local Municipality	Towns within 50 km radius	Number of employees
Thabazimbi Local Municipality	Swartklip	110
	Northam	107
	Thabazimbi	24
	Regorogile	11

Local Municipality	Towns within 50 km radius	Number of employees
	Chromite	0
	Witfontein	0
<b>Subtotal</b>	-	<b>252</b>
Moses Kotane Local Municipality	Saulspoort	20
	Mogwase	69
	Ramokokastad	16
	Kraalhoek	42
	Rhenosterkraal	2
	Modderkuil	98
	Mabeskraal	12
	Kameelboom	0
	Mononono	10
	Mokgalwana	59
	Mantserre	83
	Mopyane	24
	Sefikele / Spitskop	85
	Molatedi	0
	Lesetlheng	0
	Molorwe	0
<b>Subtotal</b>	-	<b>520</b>
<b>RPM-US community total</b>	-	<b>772</b>

## 7 STAKEHOLDER ENGAGEMENT

The compilation of this EMPR, for the Retained Operations, consisted of combining already approved EMPR's and amendments/addendums, and since the management commitments stayed the same, no public participation took place, as part of the process. Furthermore, this EMPR separation process did not involve any updates to commitments contained in the 2014 report. As such, there is no material change to any RPM-US commitments. **Table 7-1** describes the public participation processes that were undertaken for the approved EMPR documents.

**Table 7-1: Public Participation Summary**

Project description	Public participation duration	Empr approval date
Revision of Union Mine's Environmental Management Programme	2007	07 December 2007
Mortimer Smelter Furnace Upgrade	2008 / 2009	14 April 2010

# 8 ENVIRONMENTAL MANAGEMENT PROGRAMME

## 8.1 GENERAL COMMITMENTS

**Table 8-1** contains general commitments which are considered relevant to all Retained Operations. The relevance of each commitment will depend on the phase of the respective projects. It will be the responsibility of the operation manager to determine the relevance of each commitment.

**Table 8-1: General Commitments**

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND FAUNA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	HEALTH AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT	MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE	MANAGER
<b>Legal Requirements</b>																									
The following Acts are applicable and relevant to the said approval and RPM-US is to familiarize itself with its provisions in so far as they apply to the operations:	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X		X	
— The National Water Act (No. 36 of 1998), with particular reference to the sections pertaining to operations in the proximity of dams and their catchments areas, rivers, marshes, streams, pans and other water courses																									
— The Environmental Conservation Act (No. 73 of 1989). Your attention is specifically directed to the																									



MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES AND	HEALTH AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER								
requirements of section 20 of the above-mentioned Act																														
— The National Environmental Air Quality Act (No. 39 of 2004), with particular reference to the sections pertaining to the liberation of dust, and other emissions, created by activities into the atmosphere																														
— The National Environmental Waste Management Act (No. 57 of 2009)																														
— The Conservation of Agriculture Resources Act (No. 43 of 1983), with particular reference to the sections pertaining to soil conservation																														
— The National Heritage Resources Act (No. 25 of 1999), with particular reference to the protection of all historical and pre- historical cultural remains																														
— The National Environmental Management Act (No. 107 of 1998)																														
A copy of the Environmental Management Programme must always be available on site	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X								

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT									PHASE									RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	HEALTH AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE MANAGER
Any project, expansions or additional infrastructure must be addressed through an amendment and submitted to the Regional Manager for the approval, before they commence. This approval may be amended at any stage if deemed necessary	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				X	X
This approval does not purport to absolve the Smelter from its common law obligations towards the surface rights holder or any other affected party														X	X	X	X	X	X				
All persons concerned must be made fully conversant with the terms of this approval, copies of which must be readily available to them	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
<b>General Management</b>																							
Ensure that contractors and staff are well managed and adhere to the mitigation and management measures stipulated in this report	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X
All vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No vehicle repairs are to be undertaken at Mortimer Smelter.			X	X	X	X	X	X				X			X	X	X		X	X			

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES AND	HEALTH AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER			
All surface infrastructure must be maintained. This involves the regular cleaning of trenches, piping etc.					X	X									X	X	X		X						
All hazardous substances must be stored on an impervious surface in a designated bunded area, able to contain 110 % of the total volume of materials stored at any given time. Storage areas must be well marked with appropriate signage. Wash down water from bunded areas must be diverted into oil traps.			X	X	X	X	X					X			X	X	X		X	X		X			
Employees must be issued with appropriate PPE							X	X				X	X		X	X	X		X	X		X			
Adherence to the Smelters Environmental policy, Environmental procedures and values must be included in any construction contracts, thereby making contractors accountable.			X	X	X	X	X	X	X	X	X	X			X	X	X		X	X		X			
Good housekeeping practices must be implemented and maintained by the Smelter and its contractors.			X	X	X	X	X	X			X	X	X		X	X	X		X	X		X			

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE MANAGER		
Should any archaeological artefacts be exposed during prospecting, activities in the vicinity of findings must be stopped immediately. Under no circumstances shall any artefact be destroyed. Such an archaeological site must be marked and fenced off, and the South African Heritage Agency must be contacted immediately.										X					X	X			X	X		X	X		
Ensure that all site disturbances are limited to areas where structures will be constructed / removed	X	X	X	X					X						X		X			X					
The rehabilitation fund must be upgraded or revised on an annual basis according to the surveyed plan, which indicates the progress in rehabilitation			X	X	X	X	X									X						X	X		
The contractors must be responsible for the maintenance of the chemical toilets											X				X				X	X					
The Smelter closure objectives must be adhered to		X	X	X	X	X	X	X	X				X	X			X		X			X	X		

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT									PHASE									RESPONSIBILITY						
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE	MANAGER
Environmental conditions must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages by the implementation of an Environmental Management System (EMS).			X	X	X	X	X	X			X	X			X				X						X
Soil and Land Management Plan																									
Soil Management																									
The disturbed areas must be rehabilitated to wilderness potential			X	X											X	X	X	X					X	X	
All excavations must be backfilled to the natural surface level; if a bulk factor exists it must be accommodated on the total area of disturbance		X	X												X	X	X		X	X				X	
If deemed necessary, during rehabilitation, appropriate erosion control structures such as agricultural type contour drains must be provided			X												X	X	X			X		X	X		
Following construction, exposed areas must be rehabilitated with topsoil / subsoil and re-vegetated			X	X											X	X						X	X		

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER			
Topsoil must only be exposed for minimal periods and adequately stockpiled to prevent topsoil loss and run-off. Vegetation clearance must be conducted in phases to reduce the exposed area			X												X		X			X		X			
Sustainable erosion control measures (for wind and water erosion) must be implemented and maintained where necessary in areas disturbed by the construction / demolition operations			X	X	X		X		X						X		X		X	X		X			
Stockpiles created during the construction phase must not remain in the operation phase of the project		X	X												X					X		X			
All available topsoil must be stripped and stockpiled separately prior to any surface disturbance			X												X				X	X		X	X		
Topsoil must be kept separate from sub-soil and not be used for building purposes, maintenance or access roads.			X												X					X		X	X		



MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE MANAGER		
All topsoil from the contractor lay down area must be stripped, removed, stockpiled (as per stockpile storage guidelines) and re-used to preserve its integrity and seed reserve. Topsoil must be used to rehabilitate disturbed areas			X												X				X	X		X			
Soil must be stripped and stockpiled by means of end-tipping or dozing to avoid compaction			X												X				X	X		X	X		
The topsoil and subsoil must not be stored separately, due to their relatively homogenous structure and texture from the surface through the profile			X												X				X	X		X	X		
A minimum layer of 500 mm of topsoil must be re-established			X												X					X		X	X		
Topsoil depth must be governed by the post-closure land capability. A greater depth of topsoil is required for rehabilitation to arable standard than for grazing land (1 m of topsoil is a minimum for re-establishing arable potential and about 150 mm is a minimum for wilderness land)			X												X					X		X	X		

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE	MANAGER					
The fill material must ideally be separated from the alluvium and norite and disposed of. However due to the low mobility, this is not considered to be a necessity			X												X				X	X					X					
Land Capability Management																														
As far as practically possible, topsoil must be stripped during any expansions			X												X				X	X			X		X					
The required volume of excavated material necessary for geo-engineering must be kept to a minimum			X												X				X	X					X					
Biodiversity Management Plan																														
Roads to and on the site must serve as suitable firebreaks for part of the area. Tall grass along the edges of the roads must either be mowed or burned shortly prior to the onset of the dry season. Where no roads are available to serve as firebreaks, special firebreaks must be established each season. These could either be strips approximately 6m wide which have been mowed (or grazed) and			X	X									X	X	X	X	X	X	X	X			X		X					

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE MANAGER							
ploughed, or specially burned firebreaks																														
Unnecessary disturbances of flora and fauna must be avoided or minimised				X											X	X	X		X	X		X	X							
Limit, as far as practical, the area of land disturbed and isolated for the purpose of construction and processing activities, to the minimum required for safe and efficient operation				X											X	X			X	X		X	X							
No unnecessary destruction of vegetation must be allowed and, in particular, construction workers must not be allowed to harvest any trees for use as firewood or any other purpose.				X											X	X			X	X		X	X							
A monitoring programme must be implemented that must ensure that all weeds and alien species be eradicated in and around the project area. Monitoring must be done according to the Biodiversity Action Plan for the region.				X											X	X						X	X							

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER								
Eradication and monitoring of alien plants must be done on an ongoing basis during the life of the Smelter and following rehabilitation, until self- sustaining vegetation cover, as close as practicably possible to the composition and density of the pre-development vegetation cover is achieved.																														
It may become necessary to relocate certain species, like Ostriches, to prevent interference with construction workers during construction.				X											X	X						X	X							
Contractors are to be trained on environmental awareness and the importance of preserving indigenous fauna and flora.				X											X				X	X		X								
Conservation measures must be conducted during the construction phase.				X											X				X	X		X								
Natural flora species are not to be used as firewood				X											X					X		X								

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
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Eradication and monitoring of alien plants must be done on an ongoing basis during the life of RPM-US and following rehabilitation, until self-sustaining vegetation cover, as close as practicably possible to the composition and density of the pre-mining vegetation cover is achieved.				X													X								X	X				
On completion of the construction phase, disturbed areas must be graded and topsoiled. The topsoiled areas must then be re-vegetated using indigenous pasture species. In general, re-vegetation must be undertaken using a mixture of commercially available seeds that will germinate reliably (high seed viability). The species used must be selected on the basis of their ability to bind and cover soil, (to afford effective erosion protection) and their tolerance of the prevailing environmental conditions				X														X							X	X				

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR	QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATION SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE MANAGER	
A number of different methods of re-vegetation are available (e.g. hydroseeding, hand seeding and hand sowing) and an appropriate method must be selected by the Smelter or the contractor				X													X				X		X	X	
Following re-vegetation the site must be monitored and maintained until a sound vegetation cover that will prevent erosion, has been achieved				X													X						X	X	
The topsoil must be stripped and stored in a manner that ensures the seed bank is replaced during re-vegetation			X	X													X						X	X	
The objective must be undertaken following rehabilitation, until self-sustaining vegetation cover, as close to the composition and density of the pre-development vegetation cover as practical, is achieved in rehabilitated areas				X													X						X	X	
A basic monitoring and control programme must be adopted. Specialist advice must be taken, especially for the use of herbicides				X													X						X	X	



MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT	MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE	MANAGER
<b>Air Quality Management</b>																									
<b>Fugitive Emissions Management</b>																									
To reduce dust entrainment, water or an appropriate dust suppressant must be sprayed on topsoil stockpiles until such time as the topsoil stockpiles have been re-vegetated.			X	X	X		X		X						X	X	X			X					
There must be strict speed limits on dust roads to prevent dust entrainment into the atmosphere				X			X		X						X	X	X		X	X			X	X	
Should dust suppression measures by wetting not be effective, the Smelter must consider the use of dust suppression agents							X						X		X	X	X		X	X			X	X	
The installation of dust monitoring stations at strategic points (considering wind direction) must be undertaken should dust cause a nuisance to the surrounding communities							X						X		X	X	X		X					X	
Dust sampling must begin as soon as possible and continue on a monthly basis over a 12-month period in order to assess seasonal differences							X								X	X							X	X	

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATION SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER	ENVIRONMENTAL	SHE MANAGER							
A network of dust monitoring points must be established to determine ambient dust concentrations initially, a network of dust buckets is proposed, since this provides a baseline of dust fallout concentrations							X									X						X	X							
A series of monitoring runs using high volume samplers is recommended to determine ambient TSP and PM <sub>10</sub> concentrations. Depending on financial constraints a sampler can be installed and operated continuously for a 12-month period or a portable sampler could be used to monitor continuously for a one-month period. This procedure must be undertaken every three months over a 12-month period							X									X						X	X							
The results of the initial monitoring must determine whether any additional monitoring is necessary							X									X						X	X							
Manage possible spillages of slag, overburden and ore from trucks transporting this material as per the Environmental Management System (EMS) (Non-conformance and corrective action procedure)							X									X			X	X		X	X							

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT							PHASE										RESPONSIBILITY					
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE FAUNA AND SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES AND HEALTH AND AND SOCIO-ECONOMIC CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE	MANAGER					
Chemical dust suppressants or water sprayers must be used to control dust on the roads on a daily basis						X								X				X	X			X	X
<b>Point Source Emissions Management</b>																							
More frequent analyses are to be performed on the expected particulate emissions in order to obtain a better representation of the expected metal composition in the emissions						X								X								X	X
Mortimer Smelter is required to comply with all limits stipulated within the Atmospheric Emissions Licence. Should non-compliances be identified additional measures must be investigated						X								X								X	X
An ambient air monitoring programme must be implemented in order to review the impact of SO <sub>2</sub> and PM <sub>10</sub> emissions from the site on a consistent basis						X								X								X	X
<b>Ground and Surface Water Management</b>																							
Procedures are in place to deal with blocked drains and general maintenance principles to avoid overflow					X	X								X	X	X		X	X				

