REPORT NO 31101

PROPOSED INSTALLATION OF SULPHUR DIOXIDE ABATEMENT EQUIPMENT AT ANGLO AMERICAN PLATINUM LIMITED: MORTIMER SMELTER - NW30/5/1/2/3/2/1/366EM

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PUBLIC

WSP | PARSONS BRINCKERHOFF

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Anglo American Platinum Limited

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WSP | Parsons Brinckerhoff
199 Bryanston Drive
Bryanston
2191

Tel: +27 11 361 1392
Fax: +27 11 361 1381
www.wspgroup.com
www.pbworld.com

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A P P E N D I X 7 IMPACT ASSESSMENT

mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT
And
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT: Anglo American Platinum Limited

TEL NO: 011 373 6111

FAX NO: 011 373 5145

POSTAL ADDRESS: Private Bag 62179, Marshalltown, 2107

PHYSICAL ADDRESS: 55 Marshall Street, Floor 11, Marshalltown, Johannesburg, 2001, South Africa

FILE REFERENCE NUMBER SAMRAD: NW30/5/1/2/3/2/1/366EM

1. IMPORTANT NOTICE

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

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

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

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

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

2. OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—

  (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

  (ii) degree to which these impacts—

    (aa) can be reversed;

    (bb) may cause irreplaceable loss of resources, and

    (cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

3. CONTACT PERSON AND CORRESPONDENCE ADDRESS

a) Details of:

i) Details of the EAP

Name of The Practitioner: Anri Scheepers (WSP | Parsons Brinckerhoff)

Tel No.: 011 300 6089

Fax No. : 011 361 1381

e-mail address: Anri.Scheepers@wspgroup.co.za

ii) Expertise of the EAP.

(1) The qualifications of the EAP

(with evidence attached as **Appendix 1**).

Anri graduated from the University of Johannesburg with a BA honours in Geography in 2007, and has nine years work experience. Anri is a principal environmental consultant and team coordinator in Johannesburg's Environmental Services team.

She has been involved in numerous mining projects in the North West and Mpumalanga Provinces. The projects include Environmental and Social Impact Assessments (ESIA's), Environmental Management Programme reports (EMPr) Environmental Performance Assessments and EMPr consolidation and alignment processes associated.

Anri's roles and responsibilities include the management of Basic Assessment Processes, Scoping and Environmental Impact Assessment Reporting Processes, Water Use Licence Application Processes and Waste Licencing Processes and the implementation of ISO 14000 and 9000 systems

Professional Qualifications:

- → Bachelor of Arts (Honours), Geography, University of Johannesburg, Gauteng, South Africa, 2007
- → Bachelor of Arts, Geography, University of Johannesburg, Gauteng, South Africa, 2006

(2) Summary of the EAP's past experience.

(In carrying out the Environmental Impact Assessment Procedure)

Table 1 provides a list and descriptor of each project Anri has been involved in as a Project Manager and/or lead consultant. The Environmental Assessment Practitioners (EAP's) curriculum vitae is attached in **Appendix 2**.

Table 1: Anri Scheepers Relevant Project Experience

Sector	Project
Stakeholder Engagement	Stakeholder Engagement for Mooi-Mgeni Transfer Scheme Phase 2, Rosetta Village, Kwazulu- Natal, South Africa (2009): Assistant. This project involved undertaking the public participation process for the Mooi-Mgeni Transfer Scheme Phase 2, which will primarily encompass the construction of the proposed Spring Grove Dam and an associated transfer pipeline from the proposed dam to the Mpofana River. Client: Department of Water Affairs and Forestry (DWAF).
Environmental Authorisation Processes	Environmental Authorisation for Blue Sphere, Nigel, Gauteng, South Africa (2014): Consultant. This project includes an environmental impact assessment, environmental management programme report, water use license application, waste management license application and an atmospheric emissions licence application as well as the public participation process for the existing and proposed processes for Blue Sphere in Nigel. Client: Blue Sphere Investments and Trading 103 (Pty) Ltd. Environmental Authorisation for the Proposed Construction and Operation of Two Furnaces and Associated Infrastructure at Transalloys, eMalahleni, Mpumalanga, South Africa (2014): Consultant. The project entailed undertaking an environmental authorisation (by way of a scoping and environmental impact reporting process), including an atmospheric emissions licence application and waste management licence application process for the construction of two new 75MVA submerged arc furnaces that will primarily produce silicomanganese. Client: Transalloys (Pty) Ltd. M14 Furnace Environmental Authorisation, Meyerton, Gauteng, South Africa (2012): Consultant. The project entailed undertaking an environmental authorisation, including an atmospheric emissions licence application process, in terms of the National Environmental Management Act (No. 107 of 1998) for the construction of an 81MVA furnace that will produce Ferromanganese and Silicomanganese. Client: Samancor Manganese (Pty) Ltd. Basic Assessment Process for the Proposed Expansion and Upgrading of the Raw Materials Stockyard at Metalloys, Meyerton, Gauteng, South Africa (2011): Consultant. The project included the undertaking of an environmental authorisation process, by way of a basic assessment process, and the amendment application of an atmospheric emissions licence. The project involved the expansion and The project entailed undertaking an environmental authorisation, including an atmospheric emissions licence application process, in terms of the National Environmental Management Act (No. 107 of 1998) for the construction of an 81MVA furnace that will produce Ferromanganese and Silicomanganeseupgrading of the existing Raw Materials Stockyard at the Samancor Meyerton Works (Metalloys site). Client: Samancor Manganese (Pty) Ltd. Proposed new Sinter Plant: Mamatwan Mine, Hotazel, Northern Cape, South Africa (2010): Consultant. This project included an environmental impact assessment, environmental management programme report addendum and water use license application as well as the public participation process for a proposed sinter plant at the Mamatwan Mine in the Northern Cape. Client: Hotazel Manganese.
Environmental Management Programme Reports	EMPr Updates – Vaal River and West Wits Operations, Gauteng and North West, South Africa (2014): Project Manager. The alignment of the West Wits (WW) and Vaal River (VR) Operations EMPr in accordance with the requirements of the Mineral and Petroleum Resources

Sector	Project
	Development Act (No. 28 0f 2002) (MPRDA). Client: AngloGold Ashanti (Pty) Ltd. Environmental Management Programme Report Consolidation and Alignment of Union Mine: Rustenburg Platinum Mines, North-West, South Africa (2014): Project Manager. The EMPR consolidation and alignment process combined the original EMPR and authorised EMPR amendments into a complete and comprehensive document, which will become the overarching EMPR for the mine lease area and will be used as a concise management tool for all employees operating within mine lease area. Client: Anglo American Platinum Ltd.

b) Description of the property.

Table 2: Property Information

Farm Name:	Farms Zwartklip 405 KQ, Spitskop 410 KQ, Haardoorn 6 JQ and Turfbult 404 KQ
Application area (Ha)	Plant area – 1.78 Construction area – 3.95
Magisterial district:	Bojanala Platinum District Municipality (BPDM)
Distance and direction from nearest town	Northam - 17 km east
21 digit Surveyor General Code for each farm portion	T0KQ00000000040400000

c) Locality map

(show nearest town, scale not smaller than 1:250000 attached as **Appendix 3**).

See **Figure 1** and **Figure 2**. A3 printout is attached as **Appendix 3**.

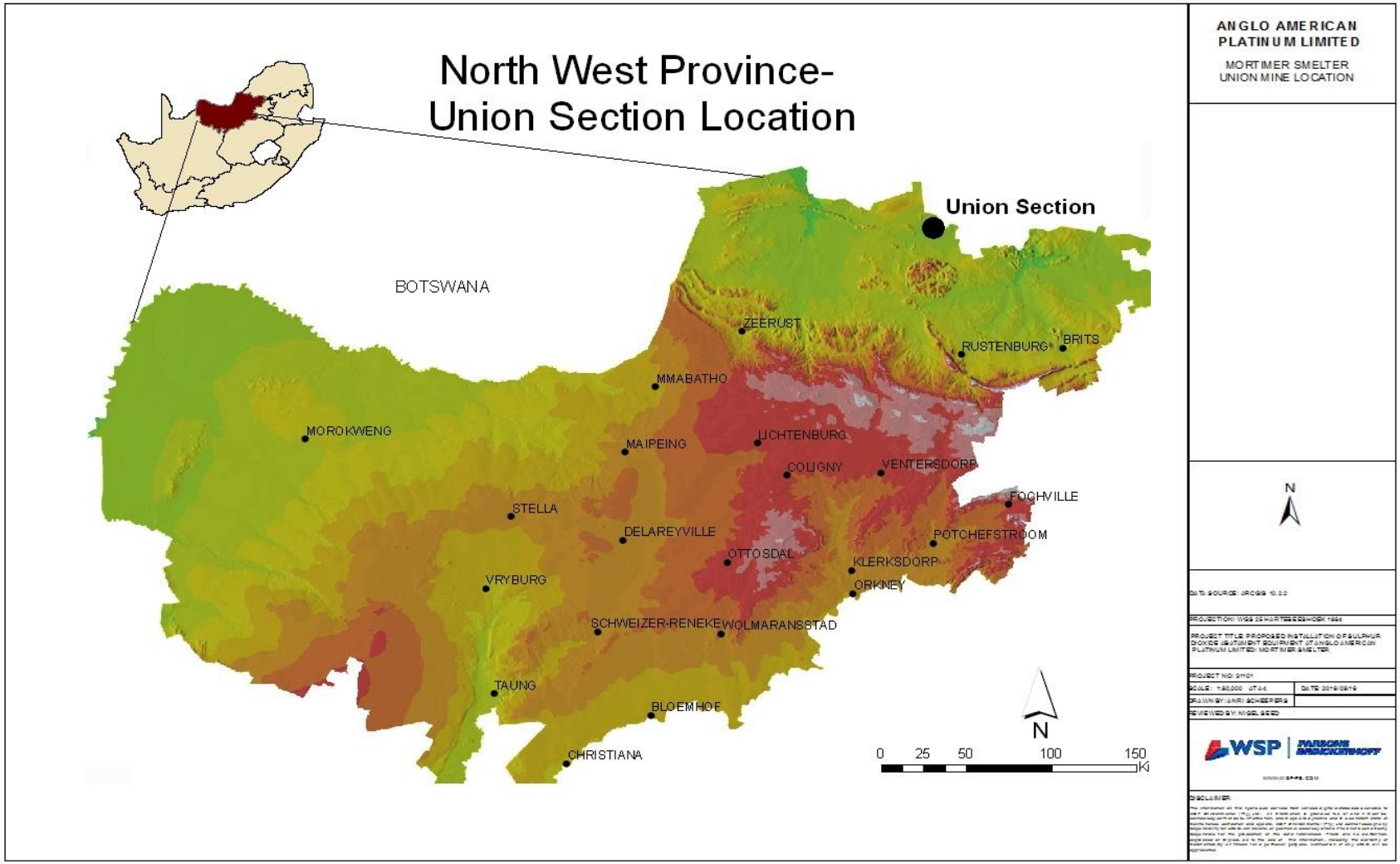


Figure 1: Union Section Operation's Location

Figure 2: Mortimer Smelter's Location

d) Description of the scope of the proposed overall activity.

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site

Refer to **Appendix 4** for a plan drawn to scale, also refer to **Figure 3** for the superimposed layout.

Anglo American Platinum Limited (AAP) owns and operates three smelting complexes, namely Polokwane, Mortimer and Waterval. This project relates to the Mortimer Smelter, which is located at the Union Section (RPM-US), straddling the Limpopo and North-West Provinces of South Africa. The Mortimer Smelter is situated in the North-West Province.

The Mortimer Smelter is an existing metallurgical industrial furnace where sulphide ores are smelted. Wet concentrate from the Concentrator is received and dried in flash dryers. The dry concentrate is smelted in an electric furnace, resulting in the recovery of platinum group metals (PGMs) and other base metals. The product of the smelting process (referred to as 'matte') is then tapped from the furnace, cast and crushed. The resulting furnace slag is currently stockpiled.

The Mortimer Smelter has been upgraded, with 'Phase One' of the upgrade occurring in 2008/2009 and 'Phase Two' in 2011, resulting in an increase in the furnace power from 19 MW to 38 MW. The off-gas is currently being treated via an electrostatic precipitator (ESP); exhaust from the ESP is vented into the atmosphere via a stack at 80m above the ground. The constituents in the emissions include particulate matter (PM), Sulphur Dioxide (SO_2) and nitrogen oxide (NO_x).

The National Environmental Management Air Quality Act (No. 39 of 2004) (NEM:AQA) requires that furnaces at metallurgical industries be operated with efficient SO_2 abatement systems by 2015, however Mortimer Smelter was given an extension until 2020. In order to comply with new South African legislation and associated more stringent emission standards, an SO_2 abatement system must be installed at the Mortimer Smelter.

The proposed strategy to reduce SO_2 to achieve the Minimum Emission Standards (MES) is the installation of a Wet gas Sulphuric Acid (WSA) Plant that will convert the SO_2 contained in the off-gas into commercial-grade concentrated sulphuric acid (H_2SO_4). The exhaust from the WSA plant (containing reduced SO_2 concentrations) will be vented into the atmosphere via a 60/80 m high stack, and the commercial grade sulphuric acid will be temporarily stored before being dispatched into the commercial market.

The area upon which the WSA Plant and associated SO_2 abatement equipment (development) will be located, is within the Mortimer Smelter complex, and is hereafter referred to as the development site. This report is in support of the application for the new activities along with the amendment of the existing EMPR held by RPM-US.

Figure 3: Proposed Layout (Superimposed)

(i) Listed and specified activities

NAME OF ACTIVITY (All activities including activities not listed) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)/NOT LISTED
Electric Furnace Primary Gas Cleaning	1 540m^2	Existing	
Secondary Gas Cleaning, including: → Quencher → Gas cooling tower Wet electrostatic precipitator	500m^2		GNR 983 Activity 27
WSA Acid Plant - Installation of a WSA Plant that will convert the SO_2 off-gas to commercial-grade concentrated H_2SO_4.	1 305m^2	x	GNR 983 Activity 34 Along with Subcategory 4.16 of GNR 893 (i.e. Requiring an Atmospheric Emissions License (AEL)
Effluent Treatment Plant – Throughput capacity of 204m^3/day	155m^2		
Acid Plant Cooling Water	1 012m^2 footprint with a capacity of 612 m^3/ hour		
Acid Storage and Load Out - quantities of sulphuric acid (classified as a dangerous substance) in excess of 500m^3 (560m^3) will be stored. Also an off-spec acid tank of 50m^3. LPG storage of 22.5m^3	1 020m^2	x	GNR 984 Activity 4
Lime storage and preparation Silo	60 m^2		
Potable water storage tank	2 500m^3		
Construction laydown area	3.95 ha		GNR 983 Activity 27
Resurfacing of existing roads and additional roads:	136 391 m^2	x	GNR 983 Activity 24 GNR 983 Activity 27

NAME OF ACTIVITY (All activities including activities not listed) (E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)	Aerial extent of the Activity Ha or m²	LISTED ACTIVITY Mark with an X where applicable or affected.	APPLICABLE LISTING NOTICE (GNR 983, GNR 984 or GNR 985)/NOT LISTED
• Project Access Road – 8m wide and 669m long • Construction truck loop – 18m wide and 195m long • Bus drop off loop – 12m wide and 125m long • Construction store access – 6m wide and 230m long • Permanent plant roads – 6m wide and 524m long • Permanent plant roads – 8m wide and 68m long • Permanent plant roads – 11m wide and 126m long • Permanent plant roads – 12m wide and 95m long			GNR 983 Activity 56

(ii) Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be mined and for a linear activity, a description of the route of the activity)

The concentration of SO_2 gas emitted from the Mortimer Smelter is approximately 1-2%. Different SO_2 Abatement technologies were assessed during the Pre-Feasibility Study phase undertaken by AAP; during which the WSA technology supplied by Haldor Topsøe was identified as the most suitable SO_2 abatement technology for Mortimer smelter. The following section comprises a description of the WSA process.

Electric Furnace Primary Gas Cleaning (Existing)

A new spray cooler will be installed prior to the off-gas entering the ESP. The effluent from the spray coller will be send to the Effluent Treatment Plant (ETP).

The furnace off-gas is initially dedusted by an ESP. As the particulate rich off-gas enters the ESP, the particulates are negatively charged by a stream of electrons. These negatively charged particles are then attracted by positively charged plates. The captured particulates contain valuable PGMs and are therefore fed back into the furnace.

Secondary Gas Cleaning

The furnace off-gas from the Electric Furnace Primary Gas Cleaning stage contains residual dust with a concentration ranging between 200-400 mg/Nm^3; while the WSA plant requires the gas to contain less than 1 mg/Nm^3 of particulate matter and less than 20 mg/Nm^3 of SO_3. Therefore, additional equipment will be required to further clean and condition the off-gas prior to processing by the WSA Plant. The additional gas cleaning and conditioning equipment are proposed to be as follows:

- Scrubber – The off-gas will be saturated and cooled by water. A large portion of the remaining dust load will be captured in the scrubber water. The interaction of SO_2 with water will produce a weak acid effluent stream that will be transported to the effluent treatment plant for neutralisation.
- Gas cooling tower – Within the gas cooling tower, liquor is sprayed over a packed bed. The off-gas is passed through the bottom of this bed and emerges cooled to the desired WSA inlet temperature of 30 to 40°C.
- Wet electrostatic precipitators (WESPs) – Within a WESP, a flow of electrons is passed over the dust particles, which are consequently ionised with a negative charge. The collector surface within the WESP is oppositely charged, thus attracting and collecting all dust particles. In this way, the particulate matter concentration in the off-gas entering the WSA plant will be reduced to less than 1 mg/Nm^3 and the acid mist to below 20 mg/Nm^3.

WSA Acid Plant

The off-gas from the WESP enters the WSA acid plant. The gas is pre-heated by hot air from the acid condenser to the required catalytic reaction temperature (405°C) before entering the SO_2 converter.

After mixing the process gas with the hot recycled process gas, the process gas is further heated by direct heat exchange with hot converted process gas in the 2nd and the 1st interbed coolers. After heating, the process gas enters the support heater, which supplies the necessary energy to make up the heat balance in case of operation with a SO_2 concentration in the process gas below the auto-thermal point of the WSA plant.

The off-gas then enters the SO_2 converter, where the SO_2 in the off-gas is converted to SO_3 in the presence of a vanadium pentoxide catalyst. The highly volatile SO_3 gas is then reacted with water vapour in the off-gas to form H_2SO_4 vapour.

The conversion process occurs as follows:

$$SO_{2(g)} + O_{2(g)} \rightarrow 2SO_{3(g)}$$

$$SO_{3(g)} + H_2O_{(v)} \rightarrow H_2SO_{4(v)}$$

The off-gas containing H_2SO_4 vapour is fed into a condenser where it is cooled, causing the H_2SO_4 vapour to condense on glass tubes to form liquid sulphuric acid with a concentration of between 95 wt% (weight percentage) to 98 wt%. The acid (at approximately 260°C) is collected at the bottom of the condenser and cooled before it is sent to the acid storage tanks.

The WSA condenser is well proven to produce sulphuric acid with a strength ≥95% H_2SO_4 even for low strength feed gas (<1% SO_2). However, in order to produce as close to 98% H_2SO_4 strength as possible under all conditions, an integrated sulphuric acid concentrator (ISAC) can be added to the WSA condenser.

The ISAC is an add-on to the acid outlet of the condenser bottom. Acid is concentrated by blowing hot, dry air at a controlled rate through the ISAC (counter current with the acid) in order to vaporise excess moisture. The ambient air used is filtered, dehumidified, pressurised with a blower and heated before entering the ISAC.

The stripped off-gas passes through a mist filter to remove any acid mist carried over from the condenser before finally being emitted to the atmosphere via the acid plant stack (60/80 m). The weak acid produced by the mist filter is fed to the effluent treatment plant for neutralisation.

Effluent Treatment Plant

The ETP will treat all streams of effluent water produced by the SO_2 abatement equipment, including:

a) Weak acid effluent (1 – 5% H_2SO_4) generated by the wet gas cleaning equipment;

b) Acid mist from the mist filter in the WSA condenser;

c) Stormwater runoff / any acid spillages captured within the bunded plant area;

d) Bleed off from the cooling towers; and,

e) Blow-down from the steam system.

The effluent containing weak sulphuric acid (effluent stream (a) in the above list) will be neutralised by a hydrated lime slurry to produce gypsum. The gypsum will be fed back to the furnace at the Mortimer Smelter.

The neutralising process can be described by the following reaction:

$$H_2SO_4 + CA(OH)_2 \rightarrow CASO_{4.2}H_2O$$

The effluent treatment plant will have a daily throughput capacity of approximately 204m^3.

Acid Plant Cooling Water

Evaporative cooling towers will supply the cooling water required by the WSA and Gas Cleaning Plant. The hot water returning from the process will be collected within a hot water tank will be pumped to the cooling water towers to be cooled. The water will be chemically treated with flocculants, and sand filters will be utilised to remove any particulate matter. A bleed stream will be fed into the ETP.

Dangerous Goods' Storage and Handling

The acid produced by the WSA process will be stored in two storage tanks. It is envisaged that approximately 560m^3 of acid will be stored. The stored acid will be removed by AAP accredited transporters.

In addition off-spec acid will be stored in 50m^3 storage tank prior to being upgraded by mixing this acid with higher grade acid.

LPG will be required by the WSA process for support heating (when the SO_2 concentration in the furnace off-gas is below the SO_2 concentration required for autothermal operation of the acid plant) and by the Mist Control Units. The peak LPG requirement will be during start-up of the WSA acid plant which can take up to 5 days. One additional LPG storage bullet of 22.5m^3 will potentially be installed. There are already two LPG bullets of 22.5m^3 each.

Water Usage and Storage

The development will require 468m^3/day of water. It is envisaged that the water will be obtained from the existing allocation of 15 000m^3/day of potable water to RPM-US. Of this allocation the Mortimer Smelter currently utilises 400m^3/day water.

In addition, there is a potential to utilise the water supplied from the New Waste Water Treatment facility at Northam. The pipeline will be approximately 13km with a throughput of 23l/s.

Currently there is no water storage at Mortimer Smelter and a potable water storage reservoir of 2 500 m^3 will be constructed. The tank will be situated within the existing impacted footprint of the Mortimer Smelter

The existing water use licence will potentially have to be amended to include a section 21c and I water use due to the proximity to the dirty water Mortimerspruit. This will be confirmed by the Department of Water and Sanitation (DWS).

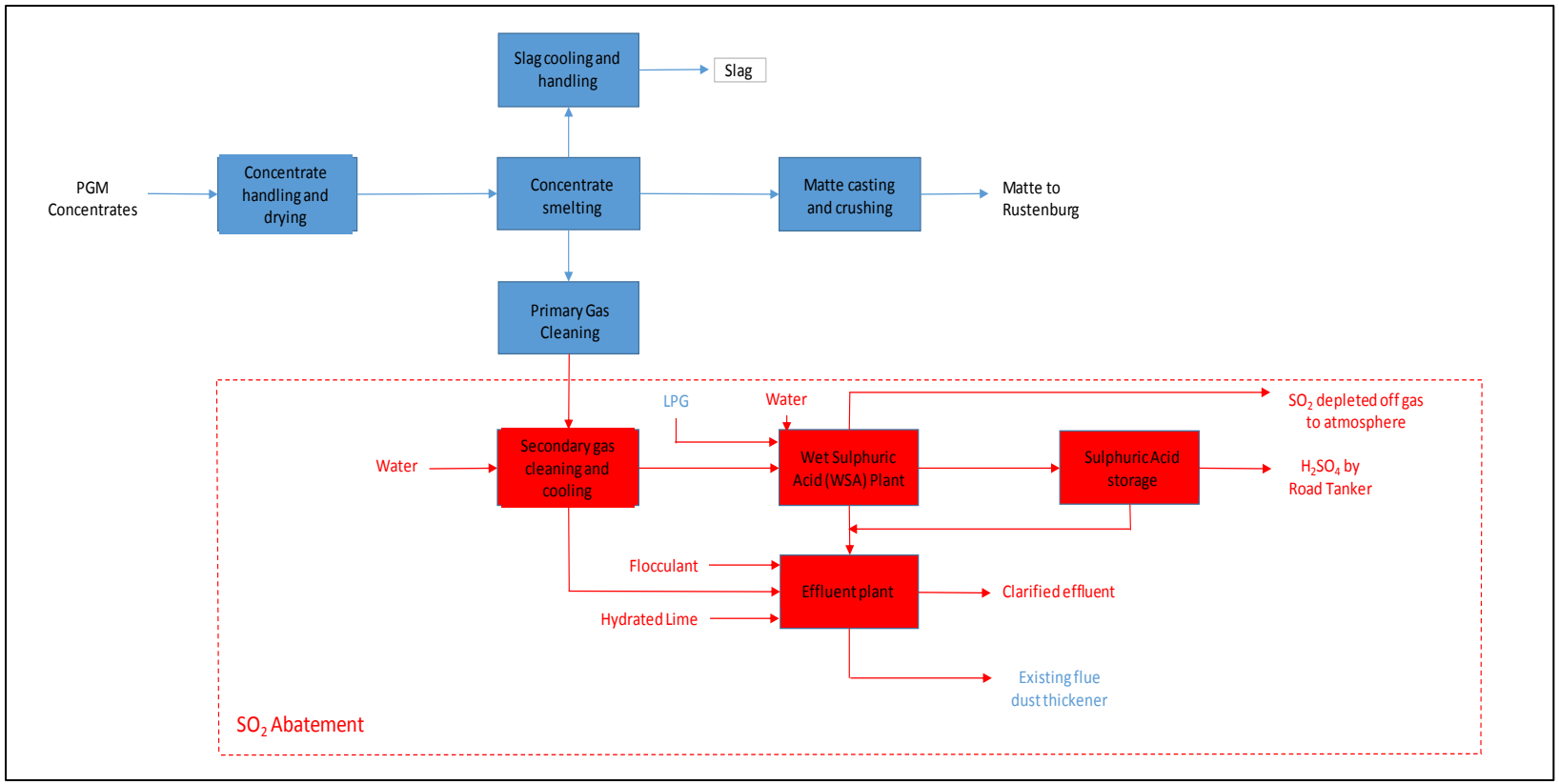


Figure 4: Schematic Overview of the Proposed Process

e) Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	**REFERENCE WHERE APPLIED** **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	**HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT** **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
The Constitution of South Africa (No. 108 of 1996)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section	The Constitution cannot manage environmental resources as a stand-alone piece of legislation hence additional legislation has been promulgated in order to manage the various spheres of both the social and natural environment. Each promulgated Act and associated Regulations are designed to focus on various industries or components of the environment to ensure that the objectives of the Constitution are effectively implemented and upheld on an on-going basis throughout the country. In terms of Section 7, a positive obligation is placed on the State to give effect to the environmental rights.
Minerals and Petroleum Resources Development Act (No. 28 of 2002)	→ Impact assessment section → Mitigation and management measures section	In terms of Section 5 of the MPRDA no person may mine any area without: - A mining right; - An approved EMPR; and - Notifying and consulting with the landowner. Even though Mortimer Smelter is not considered mining the development is situated within the Mining Right Area of RPM-US and as such the EMPR needs to be amended.
National Environmental Management Act (No. 107 of 1998)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section	In terms of Section 24(2) of the NEMA, the Minister may identify activities which may not commence without prior authorisation The Minister thus published GNR 983 (Listing Notice 1), 984 (Listing Notice 2) and 985 (Listing Notice 3) (4 December 2014) listing activities that may not commence prior to authorisation.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
	→ Specialist Studies	The regulations outlining the procedures required for authorisation are published in GNR 982 [Environmental Impact Assessment Regulations (EIA)] (4 December 2014). Listing Notice 1 identifies activities that require a Basic Assessment (BA) process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 2 identifies activities that require a Scoping and Environmental Impact Reporting (S&EIR) process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. Listing Notice 3 identifies activities within specific areas that require a BA process to be undertaken, in terms of the EIA Regulations, prior to commencement of that activity. WSP undertook a review of the listed activities according to the proposed project description to conclude that Listed Activity 24 and 34 of GNR 983, Listed Activity 4 of GNR 984 and Listed Activities 4 and 10 of GNR 985 are considered applicable. Under the One Environmental System, the Minister of Mineral Resources will issue environmental authorisations in terms of the NEMA for mining activities related to the primary extraction and/or primary processing of ore material. The Minister of Environmental Affairs will form the appeal authority.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
GNR 983 (Listing Notice 1)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section → Specialist Studies	(24) – The development of – (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 metres, or where no reserve exists where the road is wider than 8 metres; But excluding – (a) Roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or (b) Roads where the entire road falls within an urban area. *A new road which will be wider than 8 metres but have a reserve of less than 13.5 metres will be constructed.*
	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section → Specialist Studies	(27) - The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan. *The majority of the development will be situated on previously impact areas, however there is the potential that 1 hectares or more, but less than 20 hectares of indigenous vegetation be*

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
		cleared for the contractors camp and proposed road expansion. *The contractors camp will be approximately 2.6 hectares in extend.*
		(34) - The expansion or changes to existing facilities for any process or activity where such expansion or changes will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the release of emissions or pollution, excluding- (i) where the facility, process or activity is included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (ii) the expansion of or changes to existing facilities for the treatment of effluent, waste water or sewage where the capacity will be increased by less than 15 000 cubic metres per day. *The existing Atmospheric Emissions Licence (AEL) for Mortimer Smelter will be amended as a result of the proposed project.*
		(56) - The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
		(ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas. *An existing road will be widened by more than 6 metres.*
GNR 984 (Listing Notice 2)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section → Specialist Studies	(4) The development of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres. *The facility will store in excess of 500 cubic metres of dangerous goods. The dangerous goods will include acid and LPG.*
National Environmental Management: Air Quality Act (No. 59 of 2008)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section → Air Quality Impact Assessment	In terms of section 21 of the NEM:AQA a list of scheduled processes were published in GNR893 (November 2013). Potential scheduled processes applicable are Category 1 and Subcategory 4.16. An AEL is required for the smelting and converting of sulphide ores. Due to the decrease in emissions (positive impact) from the Mortimer Smelter an amendment to the existing AEL as well as a revised emissions inventory will be required for the proposed project, once authorised.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
National Water Act (No. 36 of 1998)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section	Section 22(1) of the NWA states that a person may only use water if the water use is authorised by a license under NWA or if the responsible authority has dispensed with a license requirement if it is satisfied that the purpose the NWA will be met by the granting of a license, permit or other authorisation under any other law. A person may only use water without a license if the water use is permissible: - Under Schedule I of NWA; - As a continuation of an existing lawful use; and - In terms of a general authorisation issued under Section 39 of NWA. *RPM-US was issued with Water Use Licence No: 03/A24D/ABCGIJ/18929 on 3 October 2012. The Licence will potentially have to be amended to include a section 21c and I water use due to the proximity to the dirty water Mortimerspruit. This will be confirmed by the DWS.*
National Heritage Resources Act (No. 25 of 1999)	→ Stakeholder engagement section → Impact assessment section → Mitigation and management measures section	Section 34 and 38 of the National Heritage Resources Act (No 25 of 1999) (NHRA) details specific activities that require an approved heritage impact assessment by the South African Heritage Resources Association (SAHRA).

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED **(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)**	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act:- Water Use Licence has/has not been applied for).**
		A heritage permit will be required as a new road exceeding 300m in length will be constructed. In addition there is the potential 5 000m^2 may be cleared for the contractors camp and proposed road expansion.
Moses Kotane Local Municipality (MKLM)	→ Impact assessment section → Mitigation and management measures section	Spatial Planning and Land Use Management By-Law February 2016. The Municipality must determine the use and development of land within the municipal area to which it relates in order to promote – (a) harmonious and compatible land use patterns; (b) aesthetic considerations; (c) sustainable development and densification; and (d) the accommodation of cultural customs and practices of traditional communities in land use management; and (e) a healthy environment that is not harmful to a person's health. The Environmental Authorisation process being facilitated in support of the proposed project supports the purpose of the Land Use Scheme requirements drafted by the local government.

f) Need and desirability of the proposed activities.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The need for the project is predicated on the requirement for Mortimer Smelter to comply with the postponed MES requirements for SO_2 by 2020. The desirability of the project relates to the reduction in SO_2 emissions and associated positive impact on air quality (relative to current impacts); as well as the commercial-scale generation of sulphuric acid, and the associated revenue income.

The development is located at the existing Mortimer smelter because the technology will need to be installed and connected to the existing gas cleaning equipment. The logistical and commercial disadvantages of locating the project on an alternative site are that this would require new facilities to be established, which would be unreasonable and potentially technically and/or commercially unviable. As such, no site alternatives were considered.

g) Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site.

NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.

The development will be located at the existing Mortimer Smelter, because the technology needs to be installed and connected to the existing gas cleaning equipment. As such, no site alternatives were considered.

Construction Phase

The location of the contractor's facilities (offices, lay-down areas, ablutions etc.) was based on the required space, and providing efficient access to and from the construction site. In addition the site was selected to ensure that the impact on existing operations is minimal i.e. the layout will enable the construction site to be fenced off from existing facilities (i.e. away from current operations).

A separate project entrance will be established via an existing road and will thus be within an area with an existing impact. The contractor's laydown areas will be within the Mortimer Smelter boundary, however vegetation clearance will have to take place for the establishment of the laydown area. The proposed contractor facilities and project access road are illustrated in the layout attached in **Appendix 4**.

Operational Phase

Several preliminary interdisciplinary layout reviews have been conducted to validate and optimise the layout of the project. The layout of the project was based on the following design criteria:

- The existing plant would remain operable during construction of the new facilities;
- The new acid storage facility is required to allow 20 days' storage for acid; and
- The boundaries of the plant were based on the consideration of the following:
  - Existing plant boundaries (i.e. the existing plant footprint cannot be extended);
  - Location of existing ESP and stack;
  - Existing plant buildings (furnace building, workshops, etc.); and
  - Existing granulated slag conveyor leading to slag dump.

i) Details of the development footprint alternatives considered.

With reference to the site plan provided as Appendix 4 and the location of the individual activities on site, provide details of the alternatives considered with respect to:

(a) the property on which or location where it is proposed to undertake the activity;

The development is being located at the existing Mortimer Smelter because the technology needs to be installed and connected to the existing gas cleaning equipment. As such, no site alternatives were considered.

Refer to Part A3g.

(b) the type of activity to be undertaken;

The overall project objective is to install and operate an efficient SO_2 removal system at the Mortimer Smelter in order to achieve environmental compliance levels according to the NEM:AQA. As such no activity alternatives were considered.

(c) the design or layout of the activity;

The plant areas were developed on an “island” approach, with a dedicated bund(s) for each area. This minimises the affected areas in terms of water treatment as only the spillage from the bunded areas has to be treated. The rest of the areas and roads will be surfaced as per Mortimer Smelter requirements, and the water captured in these areas will report to normal pollution control dams via the existing stormwater system.