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY					
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER					
Recycling and re-use of water must be optimised and pollution of water must be minimised					X	X								X	X			X	X		X	X				
Conduct regular surface and groundwater monitoring					X	X								X	X						X	X				
Should groundwater or surface water monitoring indicate that water quality or quantity has been affected by the Smelter, possible alternative water supply of equal or better quality must be provided to the affected communities. Furthermore, appropriate remedial measures should be taken should unacceptable levels of contamination be determined					X	X						X	X		X	X		X	X		X	X				
Dirty and clean water must be separated by implementing clean and dirty water systems / structures prior to construction to prevent pollution of clean water runoff. The clean and dirty water systems and structures must be properly designed (according to Regulation 704 of the National Water Act)				X	X									X				X	X							

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR	QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE MANAGER
A proper system for the separation of dirty water and clean water must be maintained					X												X			X	X				
Monitor surface and groundwater quality during the life of the Smelter as per the surface and groundwater monitoring procedure					X	X											X						X	X	
Investigations to assess compliance with Regulation 704 of the National Water Act (No. 36 of 1998) must be undertaken					X	X											X						X	X	
Boreholes must be sited using geophysical assessments to identify zones of deeper weathering and preferential flow paths along faults and dolerite dyke contacts					X	X											X						X	X	
Boreholes must be sampled quarterly for the first two years and thereafter biannually using standard sampling practices					X	X											X						X	X	
The Smelter must develop a spill contingency plan to ensure the clean-up of any spillages which have the potential to pollute water resources					X	X						X					X						X	X	

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES AND HEALTH AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE	MANAGER								
It is important that the Smelter prevents, minimises or controls priority risks through planning, design, investment, management and workplace procedures.					X	X									X			X	X		X	X								
<p>A water management strategy must be developed. Key features of the strategy include:</p> <ul style="list-style-type: none"> <li>— Identification and recommendations regarding water management tools such as water / salt balances, programmes for exception monitoring and graphical outputs from monitoring databases</li> <li>— Identification of contamination indicators by use of interpretation ratios (e.g. SO<sub>4</sub>:Cl ratios and how these change with location and time)</li> <li>— Setting of water quality targets in terms of concentrations, load, geographical area, time, legislative requirements, etc.</li> <li>— The Smelter must maximise on opportunities to recycle water</li> </ul>					X	X									X						X	X								

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER								
— Exposed surfaces within dirty areas must be kept to a minimum to minimise the volume of dirty runoff generated																														
The pipelines containing potentially polluting material must be designed to minimise the risk to soils and watercourses along the pipeline route			X		X	X										X			X	X										
Management measures must be devised for the detection of leakage / spills from pipes and dirty water systems and response plans					X	X										X			X	X		X								
Fulfil permit requirements as recommended in SRK Report 222565					X	X										X					X	X								
The pollution potential must be assessed to determine the significance of the impact					X	X											X				X	X								
Surface Water Management Plan																														
If surface water is contaminated by an oil spillage, the surface water must be neutralised as soon as possible					X							X	X		X	X	X		X	X		X								



MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY							
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR	QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER	ENVIRONMENTAL	SHE MANAGER				
All surface water management infrastructure (bends, canals and bunds) must be inspected on a monthly basis, more frequently during periods of high rainfall and after each major rain event					X											X	X			X	X		X	X				
No activities and infrastructure are allowed within 1:50 floodline or 100 metres from the edge of the river, whatever is the greater, without the necessary authorisation from DWA					X											X				X	X		X					
Ensure the establishment of stormwater diversion berms around the contractor lay down area and other potential contaminated areas (e.g. diesel storage tanks or refuelling stations)					X											X				X	X		X					
Clean stormwater must be diverted around the construction site to the nearest water course					X											X				X	X		X	X				
Dirty water (contaminated runoff) must be contained within the Smelter boundary to be reused, treated or evaporated					X											X				X	X		X	X				

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE FAUNA AND SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION AND HEALTH AND SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE PROJECT MANAGER	ENGINEERING MANAGER	ENVIRONMENTAL SHE MANAGER										
Dirty water must be collected in sumps and pumped to a storage facility for use in dust suppression				X								X		X											
Post closure runoff must be contained in the return water dams and evaporated				X								X		X		X									
Stormwater run-off control measures must be instituted to prevent the loss of topsoil			X	X								X		X											
Groundwater Management Plan																									
Install boreholes and monitor these and existing boreholes for water quality					X						X	X	X	X		X									
Monitoring of water levels in surrounding boreholes must form part of the existing groundwater monitoring programme				X	X						X	X	X	X		X									
Positions for additional boreholes need to be identified that would measure all current and potential future groundwater quality and groundwater level impacts					X						X	X	X	X		X									
The monitoring boreholes must be protected to prevent the ingress of surface water into the boreholes					X						X	X	X	X	X	X									

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR	QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATION SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER	ENVIRONMENTAL	SHE MANAGER						
The samples must be analysed for major anions and cations by a recognised laboratory. The analyses must be incorporated into a database to permit timeous action in the event of unacceptable contamination levels occurring						X										X	X	X	X				X	X						
Groundwater monitoring must be undertaken to demonstrate that there is little or no impact on the regional aquifer						X										X	X	X	X	X	X		X	X						
An alternative water supply must be made available to affected groundwater users should unacceptable levels of contamination occur						X										X	X	X	X		X			X						
Conduct an up-to-date detailed hydrocensus and user survey						X										X	X						X	X						
Impacts to groundwater during the construction phase are expected to be minimal and must be further reduced by following an Environmental Management System						X										X					X		X	X						
Noise Management Plan																														

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT								PHASE								RESPONSIBILITY							
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND	SURFACE WATER	GROUNDWATER	AIR	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATION SPILLAGES	AND HEALTH	AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING CED	MANAGER ENVIRONMENTAL	SHE MANAGER	
Adhere to legislated noise levels for Smelters								X									X						X	
Where it is impossible to mitigate ambient noise levels to below a change of 7dB, affected communities must be consulted to determine mitigation measures								X									X			X		X	X	
Ambient noise levels must be monitored. These monitoring activities must help to establish actual noise levels (as opposed to modelled noise levels) to reassess impacts and management measures								X									X					X	X	
Visual Management Plan																								
Use low wattage light bulbs where possible to reduce potential for light pollution									X								X			X	X			
Place focused lighting at low levels and direct on specific objects, areas, or activities to reduce potential for light pollution									X								X			X	X			
Use exterior paints and non-reflective finishes to minimise glare and reflection from built surfaces									X								X			X	X			