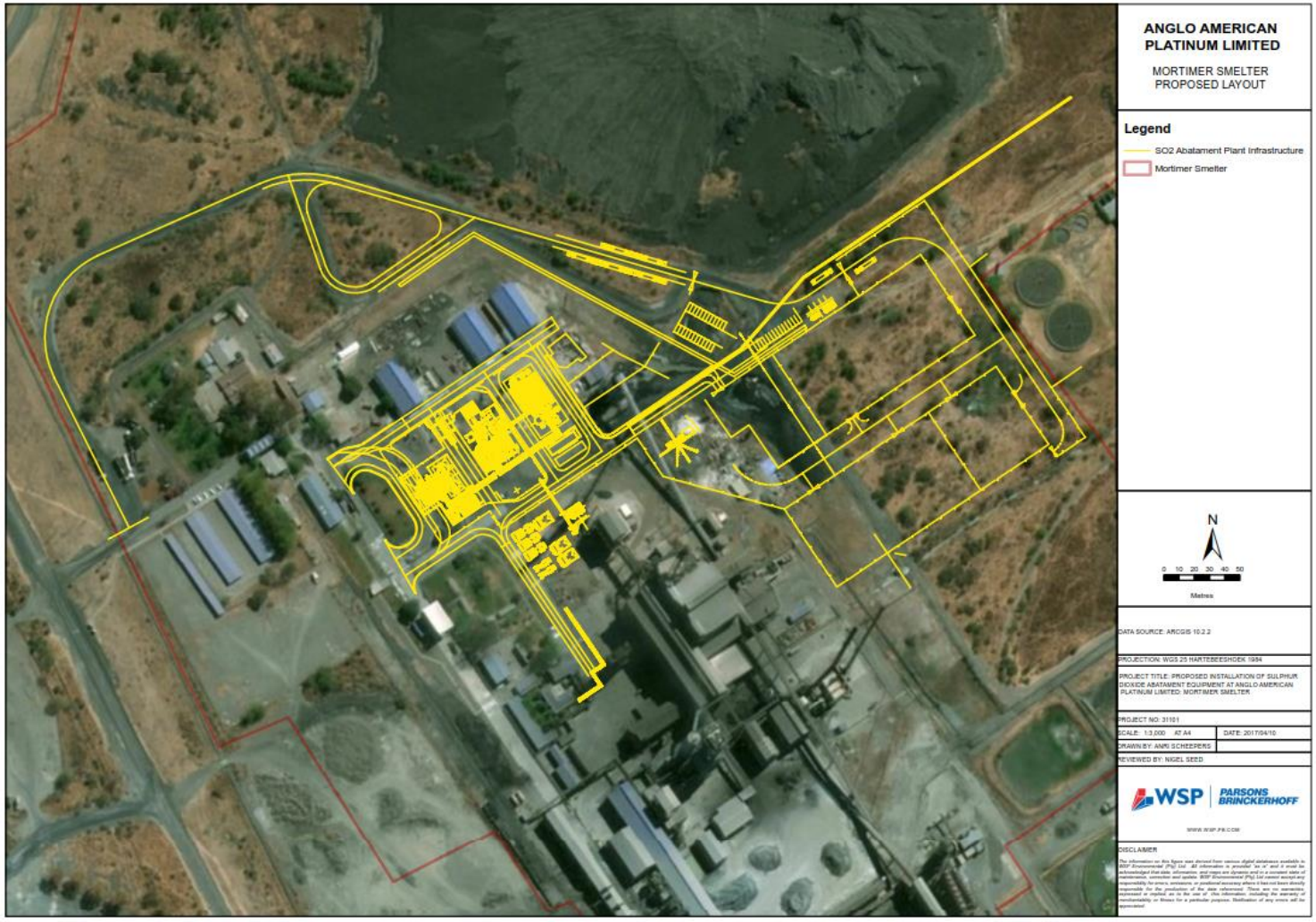


Figure 5: Proposed Layout (Superimposed)

(d) the technology to be used in the activity;

Alternatives to the WSA plant that were considered by Mortimer Smelter are described in the following section:

Cansolv Amine Scrubbing Process Producing Liquid SO_2

The Cansolv amine scrubbing process (**Figure 6**) is a wet scrubbing process that uses an amine solvent that is only selective at removing SO_2 from the off-gas stream. The inlet off-gas is contacted in an absorber tower with lean amine solvent in a counter-current arrangement. The flow of lean amine to the absorption column is varied according to the inlet SO_2 concentration. The gas leaving the absorber tower is sent to a stack and exhausted to the atmosphere. The rich amine containing the absorbed SO_2 is pumped to a regeneration tower to strip the SO_2 from the solvent. Prior to entering the regeneration tower, cool, rich amine undergoes heat exchange with hot, lean solution to reduce the amount of steam required in the regeneration tower. The generated stream of SO_2 is saturated and pure at 99 wt% on a dry basis. The high strength SO_2 gas can be further processed into a marketable product (liquid SO_2).

This option was not taken forward due to the fact that further research indicated that the market for liquid SO_2 is significantly smaller than that for H_2SO_4 and is considered specialised. It is also uncertain if SO_2 from metallurgical operations could be marketable. Additionally, the operation of a Cansolv unit requires significant quantities of cooling water (requiring a large cooling water plant), and large amounts of energy to produce the steam required for the process.

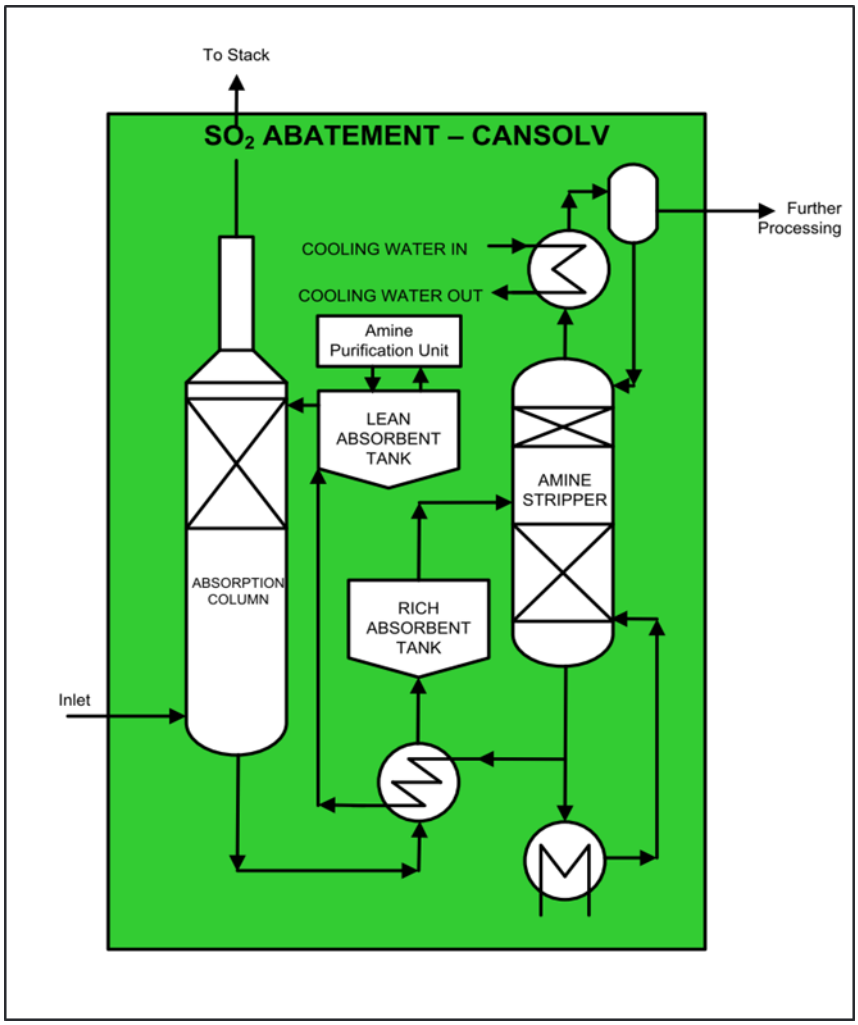


Figure 6: Schematic Diagram of Cansolv Amine Scrubbing Process

Cansolv coupled with Acid Plant

Due to the fact that the Cansolv Process produces an almost pure stream of SO_2 gas, coupling this process with an acid plant technology would produce a marketable grade (98%) H_2SO_4. The following acid plant technologies have been identified as achieving NEM:AQA compliant emission standards (except for SCSA which will require the tailgas from the acid plant to be recycled back to the Cansolv unit) :

- WSA Acid Plant;
- Lurec Acid Plant;
- Double Contact Double Absorption (DCDA); and
- Single Contact Single Absorption (SCSA).

Cansolv coupled with WSA Acid Plant

The Cansolv amine regeneration process has considerable steam and cooling water requirements and in order to minimise operating cost, only the required amount of off-gas is processed by the Cansolv unit when coupled to WSA, DCDA and SCSA to ensure that optimal concentration of SO_2

in the off-gas to the acid plant and ensure autothermal operation is maintained. The process is described in **Figure 7** below.

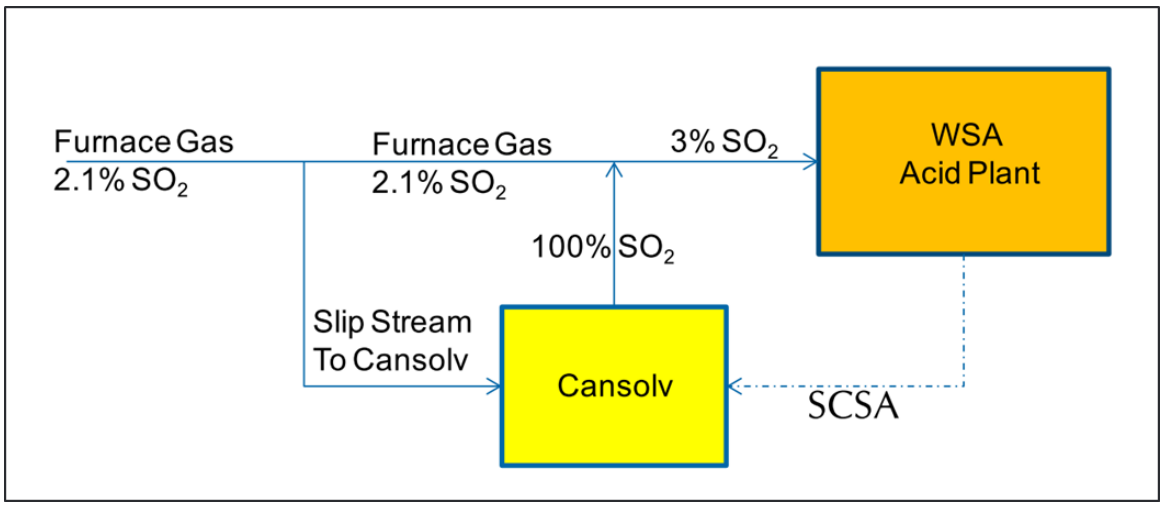


Figure 7: Process Configuration when coupling Cansolv with WSA Acid Plant

Cansolv coupled with Lurec Acid Plant

The Lurec plant has the capability to process the highest inlet SO_2 concentration (maximum 18-25 vol%) as compared to the other SO_2 abatement technologies. Therefore, in this configuration, in contrast to the above process, all the off-gas is processed by Cansolv, in an attempt to save on acid plant capital cost. Dilution air is used to control the inlet SO_2 concentration to the Lurec plant. In this way, Cansolv is able to absorb the effect of fluctuating furnace off-gas SO_2 and constantly provide the Lurec Acid plant with the optimal SO_2 concentration. Additionally, Lurec produces steam that is used by Cansolv for SO_2 stripping. The process is outlined in **Figure 8**.

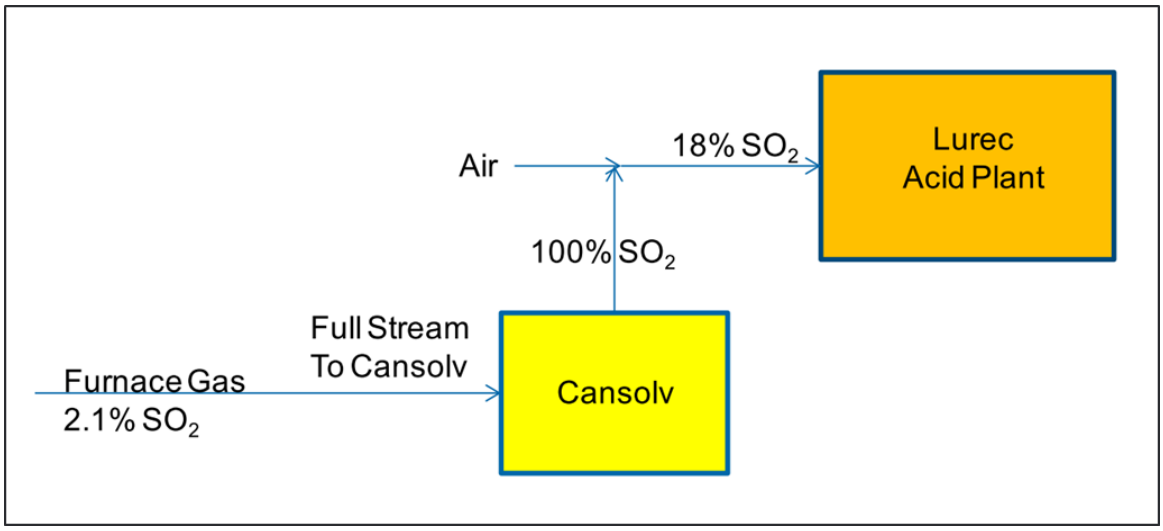


Figure 8: Process Configuration when coupling Cansolv with Lurec Acid Plant

This option was not considered further due to a significant amount of energy required by the Cansolc Process and the complexity of operating two SO_2 Abatement Plants in series.

Concentrated Mode Dual Alkali (CMDA) scrubbing process

The CMDA tray tower scrubber receives the off-gas where it is contacted with re-circulated scrubbing liquor in the scrubber vessel. SO_2 in the gas reacts with the active sodium in the scrubbing liquor to form Na_2SO_3 as well as $NaHSO_3$ to a lesser degree. The scrubbed gas from the absorber is then routed to a WESP to remove solids and droplets carried over from the absorber as well as acid mist, before it is released to atmosphere through a stack.

A bleed stream from the absorber is sent to the regeneration system for absorbent regeneration. Hydrated lime is used to regenerate the scrubbing solution in a series of reactors and precipitates a mix of calcium sulphite solids containing a small amount of co-precipitated calcium sulphate. The slurry formed during the regeneration reactors is dewatered via thickening and filtration to remove the waste solids and recover the regenerated liquor. A conventional circular thickener / clarifier is usually used to increase the solids content prior to feeding to a filter.

The CMDA process (**Figure 9**) produces a SO_2 waste that cannot be co-disposed with concentrator tailings and would require hazardous landfilling thus contributing an extra cost to the process. The CDMA process configuration would therefore involve further processing of the waste by post oxidation to produce gypsum to be sold or disposed, requiring ddditional capital investment.

This option was not taken forward due to the fact that Mortimer Smelter has indicated that they do not wish to produce gypsum in large quantities. Additionally, the operational costs associated with a CMDA plant are high due to sulphuric acid, caustic and hydrated lime feed requirements.

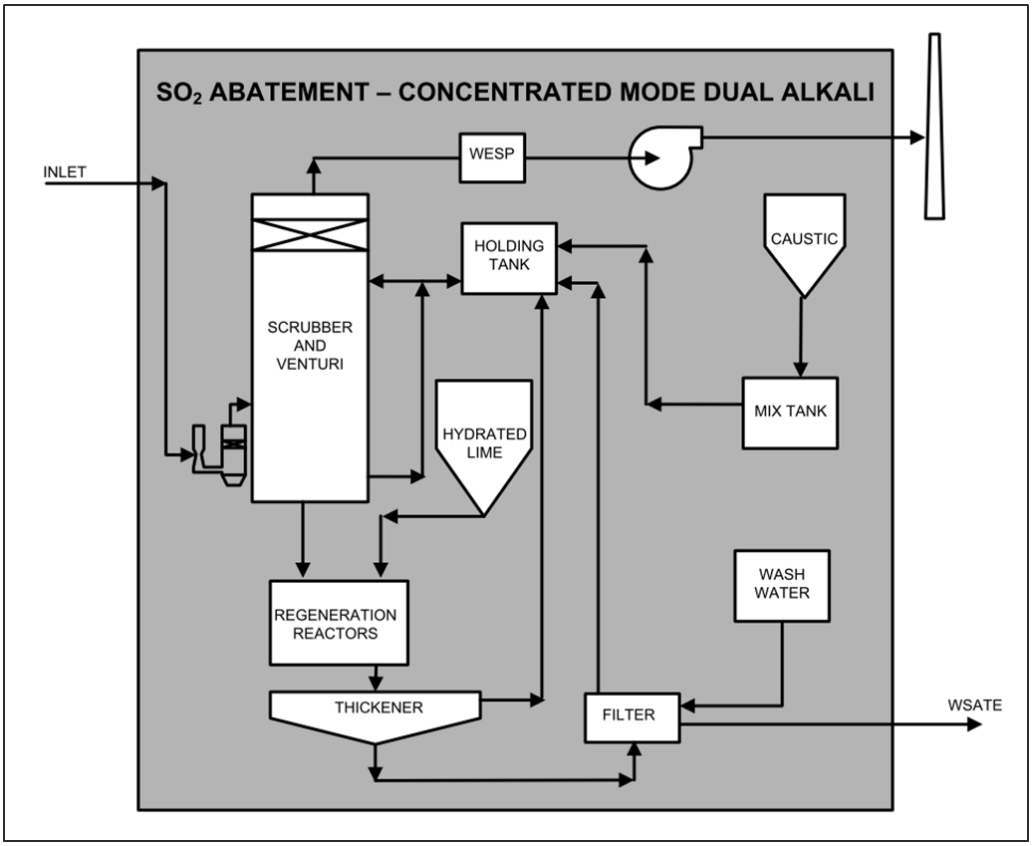


Figure 9: Schematic Diagram of Concentrated Mode Dual Alkali Process

Rationale for choosing the Preferred Technology

The WSA plant was proven to have the lowest capital and operating cost that produces a saleable by-product (H_2SO_4). In addition, the WSA plant also fulfils the purpose to effectively reduce the SO_2 emissions.

(e) the operational aspects of the activity; and

The operational philosophy for the WSA plant will be strictly prescribed by the technology suppliers to ensure inter alia process efficiency, management of process risk, pollution control, and operator safety. Because of its prescriptive nature, operational alternatives do not apply.

The only operational alternative which was considered is that of the stack height. The Air Quality Impact Assessment was used as a tool to determine whether a stack height of 80m (as proposed in the Scoping Report) will result in MES compliance rather than a 60m stack.

It was determined that there is no difference of impact at receptors with a 60m stack height and as such this is the preferred alternative.

(f) the option of not implementing the activity.

In the 'no go' option, no SO_2 abatement technology would be installed at Mortimer Smelter. This would mean that Mortimer Smelter would not meet the postponed 2020 MES for SO_2. This would constitute legal non-compliance and closure of the Mortimer Smelter; as such the no-go option is not feasible.

ii) Details of the Public Participation Process Followed

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land.

Public participation is understood to be a series of inclusive and culturally appropriate interactions aimed at providing stakeholders with opportunities to express their views, so that these can be considered and incorporated into the S&EIR process. Effective public participation requires the prior disclosure of relevant and adequate project information to enable stakeholders to understand the risks, impacts, and opportunities of the proposed project.

The objectives of the public participation process can be summarised as follows:

- → Identify relevant individuals, organisations and communities who may be interested in or affected by the proposed project;
- → Clearly outline the scope of the proposed project, including the scale and nature of the existing and proposed activities;
- → Identify viable proposed project alternatives that will assist the relevant authorities in making an informed decision;
- → Identify shortcomings and gaps in existing information;

- Identify key concerns, raised by stakeholders that should be addressed in the subsequent specialist studies;
- Highlight the potential for environmental impacts, whether positive or negative; and
- To inform and provide the public with information and an understanding of the proposed project, issues and solutions.

In accordance with the NEMA, GNR 982, Chapter 6, the following activities have taken place or are proposed to take place within the Draft EIA Report review period:

I&AP Consultations

The public participation process must include consultation with (1) the competent authority, (2) every state department that administers a law relating to the matter, (3) all organs of state which have jurisdiction in respect of the activity to which the application relates, (4) all potential, or, where relevant, registered interested and affected parties. In order to satisfy this requirement, the Environmental Assessment Practitioner (EAP) will undertake the following consultations:

- Competent Authority - The Department of Mineral Resources (DMR) is the competent authority related to this application. The application formed the first of the consultations with the DMR. The EAP undertakes to engage in on-going communications with the DMR (preferably directly with the allocated case officer).
- Departments that administer a law relating to the matter:
  - An amendment to the existing Mortimer Smelter AEL is required prior to the proposed project operational phase. As such, the BPDM is the competent authority governing the application of the AEL. The BPDM has been engaged by the project to ensure a swift authority review process.
  - An Amendment to existing RPM-US WUL may be required depending on feedback from the DWS. As such the DWS is the competent authority and have been engaged to ensure a swift authority review process.
  - Proof of communication will be submitted to the DMR to ensure awareness of the concurrent approval process. Meeting minutes have been kept, and are attached in **Appendix 5**.
- All organs of state which have jurisdiction in respect of the activity to which the application relates:
  - National Level: The Department of Environmental Affairs (DEA) - Under the “One Environmental System” rolled out by Government on 8 December 2014, licensing processes for mining, environmental authorisations and water use have been streamlined. Under the One Environmental System, The Minister of Mineral Resources will issue environmental authorisations and waste management licences in terms of the NEMA, and the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), respectively, for mining and related activities. However, note that in the new system, the Minister of Environmental Affairs will be the appeal authority for these authorisations to ensure complete independence from the competent authority.
  - Provincial Level: Given that the activity is located within the North West province the North West Department of Rural, Environment and Agricultural Development (NWREAD) will form a primary commenting authority during the process. The North West South African Heritage Resource Agency NW-SAHRA).
  - District Level The proposed project is located within the BPDM. The BPDM have been informed about the project as part of on-going spatial development planning and land use views.
  - Local Level: The MKLM is the local authority governing the proposed project area. The Municipality is responsible for managing the various wards which make up the proposed

project area and surrounds. The Wards associated include: Ward 7, Ward 8 and Ward 34. The ward councillors will be a primary target for the proposed project in an effort to communicate the project to as greater stakeholder database as possible, especially considering the locals will be the most affected stakeholder grouping.

- All potentially registered I&APs - The existing Mortimer Smelter stakeholder database was used as a base starting point. The database has been / will continue to be updated following any stakeholder request to be registered. The use of site notices, Notification Letters, Short Messaging Systems (SMS), email and fax has and will continue to be used as methods in which to reach potentially interested and affected parties.

The latest stakeholder database is included within this report as **Appendix 5**.

All registered I&APs, which have an interest with the proposed project or are directly or indirectly impacted by the proposed project, have the right to lodge a comment/question on the project (until such time that the appeals process comes to a close).

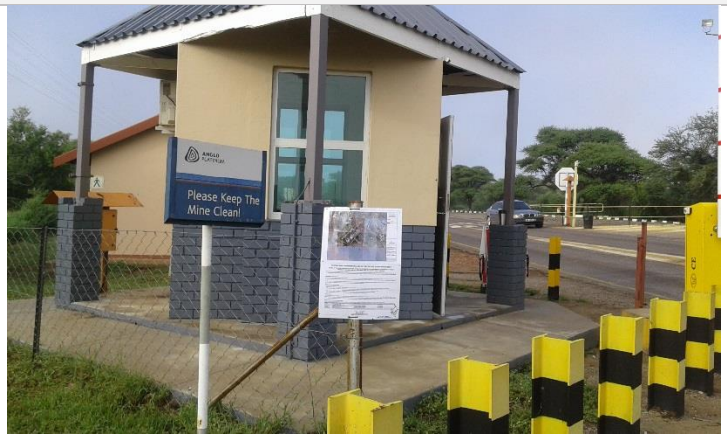
English is considered a universal language; therefore, the stakeholder engagement process was undertaken in English only.

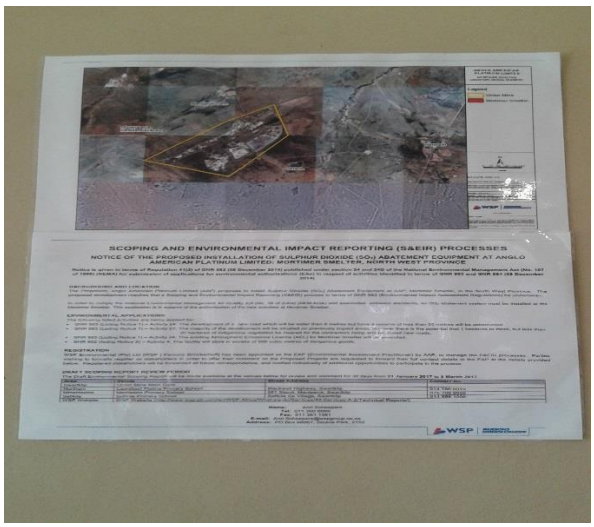
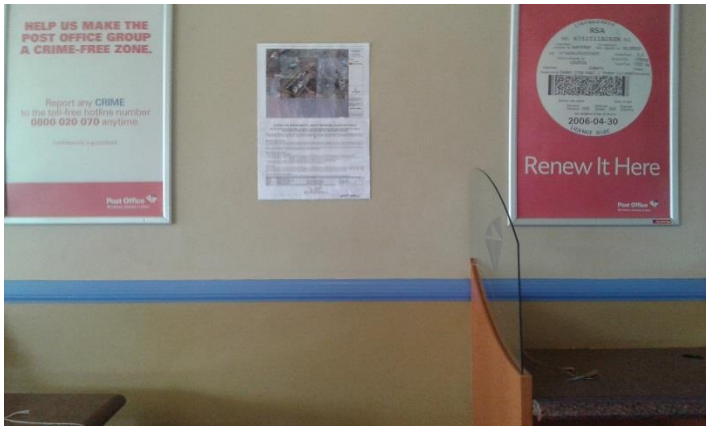
Notification of Potential I&APs

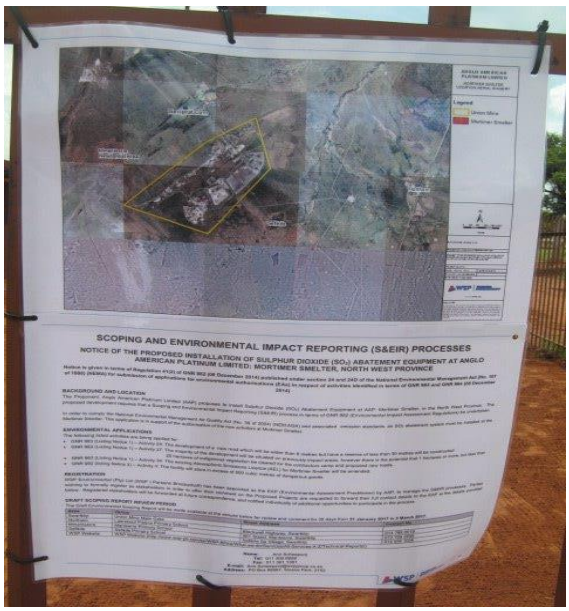
In accordance with GNR 982 Section 41(2)(a-b) a site notice was developed (see **Appendix 5**) and placed at seven locations as per **Table 3** below.

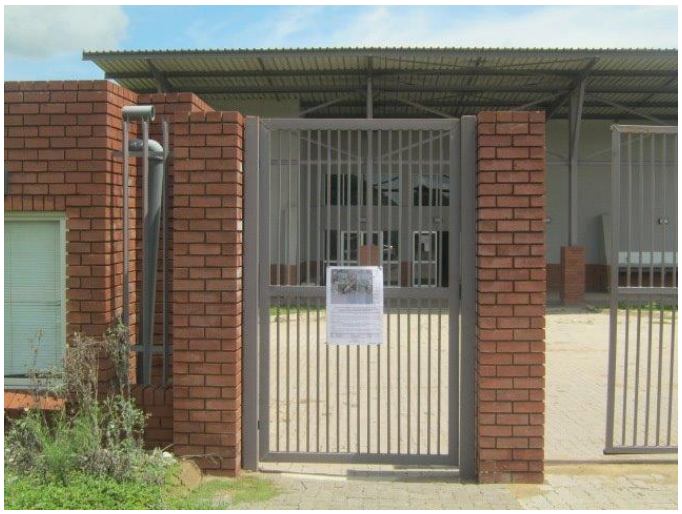
Table 3: Site Notices

Place	Evidence
RPM-US Main Gate	

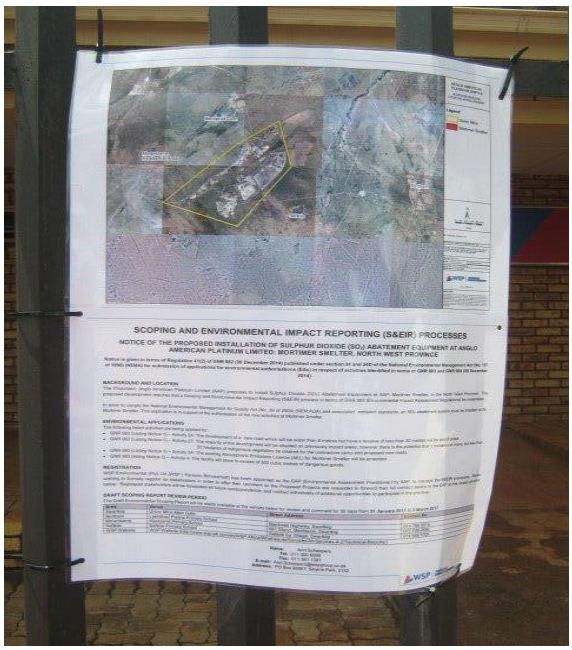
Place	Evidence
	
Mortimer Smelter	 

Place	Evidence
Northam Post Office	 
Laerskool Platina Primary School	

Place	Evidence
	
Mmantserre Primary School	 

Place	Evidence
Sefikile Clinic	 

Place	Evidence
Sefikile Primary School	 

Place	Evidence
Mmantserre Post Office	 

The site notices served to inform the occupiers of the land along with the newspaper advert and notices to existing stakeholders on the stakeholder database.

In accordance with GN. R 982 41(2)(c) of Chapter 6 an advert was placed in the Platinum Bushvelder. There are many local languages spoken in the area of which Tswana and Xhosa are the most prevalent. English is considered a universal language; therefore, the newspaper advert was placed in English only. The proof of advert placement is attached in **Appendix 5**.

Should the EAP note an affected stakeholder, and be made aware of his/her existence by the ward councillor, or traditional leader, efforts will be made to ensure his/her participation in the stakeholder engagement process [as required by Section 41(2) (e) of Chapter 6].

In addition to the minimum requirements outlined in GNR 982, the EAP has undertaken the following:

- Distribution of notification letters to Mortimer Smelter's stakeholders via email (where contact data is available);
- Telephonic discussions with existing registered stakeholders; and
- A public meeting is planned during the Environmental Authorisation process. The meeting will take place on 24 May 2017 from 17:30 to 19:00 at the Swartklip Recreation Centre.

Any stakeholder whom submits a comment along the course of the process will be registered on the project specific stakeholder database.

Public Review of the Draft Scoping Report

The Draft Scoping Report was available for a public review period of 30 days from **31 January 2017** to **3 March 2017**, at Laerskool Platina Primary School, Mmantserre Primary School and Sifikile Primary School. The report was also made available on the WSP | Parsons Brinckerhoff website(http://www.wsp-pb.com/en/WSP-Africa/What-we-do/Services/All-Services-A-Z/Technical-Reports//) . The website report was not accompanied by appendices due to report size restrictions.

All registered stakeholders and authorising/commenting state departments were notified of the public review period as well as the locations of the DSRs via email as well as telephonically. The abovementioned plan, for notification and provision of reports, will also be utilised for the review of the EIR once the EIR Phase has commenced.

The final Scoping Report was submitted to the DMR on 13 March 2017 and approval was received on 9 May 2017 (Refer to **Appendix 5**).

iii) Summary of issues raised by I&Aps

(Complete the table summarising comments and issues raised, and reaction to those responses). The comment and response report is attached in **Appendix 5.**

Interested and Affected Parties **List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.**		**Date Comments Received**	**Issues raised**	**EAPs response to issues as mandated by the applicant**	**Section and paragraph reference in this report where the issues and or response were incorporated.**
AFFECTED PARTIES					
Landowner/s	**X**		The Bakgatla-Ba-Kgafela Tribe is the legal landowner. An existing lease agreement is in place. No issues raised during the Scoping Phase. A meeting will be held during the Draft Environmental Impact Assessment Review Period		Part A 3 (g) ii
Lawful occupier/s of the land	**X**		AAP is the lawful occupier of the land and no issues were raised during the Scoping Phase		Part A 3 (g) ii
Landowners or lawful occupiers on adjacent properties	**X**		AAP is the lawful occupier of the adjacent land and no issues were raised during the Scoping Phase Adjacent landowners and lawful occupiers were notified of the project.		Part A 3 (g) ii
Municipal councillor (Ward 7)	**X**	3 April 2017 Ward Councillor Meeting	As part of the Social Impact Assessment a meeting was held on 3 April 2017 with the ward councillors, the majority of the issues raised related to RPM-US	As part of the mitigation and management measures the following commitments are made: → Should unskilled labour be required during the construction phase, this should be sourced	Part A 3 (i) Part A 3 (j) Part A 3 (k)

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
			and not to the SO_2 Abatement Plant specifically. The only issues specifically raised against the SO_2 Abatement Project: → Requested that local community members be employed on the project. → Requested that a skills development program be established to empower the communities.	from the local communities. This requirement must be specified within the contract signed by the contractor. → AAP is to ensure that any new or replacement employment and procurement opportunities maximise benefits to local communities. → Local entrepreneurs and previously disadvantaged contractors must be provided preferential opportunities to tender for contracts. → Local recruitment must take place through the tribal recruitment office and with the knowledge of mutually agreed community structures and recruitment channels / mechanisms. → Sub-contractors must sign a compliance agreement with regards to local employment. → Sub-contractors must submit labour returns to verify local recruitment. → RPM-US must keep records of the number of local people employed, place of residence, recruitment office, job descriptions, length of service and opportunities for career development. Sub-contractors to RPM-US must keep similar records for all placements of local people. → 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,	Part B 1
Municipal councillor (Ward 5)	**X**	3 April 2017 Ward Councillor Meeting	As part of the Social Impact Assessment a meeting was held on 3 April 2017 with the ward councillors, the majority of the issues raised related to RPM-US and not to the SO_2 Abatement Plant specifically. The only issues specifically raised against the SO_2 Abatement Project: → Majority of the local woman are unemployed and hence get into relationships with the migrant workers. There is an increase in children with no fathers and other social problems. Requested that local community		

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
			members be employed on the project. → Requested that employment opportunities are communicated directly with the community representatives and not only to the tribal authorities.	medium and micro enterprise (SMME) development. → RPM-US must assist with the administration of the tribal recruitment office. This includes the facilitation of local skills audits, baseline data and the development of socio-economic databases. → Currently, AAP has a local recruitment and procurement policy in place, which their contractors must adhere to and provide evidence thereof. This may be enhanced through consultation with local communities and leadership, as well as the Department of Labour. This engagement may include ascertaining the local skills levels and providing information on general and scarce skills needs, as well as procurement opportunities available at the AAP facility. This process would aim at encouraging local communities to develop skills for future employment at the Mortimer Smelter operations. → The establishment of a Stakeholder Engagement Forum, with representatives from local community (including informal communities) is recommended. This should be developed into a structure to promote on-going discussions, and ensure actions are taken by AAP, the local communities, traditional leadership and the local municipality to ensure that issues raised are resolved over time.	
Municipality (Moses Kotane Local Municipality)	**X**	3 April 2017 Meeting	As part of the Social Impact Assessment a meeting was held on 3 April 2017 with the ward councillors, the majority of the issues raised related to RPM-US and general issues in the area, and not to the SO_2 Abatement Plant specifically. The only issues specifically raised against the SO_2 Abatement Project: → Requested that local community members be employed on the project.		
Municipality (Thabazimbi Local Municipality)	**X**	4 April 2017 Meeting	As part of the Social Impact Assessment a meeting was held on 4 April 2017 with the ward councillors, the majority of the issues raised related to RPM-US and general issues in the area, and not to the SO_2 Abatement Plant specifically.		

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
			There were no issues with the SO_2 Abatement Plant.	→ The outcomes of regular meetings should be tracked and managed to ensure that the information shared at forum meetings is meaningful and actions are implemented by the relevant parties. → AAP must identify ways in which they can improve their engagement with stakeholder through other existing forums, improved communication and regular feedback mechanisms. → Principles of equality, BEE, gender equality and non-discrimination must be implemented.	
Municipality (Bojanala District Municipality)	**X**	14 March 2017 Meeting (minutes attached in **Appendix 5**)	It was queried whether Subcategory 2.3: Sulphur Recovery Units of GNR 983 (22 November 2013) could be applicable to the application.	Subsequent to the meeting it was confirmed that Anglo American Platinum Limited and the Department of Environmental Affairs (DEA) reached a consensus that none of the activities specified in Categories beside Category 4: Metallurgical Industry are applicable to their operations. As such Subcategory 2.3 will not be applicable.	Part A 3 (e) Part A 3 (i) Part A 3 (j) Part A 3 (k)
Organs of state (Responsible for infrastructure that may be affected Roads Department, Eskom, Telkom, DWA e	X	Department of Water and Sanitation (DWS) 17 May 2017 Meeting (minutes attached in **Appendix 5**)	It was agreed that a Section 21b water use licence will not be required for the potable water reservoir.	Noted	Part A 3 (e)
			It was noted by EM that even though the wetland is considered part of the dirty stormwater management a Section 21 c and i water use licence may be required and this will have to be discussed with Pieter Ackerman.	At the time of release of the Draft EIAR a meeting had not yet been held with Pieter Ackerman and the Section 21c and I WUL has been included as a precautionary approach.	Part A 3 (e)

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
			DWS agreed to urgently arrange a meeting with Pieter Ackerman.		
			It was agreed that AS will, via email, provide EM with the IWWMP, WUL and wetland assessment for the Mortimerspruit.	The IWWMP, WULA and RPM-US Wetland Assessmentw as submitted to the DWS via email on 22 May 2017	
			EM requested that the following civil designs be submitted to the DWS: → Acid Storage Area → Effluent Treatment Plant	This will be submitted to the DWS once finalised.	
			EM requested the detailed water balance be submitted to the DWS.	The development will require 468m^3/day of water. It is envisaged that the water will be obtained from the existing allocation of 15 000m^3/day of potable water to RPM-US. Of this allocation the Mortimer Smelter currently utilises 400m^3/day water. This will be submitted to the DWS once finalised.	Part A 3 (d)
			It was agreed that a 30 day public participation period as specified in the EIA Regulations will be acceptable, should a water use licence be required.		Part A 3 (g) ii
			It was agreed that 1 Hard copy and 1 electronic copy of all documentation will be submitted to the DWS.		Part A 3 (g) ii

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
Communities – Mantserre Tribal Office	**X**	4 April 2017 Meeting	As part of the Social Impact Assessment a meeting was held on 4 April 2017 with the Mantserre Tribal Office the majority of the issues raised related to RPM-US and general issues in the area, and not to the SO_2 Abatement Plant specifically. There were no issues with the SO_2 Abatement Plant.		
Dept. Land Affairs			No issues raised during the Scoping Phase.		
Traditional Leaders			No issues raised during the Scoping Phase.		
Dept. Environmental Affairs (North West Department of Agriculture and Rural Development)	X	16 March 2017 Meeting (minutes attached in **Appendix 5**)	The NWREAD requested that activity 56 in terms of Listing Notice 1 be included.	An existing road will be widened by more than 6 metres and this activity has been included.	Part A 3 (e)
			It was queried whether Subcategory 7.2 Production of Acids of GNR 983 (22 November 2013) could be applicable to the application.	Subcategory 7.2 states that it is applicable to all installations producing, handling and or using more than 100 tons per annum of any of the listed compounds (Excluding metallurgical processes-related activities regulated under category 4). Subcategory 4.1 and 4.16 are being applied for and as such Subcategory 7.2 will not be applicable. In addition subsequent to the meeting it was confirmed that Anglo American Platinum Limited and the Department of Environmental Affairs (DEA) reached a consensus that none of the activities specified in Categories beside Category 4:	Part A 3 (e) Part A 3 (i) Part A 3 (j) Part A 3 (k)

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
				Metallurgical Industry are applicable to their operations. As such Subcategory 7.2 will not be applicable.	
			NWREAD indicated that they only received a hard copy of the Draft Scoping Report for comment on 9 March 2017 and raised a concern that the Final Scoping Report submitted to the DMR did not include their comments.	WSP indicated that an electronic copy of the Draft Scoping Report was submitted to the NWREAD on 22 February 2017. WSP agreed to address the comments raised by the NWREAD in the Draft Environmental Impact Assessment Report, however to date no further comments have been received.	Part A 3 (g) ii
		12 May 2017 Formal Correspondence (attached in **Appendix 5**)	It was indicated by WSP at a meeting held in our offices on 16 March 2017 that the applicant intends to upgrade an existing road; and to construct a new road that will complete the road network that will provide access the site; It is recommended that Activity 56 of Listing Notice 1 of EIA Regulations of 2014 be included in the list of activities appluied—or to ensure that the road upgrade activity is covered in the Environmental Authorisation. This will avoid future confusion of compliance monitoring for the road activity as both upgrading existing road and construction of new road are listed separately in the Listing Notices.	Activity 56 of Listing Notice 1 of EIA Regulations of 2014 have been included.	Part A 3 (e)

Interested and Affected Parties List the names of persons consulted in this column, and Mark with an X where those who must be consulted were in fact consulted.		Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and or response were incorporated.
			It was noted that the final Scoping Report was already submitted to the DMR at the that the draft Scoping Report was provided to this Department for comment.	An electronic copy of the Draft Scoping Report was submitted to the NWREAD on 22 February 2017, however subsequently it was requested that a hard copy be submitted. WSP commits to provide the NWREAD with two hard copies and 2 electronic copies of all reports at the outset of the public review period.	Part A 3 (g) ii
OTHER AFFECTED PARTIES			No issues raised during the Scoping Phase.		
INTERESTED PARTIES			No issues raised during the Scoping Phase.		

iv) The Environmental attributes associated with the development footprint alternatives.(The environmental attributed described must include socio- economic, social, heritage, cultural, geographical, physical and biological aspects)

(1) Baseline Environment

(a) Type of environment affected by the proposed activity.

(its current geographical, physical, biological, socio- economic, and cultural character).

Information contained in this section was obtained from the following sources:

- Final Mortimer Smelter Upgrade, EIA/EMP Report, compiled by WSP Environmental dated February 2009.
- Integrated Water and Waste Management Plan, compiled by SRK Consulting dated 2011.
- Final Environmental Management Programme Alignment and Consolidation for RPM-US, compiled by WSP Environmental dated March 2014.
- BPDM Draft Air Quality Management Plan, compiled by Gondwana Environmental Solutions dated May 2011.
- State of the Environment Report (SOER) to Inform Closure Planning at the Rustenburg Platinum Mine – Union Section, compiled by Golder Associates, dated August 2013.
- Ambient Air Quality Report, compiled by C&M Consulting Engineers, dated September 2016.
- Groundwater Quality results, compiled by Aquatico, dated August 2016.
- Environmental Acoustic Impact Assessment, Sulphur Dioxide Abatement Plant at the Mortimer Smelter, compiled by WSP | Parsons Brinckerhoff, dated April 2017. Attached in **Appendix 6**.
- Mortimer Smelter SO_2 Abatement Air Quality Impact Assessment, compiled by WSP | Parsons Brinckerhoff, dated April 2017. Attached in **Appendix 6**.
- Biodiversity Assessment SO_2 Abatement Plant at Mortimer Smelter, compiled by the Biodiversity Company, dated April 2017. Attached in **Appendix 6**.
- A Report on Cultural Heritage Impact Assessment for the Proposed Mortimer Smelter SO2 Abatement Project, North West province, compiled by Archaetnos Culture and Cultural Resource Consultants, dated April 2017. Attached in **Appendix 6**.
- Proposed Installation of Sulphur Dioxide Abatement Equipment at Mortimer Smelter Social Impact Assessment, compiled by WSP | Parsons Brinckerhoff, dated April 2017. Attached in **Appendix 6**.

GEOLOGY

Regional Description

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 10**). 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^2; 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.

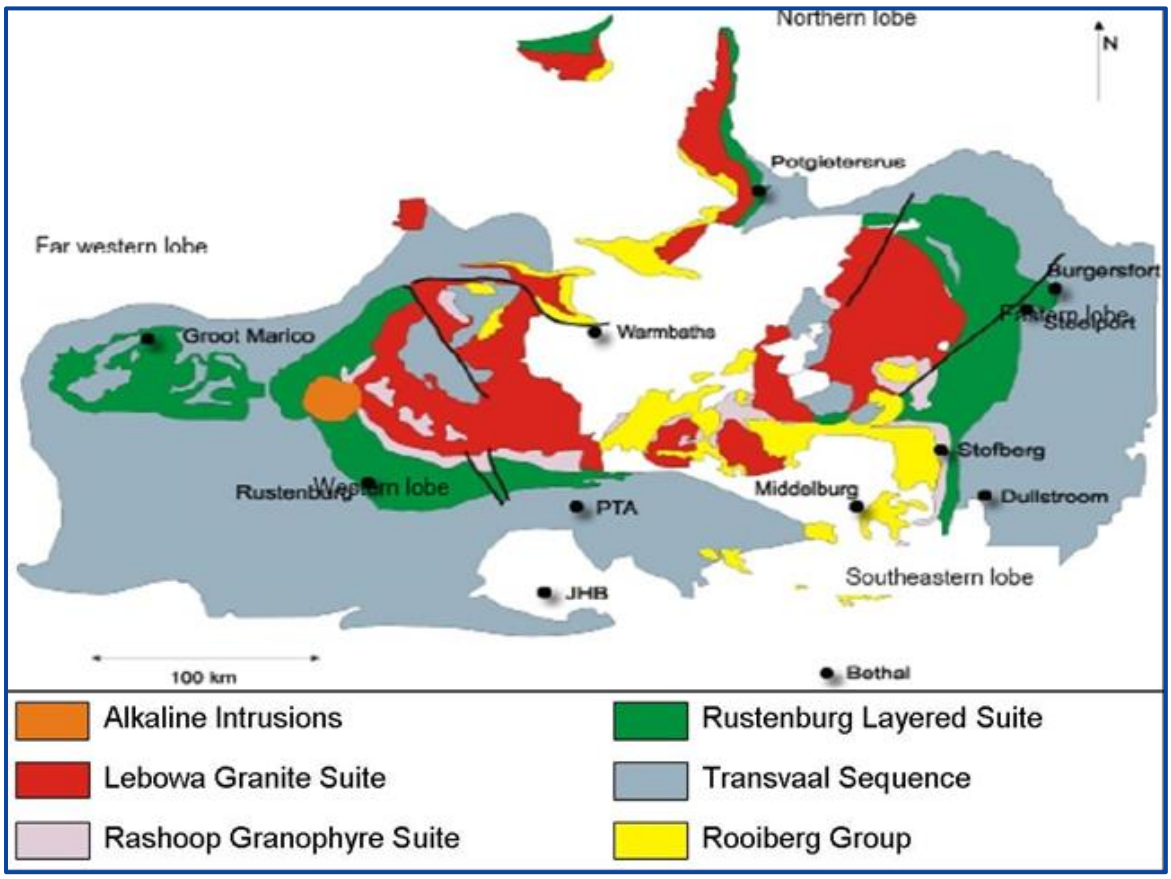


Figure 10: Generalised Geological Map of the BIC

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 and in **Figure 11**:

- 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); and
- Upper zone (this is 200 m thick and is characterised by lithologies of anorthosite, tractolite and ferrogabbro to diorite).

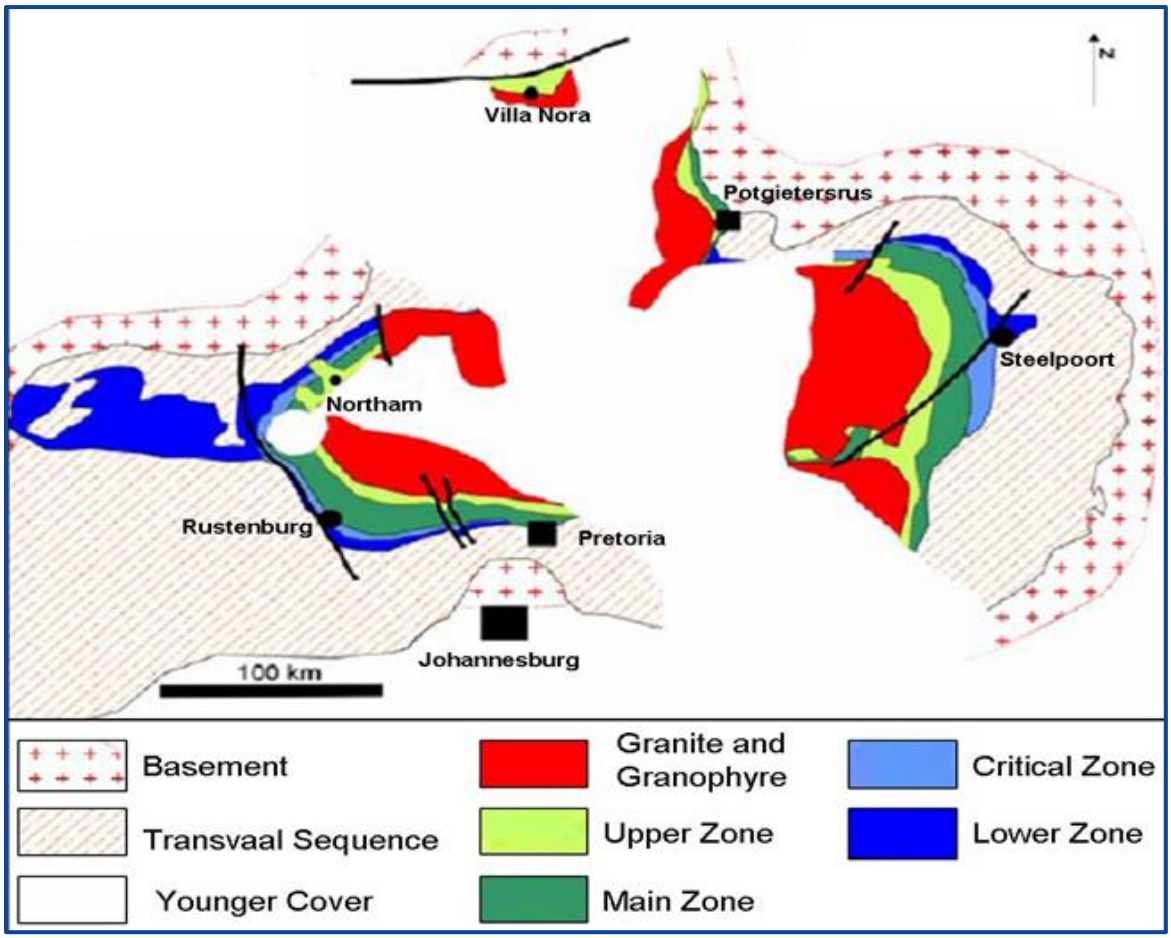


Figure 11: Subdivision of Rustenburg Layered Suite

Development Site Description

The development site is situated in the north-eastern section of the BIC. The Merensky Reef and the UG2 Reef outcrop approximately 9 km to the north-eastern boundary of RPM-US. The Merensky reef comprises of felspathic pyroxenite and is pproximately 1 m thick and is underlain there by the UG2 reef comprising of chromitite with a thickness of approximately 1.5 m. These reefs have a region dip of about 18˚ to the south-east.

The development site is underlain by the gabbro, norite and anorthosites of the Pyramid Gabbro-norite Formation of the Rustenburg Layered Suite, which forms part of the Bushveld Igneous Complex. A number of southwest to northeast trending dykes have been observed, particularly on the south eastern parts of RPM-US (**Figure 12**).

Sensitive Areas

There are no sensitive areas associated with the geology.

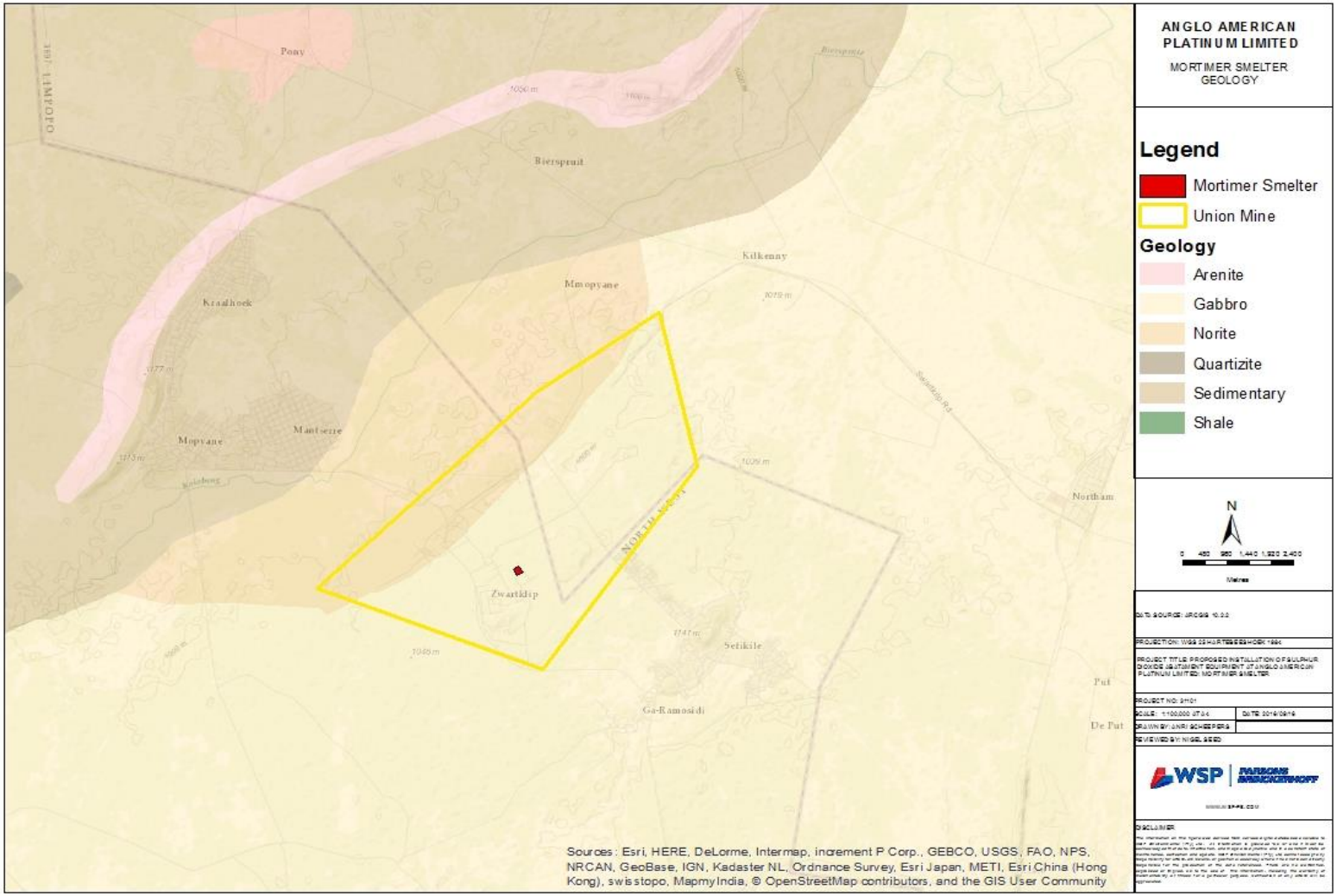


Figure 12: Geology at RPM-US

TOPOGRAPHY

Regional Description

The topography of the RPM-US 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 (±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 410 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.

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.

Development Site Description

The majority of the development site is located within an area that has already been levelled and is sloping gently to the north. The proposed road expansion and contractors laydown area will be situated on area not yet cleared or levelled which may result in a minimal change to the topography.

Sensitive Areas

There are no sensitive areas associated with the topography.

CLIMATE

Regional Description

The Mortimer Smelter ambient air monitoring stations are situated at the Smelter, Bierspruit, 4B Decline and the Fridge Plant (**Figure 13**). Meteorological variables including; wind speed, wind direction and ambient temperature, were sourced from the Mortimer on-site weather station for the period January 2013 – December 2015. This site is located on-site, and as such, is considered representative of the meteorological conditions for the area.

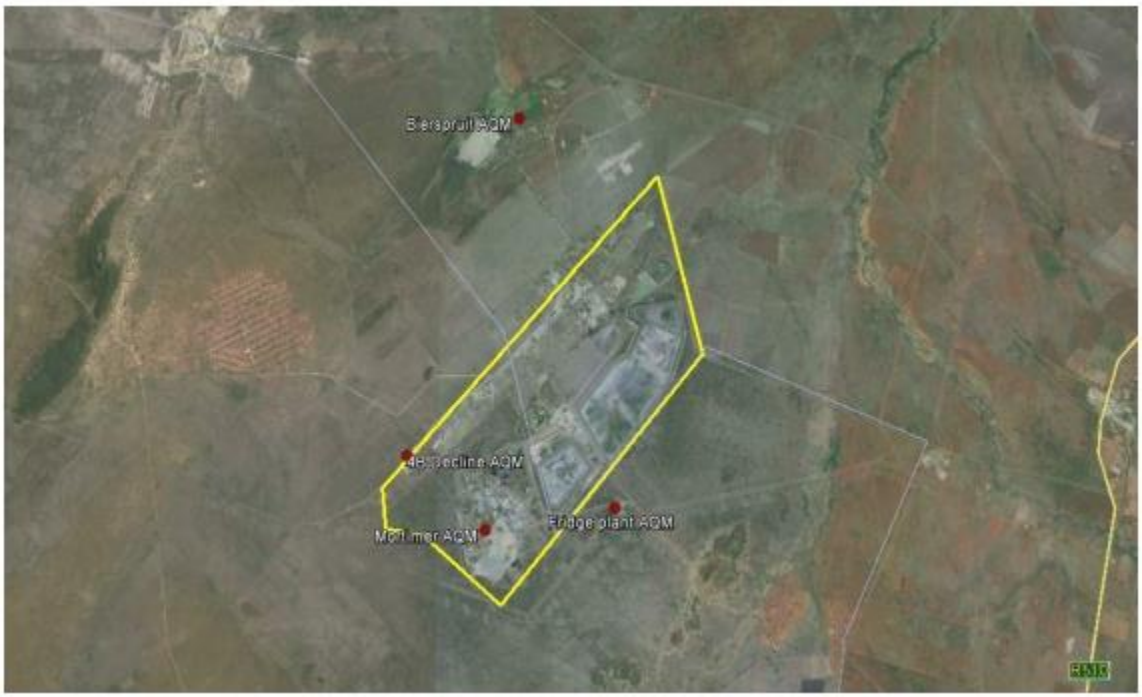


Figure 13: Ambient Monitoring Stations

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 14**.

Mean annual precipitation (MAP) for RPM-US has been obtained from the South African Weather Bureau (SAWB) for station No. W0587139-Middelkop (**Table 4**). The annual average number of rain days with rainfall in excess of 0.25 mm is 64.

The mean evaporation in the vicinity of RPM-US is 1800 mm / annum. Rainfall and evaporation data for the 10 wettest years are presented in **Table 5**. The mean monthly evaporation exceeds the mean monthly rainfall.

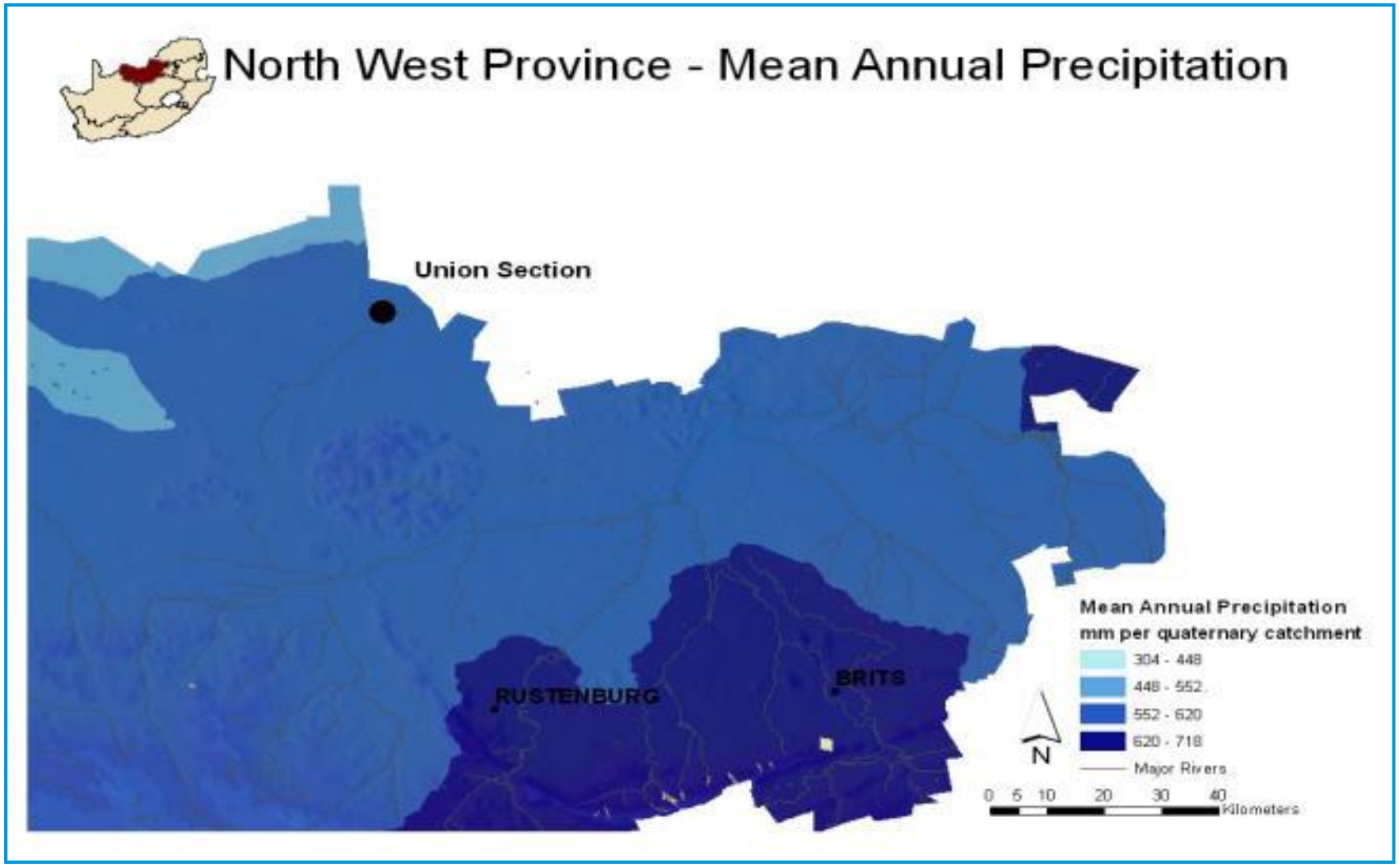


Figure 14: Mean Annual Precipitation (North West Province)

Table 4: Rainfall Data

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 5: Rainfall and Evaporation Data for Ten Wettest Years

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
2nd wettest	1939	990.3	1984	1 753.5
3rd wettest	1956	964.1	1979	1 689.8
4th wettest	1961	949.5	1983	1 647.9
5th wettest	1943	945.8	1982	1 613.9
6th wettest	1957	923.7	1977	1 595.7
7th wettest	1944	905.9	1972	1 483.9
8th wettest	1940	865.4	1980	1 474.3
9th wettest	1925	855.8	1978	1 422.8
10th wettest	1974	854.2	1973	1 375.4

Mean Monthly Evaporation

The mean annual S-pan evaporation at RPM-US is 1 800 mm. Mean monthly evaporation values are shown in **Table 5**.

Temperature

Ambient air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers.

For the period January 2013 to December 2015, average temperatures were relatively stable, with an average summer temperature of approximately 26.56 °C and an average winter temperature of around 16.64 °C (**Figure 15** and **Table 6**).

Table 6: Average temperatures (°C) at Mortimer Smelter (on-site) for the period January 2013 to December 2015.

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	26.75	26.77	24.91	19.80	17.72	15.03	15.51	17.37	23.50	24.40	26.69	24.94
2014	26.68	25.46	22.06	19.19	18.02	14.20	14.03	17.89	23.06	24.73	24.42	26.01
2015	26.36	27.26	25.42	21.87	19.99	14.89	18.01	22.84	23.00	27.06	26.57	28.78

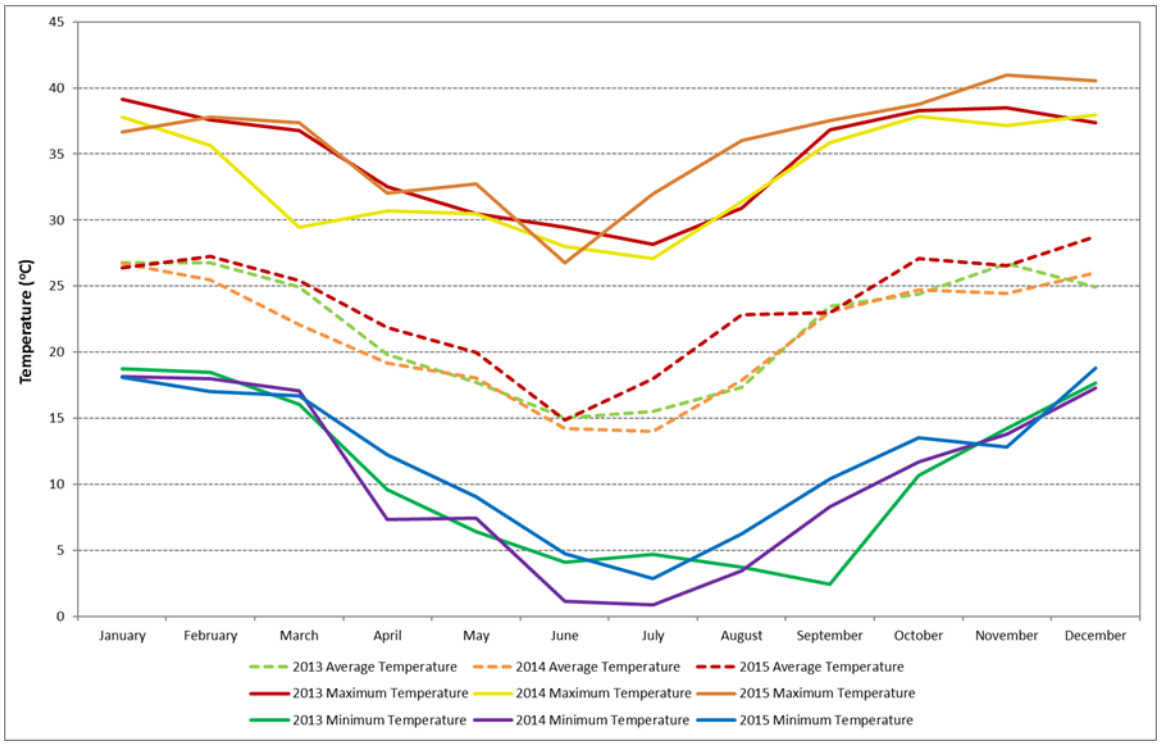


Figure 15: Average, maximum and minimum temperatures (°C) at Mortimer Smelter (on-site) for the period January 2013 to December 2015.

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.

Wind

Figure 16 presents the wind field characteristics for Mortimer Smelter on-site monitoring data for the period January 2013 to December 2015 and modelled meteorological data for the period January 2014 to December 2016. In the wind roses, the colour of the bar indicates the wind speed

while the length of the bar represents the frequency of winds blowing from a certain direction (as a percentage).

Based on the available on-site data, south-easterly winds predominate, accompanied by frequent north-easterly and north-north-westerly winds. Wind speeds were generally slow to moderate, with prevailing winds generally below 6 m/s. Calm conditions, which are defined as wind speeds less than 1 m/s, occur quite frequently (36.99 % of the time). A similar wind field is observed in the modelled (MM5) meteorological data, although a slight shift is observed with dominant easterly and east-south-easterly winds. Wind speeds are slow to moderate with calm conditions, occurring 18.16 % of the time.

Diurnal variations in winds are depicted in **Figure 17**. During the evening (18:00 – 24:00) both on-site and MM5 data show dominant northerly winds, with a shift to dominant south-easterly and south-south-easterly winds in early morning hours (00:00 – 06:00) for on-site and MM5 data, respectively. The MM5 wind rose shows that dominant south-south-easterly winds are maintained through to the late morning hours (06:00 – 12:00), while the on-site wind rose shifts back to dominant north-easterly winds. During the afternoon (12:00 – 18:00) the on-site wind rose shows a shift to dominant north-westerly winds, while dominant easterly winds are observed for the MM5 wind rose.

Seasonal variations in winds over Mortimer Smelter are depicted in **Figure 18**. During autumn (April – May) and winter (June – August) months, on-site monitored and modelled meteorological wind roses show dominant south-westerly and east-south-easterly winds, respectively. On-site wind roses show predominant north-north-westerly winds during spring (September – November) with a shift to north-easterly winds in summer (December – February). MM5 data shows that east-south-easterly winds dominate during the autumn and winter months. During the months of spring, strong northerly winds are dominant while a shift to dominant easterly winds occurs during summer. Winds are generally slow to moderate for both datasets, although faster winds are observed on occasion in the modelled dataset.