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT									PHASE									RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND SURFACE WATER	FAUNA	FLORA	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES AND HEALTH AND SAFETY	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE	MANAGER
<b>Social Management Plan</b>																							
Local entrepreneurs and previously disadvantaged contractors must be provided preferential opportunities to tender for contracts													X	X	X	X	X	X	X	X			X
Recruitment must favour local employment and skills training. RPM-US must establish skills training programmes for locals to address RPM-US's needs and to promote small, medium and micro enterprise (SMME) development													X	X	X	X	X	X	X	X	X		X
No loitering must be allowed in the vicinity of the Smelter outside working hours												X	X	X	X	X	X	X	X	X			X
A complaints register must be developed and should any complaints be received, these must be logged in the complaints register and reported to the responsible person on site			X	X	X	X	X	X				X	X	X	X	X	X			X	X		
Complaints must be treated seriously and Smelter must respond to all complaints. Furthermore, corrective actions should be implemented			X	X	X	X	X	X				X	X	X	X	X	X	X	X	X	X	X	X

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	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE FAUNA AND SURFACE WATER GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES AND	HEALTH AND	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	CEDED	MANAGER	ENVIRONMENTAL	SHE	MANAGER					
Where possible, skilled and unskilled labour must be sourced locally													X	X	X	X			X	X	X						
Principles of equality, BEE, gender equality and non-discrimination must be implemented													X	X	X	X			X	X	X						
No recruitment at the construction site is allowed													X	X	X	X			X	X	X		X				
Material Data Sheets must be updated regularly and be available on site													X		X	X	X		X	X	X	X	X				
The Smelter must actively participate in regional, district and local development forums and establish appropriate communication mechanisms with local political and institutional structures														X	X	X	X		X		X						
The Smelter, its contractors, authorities and neighbouring communities must liaise regularly														X	X	X	X		X	X	X		X				
Extend and improve HIVI AIDS awareness programme for workers and contractors														X	X	X	X		X		X		X				

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The Smelter must formulate joint safety and security measures with local stakeholders, support community policing forums and assist in policing surrounding public spaces										X		X	X	X		X		X		X										
The Smelter must implement management commitments with respect to noise, dust, safety, blasting and vibrations and other, activities having a significant impact on community health							X	X		X		X	X	X		X	X	X	X	X										
To prevent inadvertent access, community access to construction and operation areas, must be strictly controlled using fencing / warning tape and warning signs and access control										X		X	X	X		X	X	X		X										
Smelter employees and contractors must be briefed about appropriate road safety measures. In addition, traffic control measures must be enforced										X		X	X	X		X	X	X	X	X										



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Penalties and disciplinary actions must be imposed on employees and contractors for non-compliance with safety, environmental and social measures												X	X	X	X	X		X	X	X	X	X			
Suitable accommodation and security must be provided for employees during construction													X	X				X	X	X		X			
Construction sites must be fenced and access controlled (for people and cattle)												X	X	X				X	X	X		X			
Spillages and Incident Management Plan																									
An emergency management system must be implemented, including procedures and training for dealing with incidents as per the Environmental Management system.			X	X	X	X				X	X			X	X	X		X	X		X	X			
In the event of an incident the Emergency Preparedness and Response Plan must be followed			X	X	X	X				X	X			X	X	X		X	X		X	X			

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY					
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR	QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE MANAGER	
Any incidents must be reported as soon as possible. Measures must be put in place to prevent similar incidences from occurring. If necessary, remediation of any contamination must be carried out			X	X	X	X						X	X			X	X	X		X	X			X	X	
Management measures must be put in place for the detection and repair of leakage / spills from pipes and dirty water facilities			X	X	X	X						X	X			X	X	X		X	X			X	X	
If a spillage of a hazardous material occurs the resultant hazardous waste must be cleaned up using absorbent material provided in spill kits on site and disposed of in a designated hazardous waste bin			X	X	X	X						X	X			X	X	X		X	X			X	X	
Spilled hydrocarbons must be disposed of at a designated area			X										X			X	X	X		X	X			X	X	
Spilled material must be cleaned up and disposed of appropriately as soon as practically possible			X	X	X	X							X			X	X	X		X	X			X	X	
Access to storage areas on site must be restricted to authorised employees only													X			X	X	X		X	X				X	

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR	QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATED SPILLAGES	AND HEALTH	AND SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT	MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE	MANAGER			
Appropriate remedial measures as detailed in the non-conformance and corrective actions procedures and spillage-handling and clean up procedure must be implemented to deal with incidents of spillages. These procedures are included in this EMPR			X													X									X		X			
Waste Management Plan																														
All hazardous waste must be disposed of at a registered hazardous waste disposal facility (Holfontein) or stored in designated, lined and bunded areas (for no longer than 90 days)			X	X	X	X						X				X	X	X				X			X		X			
Records of all waste being taken off site must be recorded and kept as evidence			X	X	X	X						X				X	X	X							X					
General waste must be disposed of an approved waste disposal facility which must be made available for all employees to use												X				X	X	X							X		X			
Waste oil and any other hazardous wastes must be disposed of by suitably qualified contractors (WMP)					X	X						X				X	X								X		X			

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY									
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND FAUNA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION AND SPILLAGES	HEALTH AND SAFETY	SOCIO-ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	CED	MANAGER	ENVIRONMENTAL	SHE MANAGER								
All waste must be sorted and stored in clearly marked containers										X					X	X		X	X		X									
A formal waste collection system is in operation at the Smelter, disposal must take place at a licenced waste disposal site according to Smelters waste management protocol				X	X					X					X						X	X								
Waste (other than mine residue) must be stored, handled, transported and disposed of in accordance with a documented waste management protocol				X	X					X					X			X			X	X								
Health and Safety Management																														
Access to the site must be controlled											X		X	X	X		X	X				X								
Ensure the appointment of a Safety Officer to continuously monitor the safety conditions during construction and closure											X		X	X	X							X								
Facilitate regular medical examinations for Smelter employees through local health care services											X	X	X	X	X		X	X				X								

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT										PHASE										RESPONSIBILITY				
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE	FAUNA AND SURFACE	WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE	GENERATION	SPILLAGES	AND HEALTH	AND SOCIO-ECONOMI	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING	MANAGER	ENVIRONMENTAL	SHE	MANAGER
The Smelter must ensure that contractors and their staff are trained regarding the SHE procedures to be followed on site. Penalty clauses for transgressions must also be considered in this regard														X		X	X	X		X	X		X	X	
Ensure passenger safety; required road signs and marked passenger crossing, bus and taxi stops														X		X	X	X		X	X				X
In-service training, where applicable, must be provided to contractors and labourers														X	X	X	X			X					
Contractors and labourers must be trained in Health and Safety Policies, Environmental Awareness, Emergency Preparedness														X	X	X	X			X	X		X	X	
The Smelter must be actively involved in the prevention of social ills associated with contractors														X	X	X				X	X				
Contractors and their families may not stay on site														X	X	X				X	X				X

## 8.2 PROCESSING OPERATIONS COMMITMENTS

**Table 8-2** contains the commitments relevant to Processing Operations. The relevance of each commitment will depend on the phase of the respective projects. It will be the responsibility of the operation manager to determine the relevance of each commitment.

**Table 8-2: Processing Operations Commitments**

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT									PHASE									RESPONSIBILITY			
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND CAPABILITY	FAUNA AND FLORA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION SPILLAGES AND INCIDENTS	HEALTH AND SAFETY	SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING MANAGER	CEO MANAGER	ENVIRONMENTAL COORDINATOR	SHE MANAGER
<b>Soil and Land Management Plan</b>																						
<b>Soil Management</b>																						
Volumes of stockpiled materials must be accurately recorded. Records must be made available on request			X											X							X	X
Systems to separate clean and dirty water must be installed and maintained for all new infrastructure			X												X			X	X			X
<b>Land Capability Management</b>																						
The norite and alluvial material can be used on site as backfill or for landscaping purposes			X											X	X	X					X	X
<b>Biodiversity Management Plan</b>																						
The Smelter must limit, as far as practical, the area of land disturbed and isolated for the purpose of construction				X										X	X			X			X	X

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT							PHASE							RESPONSIBILITY								
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND CAPABILITY	FAUNA AND FLORA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION	SPILLAGES AND INCIDENTS	HEALTH AND SAFETY	SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING MANAGER	CEO MANAGER	ENVIRONMENTAL COORDINATOR	SHE MANAGER
and processing activities, to the minimum required for safe and efficient operation																							
Air Quality Management Plan																							
Fugitive Emissions Management																							
In order to accurately quantify the risks associated with the disposal of the milled slag onto a TSF, the following are required:  — Take multiple samples of slag and residues from each facility  — Analyse a number of replicates for each sample to avoid calculations involving outliers  — Use spiked samples to confirm critical values close to the detection limit, especially for Hazard Rating 1 constituents  — Compare the findings in terms of Minimum Requirements with those in terms of US Environmental Protection Agency and possibly European Union protocols to get a more balanced assessment of the Hazard			X	X		X	X									X						X	X



MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT					PHASE										RESPONSIBILITY					
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND CAPABILITY FAUNA AND FLORA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION SPILLAGES AND INCIDENTS	HEALTH AND SAFETY	SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING MANAGER	CEO MANAGER	ENVIRONMENTAL COORDINATOR	SHE MANAGER
<ul style="list-style-type: none"> <li>Base acid generation potential on sulphide as opposed to total sulphate, particularly on weathered or chemically oxidized materials</li> <li>Sensitivity analyses on a range of slag footprint areas onto which the slag is likely to be disposed. Perform high level risk assessments to indicate the likely risks to realistic receptors</li> </ul>																					
<b>Point Source Emissions Management</b>																					
Mortimer Smelter is required to comply with all limits stipulated within the Atmospheric Emissions Licence. Should non-compliances be identified additional measures must be investigated.						X								X						X	X
Mortimer Smelter is required to comply with the monitoring requirements stipulated within the Atmospheric Emissions Licence						X								X						X	X

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT						PHASE										RESPONSIBILITY						
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND CAPABILITY	FAUNA AND FLORA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION	SPILLAGES AND INCIDENTS	HEALTH AND SAFETY	SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING MANAGER	CED MANAGER	ENVIRONMENTAL COORDINATOR	SHE MANAGER
The regular maintenance and servicing of the electrostatic precipitators is to be done as per the maintenance schedule. External contractors are to be used for major maintenance							X									X			X				
If continuous measurements on the stacks are not performed, source emission measurements must be completed on a scheduled basis to obtain a more representative record of emissions							X									X						X	X
Ground and Surface Water Management																							
Seepage must be collected in perimeter drains, which flow to the return water dams for reuse					X	X										X			X				X
Hydrogeological assessments must be undertaken along the southern and eastern boundary of the Smelter operational area to assess the extent of the contaminant plume. Transport modelling may be required to assess the long-term impact of groundwater pollution on closure					X	X										X	X	X				X	X

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT						PHASE										RESPONSIBILITY						
	GEOLOGY	TOPOGRAPHY	SOIL, LAND USE AND CAPABILITY	FAUNA AND FLORA	SURFACE WATER	GROUNDWATER	AIR QUALITY	NOISE	VISUAL	ARCHAEOLOGY	WASTE GENERATION	SPILLAGES AND INCIDENTS	HEALTH AND SAFETY	SOCIO- ECONOMIC	CONSTRUCTION	OPERATIONAL	CLOSURE	POST CLOSURE	PROJECT MANAGER	ENGINEERING MANAGER	CEO MANAGER	ENVIRONMENTAL COORDINATOR	SHE MANAGER
Rehabilitation of the slagheap must be done at closure, to ensure that it blends with the surrounding environment. Thereafter topsoil must be deposited. Compost might be added if necessary to facilitate re-vegetation					X	X			X							X						X	X
Groundwater Management Plan																							
Transport modelling may be required to assess the long term impact of groundwater pollution on closure						X									X	X	X	X				X	X
The infrastructure must be dismantled and removed on closure						X											X		X				
Visual Management Plan																							
The plant infrastructure must be dismantled at closure and the plant area rehabilitated in line with the following commitment contained in Smelters existing EMPR:  — Infrastructure that cannot be used following closure must be demolished and the demolished structure removed from the area. The ground must then be ripped, levelled and the area rehabilitated									X								X		X			X	X

## 8.3 CENTRAL SERVICES COMMITMENTS

**Table 8-3** contains the commitments relevant to all Central Services. The relevance of each commitment will depend on the phase of the respective projects. It will be the responsibility of the operation manager to determine the relevance of each commitment.

**Table 8-3: Central Services Commitments**

MITIGATION AND MANAGEMENT MEASURES	ENVIRONMENT													PHASE				RESPONSIBILITY					
	Geology	Topography	Soil, Land Use and Capability	Fauna and Flora	Surface Water	Groundwater	Air Quality	Noise	Visual	Archaeology	Waste Generation	Spillages and Incidents	Health and Safety	Socio-Economic	Construction	Operational	Closure	Post Closure	Project Manager	Engineering Manager	CED Manager	Environmental Coordinator	SHE Manager
Soil and Land Management Plan																							
Soil Management																							
Linear infrastructure (roads and pipelines) must be inspected on a monthly basis to check that the associated water management infrastructure is effective in controlling soil erosion			X		X	X									X	X			X	X			
Soil for the purpose of rehabilitation must be stripped from areas to be cleared for construction and operation. This soil must be stockpiled and stored using the following conservation principles: <div><div>—</div>Usable soil must be stripped and stored with as little compaction as possible</div> <div><div>—</div>Stockpile areas must have their soil stripped to conserve the seed bank</div> <div><div>—</div>Single handling must be practised where possible</div>			X												X	X			X	X		X	X