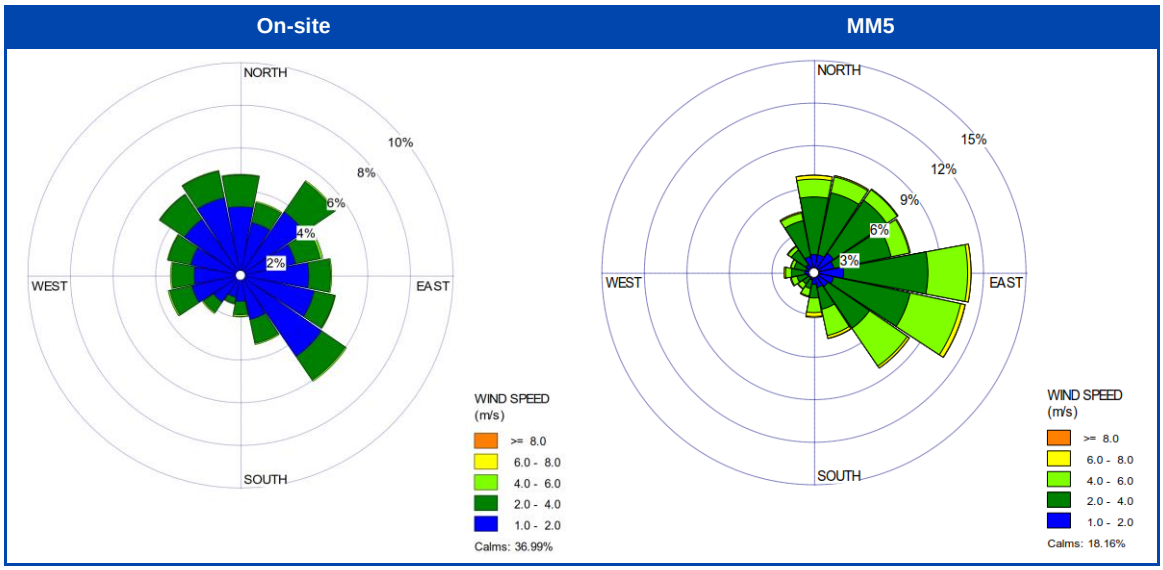


Figure 16: Period wind rose for Mortimer Smelter for the period January 2013 to December 2015 (on-site) and January 2014 to December 2016 (MM5)

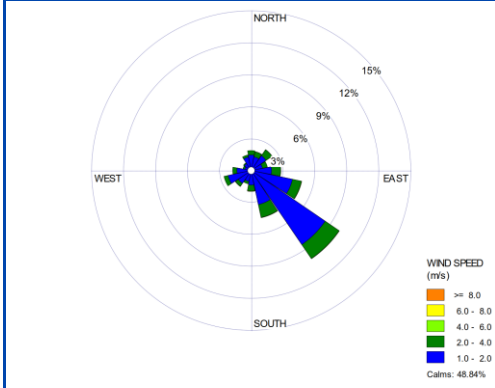
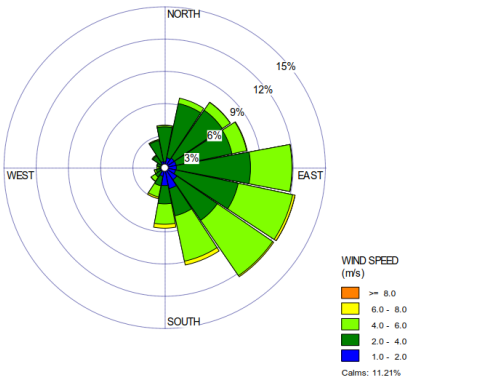
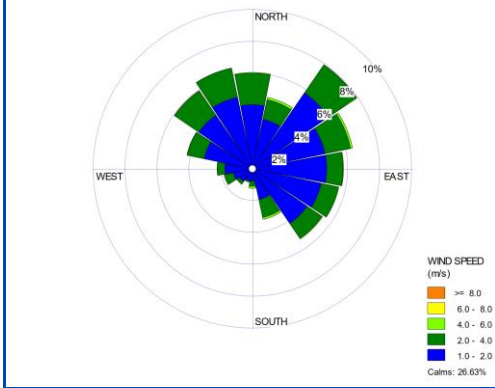
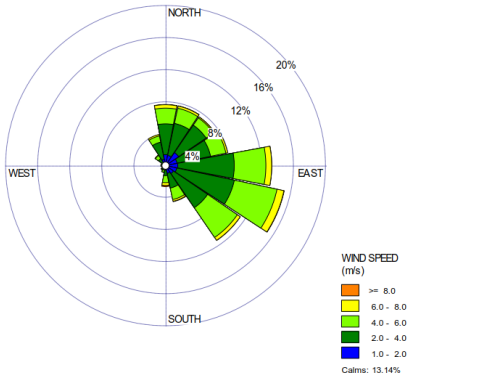
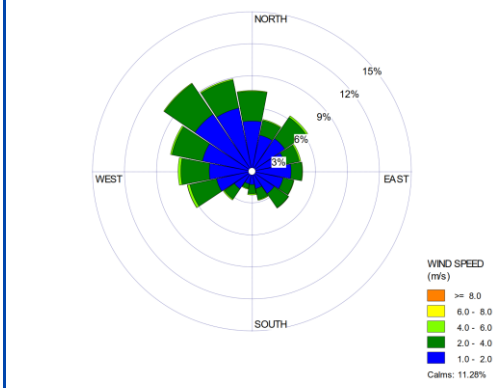
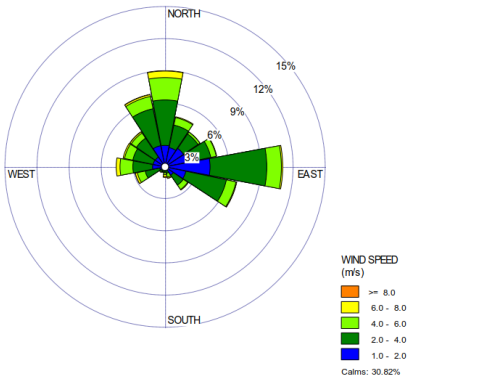
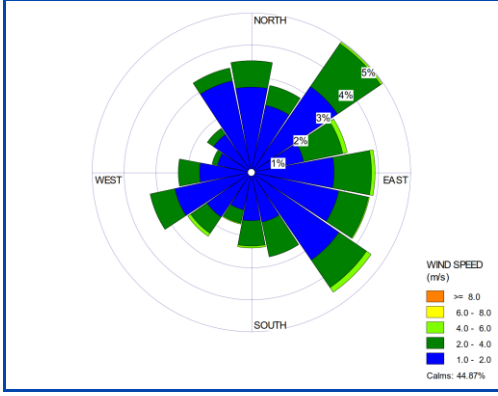
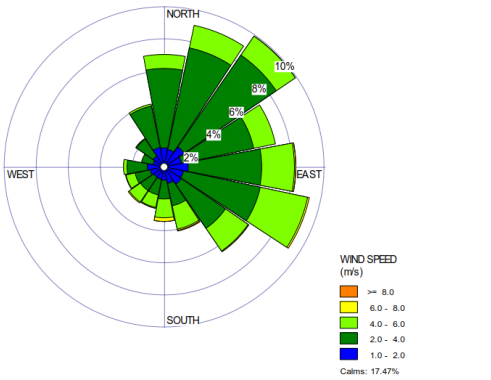
On-site	MM5
00:00 – 06:00	
	
06:00 – 12:00	
	
12:00 – 18:00	
	
18:00 – 24:00	
	

Figure 17: Diurnal wind roses for Mortimer Smelter for the period January 2013 to December 2015 (on-site) and January 2014 to December 2016 (MM5)

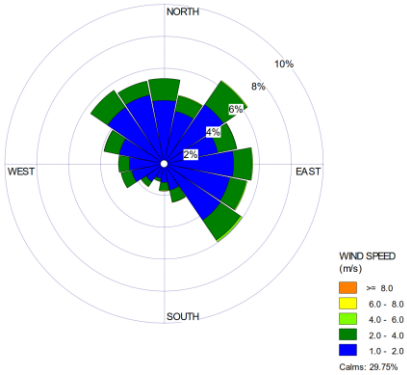
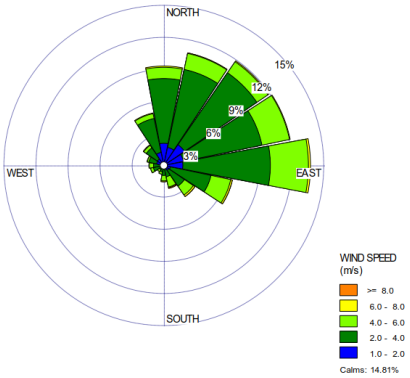
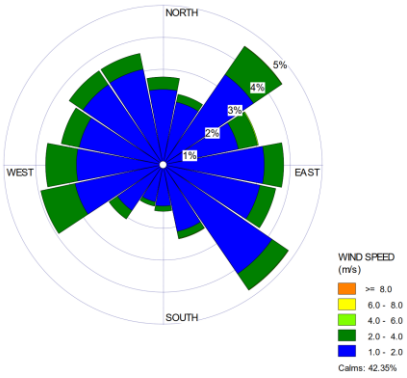
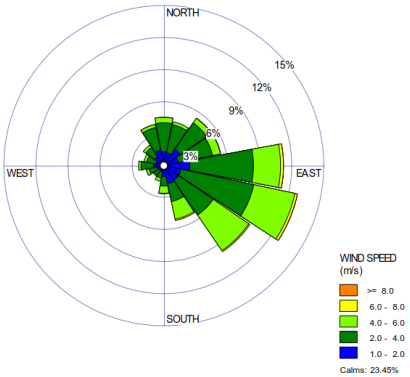
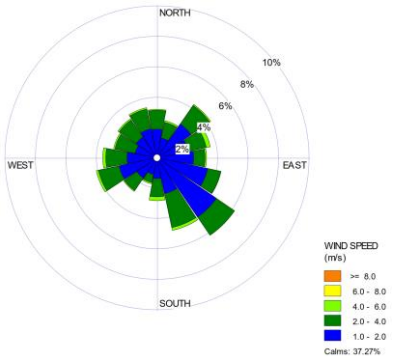
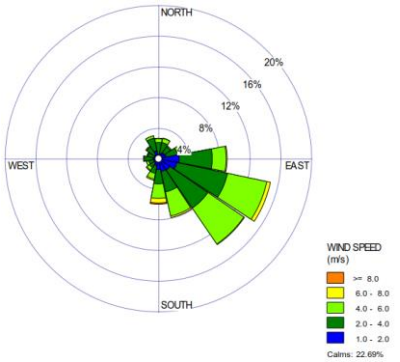
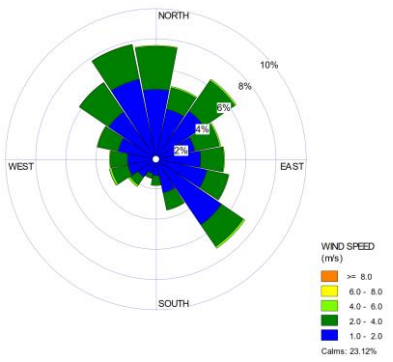
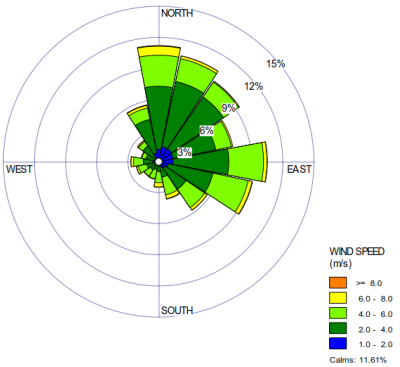
On-site	MM5
Summer	
	
Autumn	
	
Winter	
	
Spring	
	

Figure 18: Seasonal wind roses for Mortimer Smelter for the period January 2013 to December 2015 (on-site) and January 2014 to December 2016 (MM5)

Extreme Weather Events

Rainfall conditions are highly variable and droughts and floods do occur. Thunderstorm events account for the majority of the annual rainfall and are sometimes accompanied by hail. Snow has not been recorded in the area.

Development Site Description

No climatological variation at the development site level – see regional description.

Sensitive Areas

There are no sensitive areas associated with the climate.

SOILS AND LAND CAPABILITY

Regional Description

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.

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 area is comprised mainly of black clayey soils of the land type Ea70 which covers a total area of 65 760 ha in the region and are commonly known as ‘Black Turf’. They are dark, strongly structured, usually calcareous, swelling clay soil of the Arcadia soil form with crusting or self-mulching surface and constitute 68% of the land type. **Figure 19** indicates the location of the soil map units for the region.

Land capability on Arcadia soil is arable with moderate material. These soils cover the majority of the disturbed area. 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.

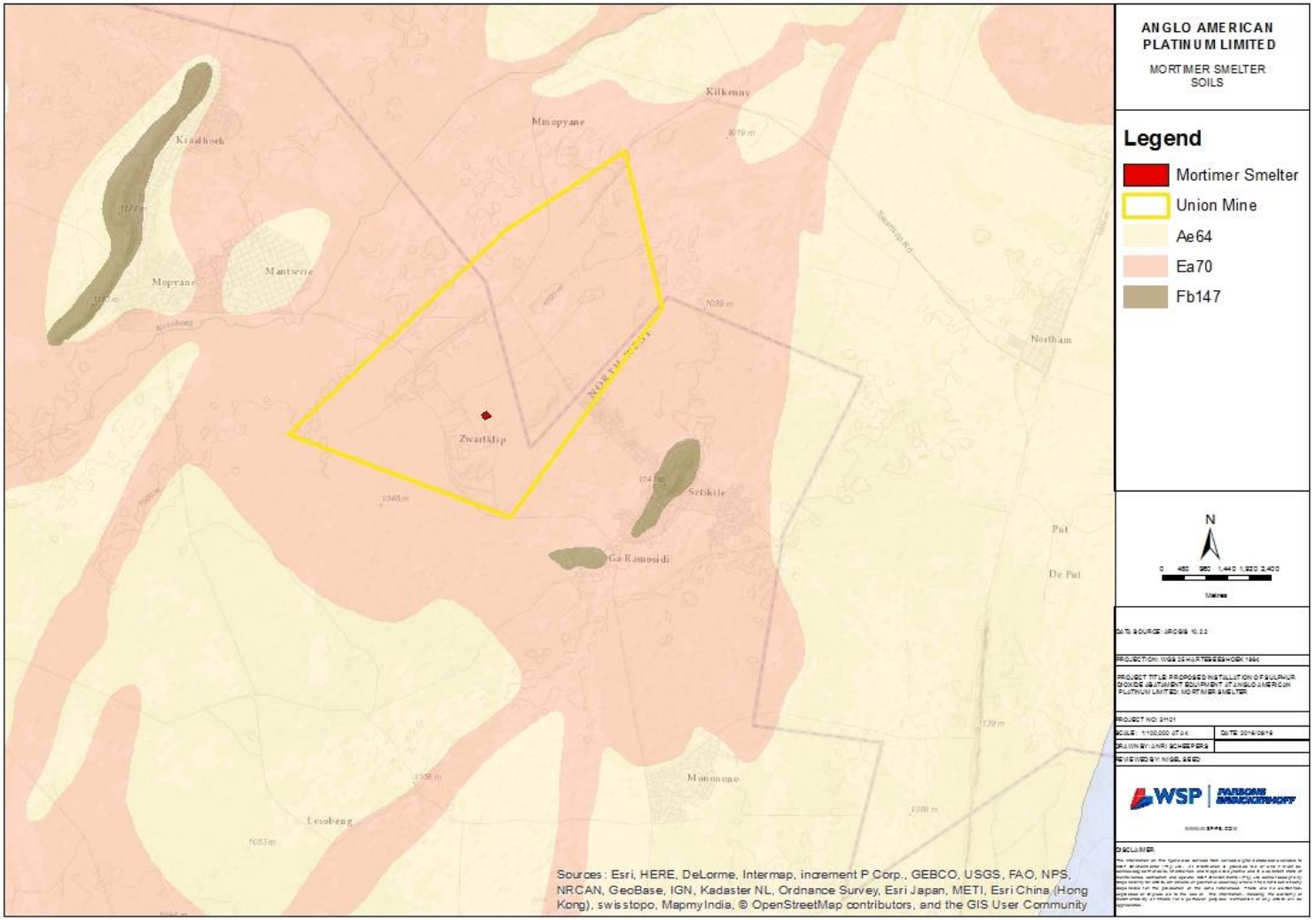


Figure 19: Regional Land Type Map

Development Site Description

The majority of the development site has previously been transformed from its natural state due to levelling and construction activities associated with the development of the Mortimer Smelter. The proposed road expansion and contractors laydown area will be situated on areas not yet cleared or levelled which may result in a minimal change to the soil and land capability, however these areas have already been disturbed by existing activities at the Smelter.

Typically the norite and anorthosite bedrock has weathered to form residual soils varying from a highly active “black turf” to a sandy gravel material. Generally this residual soil horizon is relatively thin (<1.0m). However local variations in rock mineralisation and faulting patterns can result in residual soil horizons in the order of 2m to 9m in thickness.

The overlying transported soils exhibit very similar engineering parameters to the residual “black turf” and as a result the two horizons are particularly difficult to distinguish. Ongoing construction at Mortimer Smelter has resulted in varying quantities of fill, concrete, paving and asphalt occurring above the insitu transported and residual soils.

Sensitive Areas

There are no sensitive areas associated with the soils and land capability.

FLORA

Regional Description

Vegetation

The Mortimer Smelter site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

- Seasonal precipitation; and,
- (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006). The Savanna biome comprises many different vegetation types. The Mortimer Smelter site is situated in the Dwaalboom Thornveld (SVcb1) vegetation community (**Figure 21**).

Dwaalboom Thornveld occurs on black clay soils in the North West and Limpopo Provinces (Mucina & Rutherford, 2006). This vegetation community is characterised by layers of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species and an almost continuous herbaceous layer dominated by grasses (Mucina & Rutherford, 2006). Approximately 6% of this vegetation community is statutorily conserved, mostly in the Madikwe Game Reserve and by 2006,14% had already been transformed. The conservation status of this vegetation community was listed by Mucina & Rutherford (2006) as Least Concern (LC).

Based on the Plants of Southern Africa (POSA, 2017) database, 387 plant species are expected to occur in topographical grid square 2427CC. The list of expected plant species is provided in Biodiversity Impact Assessment attached in **Appendix 6**.

Plant Species of Conservation Concern

A list of plant species of conservation concern was compiled based on the POSA database (POSA, 2017). Three (3) plant species of conservation concern are expected to occur within QDS 2427CC (**Table 7**). No SA endemic plant species are expected to occur in QDS 2427CC (**Table 7**). The likelihood of occurrence of these species was assessed based on their known habitat preferences.

Ilex mitis (Cape holly) occurs throughout South Africa with the exception of the Northern Cape. Beyond South Africa's borders its range extends to Ethiopia and also Madagascar. Populations of this species have declined in certain parts of its range due to harvesting of bark for the medicinal plant trade (SANBI, 2017). This plant species is typically associated with riparian habitats, forests and thickets. Its presence in the project area is therefore regarded as unlikely.

Ledebouria atrobrunnea is restricted to plains north of Pilanesberg to Rustenburg and Borakalalo (SANBI, 2017). Due to this restricted range, this species is listed as Vulnerable (VU) by some sources, it is however locally abundant and is resilient to anthropogenic impacts such as overgrazing (SANBI, 2017). It occurs in rocky areas and quartzitic outcrops and therefore its presence in the project area is regarded as unlikely.

Myrothamnus flabellifolius occurs in Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga and North West Provinces. It usually occurs in shallow soil on sunny rocky hills or along cracks and crevices in rocks, its presence in the project area is therefore regarded as unlikely.

Table 7: Plant species of conservation concern expected to occur in grid square 2427CC as well as the conservation status of each (POSA, 2017; SANBI, 2017)

Species	Threat status	SA Endemic
Ilex mitis (L.) Radlk. var. *mitis*	**Declining**	No
Ledebouria atrobrunnea S.Venter	**VU**	No
Myrothamnus flabellifolius Welw.	**DDT***	No
* *Data Deficient*		

Development Site Description

Vegetation

The vegetation community in the project area was found to be highly disturbed with an associated high incidence of alien plant infestation.

The broad vegetation communities comprised of:

- → Disturbed Turf-thornveld; and
- → Wetland areas.

The disturbed turf-thornveld was found along the proposed road upgrade as well as in the proposed contractors camp site. The vegetation community was dominated by *Vachellia tortilis* (Umbrella Thorn) and *Vachellia nilotica* (Scented thorn) thornveld. *Ziziphus mucronata* (Buffalo Thorn) was very abundant whilst *Senegalia mellifera* (Black thorn) and *Dichrostachys cinerea* (Sickle bush) were also present but occurred more sporadically.

Broad-leaved tree species included: *Searsia pyroides* (Common wildcurrant), *Gymnosporia buxiolia* (Common spike thorn) and *Diospyros lycioides* subsp *sericea* (Bluebush).

Grass species included: Setaria incrassata (Vlei Bristle Grass), Ischaemum afrum (Turf grass), Eragrostis rigidor, Heteropogon contours (Spear grass), Melinis repens, Bothriochloa insculpta

(Pinhole grass), Urochloa mossambicensis and Panicum maximum along the proposed road upgrade.

Alien invasive plant species were abundant in this area and included: *Tithonia rotundifolia* (Mexican sunflower), *Zinnia peruviana* (Jakobregop), *Melia azedarach* (Syringa) and *Tipuana tipu* (Tipu tree).

Forbs, shrubs and climbers included: *Asparagus cooperi* (Haakdoring), *Cucumis zeyheri*, *Sesbania bispinosa* (Spiny sesbania).

Plant Species of Conservation Concern

No plant species of conservation concern were recorded during the April 2017 survey.

Alien Invasive Plant Species

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of natural ecosystems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species (Henderson, 2001).

The National Environmental Management: Biodiversity Act (NEMBA) is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, 1 August 2014. The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

The importance and sensitivity of the plant communities associated with the proposed road upgrade and contractors camp site was regarded as low due to the absence of plant species of conservation concern, the high degree of anthropogenic disturbance and the prevalence of alien invasive plant species.

Sensitive Areas

Based on the review of existing documentation, no rare or endangered species are known to occur in any of the mining, process or support areas which have been surveyed within the RPM-US. The development site is situated within 5 km of a private nature reserve (**Figure 24**).

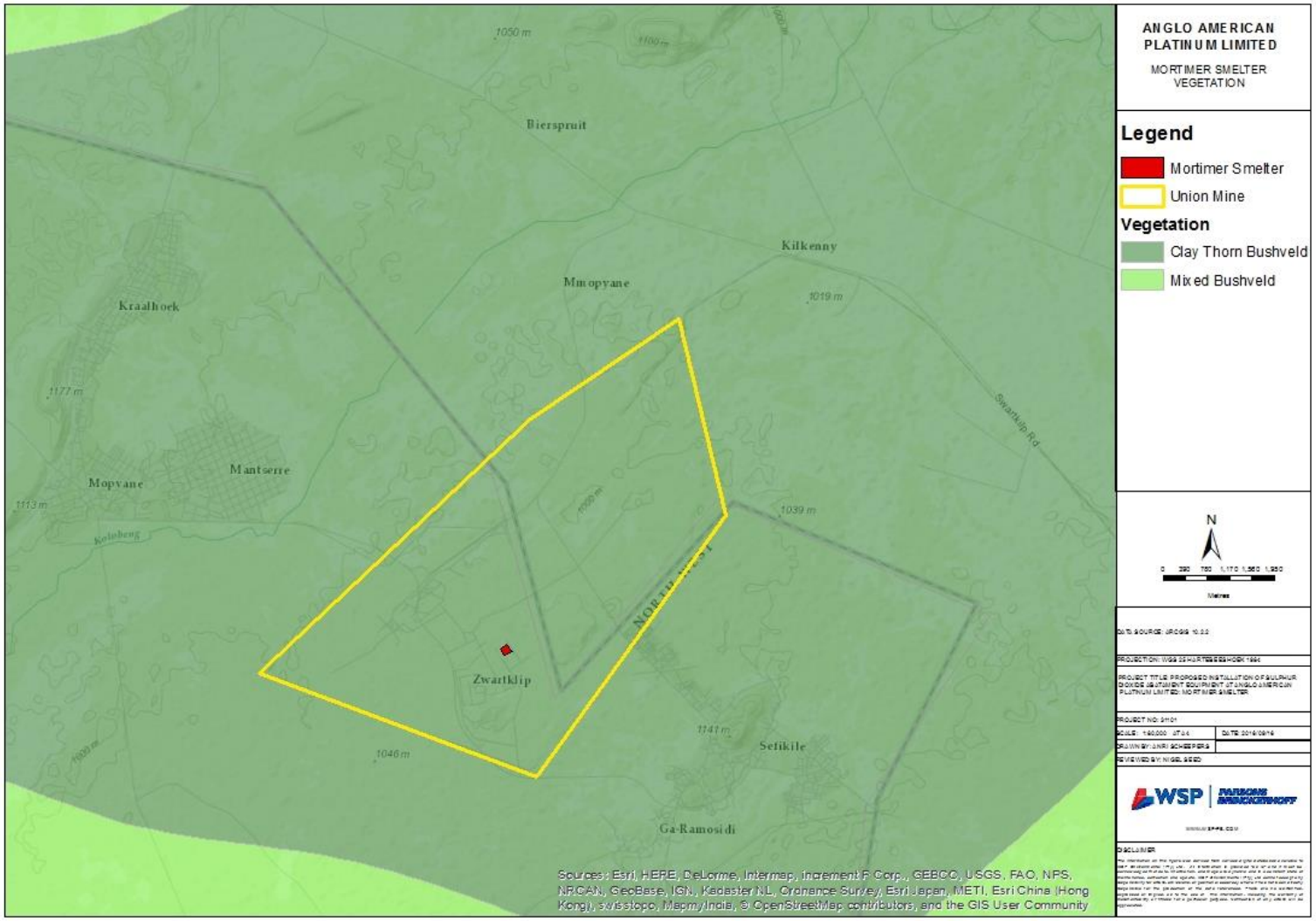


Figure 20: Regional Vegetation

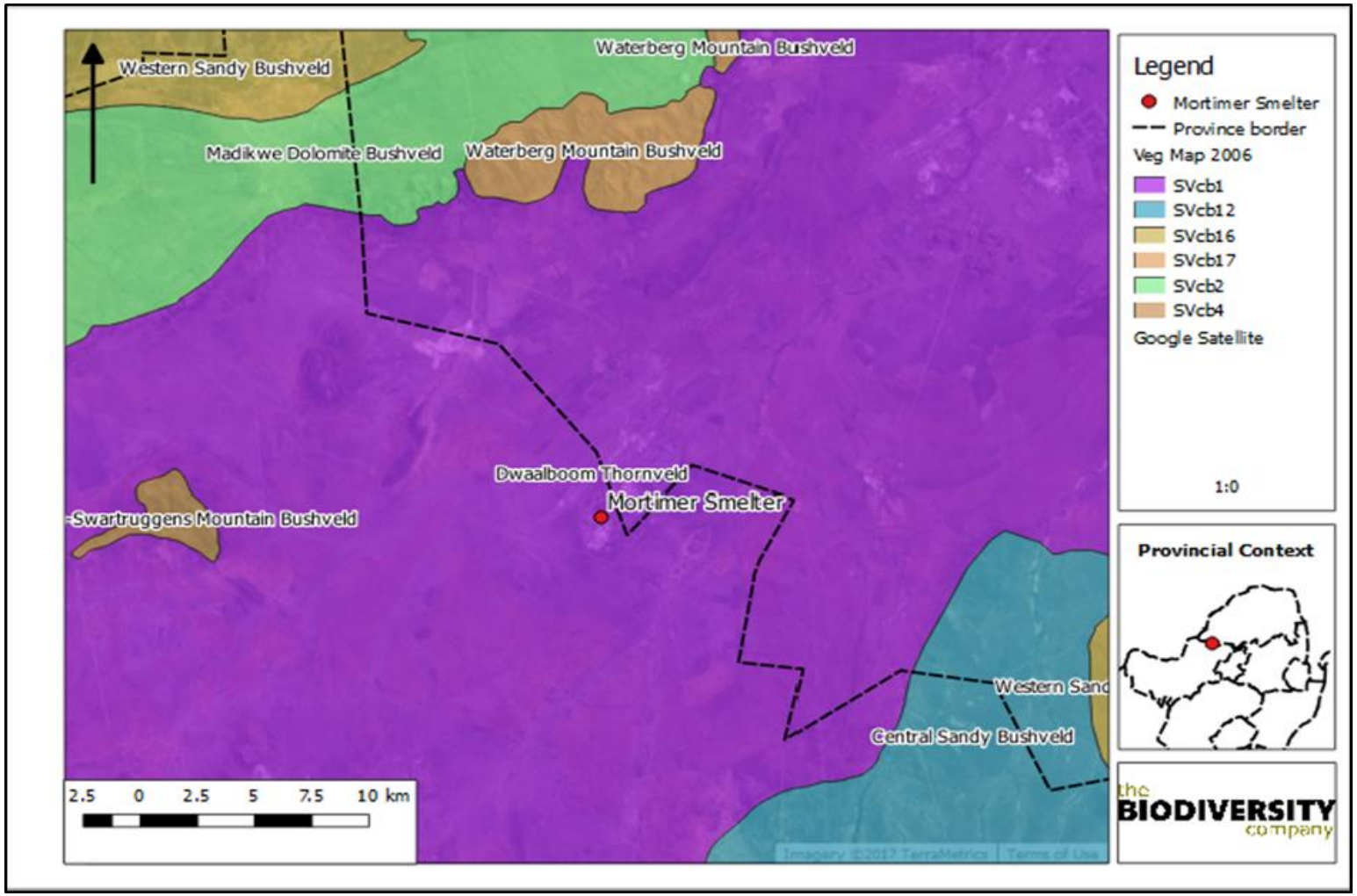


Figure 21: Mortimer Smelter project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (Mucina & Rutherford, 2006)

FAUNA

Regional Description

Avifauna

Based on the South African Bird Atlas Project (SABAP, Version 2) 250 bird species are expected to occur in pentad 2455_2705. The full list of potential bird species is provided in the Biodiversity Impact Assessment attached in **Appendix 6**.

Of these bird species, 6 (2.4%) are listed as being of conservation importance either on a regional or global scale (**Table 8**).

The expected bird species list includes:

- Three (3) species that are listed as Endangered (EN) on a regional basis;
- One (1) species that is listed as Vulnerable (VU) on a regional basis; and
- Two (2) species that are listed as Near Threatened (NT) on a regional basis (**Table 8**).

On a global scale, 1 species is listed as CR and 1 as EN (**Table 8**).

Table 8: List of bird species of regional or global conservation importance that are expected to occur in QDS 2628AD as well as their likelihood of occurrence in the project area (SABAP2, 2017, ESKOM, 2014; IUCN, 2017)

Species	Common Name	Conservation Status		Likelihood of occurrence
		Regional (Eskom, 2016	Global (IUCN, 2017)	
Gyps africanus	Vulture, White-backed	**EN**	**CR**	Low
Gyps coprotheres	Vulture, Cape	**EN**	**EN**	Low
Mycteria ibis	Stork, Yellow-billed	**EN**	LC	Low
Tyto capensis	Grass-owl, African	**VU**	LC	Low
Leptoptilos crumeniferus	Stork, Marabou	**NT**	LC	Low
Pterocles gutturalis	Sandgrouse, Yellow-throated	**NT**	LC	Low

The 2 vulture species, *Gyps africanus* and *G. coprotheres,* are both listed as EN on a regional basis, whilst *G. africanus* is listed as CR on a global basis (**Table 8**).

Gyps africanus (White-backed vulture) occurs across sub-Saharan Africa, with the exception of the Congo basin (Birdlife, 2017). The precipitous decline in this species is attributed to habitat loss and conversion to agro-pastoral systems, declines in wild ungulate populations, hunting for trade, persecution, powerline collisions and poisoning (Birdlife, 2017). It is primarily a lowland species of open wooded savanna, particularly areas of Acacia and requires tall trees for nesting (IUCN, 2017).

Gyps coprotheres (Cape vulture) has a more restricted range and only occurs in Southern Africa. According to the IUCN (2017) a decrease in the availability of carrion (particularly during chick-rearing), inadvertent poisoning, electrocution on pylons or collision with cables, loss of foraging habitat and unsustainable harvesting for traditional uses are the most factors contributing to the decline of this species. Although both vulture species are expected in pentad 2455_2705, the absence of carrion suggests that they are very unlikely to occur in the project area.

Mycteria ibis (Yellow-billed stork) is listed as EN on a regional basis and LC on a global basis. This species is migratory and has a large distributional range which includes much of sub-Saharan Africa. It is typically associated with freshwater ecosystems, especially wetlands and the margins of lakes and dams. Although there are wetlands within close proximity to the site, the absence of any records of this species in pentad 2455_2705 over the course of SABAP2 (July 2007 to April 2017) suggests that the habitat is perhaps sub-optimal or more suitable habitat exists elsewhere.

Tyto capensis (Grass owl) is a habitat specialist and mainly restricted to the open, grassy habitats of marshes, wetlands and floodplains. Its distributional range includes Africa, south of the equator. Although the habitat suggests a moderate likelihood of occurrence of this species in this project area, only a single record of this species dating to 2008, exists for pentad 2455_2705 over the course of SABAP2 (July 2007 to April 2017) suggesting that the habitat is perhaps sub-optimal and the likelihood of occurrence low.

Leptoptilos crumeniferus (Marabou stork) and *Pterocles gutturalis* (Yellow throated sandgrouse) are both listed as NT on a regional scale and LC on a global scale (**Table 8**). *Leptoptilos crumeniferus* is a carrion feeder that occurs in open dry savannas, grasslands, swamps, riverbanks, lake shores and receding pools. The absence of carrion suggests a low likelihood of occurrence of this species in the project area. There are 3 records of this species occurring in pentad 2455_2705 between July 2007 to April 2017.

Pterocles gutturalis has an extremely large range that extends across Southern and East Africa. Populations of this species are declining due to ongoing habitat loss. Its preferred habitat is described as short grassy plains and cultivated fields. Although there are 7 records of this species in pentad 2455_2705 over the period July 2007 to April 2017, most recently in 2015, the habitat in the project area is considered to be sub-optimal and the likelihood of occurrence low.

Mammals

The IUCN Red List Spatial Data (IUCN, 2017) lists 99 mammal species that could be expected to occur within the project area. Of these species, 17 are medium to large conservation dependant species, such as *Diceros bicornis* (Black rhinoceros), *Ourebia ourebi* (Oribi) and *Equus quagga* (Plains zebra) that in South Africa are restricted to protected areas such as game reserves. These species are therefore not expected to occur in the project area and have been excluded from the assessment.

Of the remaining 80 small to medium sized mammal species, 10 (13%) are listed as being of conservation concern on a regional or global basis (**Table 9**). The list of potential species includes 1 species that is listed as EN, 3 that are listed as VU and on a regional basis and 6 that are listed as NT on a regional scale (**Table 9**). On a global scale, 3 species are listed as VU and 2 as NT (**Table 9**).

Table 9: List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses and the likelihood of occurrence in the project area (IUCN, 2017; SANBI, 2016)

Species	Common name	Conservation Status		Likelihood of occurrence
		Regional (SANBI, 2016)	IUCN (2017)	
Cloeotis percivali	Short-eared Trident Bat	**EN**	LC	Unknown
Felis nigripes	Black-footed Cat	**VU**	**VU**	Moderate to low
Panthera pardus	Leopard	**VU**	**VU**	Low
Smutsia temminckii	Temminck's Ground Pangolin	**VU**	**VU**	Low
Aonyx capensis	Cape Clawless Otter	**NT**	**NT**	Good

Atelerix frontalis	South African Hedgehog	**NT**	LC	Good
Crocidura mariquensis	Swamp Mush Shrew	**NT**	LC	Good
Leptailurus serval	Serval	**NT**	LC	Good
Parahyaena brunnea	Brown Hyaena	**NT**	**NT**	Moderate
Poecilogale albinucha	African Striped Weasel	**NT**	LC	Good

The expected mammal species of conservation concern are discussed separately below.