<ul style="list-style-type: none"><li>— Stockpiles that are likely to remain undisturbed for 12 months or more must be revegetated to manage dust and erosion and to maintain the soil's viability</li><li>— Usable soil must be spread with as little compaction as possible</li><li>— Land to which soil has been reapplied must be revegetated</li></ul>																						
Contractors must construct berms after clearing of an area to minimise erosion			X											X				X	X			X
Biodiversity Management Plan																						
Permits must be obtained from the relevant authority prior to the transportation of any rare / endangered species				X										X						X	X	
Ground and Surface Water Management																						
Ensure that reticulation systems are properly maintained and regularly checked for blockages					X	X									X			X	X			X
The Smelter must monitor water levels in the return water dams and take corrective action as required					X	X									X				X			X
Stormwater management must be enhanced as follows: <ul style="list-style-type: none"><li>— Return water dams must be maintained and operated under supervision to ensure that maximum storage capacity is available to minimise discharge and subsequent impacts on the receiving water environment during storm events.</li><li>— Stormwater must be monitored at the main discharge point during a rainstorm.</li></ul>					X	X									X			X	X		X	X

Contaminated runoff from the Smelters infrastructure must be diverted to the return water dams					X	X									X			X	X			X
The existing monitoring points must be maintained to assess compliance with water quality guidelines					X	X									X						X	X
<b>Surface Water Management Plan</b>																						
The hydrology for the post closure scenario must be determined and if necessary the dam capacity will have to be increased to allow for evaporation					X											X	X	X			X	X
The return water dams must become evaporation facilities.					X											X		X	X			X
On closure the cells must be covered with 150mm of soil and revegetated					X											X					X	X
<b>Groundwater Management Plan</b>																						
Seepage from the return water dams must be intercepted and pumped back to the return water system						X										X	X		X	X		
Hydrogeological assessment to investigate the extent of the contaminant plume emanating from the return water dams and downstream users						X										X					X	X

## 9 KNOWLEDGE GAPS AND ADEQUACY OF PREDICTIVE METHODS

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### 9.1 ASSUMPTIONS

All information regarding the current RPM-US operations was provided by AAP personnel. It is assumed that this information is accurate.

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### 9.2 KNOWLEDGE GAPS

The environment that is likely to be affected by the operations has been assessed utilising existing reports that cover the prevailing conditions of the environmental aspects identified, including cumulative impacts.

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### 9.3 ADEQUACY OF PREDICTIVE METHODS

This document is a consolidation (allocation) of existing approved EMPRs, subsequent amendments/addendums and supporting documentation, as such it is believed that the predictive measures that were utilised during their original compilation were suitable and with no limitations.

## 10 ENVIRONMENTAL PROCESS RELATED TO EMERGENCIES AND REMEDIATION

RPM has developed and implemented an ISO 14001:2004 Environmental Management System (EMS) and has resulted in all significant environmental aspects being identified and rigorously managed through the following activities:

- Identification and application of applicable legal and other environmental requirements
- Identification of environmental aspects and associated impacts
- Determination of environmental aspect and impact significance
- Development of a Management Programme (and associated Action Plans) to address significant aspects and impacts
- Development of strategic and operational procedures to implement the Management Programme
- Development of operations procedures for the development and implementation of environmental awareness
- Determination of Corrective and Preventative actions related to environmental incidents
- Implementation of environmental monitoring and measurement procedures to measure compliance with the EMS and other environmental requirements
- Identification and management of potential emergency situations and potential incidents that can potentially impact on the environment
- Checking and auditing of the suite of EMS requirements to ensure compliance and maintain certification



Section 4.4.7 of the EMS standard ISO 14001:2004 requires that the organisation establish and maintain procedures to identify potential for and respond to accidents and emergency situations, and for preventing and mitigating the environmental impacts that may be associated with them. The organisation shall review and revise, where necessary, its emergency preparedness and response procedures, in particular, after the occurrence of incidents where practicable. The organisation shall also periodically test such procedures where practicable.

The EMS, as briefly mentioned above, identifies and ensures management of environmental emergencies and remediation through an emergency preparedness and response plan. An effective, comprehensive, well-considered and tested environmental emergency preparedness and response plan has the potential to save lives, prevent unnecessary damage to the company and other property and to manage environmental risk in the event of a large chemical spill, oil spill or fuel spill. RPM has an emergency preparedness and response plan (as contained in **Appendix C**), which is certified and therefore complies with the requirements of both the MPRDA and ISO 14001:2004. Also, note that each operation has an emergency preparedness response plan that is specific to its needs.

The purpose of the emergency preparedness and response plan is to provide guidance to employees and contractors as to their responsibilities in the event of an actual environmental emergency or potential environmental emergency, concerning chemical, oil, fuel, spills and other incidents.

The emergency preparedness and response plan has been developed to provide guidance to ensure that:

- Actual and potential emergency situations or accidents have been identified
- Legal liability is managed and danger to the environment, personnel, contractors and non-employees is minimised
- Public relations are effectively managed during and following an emergency
- Reporting is effective and corrective / follow-up actions are implemented

# 11 MONITORING AND EMP PERFORMANCE ASSESSMENT

Section 24Q of the National Environmental Management Amendment Act (No. 62 of 2008) (NEMAA) details the monitoring and performance assessment requirements of an environmental authorisation (including EMPRs).

The section states, ‘As part of the general terms and conditions for an environmental authorisation and in order to—

- a. Ensure compliance with the conditions of the environmental authorisation; and
- b. In order to assess the continued appropriateness and adequacy of the EMPR, every holder and every holder of an old order right must conduct such monitoring and such performance assessment of the approved EMPR, as may be prescribed.

Section 34 of the NEMA 2014 EIA Regulations (GNR 982), gives effect to the NEMAA by specifying the manner in which auditing (or performance assessment) of an Environmental Authorisation should be carried out. Section 34 falls under ‘Part 3’ (Auditing and amendment of environmental authorisation, environmental management programme and closure plan).

Section 34, states the following:

- 1 The holder of an environmental authorisation must, for the period during which the environmental authorisation and EMPR, and where applicable the closure plan, remain valid-
  - a. Ensure that the compliance with the conditions of the environmental authorisation and the EMPR, and where applicable the closure plan, is audited; and
  - b. Submit an environmental audit report to the relevant competent authority.
- 2 The environmental audit report contemplated above, must-
  - a. Be prepared by an independent person with the relevant environmental auditing expertise;
  - b. Provide verifiable findings, in a structured and systematic manner, on-
    - i. The level of performance against and compliance of an organisation or project with the provisions of the requisite environmental authorisation or EMPR and, where applicable, the closure plan; and
    - ii. The ability of the measures contained in the EMPR, and where applicable the closure plan, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity;
  - c. Contain the information set out in Appendix 7 (of GNR 982); and
  - d. Be conducted and submitted to the competent authority at intervals as indicated in the environmental authorisation (in this case and EMPR).
- 3 The environmental audit report, described above, must determine -
  - a. The ability of the EMPRR, and where applicable the closure plan, to sufficiently provide for the avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity on an ongoing basis and to sufficiently provide for the, avoidance, management and mitigation of environmental impacts associated with the closure of the facility/operation; and

- b. The level of compliance with the provisions of environmental authorisation, EMPR and where applicable the closure plan.

**4** Where the findings of the environmental audit report indicate-

- a. Insufficient mitigation of environmental impacts associated with the undertaking of the activity; or
- b. Insufficient levels of compliance with the environmental authorisation or EMPR and, where applicable the closure plan;

The holder must, when submitting the environmental audit report to the competent authority, submit recommendations to amend the EMPR or closure plan in order to rectify the shortcomings identified in the environmental audit report.

- 5** When submitting these recommendation, such recommendations must have been subjected to a public participation process, which process has been agreed to by the competent authority and was appropriate to bring the proposed amendment of the EMPR and, where applicable the closure plan, to the attention of potential and registered interested and affected parties, including organs of state which have jurisdiction in respect of any aspect of the relevant activity and the competent authority, for approval by the competent authority.
- 6** Within seven days of the date of submission of an environmental audit report to the competent authority, the holder of an environmental authorisation must notify all potential and registered interested and affected parties of the submission of that report, and make such report immediately available-
  - a. To anyone on request; and
  - b. On a publicly accessible website, where the holder has such a website.

**7** The environmental audit report must contain all information set out in Appendix 7 of GNR 982.

The latest Regulation 34 Audit is included in **Appendix D**. *Note: The past auditing/monitoring was undertaken as part of the MPRDA Regulation 55 requirement. Going forward the NEMA 'One Environmental System' approach will apply to the operations (i.e. GNR 982).*

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## 11.1 OPERATING PROCEDURES RELATING TO MONITORING

All monitoring and performance assessments of health, safety, environment and legal compliance are executed in accordance with the relevant RPM-US operating procedures. Copies of the operating procedures can be made available on request. It must be noted that although the operating procedures are utilised, requirements contained in the relevant South African statutes are also utilised to ensure compliance and best practise.

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## 11.2 MONITORING SCHEDULE

RPM-US will establish, implement and maintain a procedure(s) to monitor and measure, on a regular basis, the key characteristics of the operations that have a significant environmental impact. The procedure(s) shall include the documenting of information to monitor performance, applicable operational controls and conformity with each operations environmental objectives and targets (EMPR). RPM will ensure that calibrated or verified monitoring and measurement equipment is used and maintained and shall retain associated records as proof.

RPM will establish, implement and maintain a procedure(s) for periodically evaluating compliance with applicable legal requirements within each operation and evaluate compliance with other requirements to which it subscribes. Records of findings, observations, etc. of the evaluation shall be maintained.

RPM shall establish, implement and maintain procedures for dealing with actual and potential non-conformities identified and will develop procedures for taking corrective and preventive action. The procedures shall define requirements for the following:

- Identifying and correcting non-conformities and taking actions to mitigate their environmental impact
- Investigating non-conformities, determining their causes and taking actions in order to avoid their recurrence
- Evaluating the need for actions to prevent non-conformities and implementing appropriate actions designed to avoid their occurrence
- Recording the results of corrective actions and preventive actions taken
- Reviewing the effectiveness of corrective actions and preventive actions taken

RPM-US will ensure that any necessary changes are made and adequately documented and recorded and will establish and maintain records as necessary to demonstrate conformity to the requirements of the EMPR and relevant procedures.

RPM will ensure that annual internal audits of the conditions within the EMPR are conducted at planned intervals. Audit procedures shall be established, implemented and maintained and shall address the responsibilities and requirements for planning and conducting audits, reporting results and retaining associated reports. The procedure will also address the determination of the audit criteria, scope, frequency and methods. Internal auditors shall ensure objectivity of the audit process.

## 12 ENVIRONMENTAL AWARENESS PLANNING

EMPR. Regulation 1(m) states, ‘an environmental awareness plan describing the manner in which:

- i. The applicant intends to inform his or her employees of any environmental risk which may result from their work; and
- ii. Risks must be dealt with in order to avoid pollution or the degradation of the environment.

The existing AAP environmental awareness plan was compiled in terms of the MPRDA, under regulation 55 (b)(vi). At this stage the existing environmental awareness plan will be utilised going forward. During the following update process, the plan should be updated to reflect the requirements of the NEMA EIA Regulations. The existing Environmental Awareness Plan is attached as **Appendix E**. This Environmental Awareness Plan was developed as part of the development and implementation of the certified ISO 14001:2005 EMS.

The following methodology is currently being used at the operations to implement and ensure environmental awareness:

- Internal Communication;
- Standard Meetings;
- Environmental Topics;
- External Communication;
- Complaints; and
- Training.

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## 12.1 INTERNAL COMMUNICATION

Internal communication of environmental issues to ensure environmental awareness will be done by the following means:

- Meetings
- Memos
- Notice boards
- Briefs
- Reports
- Monthly themes
- Daily operational bulletin
- Newsletter
- E-mail
- Telephone
- Induction training

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## 12.2 STANDARD MEETING

The following standard meetings are held at specific times to ensure that environmental awareness; potential problems, complaints etc. are heard and addressed proactively:

- Safety, Health and Environmental Meetings are held monthly by the Senior Management
- Safety, Health and Environmental Meetings are held daily, weekly and monthly by the different operations and environmental issues are one of the topics on the agenda
- Monthly EMS meetings are held where environmental issues relating to the EMS are discussed
- All Employees can also communicate to Senior Management through their reporting lines or by using complaint forms and incident forms to improve communication

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## 12.3 ENVIRONMENTAL TOPICS

Monthly environmental talk topics are compiled and distributed by the Environmental Section personnel to relevant people and are displayed on the relevant notice boards.

The following environmental topics are covered:

- Water Quality
- Air Quality
- Power Consumption
- Waste Management
- Fauna and Flora
- Emergency Procedures
- Incident Reporting
- Systems
- General Environmental Awareness (e.g. World Environment Day, National Harbour Day)

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## 12.4 EXTERNAL COMMUNICATION

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### 12.4.1 SEAT MEETING

The Socio-Economic Assessment Toolbox (SEAT) meeting (which is held on a bi-monthly basis) is a forum used to keep stakeholders informed of the significant environmental aspects identified through the EMS. This is also the forum where I&APs get the opportunity to raise environmental concerns. Records are kept of all decisions and concerns.

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### 12.4.2 PUBLICATIONS

The following publications are also used to communicate environmental issues to outside parties:

- Let's Talk newsletters
- Annual Sustainable Development Report
- AAP Annual Report

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### 12.4.3 GENERAL COMMUNICATIONS

Any environmental issues will be communicated to and from Head Office (in terms of Divisional and Group Communication) by means of the following:

- Fax or E-mail
- News briefs from Head Office
- Formal meetings and workshops
- Quarterly environmental report
- Annual environmental report

Communication to community, government, neighbouring mines, farmers, land owners, environmental Groups, Non-Governmental Organisations (NGOs) and other I&APs will be communicated to ensure environmental awareness by means of the following:

- Fax or e-mail
- Postal system
- Telephone
- Formal meetings
- Open days

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## 12.5 COMPLAINTS

All environmental related complaints and queries must be directed to the relevant Environmental Co-ordinator for attention. All information regarding complaints reported to the RPM-US telephone exchange will be captured on a complaint form and handed to the relevant Environmental Co-ordinator. The relevant Environmental Co-ordinator will record all complaints in the complaints register.