Cloeotis percivali (Percival's trident bat) is a poorly known species which is largely confined to southern Africa. It occurs in savanna areas where there is sufficient nearby cover in the form of caves and mine tunnels for day roosting. There are no records of this species in the project area, although being a relatively cryptic and poorly known species that is hardly surprising. Although the habitat is suitable, it is unknown whether suitable roosting sites exist for this species

Felis nigripes (Black-footed cat) is endemic to the arid regions of southern Africa. This species is naturally rare, has cryptic colouring is small in size and is nocturnal. These factors have contributed to a lack of information on this species. Given that the highest densities of this species have been recorded in the arid central Karoo region of South Africa, the habitat in the project area can be considered marginal at best and the likelihood of occurrence therefore moderate to low.

Panthera pardus (Leopard) has a wide distributional range across Africa and Asia, but populations have become reduced and isolated, and they are now extirpated from large portions of their historic range (IUCN, 2017). Impacts that have contributed to the decline in populations of this species include continued persecution by farmers, habitat fragmentation, increased illegal wildlife trade, excessive harvesting for ceremonial use of skins, prey base declines and poorly managed trophy hunting (IUCN, 2017). Although known to occur and persist outside of formally protected areas, the densities in these areas are considered to be low and the likelihood of occurrence in a highly-disturbed area such as the project area can be regarded as low.

Smutsia temminckii (Temminck's Ground Pangolin) is the most widespread African pangolin species (IUCN, 2017). Their inconspicuous nature and nocturnal habits have resulted in their abundance being historically underestimated throughout their range (IUCN, 2017). This species inhabits savanna woodland in low-lying regions with moderate to dense scrub (IUCN, 2017). Although suitable habitats exist for this species, the high level of harvesting of this species outside of protected areas and naturally low density suggests that the likelihood of occurrence in the project area is considered to be low.

Aonyx capensis (Cape Clawless Otter) is the most widely distributed otter species in Africa (IUCN, 2017). This species is predominantly aquatic and it is seldom found far from water. Based on the confirmed availability of this habitat in the project area, together with this species' ability to persist in peri-urban areas, the likelihood of occurrence of this species occurring in the project area is considered to be good.

Atelerix frontalis (South African Hedgehog) has a tolerance of a degree of habitat modification and occurs in a wide variety of semi-arid and sub-temperate habitats (IUCN, 2017). The likelihood of occurrence of this species in the project area is considered to be good.

Crocidura mariquensis (Swamp Mush Shrew) has very specific habitat requirements. It occurs in close proximity to open water with a distinct preference for marshy ponds, and riverine and semi-aquatic vegetation such as reed beds (IUCN, 2017). It is considered to be common in suitable habitats. Based on the confirmed availability of this habitat type in the project area, the likelihood of occurrence of this species occurring in the project area is considered to be good.

Leptailurus serval (Serval) occurs widely through sub-Saharan Africa, with the exception of tropical rainforest and the Saharan desert (IUCN, 2017). In sub-Saharan Africa, Servals are found in well-watered savanna long-grass environments and are particularly associated with reedbeds and other riparian vegetation types (IUCN, 2017). Based on the confirmed availability of this habitat type in the project area, the likelihood of occurrence of this species occurring in the project area is good.

Parahyaena brunnea (Brown Hyaena) is endemic to southern Africa. This species occurs in dry areas, generally with annual rainfall less than 100 mm, particularly along the coast, semi-desert, open scrub and open woodland savanna. Given its known occurrence in the Pilanesberg National Park, together with its known ability to persist outside of formally protected areas the likelihood of occurrence of this species in the project area is moderate. The absence of carrion in the project area decreases the likelihood of occurrence of this species.

Poecilogale albinucha (African Striped Weasel) is usually associated with savanna habitats, although it probably has a wide habitat tolerance (IUCN, 2017). Due to its secretive nature, it is often overlooked in many areas. The likelihood of occurrence of this species in the project area is good.

Herpetofauna (Reptiles and Amphibians)

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2017) 34 reptile species are expected to occur in the project area. None of the expected reptile species are listed as being of conservation concern either on a regional or global scale.

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2017) 22 amphibian species are expected to occur in the project area. Of the expected amphibian species, *Pyxicephalus adspersus* (Giant bullfrog) is listed as NT on a regional scale. None of the expected species are listed as being of conservation concern on a global scale.

Development Site Description

Avifauna

A total of 18 bird species (7.2% of expected) were observed in the project area during the April 2017 survey (**Table 10**). The low species diversity was attributed primarily to the small size of the site and the degree of anthropogenic disturbance.

No regionally or globally important bird species were recorded during the survey (**Table 10**).

Table 10: Bird species observed in the project area during the April 2017 survey

Species	Common Name	Conservation Status	
		Regional (Eskom, 2016	Global (IUCN, 2017)
Acridotheres tristis	Myna, Common	Unlisted	LC
Apus affinis	Swift, Little	Unlisted	LC
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC
Bubulcus ibis	Egret, Cattle	Unlisted	LC
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC
Columba guinea	Pigeon, Speckled	Unlisted	LC
Corvinella melanoleuca	Shrike, Magpie	Unlisted	LC
Corvus albus	Crow, Pied	Unlisted	LC

Species	Common Name	Conservation Status	
		Regional (Eskom, 2016	Global (IUCN, 2017)
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC
Dendroperdix sephaena	Francolin, Crested	Unlisted	LC
Euplectes orix	Bishop, Southern Red	Unlisted	LC
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC
Poicephalus meyeri	Meyer's parrot	Unlisted	LC
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC

Mammals

No mammal species were observed during the April 2017 survey. Given that many of the expected mammal species are small and cryptic species such as rodents the likelihood of occurrence of some small mammal species occurring in the project area is considered to be very good.

Herpetofauna (Reptiles and Amphibians)

No reptiles or amphibians were observed during the survey. Given the presence of wetland habitats the likelihood of reptiles and amphibians occurring on the site is good.

Sensitive Areas

Based on the Critical Biodiversity Areas (2015) for North West, the proposed project area does not overlap with any aquatic Critical Biodiversity Areas (CBAs) or Ecological Support Areas (ESAs) (**Figure 22**). The nearest is aquatic CBA is situated approximately 1.4 km north of the project area (**Figure 22**). The nature of that CBA is unclear particularly as it appears to overlap with a mine and consists of an isolated patch with no connectivity to other aquatic CBAs or features.

The project area also doesn't overlap with any terrestrial CBAs or ESAs (**Figure 23**). The nearest terrestrial CBAs are situated approximately 2.8 km south-west of the site.

Based on this assessment it can be concluded that the proposed development is unlikely to impact on any aquatic or terrestrial CBAs or ESAs.

There is a private nature reserve situated within 5km of the proposed development (**Figure 24**).

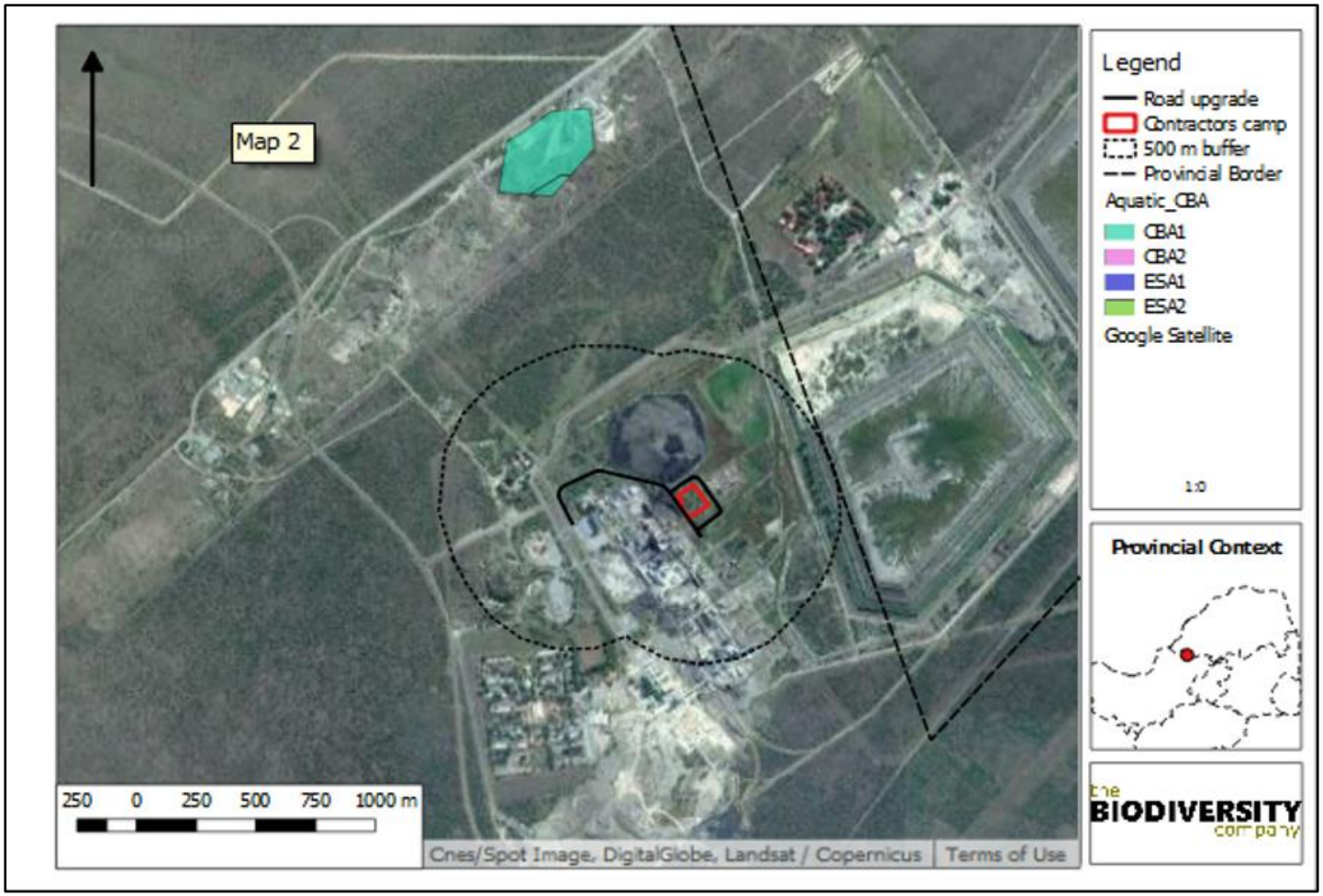


Figure 22: Aquatic Critical Biodiversity Areas

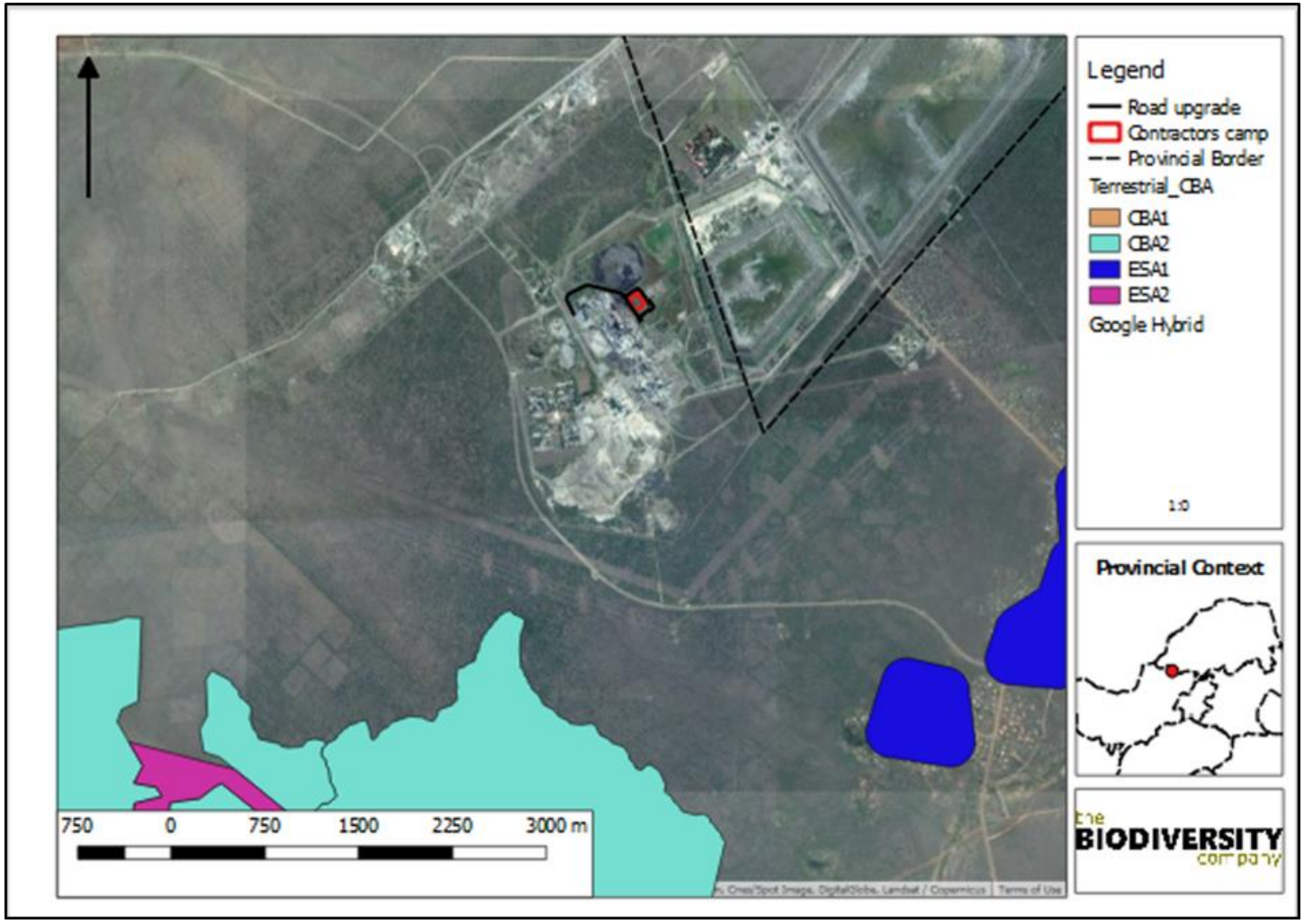


Figure 23: Terrestrial Critical Biodiversity Areas

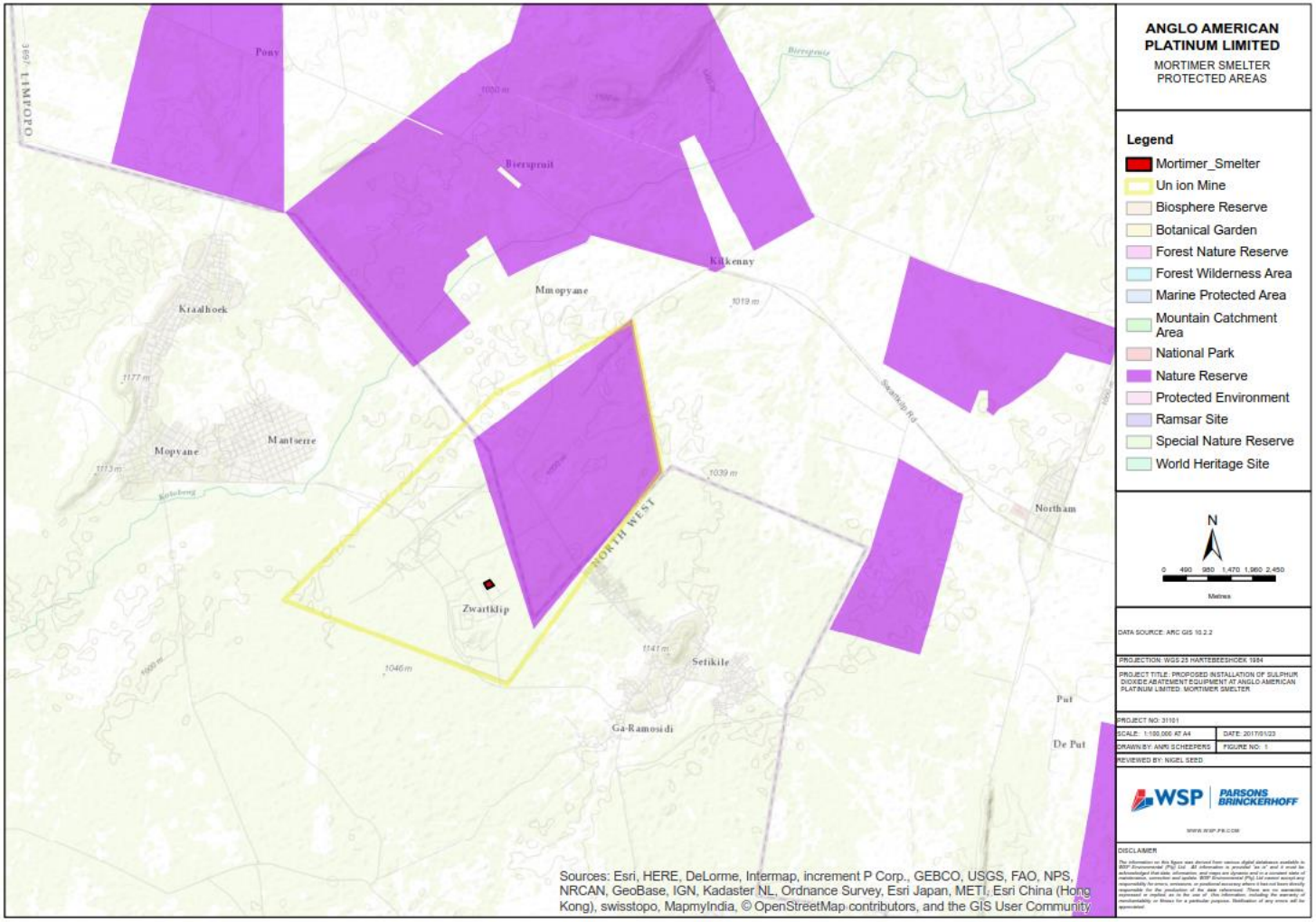


Figure 24: Protected Areas

AIR QUALITY

Regional Description

Potential air pollution sources in the BPDM have been identified as:

- Industrial operations
- Mining activities
- Agricultural activities
- Biomass burning (veld fires)
- Domestic fuel burning (particularly, coal)
- Vehicle tailpipe emissions
- Waste treatment and disposal (landfills and incineration)
- Vehicle entrainment of dust from paved and unpaved roads
- Other fugitive dust sources such as wind erosion of exposed areas

The National Framework for Air Quality Management in the Republic of South Africa (2005) rates the Bojanala Platinum District as having poor air quality mainly due to emissions from industries.

Table 11 indicates the mines within the area, which are likely sources of air pollutants in the region other than RPM-US.

Table 11: Mines in the Area

Group	Company	Mine	Mineral
AAP	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	Andulisite

Development Site Description

Mortimer Smelter operates five continuous monitoring stations that record ambient PM_{10} and SO_2 concentrations, namely: Mortimer (RPM-US), 4B Decline (RPM-US), Fridge Plant (off-site) and Bierspruit (off-site) (**Figure 30**). Ambient monitoring data was obtained for the period January 2014 – December 2016 and is illustrated in **Figure 25** – **Figure 27**.

Figure 25 illustrates the daily average PM_{10} concentrations for the period January 2014 to December 2016 for each of the four monitoring stations. Ambient PM_{10} concentrations were compliant with the previous daily average standard (120 µg/m^3) in 2014, with less than four exceedences recorded at each of the stations. Daily average PM_{10} concentrations were compliant with the current standard (75 µg/m^3) at the 4B Decline monitoring station, though non-compliant at all other stations (recording more than four exceedences), for 2015. Ambient PM_{10} concentrations were compliant with the current daily average standard at the Mortimer and 4B Decline monitoring stations, though non-compliant at Bierspruit and Fridge Plant monitoring stations for 2016. **Table 12** presents the daily maximum (5th highest) and annual average PM_{10} concentrations recorded over the period, for compliance assessment. Annual average PM_{10} concentrations fell below both the previous and current (where applicable) annual average standards of 50 and 40 µg/m^3 respectively, over the monitoring period.

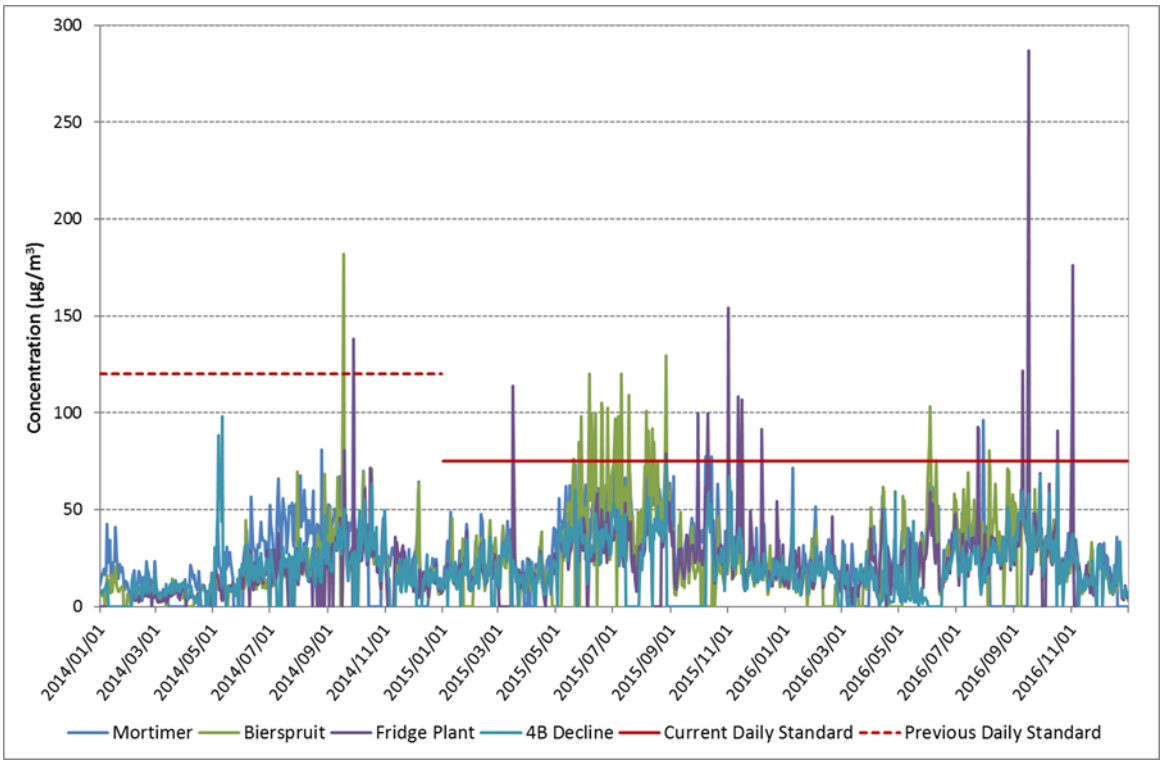


Figure 25: Daily average PM_{10} concentrations monitored at Mortimer Smelter for the period January 2014 – December 2016.

Table 12: Ambient PM_{10} concentrations at Mortimer Smelter for the period January 2014 – December 2016. Values highlighted in blue bold exceed their respective standards

Monitoring Station	PM 10 Concentration (µg/m³)					
	Daily Maximum (5th Highest)			Annual Average		
	2014(1)	2015(2)	2016(2)	2014(1)	2015(2)	2016(2)
Mortimer	67.7 (1)	**75.3 (5)**	63.8 (3)	29.0	35.9	27.8
Bierspruit	68.5 (1)	**105.3 (22)**	**75.6 (5)**	17.7	32.5	26.7
Fridge Plant	60.7 (1)	**99.6 (8)**	**92.5 (7)**	17.1	27.8	25.1
4B Decline	58.9 (0)	59.1 (0)	58.8 (0)	19.1	26.1	20.7

Notes:

(1) As compared against the current National standards and allowable frequency of exceedence
(2) As compared against the previous National standards and allowable frequency of exceedence
(3) Number of exceedences of the daily average standard provided in brackets

Figure 26 and **Figure 27** illustrates the hourly and daily average SO_2 concentrations for the period January 2014 – December 2016 for each of the four monitoring stations. SO_2 concentrations were compliant with the hourly average standard (350 µg/m³) for the monitoring period, with only one exceedence recorded at Mortimer during 2015. Daily average SO_2 concentrations were also compliant with the standard (125 µg/m³) for the monitoring period, with no exceedences recorded. **Table 13** presents the hourly and daily maximum, and annual average SO_2 concentrations recorded

over the period. Annual average SO_2 concentrations fell below the annual average standard (50 µg/m^3) for the monitoring period.

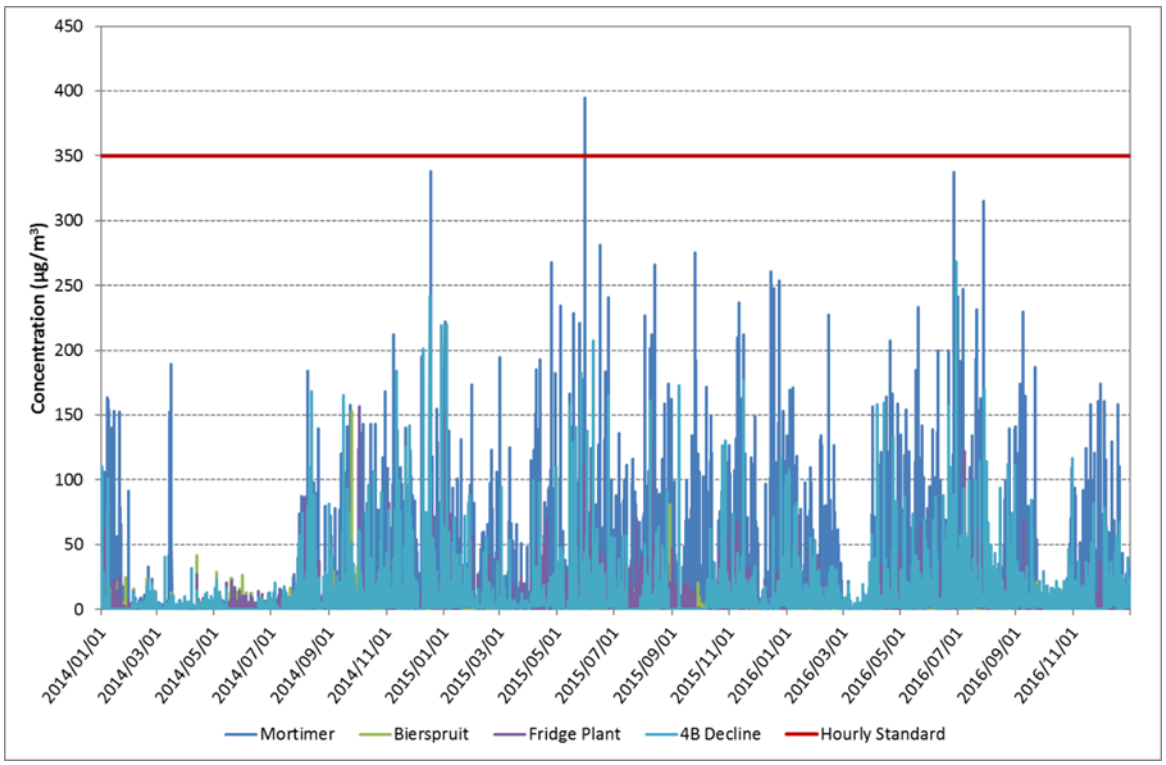


Figure 26: Hourly average SO_2 concentrations monitored at Mortimer Smelter for the period January 2014 – December 2016

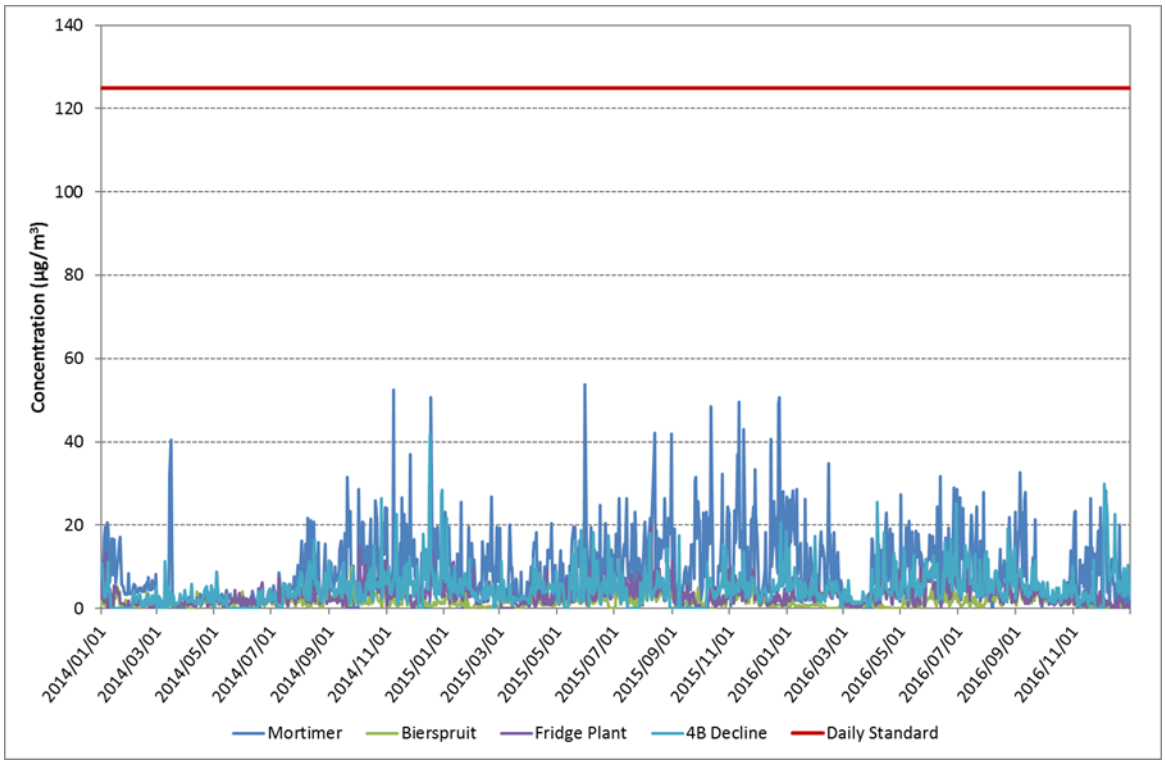


Figure 27: Daily average SO_2 concentrations monitored at Mortimer Smelter for the period January 2014 – December 2016

Table 13: Ambient SO_2 Concentrations at Mortimer Smelter for the period January 2014 – December 2016

Pollutant	SO_2 Concentration (µg/m³)								
	Hourly Maximum (89th Highest)			Daily Maximum (5th Highest)			Annual Average		
	2014	2015	2016	2014	2015	2016	2014	2015	2016
Mortimer	82.6 (0)	121.7 (1)	103.1 (0)	32.2 (0)	48.5 (0)	28.7 (0)	7.8	11.6	9.6
Bierspruit	14.3 (0)	13.2 (0)	10.8 (0)	7.6 (0)	6.9 (0)	5.5 (0)	1.7	2.0	1.4
Fridge Plant	18.4 (0)	27.9 (0)	21.2 (0)	10.6 (0)	11.6 (0)	10.2 (0)	2.9	4.0	3.3
4B Decline	41.3 (0)	38.9 (0)	46.7 (0)	26.4 (0)	18.3 (0)	22.6 (0)	5.0	5.3	5.8

Notes:
Number of exceedences of the daily average standard provided in brackets

Mortimer Smelter operates a dust fallout monitoring network of 13 monitoring units (nine non-residential and four residential) (**Figure 31**). Dust fallout is presented in **Figure 28** and **Figure 29** for the period January 2013 – December 2014 at non-residential and residential monitoring locations, respectively. No exceedences of the non-residential and residential standards were recorded for the monitoring period.

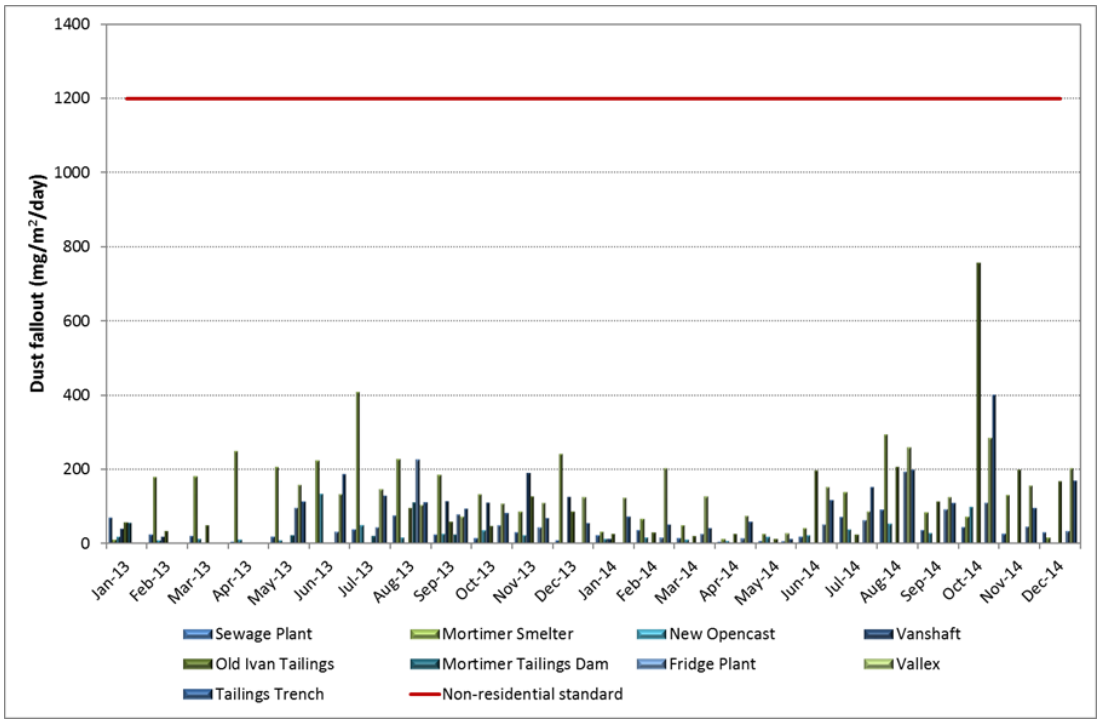


Figure 28: Dust fallout measured at non-residential locations for the period January 2013 – December 2014

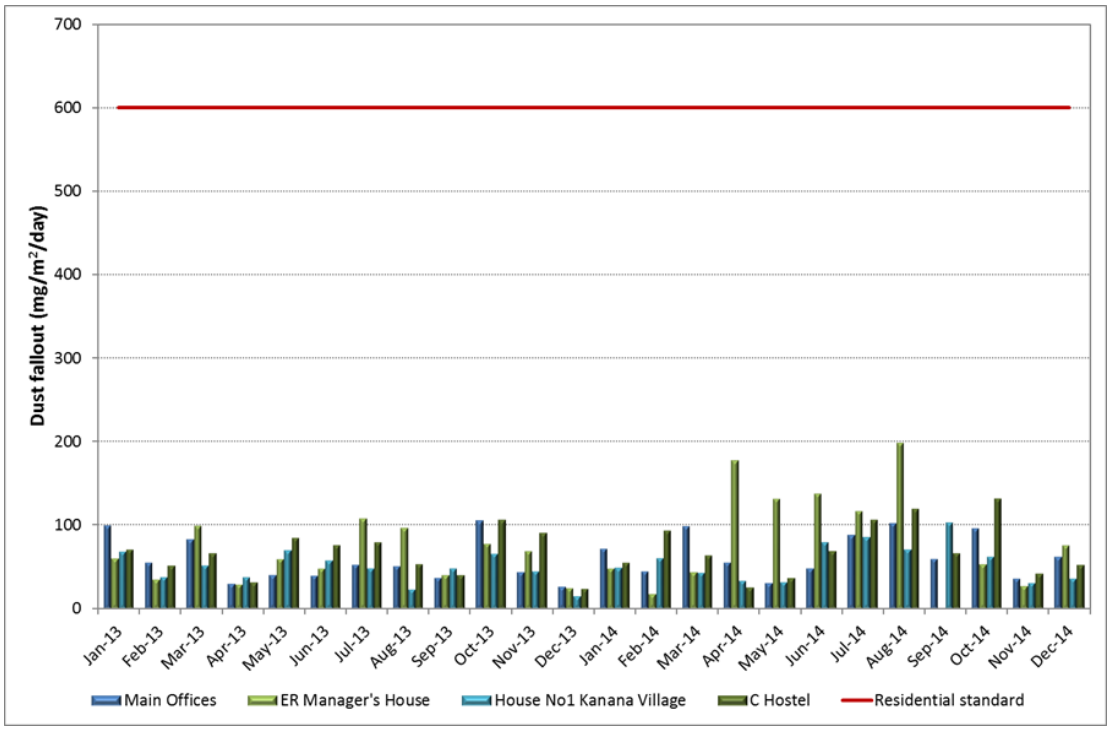


Figure 29: Dust fallout measured at residential locations for the period January 2013 – December 2014

Sensitive Areas

Seven sensitive areas (sensitive receptors/resources) in relation to air quality have been identified for RPM-US as indicated in **Figure 32**.