The Environmental Co-ordinator will forward all complaints received onto the Community Engagement Department (CED) Department or as detailed in the relevant complaints procedure (specific for each operation). The CED Department will be responsible for capturing the complaints on an EMS system and developing appropriate actions.

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## 12.6 TRAINING

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### 12.6.1 INDUCTION

Environmental awareness training is given at induction when personnel join the company and / or return from leave. Induction training is also given to visitors entering the site.

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### 12.6.2 JOB SPECIFIC TRAINING

Job specific training programs are developed for the Business Areas as and when required. The programs are based on the significant environmental aspects / impacts that were identified during the Audit and Site inspections.

The training material focuses on the following:

- Waste prevention and control
- Storing and handling of chemicals
- Incident reporting
- Spill management

This training is not linked to a specific role or task, but rather to the Business Area as a whole. Supervisory staff, within a specific Business Area, are equipped with the necessary knowledge and information to guide their employees on environmental aspects applicable to performing a specific task.

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### 12.6.3 COMPETENCY TRAINING

The Environmental Coordinator(s) are responsible for the environmental competency and awareness training of Middle Management and supervisors. This training is done both on a one-on-one basis (e.g. the Electronic Action Management System (IRM.net) operation and setting of environmental programmes) and through workshops and presentations.

Competence and the effectiveness of training and development initiatives are determined through the following methods:

- Trend analysis of incidents reported
- Analysis of work areas during visits and audits

The process to declare competency of personnel is documented in the ISO9001:2000 procedures at the KBC training centre.

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## 13 ENVIRONMENTAL GOALS AND OBJECTIVES

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### 13.1 ENVIRONMENT IMPACT MANAGEMENT

Existing impacts on the environment will be mitigated and managed by implementing the management and mitigation requirements as identified in **Section 8**.

All future projects will be assessed in accordance with the environmental procedure (CTR-SHE-ENV-PRO-003 – launched in 2006) that sets out AAP's standard process, format and content that must be complied with for the



compilation and implementation of an EMP as required in terms of the Environmental Authorisation in terms of Section 24 of the NEMA. All identified impacts will be rated using the prescribed Significance Rating Matrix. Applicable South African legislation will also be covered as part of the EIA-EMPR process.

## 13.2 FINANCIAL PROVISION FOR CLOSURE

Trust (PPET) was established for the AAP mining operations during 1995 to provide for the final rehabilitation and closure of these operations. Each Operation has a separate account in the Fund. Till end 2013, all the AAP mining operations contribute to the fund on an annual basis as part of the total financial provision for closure. Part of the financial provision was raised through financial guarantees. From 2014 onwards, with the agreement of the DMR, the financial provision for the closure of the AAP mining operations is being funded through financial guarantees. The latest closure liability assessment for RPM-US is summarised below (**Table 13-1**). A copy of the 2015 Certificate of Approval for closure contributions from the DMR is attached in **Appendix F**.

**Table 13-1: Liability Assessment 2015**

OPERATION	LIABILITY ASSESSMENT 2016			
	Demolition	Rehabilitation	Restoration	Total
Mortimer Smelter	17 013 351	4 058 140		21 071 491
Additional Thickeners from Mortimer Concentrators	688 843			688 843
Additional Dams			91 564	91 564
Slag Dumps			5 410 308	5 410 308
Monitoring and Maintenance			1 653 210	1 653 210
<b>TOTAL</b>	<b>17 702 194</b>	<b>4 058 140</b>	<b>7 155 082</b>	<b>28 915 416</b>

# 14 UNDERTAKING

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## 14.1 APPLICANT

NAME OF EMPR OWNER:

UNDERTAKING

I, \_\_\_\_\_, the undersigned and duly authorized thereto, by \_\_\_\_\_, have studied the contents of the Retained Operations Environmental Management Programme (EMPR) and signed by me under today's date, duly undertake to adhere to the conditions as set out herein, unless otherwise agreed to.

Signed at \_\_\_\_\_ on this the \_\_\_\_\_ day of \_\_\_\_\_ 20 .

\_\_\_\_\_  
**SIGNATURE OF EMPR OWNER**

APPROVED IN TERMS OF REGULATION 29(A) OF THE EIA REGULATIONS, 2014 (NEMA) AS READ WITH SECTION 102 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT (NO. 28 OF 2002)

Signed at \_\_\_\_\_ on this \_\_\_\_\_ day of \_\_\_\_\_ 20 .

\_\_\_\_\_  
DEPARTMENT OF MINERAL RESOURCES: RESPONSIBLE PERSON:

MINERAL DEVELOPMENT NORTH WEST REGION

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## 14.2 ENVIRONMENTAL ASSESSMENT PRACTITIONER

NAME OF EAP/CONSULTANT:

UNDERTAKING

I, \_\_\_\_\_, the undersigned acknowledge the contents of **Table 14-1**.

**Table 14-1: EAP Undertaking**

NO.	NEMA REGULATION REQUIREMENT	COMMENT
1.	The correctness of the information provided in the reports.	The information contained in this report is based on the assumption that the information contained within the 2013 RPM-US consolidated EMPR is correct. This item is acknowledged on the basis of consideration of <b>Section 8</b> .
2.	The inclusion of comments and inputs from stakeholders.	All stakeholder feedback was considered by the EAP responsible for the project specific process at undertaken during the project planning phase. This report was not subjected to stakeholder review, thus no comments were presented to the EAP.
3.	The inclusion of inputs and recommendations from the specialist reports where relevant.	This item is acknowledged on the understanding that the original project reporting considered the specialist recommendations. Furthermore, the EAP assumes that the specialist findings/recommendation were transferred to the 2013 consolidated RPM-US EMPR.
4.	Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties.	As per <b>Item 2</b> , not relevant to this report/project.

# 15 CONCLUSION

This report has the purpose of presenting the EMPR commitments relevant to the RPM-US Smelters (Retained Operations) in a consolidated manner. The environmental management measures are considered important to the reduction of the Operations environmental/social impacts during all project phases. The report will become the overarching comprehensive management tool/document for managers, co-ordinators and contractors taking responsibility of the Smelters.

The management measures/recommendations contained, must be applied to the Retained Operations until a closure certificate has been obtained (i.e. the commitments do not cease upon the completion of the operational phase). To ensure legal compliance, the report has been compiled in a manner which makes it as compliant as possible with the requirements of both the NEMA, with specific reference to the EIA Regulations.

# APPENDIX

## A CURRICULUM VITAE



# APPENDIX

## APPENDIX

### ***A-1 ANRI SCHEEPERS***



## APPENDIX

### ***A-2 JARED O'BRIEN***

# APPENDIX

## **B** CAPABILITY STATEMENT



# APPENDIX

## C EMERGENCY PREPAREDNESS AND RESPONSE PLAN

# APPENDIX

## D LATEST REGULATION 34 AUDIT

# APPENDIX

# E ENVIRONMENTAL AWARENESS PLAN



# APPENDIX

## **F** LATEST CLOSURE LIABILTY ASSESSMENT – DMR 2015 CERTIFICATE OF APPROVAL