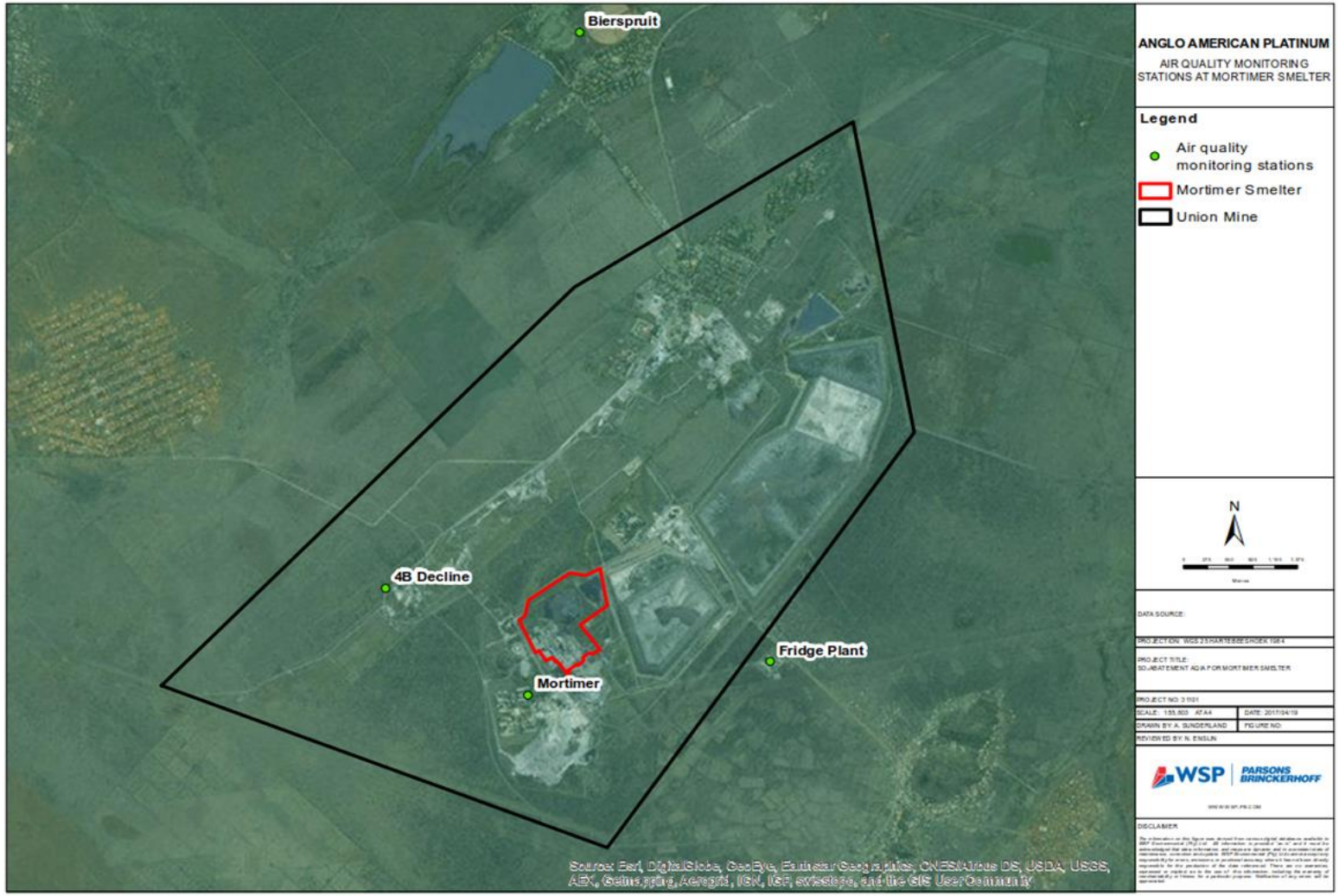


Figure 30: Ambient Air Quality Monitoring Stations at Mortimer Smelter

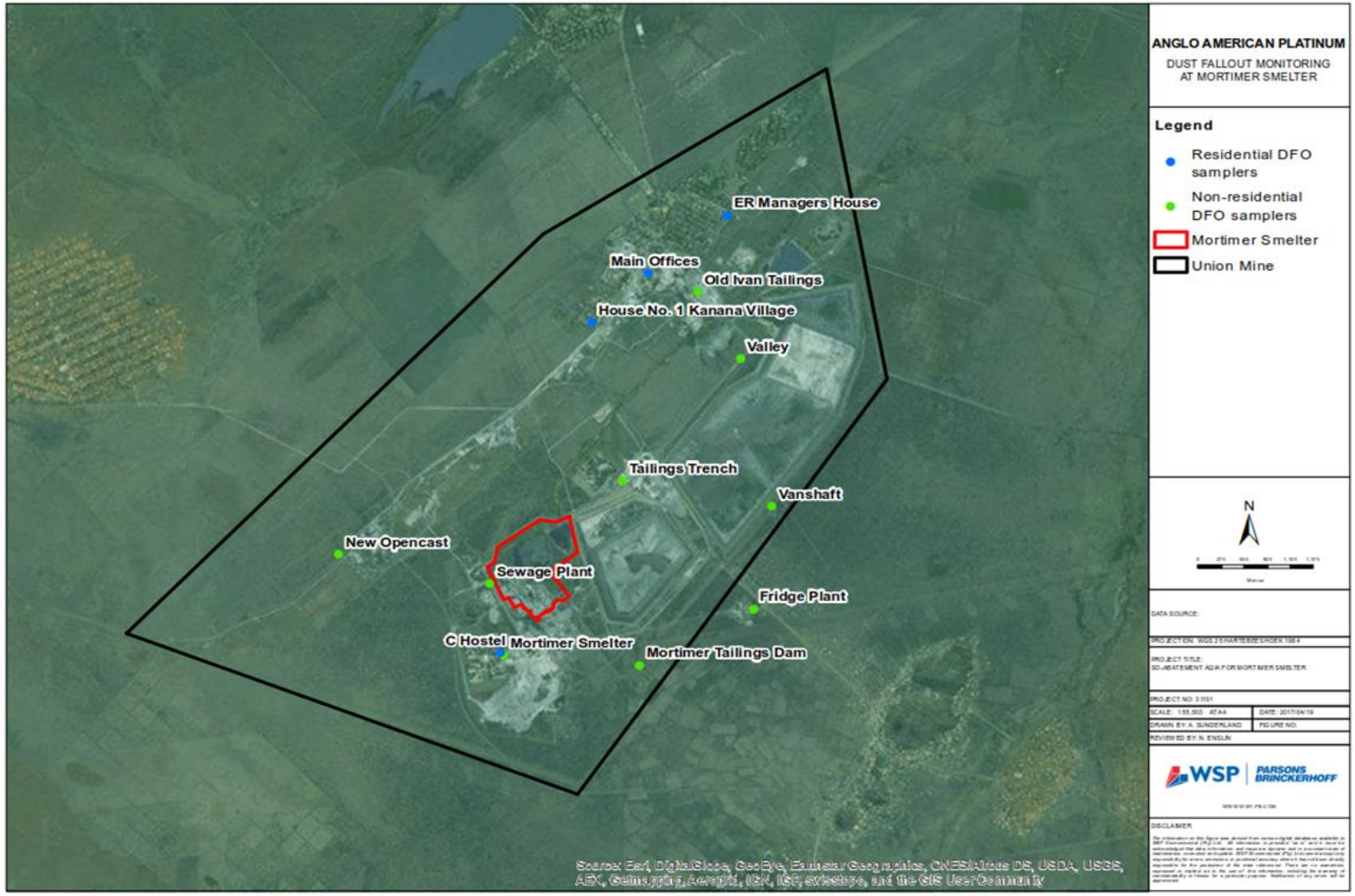


Figure 31: Dust fallout monitoring at Mortimer Smelter

Figure 32: Sensitive Receptors

HYDROLOGY

Regional Description

Water Management Area

RPM-US straddles the A24D, A24E and A24F quaternary catchments within Water Management Area 2 as shown in **Figure 33**. 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.

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.

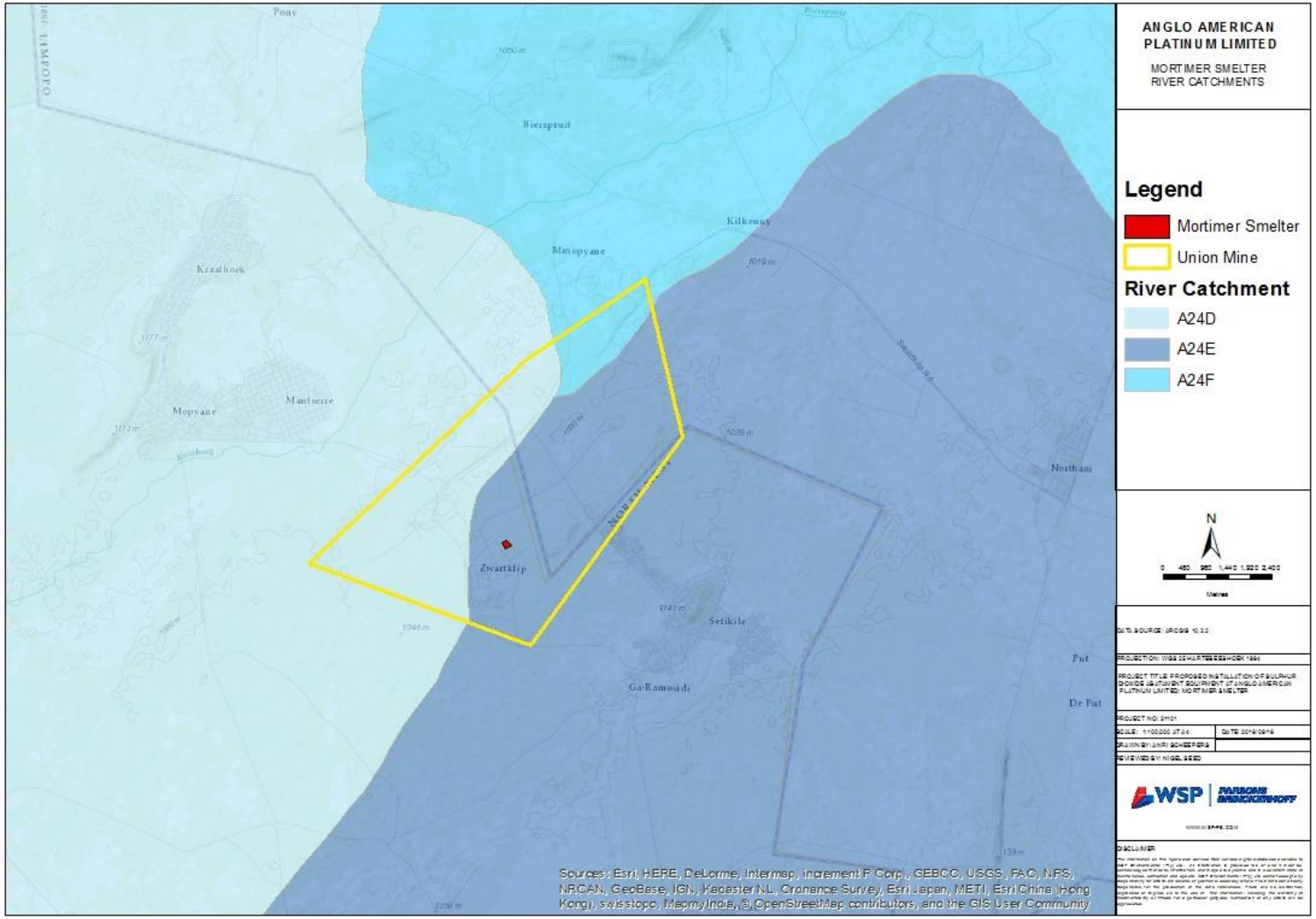


Figure 33: River Catchment Areas

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 14**.

Table 14: Mean Annual Runoff

River Name	Area (km^2)	MAR (ml/m^3)	Infrastructure Area (km^2)	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 %

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.

Floodlines

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. Refer to **Figure 34**.

River diversions

No streams, natural drainage lines or rivers have been diverted from their natural route.

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.

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.

Industrial use

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 Raw Water Dams.

Recreational use

The Bierspruit Dam is used for recreational purposes such as water sports.

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.

Irrigation

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

Aquatic ecosystems

The spruits are ephemeral and therefore aquatic ecosystems in the natural watercourses are limited.

Surface Water Quality

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.

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.

Development Site Description

Due to the historical nature of RPM-US and use of in-stream return water dams, the Mortimer Spruit within the mine lease area is operated as a dirty water channel and flows to the Barbers return water dam where dirty water is contained under normal operating conditions. Overflows from Fraser Alexander return water dam will drain to Barbers return water dam via Mortimer Spruit.

Below Barbers return water dam is the Game Farm flood storage dam which is the furthest downstream dirty water containment facility within the mine lease area. Game Farm flood storage dam should be kept as dry as possible to allow major flood events to be stored and settled in the dam before overflowing into the natural watercourse. However, overflows to the Brakspruit from Game Farm flood storage dam were recorded in December 2009, April 2010 and December 2010 after heavy rainfall.

Stormwater runoff from west of the Mortimer Spruit including Ivan Shaft area and No. 1 and No. 2 sewage treatment plants flows to Barbers Pan. Overflows from Barbers Pan will drain to Barbers return water dam and ultimately Game Farm flood storage dam via Mortimer Spruit.

Clean water diverted around the west of Barbers return water dam and Game Farm flood storage dam flows to the Brakspruit immediately downstream of Game Farm flood storage dam.

There are no stormwater dams at the concentrators or smelters as runoff is drained to the tailings return water dams.

Sensitive Areas

The sensitive areas (sensitive receptors) in relation to water quality are illustrated in **Figure 35**, and include the:

- Bierspruit
- Brakspruit

The sensitive areas will be susceptible to the release of pollution within the Mortimer Smelter as a result of inadequacy or failure of the site stormwater management system.

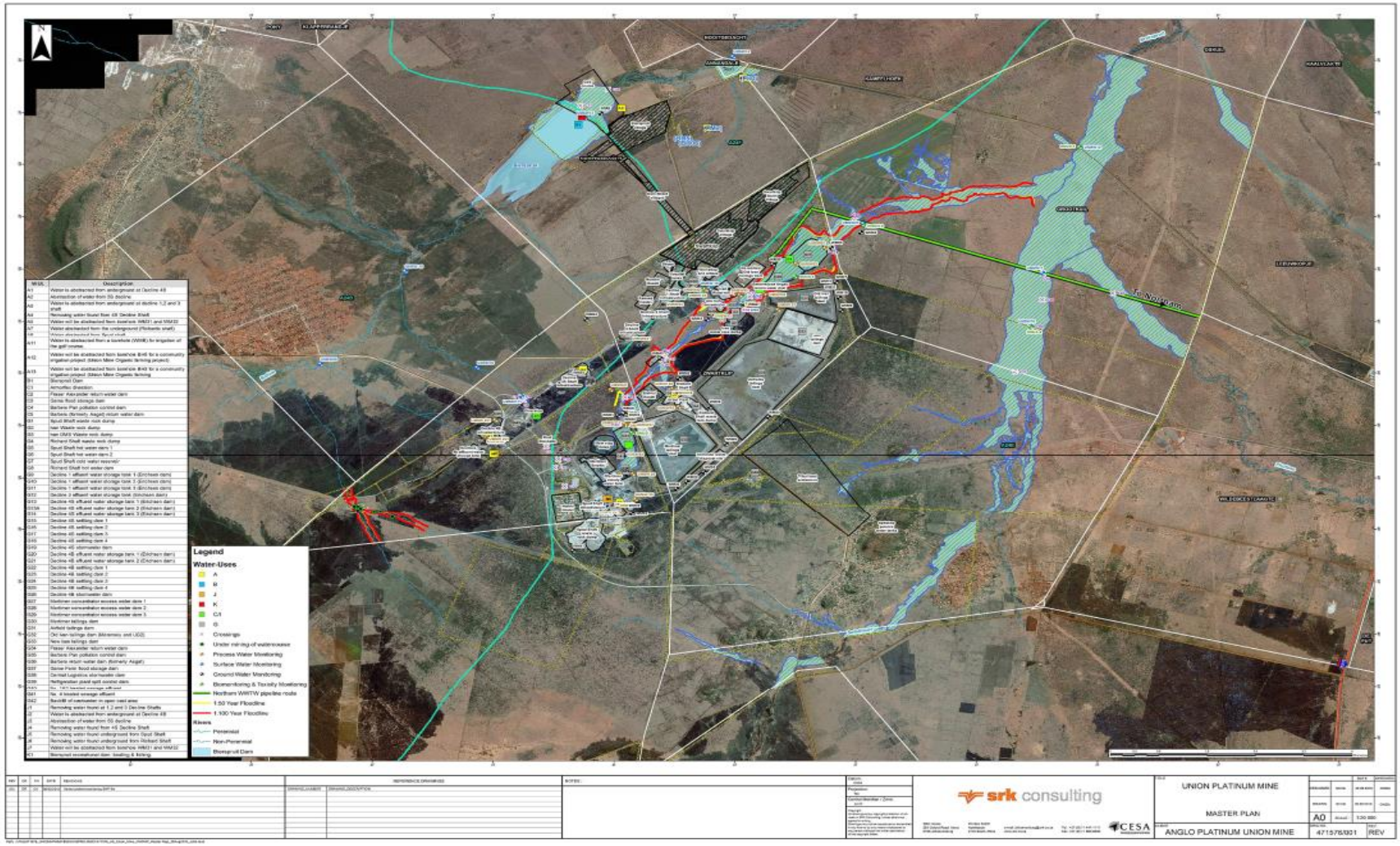


Figure 34: RPM-US Surface Water Plan

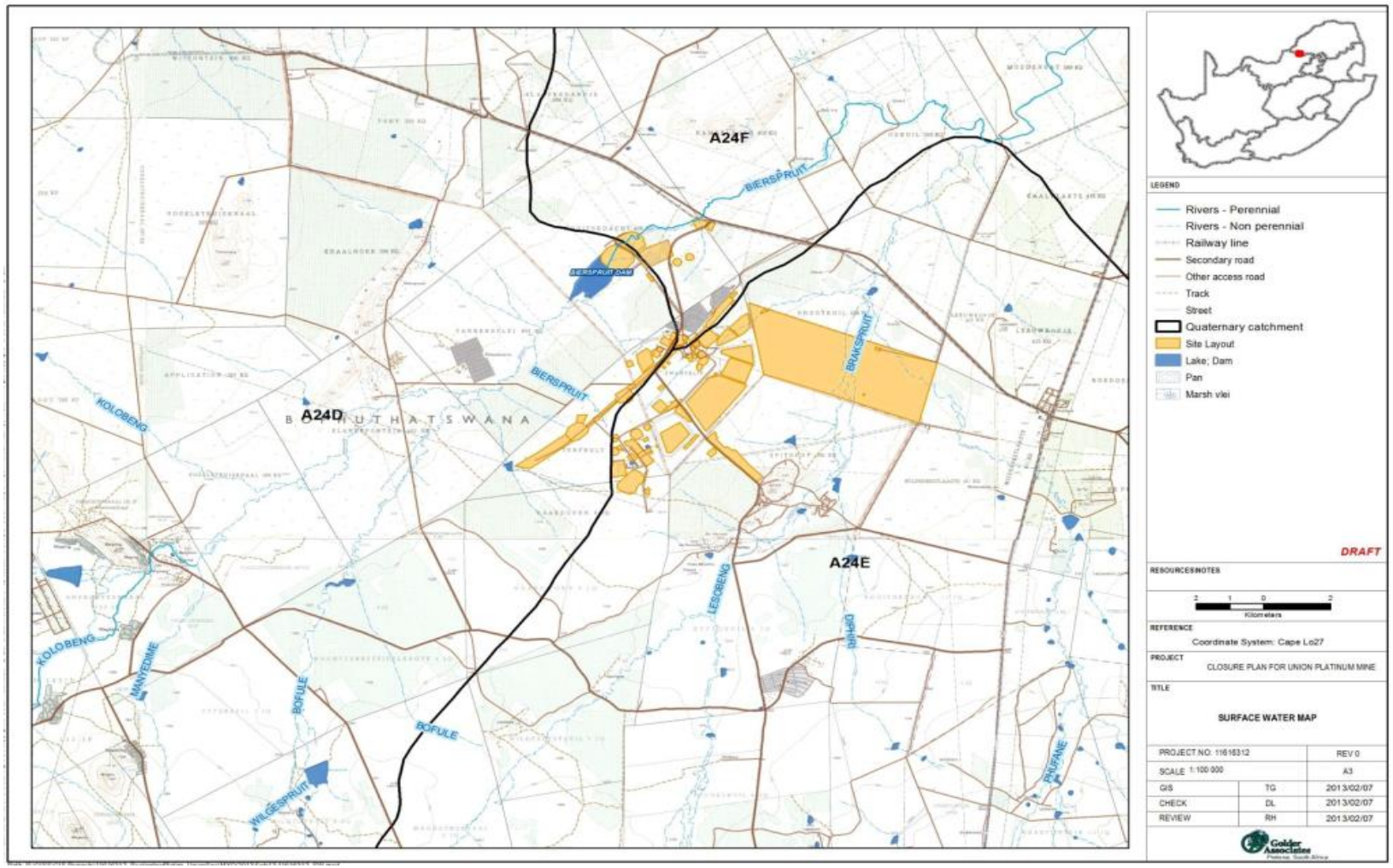


Figure 35: Surface Water System

GROUNDWATER

Regional Description

Aquifer Characteristics

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. 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^3/hr to 5m^3/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 m3/hr at WM9 and WM32, 20 m^3/hr at WM 26 and 35 m^3/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^3/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 10-4 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. 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.

Presence of Springs

There are no springs reported in the area.

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 WRDs and TSFs with a general deterioration in groundwater quality associated with the reside 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.

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, see detail below:

- Domestic
  - 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.
- Industrial
  - 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 (±1.1 million m^3/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 TSFs, WRDs 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.
- 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.
- Livestock watering.

- The potential exists for game and cattle to drink from groundwater resources.

Development Site Description

The aquifer characteristics are consistent with the regional description provided above. The rest groundwater level in the vicinity of the Mortimer Concentrator Complex is approximately 3m below ground level.

Groundwater data from monitoring points adjacent to the Mortimer Smelter indicate that the water quality south east of the Smelter is more impacted on than north of the Smelter. It is also important to note that the water quality for the total dissolved solids (TDS), arsenic, chloride and mercury lie outside the target water quality ranges for either irrigation or livestock watering.

Sensitive Areas

Irrigation or livestock watering are sensitive areas should the groundwater quality not be within the required limits.

ENVIRONMENTAL NOISE

Regional Description

Noise levels 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 15**. Noise measurements are not taken at the mining areas.

Table 15: Noise Measurements

Area	Measurement (dBA)
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

Area	Measurement (dBA)
Salvage yard	12
Rockdrill	10

Development Site Description

Ambient sound level measurements were undertaken at Mortimer Smelter on 23 May 2012 at nine locations in and around the smelter as presented in **Figure 38**. These locations were selected to be representative of current baseline conditions of industrial land use. All sound level measurements were free-field measurements (i.e. at least 3.5 m away from any vertical reflecting surfaces). Measurement procedures were undertaken according to the relevant South African Code of Practice SANS 10103:2008. This guides the selection of monitoring locations, microphone positioning and equipment specifications.

Average day-time (L_{Aeq}) sound levels from all the locations adhered to the relevant SANS 10103 industrial guideline (70 dB(A)), with the exception of NS 06 which exceeded the guideline by 9 dB(A). The dominant noise source for NS 06 was most likely from the furnace hearth cooling fans. As such, the Mortimer Smelter noise climate can be described as predominantly industrial. The day-time monitored levels are considered an accurate representation of ambient conditions, with limited impact from external sources.

During the night-time, existing ambient sound levels at all locations did not adhere to the relevant SANS 10103 industrial guideline (60 dB(A)), except for NS 09 which is located 50 m from the fence line of the site. The flash dryer and other plant operations contributed to the elevated ambient levels recorded at night at all locations.

Ambient sound level monitoring results are presented in **Table 16** and **Table 17** and illustrated in **Figure 36** and **Figure 37**.

Table 16: Day-time Noise Monitoring Results

ID	L_{Aeq} (dBA)	L_{Amax} (dBA)	L_{Amin} (dBA)	SANS guideline (dBA)
NS 01	69.1	77.6	67.0	70
NS 02	64.9	80.7	59.1	70
NS 03	65.8	73.9	63.3	70
NS 04	67.4	73.4	62.5	70
NS 05	65.4	72.3	62.6	70
NS 06	**79.0**	84.0	77.5	70
NS 07	65.6	69.9	64.1	70
NS 08	61.9	74.7	58.9	70
NS 09	62.7	85.0	47.5	70

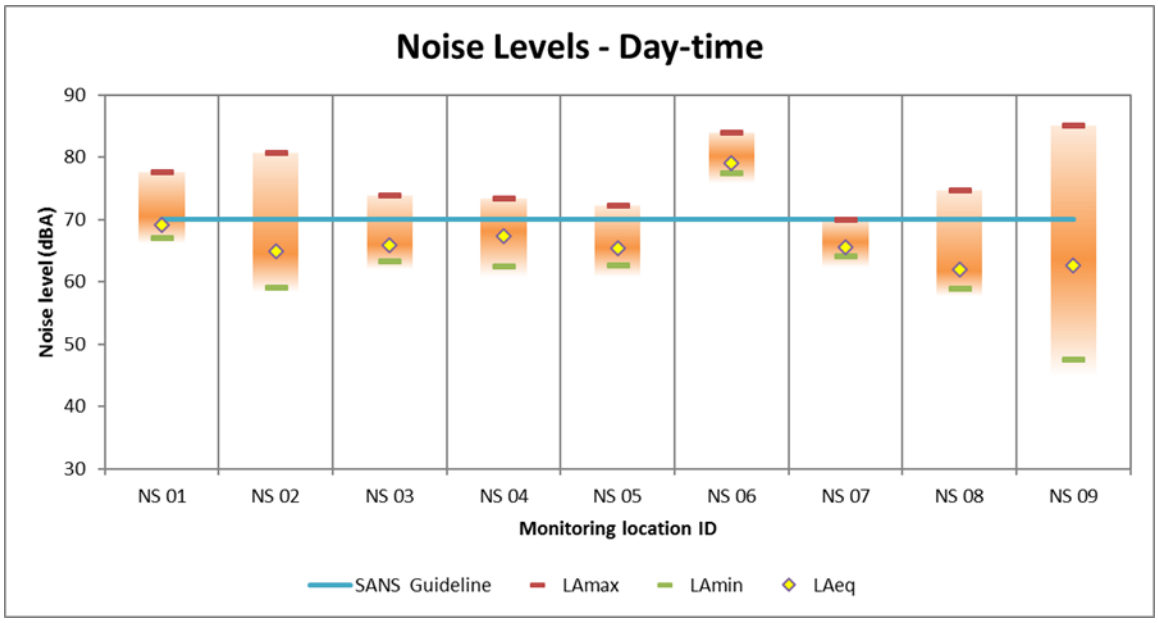


Figure 36: Day-time Environmental Baseline Noise Monitoring Results

Table 17: Night-time Noise Monitoring Results

ID	L_{Aeq} (dBA)	L_{Amax} (dBA)	L_{Amin} (dBA)	SANS guideline (dBA)
NS 01	**69.4**	87.8	67.4	60
NS 02	**63.1**	77.2	58.8	60
NS 03	**64.2**	77.4	62.3	60
NS 04	**66.1**	69.3	64.8	60
NS 05	**64.2**	73.0	62.4	60
NS 06	**77.7**	80.7	76.4	60
NS 07	**65.0**	77.7	63.8	60
NS 08	**61.6**	73.0	58.8	60
NS 09	58.9	81.6	48.8	60

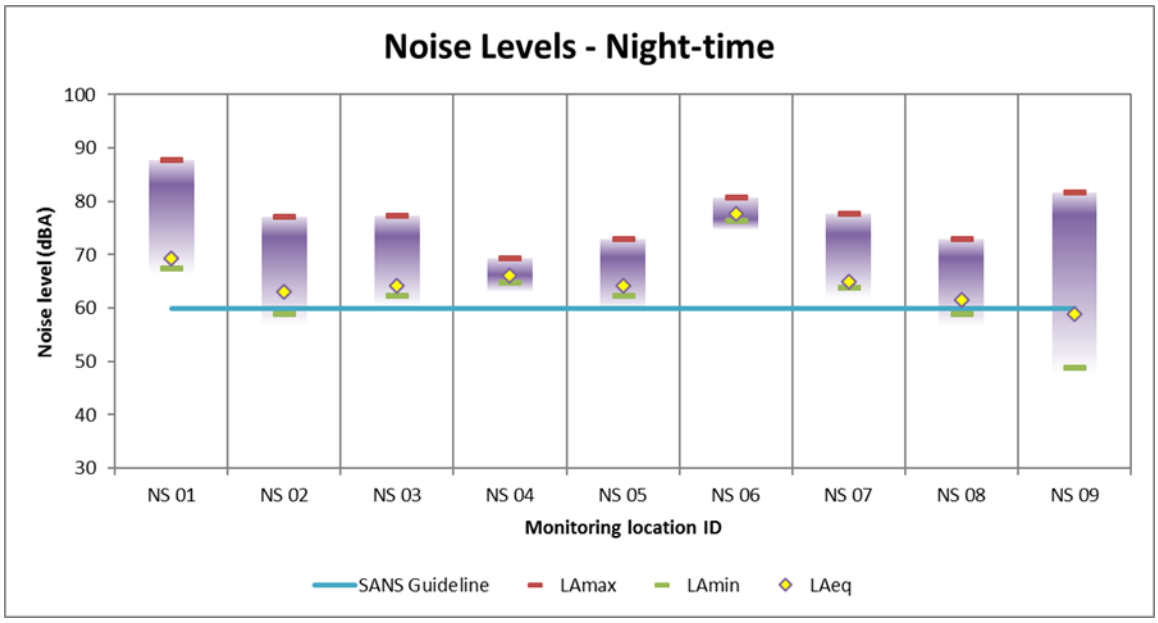


Figure 37: Night-time Environmental Baseline Noise Measurement Results

Sensitive Areas

Sensitive receptors have been identified in the region surrounding the proposed operations within a 10 km radius of the site boundary and are presented in **Table 18** and illustrated in **Figure 39.**

Table 18: Locations and Distances of the Receptors Surrounding the Proposed Development within 10km Radius

Sensitive Receptor	Distance from Nearest Site Boundary (km)	Latitude (S)	Longitude (E)
Workers' Accommodation	0.26	24°58'35.95"	27° 8'24.33"
Swartklip	3.58	24°56'49.03"	27°9'45.23"
Ga-Ramodisi	4.43	25°0'10.97"	27°10'14.85"
Sefikile	4.97	24°59'24.47"	27°11'15.92"
Mantserre Residential Area	5.65	24°56'48.44"	27°05'38.49"
Mopyane	7.58	24°56'45.10"	27°04'17.86"
Kraalhoek	8.97	24°55'06.78"	27°04'27.68"
Mononono	9.54	25°02'55.24"	27°11'16.71"

Figure 38: Location of Acoustic Monitoring Points

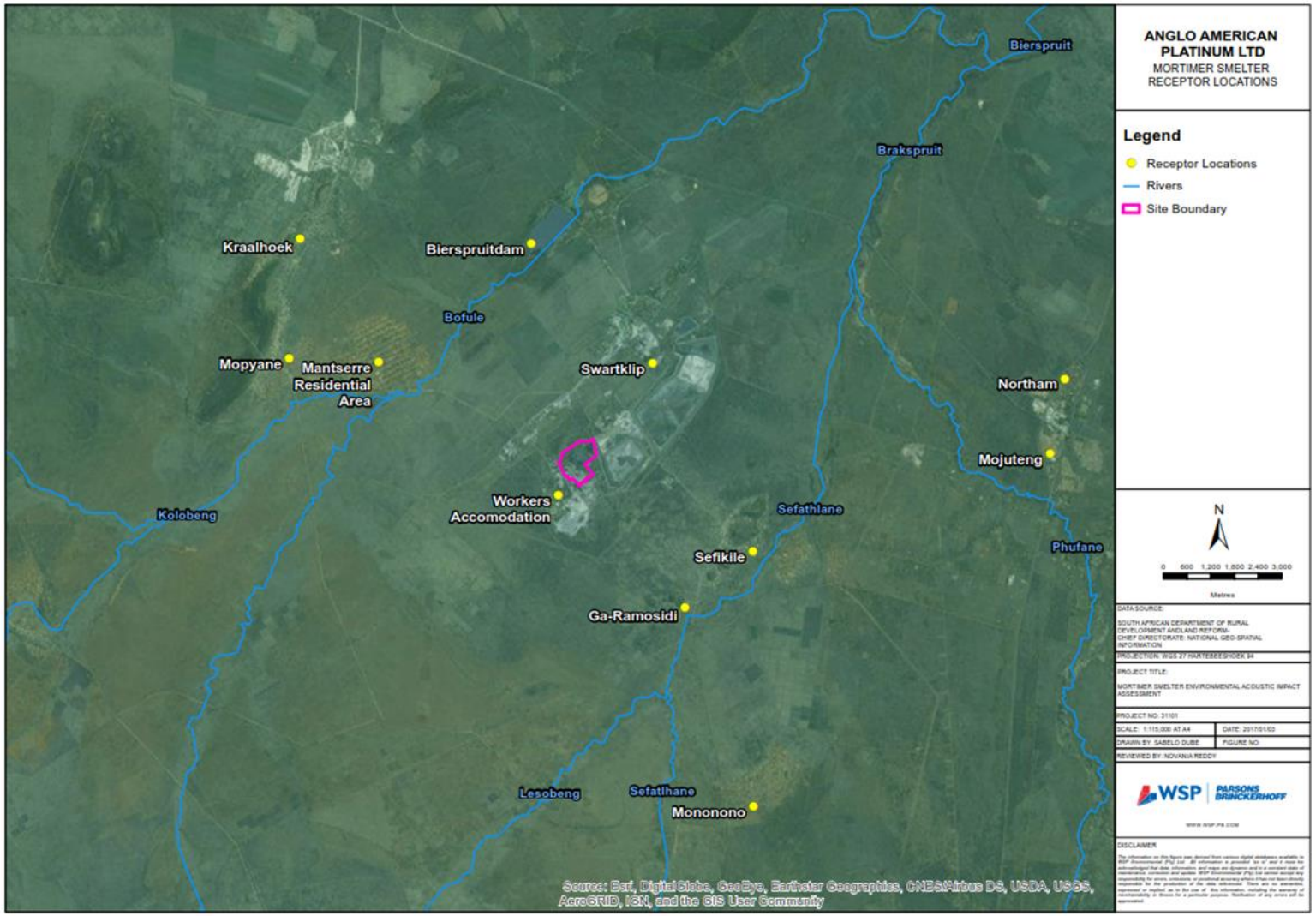


Figure 39: Acoustic Sensitive Receptor Locations

ARCHAEOLOGY AND CULTURAL HERITAGE

Regional Description

Stone Age

The Stone Age is the period in human history when lithic material was mainly used to produce tools (Coertze & Coertze 1996: 293). In South Africa the Stone Age can be divided in three periods. It is, however, important to note that dates are relative and only provide a broad framework for interpretation. The division for the Stone Age according to Korsman & Meyer (1999: 93-94) is as follows:

- Early Stone Age (ESA) 2 million – 150 000 years ago
- Middle Stone Age (MSA) 150 000 – 30 000 years ago
- Late Stone Age (LSA) 40 000 years ago – 1850 - A.D

The closest known Stone Age site in the vicinity of Northam is a number of Late Stone Age sites in the Magaliesberg Mountains, which lies approximately 100 km to the south. A rock art site is known to the northeast. Rock engravings are found to the south and east of Rustenburg (the latter lying about 100 km to the south of the surveyed area). These date back to the Late Stone Age (Bergh 1999: 4-5).

Iron Age

The Iron Age is the name given to the period of human history when metal was mainly used to produce metal artifacts (Coertze & Coertze 1996: 346). In South Africa it can be divided in two separate phases according to Van der Ryst & Meyer (1999: 96-98), namely:

- Early Iron Age (EIA) 200 – 1000 A.D.
- Late Iron Age (LIA) 1000 – 1850 A.D.

Huffman (2007: xiii) however, indicates that a Middle Iron Age should be included. His dates, which now seem to be widely accepted in archaeological circles, are:

- Early Iron Age (EIA) 250 – 900 A.D.
- Middle Iron Age (MIA) 900 – 1300 A.D.
- Late Iron Age (LIA) 1300 – 1840 A.D.

Many Late Iron Age sites have been identified in the area around the towns of Rustenburg, Koster and Groot Marico as well as in the Waterberg Mountains. This however excludes the surveyed area (Bergh 1999: 7-8). During earlier times the area was inhabited by Tswana groups, namely the Fokeng and Kwena. These people fled from Mzilikazi during the Difaquane, but later on returned (Bergh 1999: 9-11).

Historical Age

The historical age started with the first recorded oral histories in the area. It includes the moving into the area of people that were able to read and write. This era is sometimes called the Colonial era or the recent past.

Due to factors such as population growth and a decrease in mortality rates, more people inhabited the country during the recent historical past. Therefore and because less time has passed, much more cultural heritage resources from this era have been left on the landscape. It is important to

note that all cultural resources older than 60 years are potentially regarded as part of the heritage and that detailed studies are needed in order to determine whether these indeed have cultural significance. Factors to be considered include aesthetic, scientific, cultural and religious value of such resources.

Early travelers have moved through this part of the Northwest and Limpopo Provinces. The first of these was the expedition of Dr. Andrew Cowan and Lt. Donovan in 1808. They were followed by Robert Scoon and William McLuckie in 1827 and 1829 and Dr. Robert Moffat and Reverend James Archbell in 1829 (Bergh 1999: 12, 117-119).

Hume again moved through this area in 1830 followed by the expedition of Andrew Geddes Bain in 1831. After them came Dr. Andrew Smith in 1835 (Bergh 1999: 13, 120-121). Hume again moved through the area with Scoon in 1835. In 1836 William Cornwallis Harris visited the area. The well-known explorer Dr. David Livingston passed through this area in 1847 (Bergh 1999: 13, 119-122).

In 1837 the Voortrekkers also moved through the Swartruggens area (Bergh 1999: 11). During this year a Voortrekker commando moved out against Mzilikazi and was engaged in a battle with his impi to the north of Swartruggens. The area surveyed was inhabited by white settlers between 1841 and 1850 (Bergh 1999: 14-15).

Historical structures, such as farm houses and infrastructure relating to these times, may therefore be found in the area. It also is possible to find graves from this era, which indeed was the case during previous surveys close to Northam (SAHRA's SAHRIS database, Archaetnos database).

Development Site Description

No sites of cultural heritage significance were located during the survey.

Stone Age

No natural shelter exists in the surveyed area, but the mountains to the north-east may have sheltered Stone Age people. The low hills in and around the surveyed area also may have provided shelter. The area probably provided good grazing and the abundance of water make it very likely that Stone Age people may have utilized the surroundings for hunting purposes. One may therefore find Stone Age material out of context lying around, although none was identified during the survey.

Iron Age

Three Iron Age sites were found during a survey close to Northam previously (Archaetnos database). This coupled with a suitable environment proves that these people utilized this area as it would have provided good grazing and water for livestock. There also is ample building material.

Sensitive 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.

VISUAL

Regional Description

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.

Development Site Description

The development site is characterised by the industrial activities associated with the Mortimer smelter.

Sensitive Areas

There are no sensitive areas associated with the visual characteristics.

SOCIO-ECONOMIC STRUCTURE

Regional Description

RPM-US straddles the borders of both the Limpopo and the North West Provinces, however Mortimer Smelter is only located in the North West Province and as such only socio-economic information for the North West Province is provided.

The proposed project falls within the Moses Kotane Local Municipality within the Bojanala District Municipality of the North West Province. The North West Province is an inland province covering an area of 106 512km^2, that borders Botswana to the north and the Northern Cape, Free State, Gauteng and Limpopo to the west, south, east and north-east respectively.

The North West Province was formed in 1994 by the merger of the former homeland, Bophuthatswana, and the former Western Transvaal region. The largest centres within the province include Rustenburg, Brits, Potchefstroom, Orkney, and Klerksdorp which are key mining and economic centres for the province. In 2011, the total population was estimated to be 3,5million people and the Black African group (**Figure 40**) constitutes the majority of the population (Statistics SA, 2011).

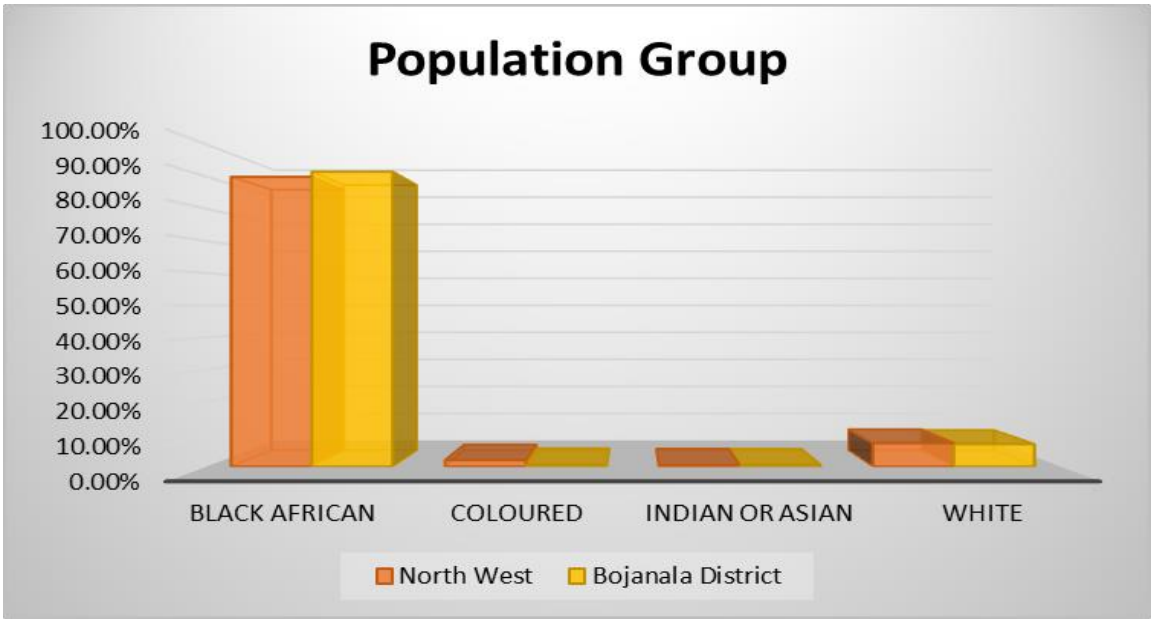


Figure 40: Population Group for the North West and Bojanala Platinum District Municipality (Statistics SA, 2012)

Mining and agriculture are the two key economic sectors with a comparative advantage in the province. Mining contributes 23.3% to the North West economy, and makes up more than a fifth of the South African mining industry as a whole. Key mining companies in the area include the Anglo American Platinum, Royal Bafokeng Platinum, Impala Platinum and Lonmin mining groups. These mining activities are concentrated around the Rustenburg and Brits area. The second largest contributor to the local economy is farming, including sheep, cattle and game farms in the northern regions, and maize, sunflowers, tobacco, cotton and citrus crops in the southern and eastern regions.

Bojanala District Municipality

The Bojanala Platinum District Municipality comprises five local municipalities (Moretele, Madibeng, Rustenburg, Kgetleng and Moses Kotane) and covers an area of approximately 18 333km^2. The district municipality can be classed as being rural because 54% of the land falls under traditional areas (**Figure 41**) and 55.14% of the dwellings are traditional settlement types (Statistics SA, 2012).

The Black African (91.4%) population group dominates the Bojanala Platinum District Municipality with Setswana (54.27%) being the most spoken language followed by Xitsonga (7.9%) and Afrikaans (7.07%) (**Figure 42**). The population of the district municipality is male dominated (52.37%) which is an outcome of the prevalent economic activities (mining) in the region. A fair size of the population have some form of schooling and 19.2% have completed their Matric. A challenge is to increase the numbers of the skilled level group people with Matric and a Bachelor's degrees (0.53%) (Statistics SA, 2012).

The Bojanala Platinum District Municipality is the economic growth engine of the North West Province and contributes to majority of total production output and employment opportunities within the province. The mining sector is the biggest employer (43%) followed by trade (15.4%). and of 20.89% employed in the formal sector and 3.91% employed in the informal sector. The income levels within the district remain very low (**Figure 43**) with 43.7% having no income and 34.08% earning between R1- R3, 200 (Statistics SA, 2012).

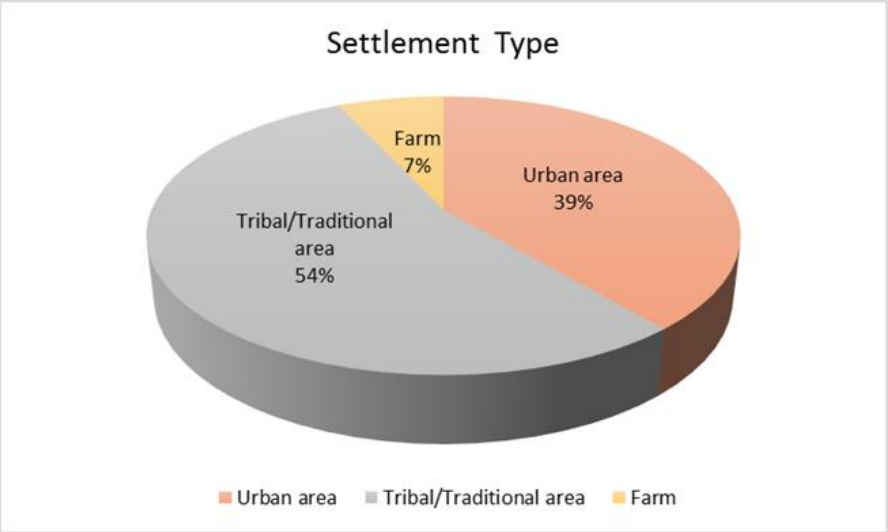


Figure 41: Bojanala Platinum District Municipality Settlement Type (Statistics SA, 2012)

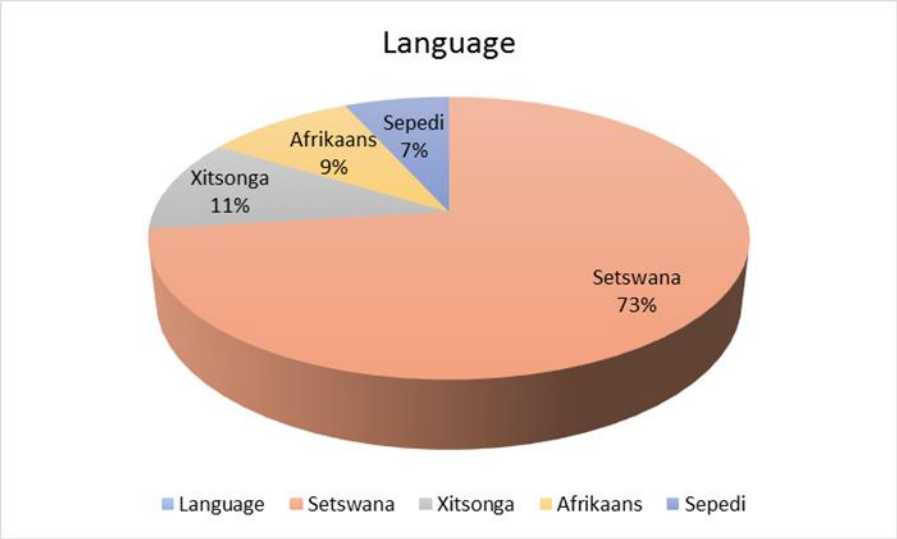


Figure 42: Dominant Languages within Bojanala Platinum District Municipality (Statistics SA, 2012)

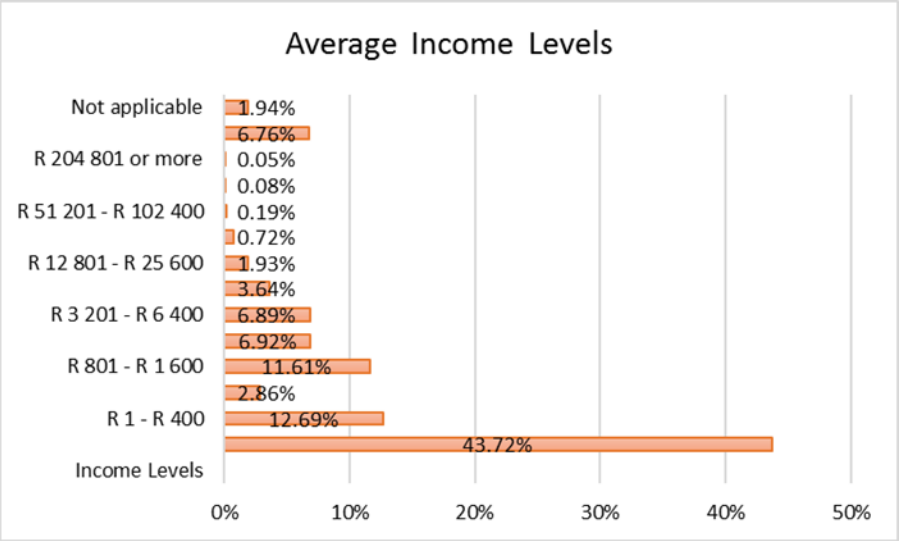


Figure 43: Average Household Income within Bojanala Platinum District Municipality (Statistics SA, 2012)

Moses Kotane Local Municipality

The local context refers to the area surrounding the site contextualised within the local municipality. The proposed project site is located within the Moses Kotane Local Municipality. Moses Kotane Local Municipality is bordered by Limpopo's Thabazimbi Local Municipality in the north and the Kgetlengrivier and Rustenburg Local Municipalities to the south. The seat of local government is located in the town of Mogwase, and the main economic sectors are tourism, mining and agriculture.

The Moses Kotane Local Municipality covers an area of approximately 5,719km^2, has a population of approximately 242 554 people, and a population density of 42 person per square kilometre (Statistics South Africa, 2012). The dominant population group is the Black African (98,3%), followed by Whites (0.8%) and others (1%), as depicted in **Figure 44**. The population has a slightly higher number of more (50.31%) than males (49.69%). The main languages spoken are Setswana (80.5%) and IsiZulu (4%) (Statistics South Africa, 2012) (**Figure 44**).

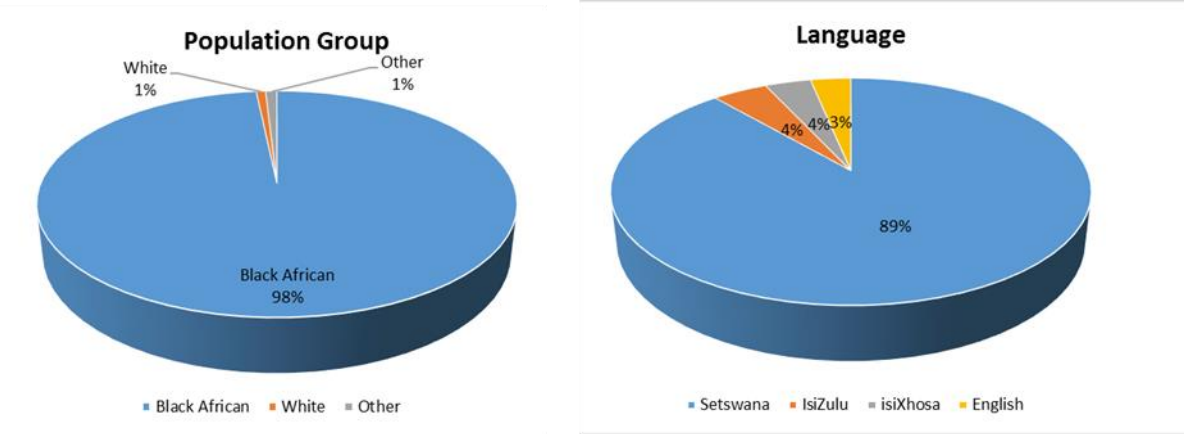


Figure 44: Dominant Population and Languages Spoken within Moses Kotane Local Municipality (Statistics SA, 2012)

The dependency ratio (the number of dependents ages zero to 14 years and over the age of 65 years as a percentage of the total population) is 58.6% which is relatively high compared to the National level of 52.14% in 2015 (Indexmundi, 2016), which could be explained by the proportionally high number of young adults (20 – 35 years) (**Figure 45**).

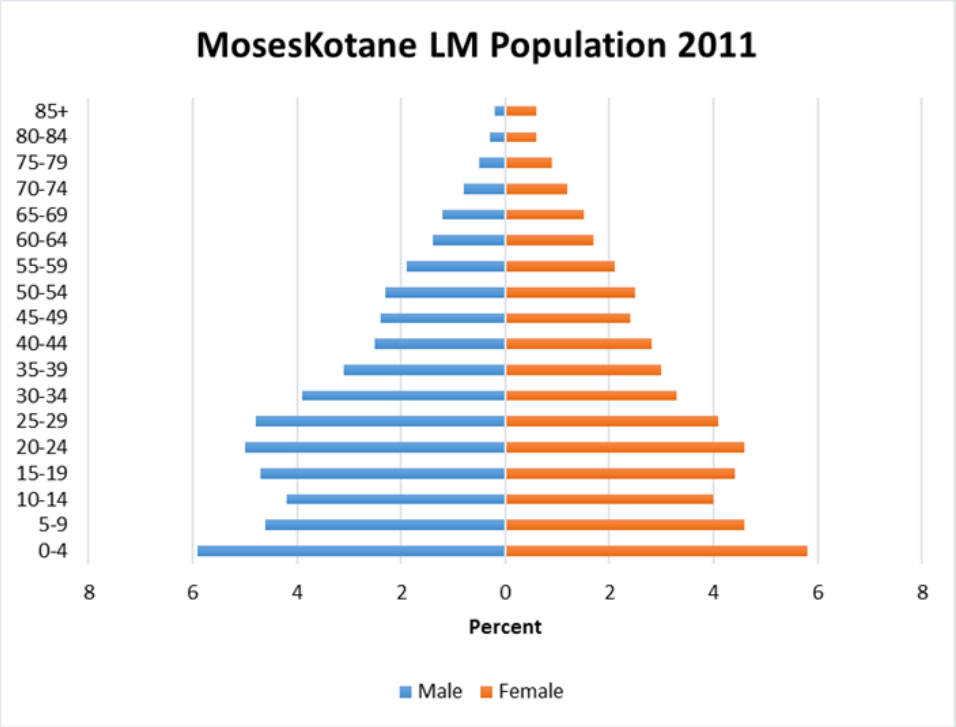


Figure 45: Moses Kotane Population Pyramid (Statistics SA, 2012)

The municipality is largely rural in nature and comprises of 107 villages and two formal towns, namely Mogwase and Madikwe. The largest concentration of settlements occur along the southern and eastern periphery of the Pilanseberg. The human settlement is concentrated within tribal authority areas (92.4%) and only 7.4% living in urban areas. The main dwelling type is formal with 75.56% of houses being of bricks and 11.79% of informal settlements (Statistics South Africa, 2012).

Service delivery within the Moses Kotane Local Municipality varies, and the absence of services is largely due to a lack of infrastructure and underdevelopment. Access to electricity is good with 89.9% of the households having access to electricity for lighting, 89.9% for cooking and 63.5% for heating. However, sanitation levels are poor with only 12.3% having access to flush toilets and 67.6% of the population utilising pit toilets without ventilation. Water service provision is fairly good with 80% of potable water is provided by the municipality and other water service providers, and 9.7% is sourced from boreholes (Statistics South Africa, 2012).

The unemployment rate in the Moses Kotane Local Municipality is extremely high with 51% of the potential labour force being unemployed (IDP, 2017), compared with the current national unemployment rate of 25.4% (Statistics SA, 2016). The main economic sectors within the Moses Kotane Local Municipality are mining, agriculture, tourism, and community and social services. The majority (14.76%) of employed persons fall within the formal sector, and 2.62% within the informal sector (Statistics South Africa, 2012).

The education levels within the Moses Kotane local municipality are average with 30.9% of people over 20 having a matric and only 7.5 % with no schooling. The education levels and skills training

are key determinants of the income levels (**Figure 46**) with 39.5% of the population earning an income range between R9 601 – R38 200 (Statics SA, 2012).

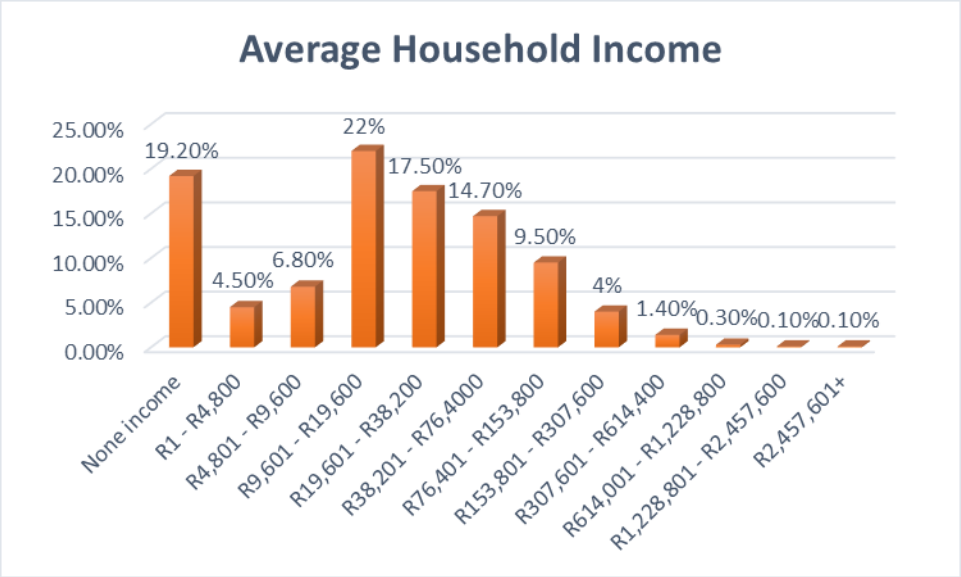


Figure 46: Average Household Income (Source: Statistics South Africa (2012)

The local economy is dominated by the mining sector, which forms the backbone of the provincial economy, contributing 42% to the GGP. Mining activities are mainly located in areas like Ledig, Sun City, Moruleng / Bakgatlha in Motlhabe area, Pilanesberg Platinum Mine, Thabazimbi (cross boarder) for Mantserre Community, Swartklip JV for Bakgatla, Ga Raborifi Batlhako Mine, Xstrata Mine and Dwaalboom for Mokgalwana village which is also a cross boarder to Thabazimbi Local Municipality (Moses Kotane IDP, 2016).

Agriculture is the second most important sector, contributing to 13% of the GGP and 18% of employment in the region. The municipality has 20 846 agricultural households and poultry production (42.4%) being the dominant agricultural activity (Statistics SA, 2012).

The Moses Kotane Local Municipality is strategically located in terms of important provincial tourism nodes. The Pilanesberg Nature Reserve and the Sun City are the main tourist attraction centres within the local municipality. Pilanesberg Game Reserve is less than 25km away from the project site and ranks amongst the world's outstanding geological wonders. There are a number of other smaller remote nature reserves such as the Madikwe, Impala, Kwa Maritane, Manyane and Bakgatla Game Reserves. Other tourism amenities include the Molatedi Dam, Madikwe Dam, the Roodeval farm and the Kolotwane River Valley. The proposed Pilanesberg / Madikwe Corridor (Heritage Park) tourism initiative has the potential to act as a catalyst for greater economic investment into the Moses Kotane Local Municipality.

(b) Description of the current land uses.

Regional Description

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 47**).

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.

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. RPM-US rehabilitates disturbed areas within their lease area on an ongoing basis.

The pre-development land uses at each area of RPM-US are summarised in **Table 19**.

Table 19: Pre-development Land Uses

Area: Shaft	Area: Process	Area: Support
Grazing	Storage area of materials e.g. Pipes and cable	Grazing
Previously mined UG2 reef using declines	Natural bush enclosed as RPM-US game park	
Abandoned shafts and other small areas of infrastructure		

Development Site Description

The land use on the development site consists of industrial activities associated with the Mortimer smelter. The proposed road expansion and contractors laydown area will be situated on area not yet cleared or levelled which may result in a minimal change to the land use, however these areas have already been disturbed by existing activities at the Smelter.

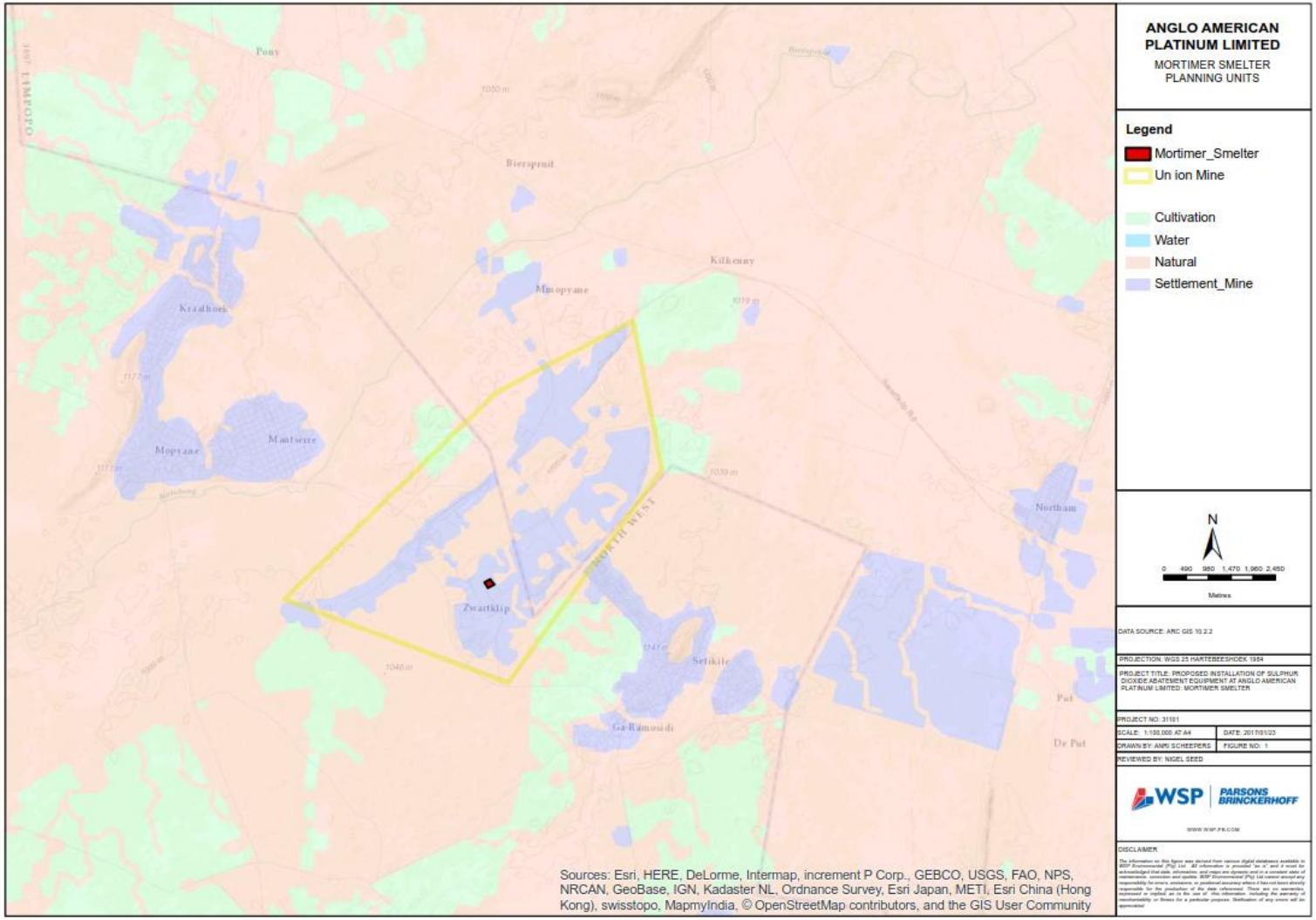


Figure 47: Land Use

(c) Description of specific environmental features and infrastructure on the site.

Regional Description

RPM-US exploits the Merensky and UG2 reefs of the Bushveld Complex for PGMs (Platinum, Palladium, Rhodium, Iridium, Ruthenium, Osmium and Gold). The Merensky reef is mined to an average depth of 1 400 m and it is intended that this depth will be extended to a depth of 2 000 m for down-dip. The UG2 reef is currently mined to an average depth of about 1 700 m. Opencast mining occurred on farm Turfbult 404 KQ to a depth of 35 m, in 200 m wide strips, however, mining ceased in 2006 and the area has subsequently been rehabilitated.

RPM-US has a combined estimated LoM for the next 50 years at a nominal production rate of 410 ktpm. RPM-US's mining infrastructure comprises decline shafts which are located parallel to the outcrop at regular intervals and includes the following shafts:

- Richard Vertical Shaft.
- Spud Vertical Shaft.
- Old Decline Shafts (Decline 1, Decline 2 and Decline 3).
- Decline Shaft 4 South, located within the previous opencast area.
- Decline Shaft 4B (the mining area was extended into the area designated as Decline Shaft 5 South project area during 2011. An additional chairlift from the surface has also been constructed to access the lower portions of 5 South).
- Ivan Decline Shaft for hoisting purposes.

The RPM-US also includes non-operational shafts, 22 Vertical Shaft and 28 Vertical Ventilation Shaft.

Ore mined at RPM-US is transported to the Mortimer UG2 Concentrator and the Mortimer Merensky Concentrator, at a rate of 235 and 84 ktpm respectively. The Ivan Concentrator receives mining residue from development reef as well as recovered residues from trenches, canals and tailings storage facilities (TSF's) at a rate of 110 ktmp.

Development Site Description

The development sites comprise a combination of vacant land and hard-standing areas associated with activities at the Mortimer smelter. The presence of any existing buildings or structures within the development footprint have been identified in the layout plan and is included in **Appendix 4**, Illustrations of the environmental and infrastructure features are provided in **Figure 48**.

View of Proposed Plant Area

Proposed Construction Access Road

Construction Laydown Area

Figure 48: Illustration of Environmental and Infrastructure Features

(d) Environmental and current land use map.

(Show all environmental, and current land use features)

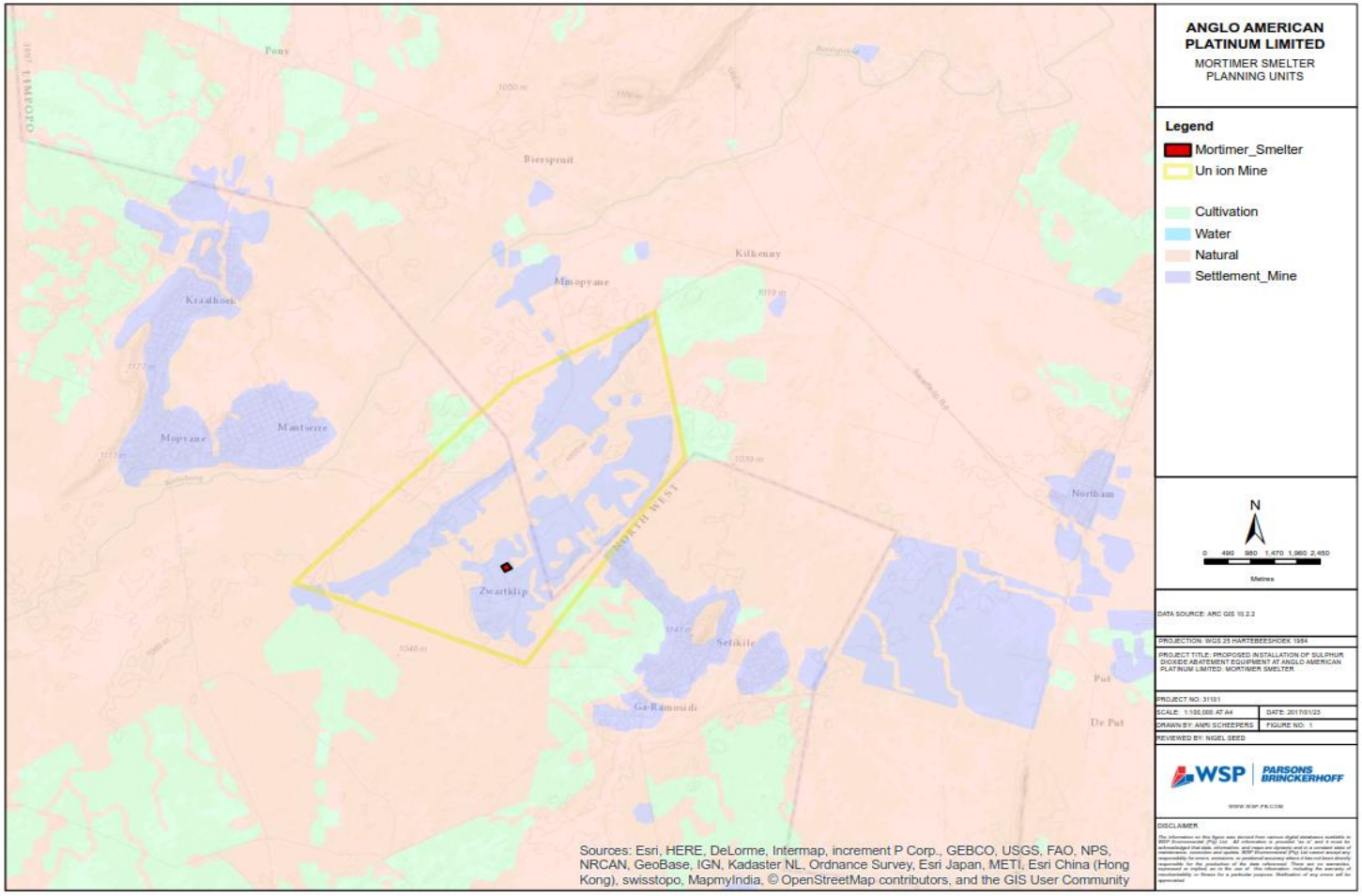


Figure 49: Land Use

v) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

Potential environmental and social impacts are described in **Table 20**.

Table 20: Potential Environmental and Social Impacts

No.	Impact Description	Phase	Without Mitigation						With Mitigation					
			Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance	Status
T1	Alteration of Topography	Construction	1	4	4	4	Medium	Ve -	1	3	2	3	Low	Ve -
T2	Restoration of Topography	Closure	1	5	4	4	Medium	Ve +	No mitigation proposed					
C1	Carbon Footprint	Construction	1	2	2	4	Low	Ve -	No mitigation proposed					
C2	Carbon Footprint	Operational	4	5	2	5	Medium	Ve -	4	5	2	5	Medium	Ve -
C3	Local Climate Change	Operational	4	5	2	5	Medium	Ve -	4	5	2	5	Medium	Ve -
C4	Project Emissions for the National Inventory and Climate Change	Cumulative	4	5	2	5	Medium	Ve -	4	5	2	5	Medium	Ve -
SL1	Contamination of soils	Construction	2	2	2	4	Low	Ve -	1	2	2	4	Low	Ve -
SL2	Change in Land Capability	Construction	1	2	2	3	Low	Ve -	1	2	2	3	Low	Ve -
SL3	Contamination of soils	Operational	2	3	4	4	Medium	Ve -	1	1	2	3	Low	Ve -

No.	Impact Description	Phase	Without Mitigation						With Mitigation					
			Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance	Status
SL4	Contamination of soils	Closure	2	5	4	3	Medium	Ve -	1	2	2	2	Low	Ve -
SL5	Quantity and Quality of Topsoil	Closure	3	3	4	4	Medium	Ve -	2	2	4	3	Low	Ve -
SL6	Ongoing Rehabilitation not to Standard	Closure	1	4	4	4	Medium	Ve -	1	1	2	3	Low	Ve -
SL7	Contradiction of SDF's	Closure	3	5	6	4	Medium	Ve -	1	1	2	3	Low	Ve -
SL8	Site-wide Rehabilitation	Closure	1	4	4	4	Medium	Ve -	1	1	2	3	Low	Ve -
FL1	Loss of Diversity of Indigenous Floral Communities	Construction	1	5	4	4	Medium	Ve -	1	5	2	3	Low	Ve -
FL2	Loss of Diversity of Indigenous Floral Communities	Operational	1	3	4	3	Low	Ve -	1	1	2	3	Low	Ve -
FL3	Invasive Species	Closure	2	5	6	4	Medium	Ve -	1	1	2	4	Low	Ve -
FL4	Land Degradation	Closure	1	5	4	3	Low	Ve -	1	1	2	2	Low	Ve -
FA1	Loss of Habitat for Faunal Communities Including Species of Conservation Concern	Construction	2	5	8	4	Medium	Ve -	1	5	6	3	Medium	Ve -
FA2	Loss of Fauna	Operational	1	3	4	3	Low	Ve -	1	1	2	3	Low	Ve -
AQ1	Impact of PM_{10} Concentrations on Receptors	Construction	2	2	4	4	Medium	Ve -	2	2	2	3	Low	Ve -

No.	Impact Description	Phase	Without Mitigation						With Mitigation					
			Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance	Status
AQ2	Impact of $PM_{2.5}$ Concentrations on Receptors	Construction	2	2	4	4	Medium	Ve -	2	2	2	3	Low	Ve -
AQ3	Impact of PM_{10} Concentrations on Receptors	Operational	2	5	2	3	Low	Ve -	2	5	2	2	Low	Ve -
AQ4	Impact of $PM_{2.5}$ Concentrations on Receptors	Operational	2	5	2	2	Low	Ve -	1	5	2	1	Low	Ve -
AQ5	Impact of SO_2 Concentrations on Receptors	Operational	2	5	4	3	Medium	Ve -	1	5	2	2	Low	Ve -
AQ6	Impact of NOx Concentrations on Receptors	Operational	1	5	2	1	Low	Ve -	1	5	0	1	Low	Ve -
AQ7	Impact of PM_{10} Concentrations on Receptors	Closure	2	2	4	4	Medium	Ve -	2	2	2	3	Low	Ve -
AQ8	Impact of $PM_{2.5}$ Concentrations on Receptors	Closure	2	2	4	4	Medium	Ve -	2	2	2	3	Low	Ve -
AQ9	Cumulative PM_{10} Concentrations	Cumulative	2	2	4	4	Medium	Ve -	2	2	2	3	Low	Ve -
AQ10	Cumulative $PM_{2.5}$ Concentrations	Cumulative	2	2	4	4	Medium	Ve -	2	2	2	3	Low	Ve -
AQ11	Cumulative SO_2 Concentrations	Cumulative	2	5	4	3	Medium	Ve -	1	5	2	2	Low	Ve -
H1	Surface Water Contamination	Construction	2	2	6	4	Medium	Ve -	1	2	4	3	Low	Ve -
H2	Surface Water Contamination	Operational	1	3	4	4	Medium	Ve -	1	2	2	3	Low	Ve -

No.	Impact Description	Phase	Without Mitigation						With Mitigation					
			Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance	Status
H3	Surface Water Contamination	Closure	2	2	6	4	Medium	Ve -	1	2	4	3	Low	Ve -
GW1	Groundwater Contamination	Construction	2	3	6	4	Medium	Ve -	1	1	4	4	Low	Ve -
GW2	Groundwater Contamination	Operational	3	3	6	4	Medium	Ve -	1	2	4	4	Low	Ve -
GW3	Groundwater Contamination	Closure	3	4	6	4	Medium	Ve -	1	1	4	2	Low	Ve -
EN1	Noise as a Result of Construction Activities	Construction	1	2	4	3	Low	Ve -	1	2	2	3	Low	Ve -
EN2	Acoustic Impact on Neighbouring Workers Accommodation	Operational	2	4	4	3	Low	Ve -	2	4	4	2	Low	Ve -
EN3	Acoustic Impact on Residential Receptors	Operational	2	4	4	2	Low	Ve -	2	4	4	2	Low	Ve -
EN4	Noise as a Result of Closure Phase	Closure	1	2	4	3	Low	Ve -	1	2	2	3	Low	Ve -
EN5	Cumulative Noise	Cumulative	2	2	6	4	Medium	Ve -	1	2	4	4	Low	Ve -
ACH1	Impact on Archaeological and Cultural Heritage	Construction	1	5	4	2	Low	Ve -	1	1	2	2	Low	Ve -
ACH2	Impact on Archaeological and Cultural Heritage	Closure	1	5	4	3	Low	Ve -	1	1	0	2	Low	Ve -
SES1	Employment Opportunities	Construction	3	2	4	3	Low	Ve+	3	2	4	4	Medium	Ve+

No.	Impact Description	Phase	Without Mitigation						With Mitigation					
			Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance	Status
SES2	Local Economic Development Opportunities	Construction	3	2	4	3	Low	Ve+	3	2	4	4	Medium	Ve+
SES3	Nuisances	Construction	2	2	4	3	Low	Ve -	2	2	2	2	Low	Ve -
SES4	Retention of Existing Employees	Operational	2	4	4	4	Medium	Ve+	2	4	6	4	Medium	Ve+
SES5	Improvement in Ambient Air Quality	Operational	2	4	2	3	Low	Ve+	2	4	2	3	Low	Ve+
SES6	Loss of Employment Opportunities	Closure	3	4	4	3	Medium	Ve -	3	4	4	3	Medium	Ve -
V1	Visual Impact	Construction	1	2	2	4	Low	Ve -	1	2	2	4	Low	Ve -
V2	Visual Impact	Operational	2	3	2	4	Low	Ve -	2	2	2	3	Low	Ve -
V3	Visual Impact	Closure	2	5	6	4	Medium	Ve -	2	2	2	3	Low	Ve -
HM1	Hazardous Materials Management	Construction	2	2	6	4	Medium	Ve -	1	2	2	3	Low	Ve -
HM2	Loss of Primary Containment of SO_3 Gas in the WSA Plant	Operational	2	1	4	2	Low	Ve -	1	1	2	2	Low	Ve -
HM3	Loss of Primary Containment of SO_2 Gas in the WSA Plant	Operational	1	1	4	2	Low	Ve -	1	1	2	2	Low	Ve -
HM4	Loss of Secondary Containment of Sulphuric Acid	Operational	1	1	2	2	Low	Ve -	1	1	2	1	Low	Ve -
HM5	Loss of Secondary Containment of	Operational	1	1	2	2	Low	Ve -	1	1	2	1	Low	Ve -

No.	Impact Description	Phase	Without Mitigation						With Mitigation					
			Extent	Duration	Magnitude	Probability	Significance	Status	Extent	Duration	Magnitude	Probability	Significance	Status
	Hydrated Lime / Effluent													
HM6	Cessation of Hazardous Activities	Closure	1	5	4	3	Low	Ve+	2	5	4	3	Medium	Ve+
HM7	Implementation of Proposed Project	Cumulative	2	4	4	4	Medium	Ve+	3	4	6	4	Medium	Ve+

vi) Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

Impacts were assessed in terms of the following criteria:

The nature, a description of what causes the effect, what will be affected and how it will be affected

Nature or Type of Impact	Definition
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

The physical extent:

Score	Description
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

The duration, wherein it is indicated whether the lifetime of the impact will be:

Score	Description
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned:

Score	Description
0	small and will have no effect on the environment.
2	minor and will not result in an impact on processes.
4	low and will cause a slight impact on processes.
6	moderate and will result in processes continuing but in a modified way.
8	high (processes are altered to the extent that they temporarily cease).
10	very high and results in complete destruction of patterns and permanent cessation of processes.

The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

- The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The status, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources; and
- The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula: S = (E+D+M)*P, where:

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	**Low**	**where this impact would not have a direct influence on the decision to develop in the area**
31-60 points	**Medium**	**where the impact could influence the decision to develop in the area unless it is effectively mitigated**
> 60 points	**High**	**where the impact must have an influence on the decision process to develop in the area**

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

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

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

The development is being located at the existing Mortimer smelter because the technology will need to be installed and connected to the existing gas cleaning equipment. The logistical and commercial

disadvantages of locating the project on an alternative site would require new facilities to be established, which would be unreasonable and potentially technically and/or commercially unviable. As such no site alternatives were considered.

The proposed project has the potential to result in impacts during the construction, operational and closure phase. The impacts are described in detail below.

GEOLOGY

Construction Phase

The proposed project will be located in the north-eastern section of the BIC, however the proposed project will not extend underground into geological features and there will be no impact.

Operational Phase

No environmental impact on geology is identified.

Closure Phase

No environmental impact on geology is identified.

Cumulative Impact

No environmental impact on geology is identified.

TOPOGRAPHY

Several sources of existing impacts to topography were identified; these include the existing Mortimer Smelter Plant infrastructure, roads, Fraser Dam, Slag Stockpile and Excess Water Dams. In addition the slag stockpile continue to increase in size.

Construction Phase

Impact T1: Alteration of Topography

The construction of the proposed abatement equipment will be accommodated within an area that has already been levelled. Impacts to surface topography will be caused by the excavation and stockpiling of in-situ soils on surface.

The proposed road expansion and contractors laydown area will be situated on area not yet cleared or levelled which may result in a minimal change to the topography.

Table 21: T1: Alteration of Topography

POTENTIAL IMPACT: T1: ALTERATION OF TOPOGRAPHY	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	4	4	4	36	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	3	2	3	18	Low	(-)	High

Operational Phase

No environmental impact on topography is identified or anticipated.

Closure Phase

Impact T2: Restoration of Topography

During the closure phase landscaping will be undertaken to restore the natural topography of the areas that have been disturbed or, at least, to reduce slopes to stable gradients (no steeper than 1:3). There is thus a positive impact anticipated.

Table 22: Impact T2: Restoration of Topography

POTENTIAL IMPACT: T2: RESTORATION OF TOPOGRAPHY	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	4	4	40	Medium	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	N/A							
With Mitigation	N/A							

Cumulative Impact

There will be no substantive increase to topographic impacts when compared to the existing level of impact on site, and thus the cumulative impact will be the same as the initial impact described above.

Mitigation Measures

The following mitigation measures are proposed:

- Restrict all activities, materials, equipment and persons within the area/s specified.
- Erect and maintain permanent and/or temporary barricading prior to starting construction.
- Maintain all demarcation barriers for the duration of construction activities.
- 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.
- Stockpiles created during the construction phase must not remain in the operation phase of the project.
- Sustainable erosion control measures (for wind and water erosion) must be implemented and maintained where necessary in areas disturbed by the construction / demolition operations.
- All structures comprising the site establishment are removed from the site and surrounding areas.
- All rubble is removed from the site to an approved licensed landfill site.
- Fences, barriers and demarcations associated with the construction phase are removed from the site.

CLIMATE

Specialist Climate Change Assessment of the Proposed Installation of Sulphur Dioxide (SO_2) Abatement Equipment at the Mortimer Smelter, undertaken by Promethium Carbon, dated May 2017 (attached in **Appendix 6-6**).

A smelter's greenhouse gas emissions inherently determine its contribution to the onset of global climate change. As such a carbon footprint of the project can help to inform the consequent climate change impact of the project and its comparability to other technologies or baselines.

Construction Phase

Impact C1: Carbon Footprint

The carbon emissions associated with the construction phase were calculated as 3 127.30 (tCO_2e). This impact is considered negligible.

Table 23: Impact C1: Carbon Footprint

POTENTIAL IMPACT: C1: CARBON FOOTPRINT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	2	2	4	20	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	No mitigation proposed.							

Operational Phase

Impact C2: Carbon Footprint

The carbon emissions associated with the operational phase were calculated as 7 972.04 (tCO_2e per annum). While the number of calculated emissions sources for the indirect Scope 3 category is the greatest, the category still accounts for the smallest proportion of the calculated emissions. The combustion of LPG onsite accounts for the majority of the Scope 1 emissions and the well to tank emissions account for the majority of the Scope 3 emissions (**Table 24**).

Table 24: The Calculated Annual Greenhouse Gas Emissions for the Operation of the Proposed Project

Source	Carbon emissions		Category
LPG	901.95	tCO_2e per annum	Scope 1
Grid electricity	6 862.88	tCO_2e per annum	Scope 2
Water	25.87	tCO_2e per annum	Scope 3
LPG well to tank	113.35	tCO_2e per annum	Scope 3
Hydrated lime production	41.63	tCO_2e per annum	Scope 3
Transport upstream (hydrated lime)	1.72	tCO_2e per annum	Scope 3
Grid electricity transmissions and distribution losses	24.64	tCO_2e per annum	
TOTAL	**7972.04**	**tCO_2e per annum**	

It can be seen that the Scope 2 emissions from electricity consumption account for the vast majority (86%) of the calculated annual operational emissions across scopes. This is further illustrated in **Figure 50**.

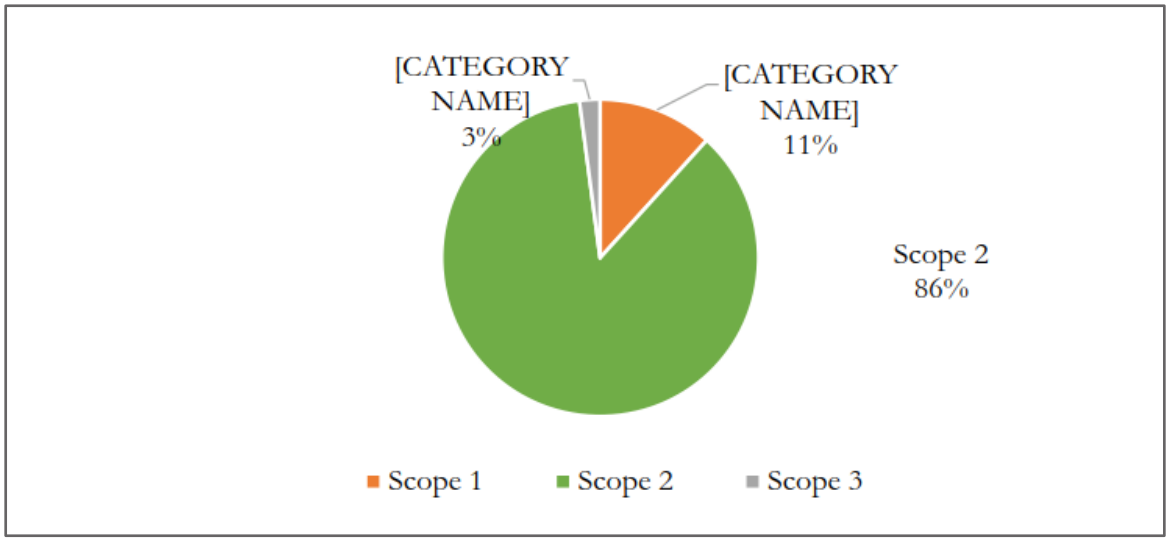


Figure 50: Summary of the Proportion of Calculated Greenhouse Gas Emissions from the Various Scopes for the Operation of the Proposed Project

Beyond changing the project's consumption of electricity these indirect Scope 2 emissions are largely dependent on the grid emissions for electricity. Assuming that the proposed SO2 abatement equipment will be developed as efficiently as possible there is likely to be little scope to reduce electricity consumption and thus the greenhouse gas emissions from this source. However, as the South African electricity grid decarbonises the emissions from this source will decline at the same rate.

As the Scope 3 emissions sources only account for a very small proportion (3%) of the calculated emissions, any emissions reductions in this scope will have a mild impact on the operation emissions of the project. Furthermore, in many cases the project implementers will not exact much control over their Scope 3 emissions and will have limited opportunity to effect reductions. The remaining direct emissions calculated for Scope 1 do, however, present an opportunity for emissions reductions. The emissions account for a sizable portion (11%) of those calculated with the emissions coming from the combustion of LPG on site. Switching towards fuels which produce lower emissions per unit of energy would enable the project implementer to reduce the emissions from this source. One possible fuel substitute for LPG

would be biodiesel.

Table 25: Impact C2: Carbon Footprint

POTENTIAL IMPACT: C2: CARBON FOOTPRINT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	4	5	2	5	55	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	4	5	2	5	55	Medium	(-)	High

Impact C3: Local Climate Change

Mortimer Smelter is located within the temperate interior climatic zone (or moderate eastern plateau). This is a summer rainfall climatic zone which is characterised by warm to hot summers and cold dry winters. The climate features are particularly extreme in the northern part of this zone where the RPM-US complex is situated. The erratic annual rainfall ranges between 450 to 750 mm per year. However, this is exceeded by the mean monthly evaporation rate throughout the year. This can present challenges for water security.

South Africa's Long Term Adaptation Scenarios identify six hydrological zones for the country, each with their own climate change projections. RPM-US fall into the Vaal Hydrological Zone. It is projected that, the Vaal Hydrological Zone will experience temperature increases and rainfall decreases beyond the range of current day climatology. This is particularly the case for the summer, spring and autumn months. This may exacerbate stresses on water resources for the area of operation.

These changes are likely to impact on the natural systems in the region as well as human activities. Any significant shortages in water yields may even directly impact upon the Mortimer Smelter and it operations. The development will require 468m^3/day of water. It is envisaged that the water will be obtained from the existing allocation of 15 000m^3/day to RPM-US. The Mortimer Smelter currently utilises 400m^3/day water. It has been predicted by the Water Research Council's Mine Water Atlas that RPM-US fall within a low risk area for climate related water risk.

Table 26: Impact C3: Local Climate Change

POTENTIAL IMPACT: C3: LOCAL CLIMATE CHANGE	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	4	5	2	5	55	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	4	5	2	5	55	Medium	(-)	High

Closure Phase

During the closure phase all emissions resulting in climate change will be removed along with the closure of the Mortimer Smelter.

Cumulative Impact

In terms of the national inventory, the emissions from the project are cumulative with the emissions from all other sources. Similarly the onset of climate change is induced by greenhouse gas emissions accumulated in the atmosphere from all sources over time. The onset of climate change is likely to be accelerated and sustained as emissions accumulate in the atmosphere.

Impact C4: Project Emissions for the National Inventory and Climate Change

In terms of the national inventory the proposed SO_2 abatement equipment for the Mortimer Smelter as a hole would account for an extremely small portion even if it includes its indirect emissions. The most recently published GHG inventory for South Africa is for the year of 2010 and the national emissions are calculated to be 544 million tonnes for the year. The annual operational CO_2e emissions for the proposed project case are close to 8 000 tonnes (0.001% of the national emissions). While this is an extremely small fraction it is still important to account for as each tCO_2e of greenhouse gas contributes to the national inventory and global climate change in the same way.

It useful to consider the contribution of the SO_2 abatement equipment in terms of its addition to the emissions for the Mortimer Smelter as a whole. As shown in Figure 2 the Scope 2 emissions from electricity use account for the largest portion of the operational emissions from the equipment. These emissions can be compared against the electricity emissions from running the smelting facility as a whole. The facility has recently been upgraded to 38 MW and the additional energy requirement of the abatement equipment would increase the Scope 2 emissions of the smelter by 2.14%. Therefore, even in terms of the individual Mortimer Smelter, the emissions from the abatement equipment are very small.

As discussed in the carbon footprint assessment the emissions from the Scope 2 category are determined by the grid emissions factor. While the technology may be for the most part locked into the energy requirements the emissions attributed to this category will decrease as the grid emission factor decreases in time. There is already evidence of the gradual decarbonisation of the electricity sector in South Africa. As such the operational emissions of the plant may be even smaller in the future.

As a single source, the proposed SO_2 abatement equipment will make a relatively small contribution to national emissions and thus its magnitude is classified as, small. Despite its very small magnitude the emissions from the proposed SO_2 abatement equipment will still contribute to the national greenhouse gas inventory. As such the national extent of the project's greenhouse emissions are considered to be very large. The duration of the impact of the greenhouse gas emissions is considered to be effectively permanent as the greenhouse gas emissions produced are assumed to remain in the atmosphere for 100 years. The combustion of LPG and consumption of electricity will definitely produce carbon emissions and it is certain that these emissions will contribute to the onset of global climate change. As the emitted greenhouse gases are assumed to remain in the atmosphere for such long durations the impact is effectively irreversible with the effects of climate change often resulting in the irreversible loss of resources.

Table 27: Impact C4: Project Emissions for the National Inventory and Climate Change

POTENTIAL IMPACT: C4: PROJECT EMISSIONS FOR THE NATIONAL INVENTORY AND CLIMATE CHANGE	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	4	5	2	5	55	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	4	5	2	5	55	Medium	(-)	High

Mitigation Measures

The following mitigation measures are proposed:

- → Operations of the SO_2 Abatement Plant must be incorporated within the ECO_2MAN* programme
- → A greenhouse gas management hand book must be developed for the smelting facility as a whole, this will not be a standalone document and will be as per the ECO_2MAN* programme

*The ECO_2MAN program identifies where energy is being used and then pinpoint the best opportunities for improving practices.

SOILS AND LAND CAPABILITY

Construction Phase

The majority of the development site has previously been transformed from its natural state due to levelling and construction activities associated with the development of the Mortimer Smelter. The proposed road expansion and contractors laydown area will be situated on areas not yet cleared or levelled which may result in a minimal change to the soil and land capability, however these areas have already been disturbed by existing activities at the Smelter.

Impact SL1: Contamination of soils

During the construction activities there is a potential that soil can be contamination as a result of spillages due to the incorrect storage and handling of hazardous materials.

Table 28: Impact SL1: Contamination of soils

POTENTIAL IMPACT: SL1: CONTAMINATION OF SOILS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	2	4	24	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	4	20	Low	(-)	High

Impact SL2: Change in Land Capability

The SO_2 Abatement Plant area forms part of the existing Mortimer Smelter site which has already been altered. The site is used for heavy industrial purposes. The proposed road expansions and contractors laydown area will be situated on areas currently characterised with vegetation that has been previously impacted with no agricultural activities taking place.

The soils at the road expansions and contractors laydown area will be compacted and may render the soils prone to erosion. Compaction will increase the bulk density of the soils subsequently as a result of heavy vehicle traffic and minimise erosion. However, this will cause the soils to be unsuitable for vegetation establishment and sustaining normal plant growth.

Table 29: Impact SL2: Change in Land Capability

POTENTIAL IMPACT: SL2: CHANGE IN LAND CAPABILITY	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	2	2	3	15	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	3	15	Low	(-)	High

Operational Phase

Impact SL3: Contamination of soils

During the operational phase there is a potential that soil can be contamination as a result of spillages due to the incorrect storage and handling of hazardous materials.

The project will entail the handling of raw materials, wastes, effluents, and products that have the potential to cause pollution of not adequately managed; these include:

- Raw materials e.g. silicon oil
- Weak sulphuric acid from the quenching process
- Concentrated H_2SO_4
- Hydrated lime
- Effluents
- Typical industrial wastes e.g. chemical contaminated materials

There is potential for direct pollution from these sources e.g. of the soil below the facility, or to stormwater runoff) as well as indirect pollution to offsite areas in the event that pollution is not adequately managed and contained.

Table 30: Impact SL3: Contamination of soils

POTENTIAL IMPACT: SL3: CONTAMINATION OF SOILS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	3	4	4	36	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	1	2	3	12	Low	(-)	High

Closure Phase

Impact SL4: Contamination of soils

Potential soil contamination at the smelter plant and adversely affecting soil fertility and beneficial post-mining land use alternatives.

Table 31: Impact SL4: Contamination of soils

POTENTIAL IMPACT: SL4: CONTAMINATION OF SOILS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	4	3	33	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	2	10	Low	(-)	High

Impact SL5: Quantity and Quality of Topsoil

During the closure phase there is the potential that the quantity and/or quality of topsoil is not adequate for successful rehabilitation.

Table 32: Impact SL5: Quantity and Quality of Topsoil

POTENTIAL IMPACT: SL5: QUANTITY AND QUALITY OF TOPSOIL	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	3	4	4	40	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	2	2	4	3	24	Low	(-)	High

Impact SL6: Ongoing Rehabilitation not to Standard

There is a possibility that rehabilitation work conducted in the past was not to the required standard and/or not sustainable, placing the effort towards closure and eventual site relinquishment at jeopardy.

Table 33: Impact SL6: Ongoing Rehabilitation not to Standard

POTENTIAL IMPACT: SL6: ONGOING REHABILITATION NOT TO STANDARD	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	4	4	4	36	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	3	12	Low	(-)	High

Impact SL7: Contradiction of SDF's

RPM-US fall within two Provinces and as such into different municipalities with different legal requirements. Contradiction of SDFs of the two district and local municipalities, therefore the possibility exists that the end land use planning is not aligned with SDF's.

Table 34: Impact SL7: Contradiction of SDF's

POTENTIAL IMPACT: SL7: CONTRADICTION OF SDF'S	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	5	6	4	56	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	3	12	Low	(-)	High

Impact SL8: Site-wide Rehabilitation

There is potential that non-integration and alignment of site-wide rehabilitation plans could result in non-achievement of the desired sustainable final land capability and end land use.

Table 35: Impact SL8: Site-wide Rehabilitation

POTENTIAL IMPACT: SL8: SITE-WIDE REHABILITATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	4	4	4	36	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	3	12	Low	(-)	High

Cumulative Impact

The overall net cumulative impact to land use will be the same as the construction phase.

Mitigation Measures

The following mitigation measures are proposed:

- Environmental conditions must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages by the implementation of ISO 14001 practices.
- All incidents must be reported to the responsible site officer as soon as they occur.
- In the event of an incident the Emergency Preparedness and Response Plan must be followed.
- Adherence to RPM-US's Environmental policy, Environmental procedures and values must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages by the implementation of good housekeeping practices.
- All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor lay down area. All repairs are to be performed on an impervious surfaces.
- Storage areas and vehicle maintenance areas must have appropriate containment measures in place, including bunds, concrete, canals, collector drains and interception trenches.
- 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.
- 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.
- 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.
- Spilled material must be cleaned up and disposed of appropriately as soon as practically possible.
- All hazardous waste must be disposed of at a registered hazardous waste disposal facility or stored in designated, lined and bunded areas (for no longer than 90 days).
- Records of all waste being taken off site must be recorded and kept as evidence.
- Sustainable erosion control measures (for wind and water erosion) must be implemented and maintained where necessary in areas disturbed by the construction / demolition operations.

- 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.
- Volumes of stockpiled materials must be accurately recorded. Records must be made available on request.
- The Rehabilitation Plan must be aligned to the local SDF's.
- Ensure closure and rehabilitation is undertaken as part the closure and rehabilitation plans.
- The rehabilitation fund must be upgraded or revised on an annual basis according to the surveyed plan, which indicates the progress in rehabilitation.

FLORA

Biodiversity Assessment Mortimer Smelter, undertaken by the Biodiversity Company, dated April 2017 (attached in **Appendix 6-3**).

The vegetation community in the project area was found to be highly disturbed with an associated high incidence of alien plant infestation. The broad vegetation communities comprised of:

- Disturbed Turf-thornveld; and
- Wetland areas.

Construction Phase

Impact FL1: Loss of Diversity of Indigenous Floral Communities

The construction and operation of the proposed abatement equipment is expected to have a limited impact on the surrounding flora due to the area already being heavily disturbed.

The proposed road expansion and contractors laydown area will be situated on areas currently covered by natural vegetation, however these areas have already been disturbed by existing activities at the Smelter.

Table 36: Impact FL1: Loss of Diversity of Indigenous Floral Communities

POTENTIAL IMPACT: FL1: LOSS OF DIVERSITY OF INDIGENOUS FLORAL COMMUNITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	4	4	40	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	5	2	3	24	Low	(-)	High

Operational Phase

Impact FL2: Loss of Diversity of Indigenous Floral Communities

During the operational phase there is a potential for increased accessibility by staff and the workforce to the natural vegetation areas remaining at Mortimer Smelter which may result in the loss of remaining albeit disturbed indigenous floral communities.

Table 37: Impact FL2: Loss of Diversity of Indigenous Floral Communities

POTENTIAL IMPACT: FL2: LOSS OF DIVERSITY OF INDIGENOUS FLORAL COMMUNITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	3	4	3	24	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	3	12	Low	(-)	High

Closure Phase

Impact FL3: Invasive Species

The clearance of natural vegetation has the potential to encourage the growth of invasive species.

Table 38: Impact FL3: Invasive Species

POTENTIAL IMPACT: FL3: INVASIVE SPECIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	6	4	52	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	4	16	Low	(-)	High

Impact FL4: Land Degradation

Degradation of re-established vegetation cover, due to trampling and grazing by large herbivores prior to adequate sustainable coverage obtained resulting in erosion, visual impact and not achieving biodiversity objectives.

Table 39: Impact FL4: Land Degradation

POTENTIAL IMPACT: FL4: LAND DEGRADATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	4	3	30	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	1	2	2	8	Low	(-)	High

Cumulative Impact

The overall net cumulative impact to flora will be the same as the construction phase.

Mitigation Measures

The following mitigation measures are proposed:

→ Contractors are to be trained on environmental awareness and the importance of preserving indigenous fauna and flora.

- Ensure that all site disturbances are limited to areas where structures will be constructed / removed.
- Natural flora species are not to be used as firewood.
- Following construction, exposed areas must be rehabilitated and re-vegetated.
- On completion of the construction phase, disturbed areas must be re-vegetated using indigenous pasture species. In general, re-vegetation must be undertaken using a mixture of commercially available seeds that will geminate 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.
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species;
- 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 RPM-US or the contractor.
- Following re-vegetation the site must be monitored and maintained until a sound vegetation cover that will prevent erosion, has been achieved.
- Compilation of and implementation of an alien vegetation management plan for the entire site.
- 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.
- 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.
- 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 ploughed, or specially burned firebreaks.
- 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.
- RPM-US must limit, as far as practical, the area of land disturbed and isolated for the purpose of construction, mining and processing activities, to the minimum required for safe and efficient operation.
- The disturbed areas must be rehabilitated.

FAUNA

Biodiversity Assessment Mortimer Smelter, undertaken by the Biodiversity Company, dated April 2017 (attached in **Appendix 6-3**).

The construction and operation of the proposed abatement equipment is expected to have a limited impact on the surrounding fauna and flora due to the area already being heavily disturbed.

The proposed road expansion and contractors laydown area will be situated on areas currently covered by natural vegetation, however these areas have already been disturbed by existing activities at the Smelter.

Construction Phase

Impact FA1: Loss of Habitat for Faunal Communities Including Species of Conservation Concern

Table 40: Impact FA1: Loss of Habitat for Faunal Communities Including Species of Conservation Concern

POTENTIAL IMPACT: FA1: LOSS OF HABITAT FOR FAUNAL COMMUNITIES INCLUDING SPECIES OF CONSERVATION CONCERN	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	8	4	60	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	5	6	3	36	Medium	(-)	High

Operational Phase

Impact FA2: Loss of Fauna

During the operational phase there is a potential that access are gained to the natural vegetation areas remaining at Mortimer Smelter which may result in the loss of indigenous floral communities.

Table 41: Impact FA2: Loss of Fauna

POTENTIAL IMPACT: FA2: LOSS OF FAUNA	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	3	4	3	24	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	3	12	Low	(-)	High

Closure Phase

Until rehabilitated, the impact will remain as per the construction phase.

Cumulative Impact

The overall net cumulative impact to flora will be the same as the construction phase.

Mitigation Measures

The following mitigation measures are proposed:

- Contractors are to be trained on environmental awareness and the importance of preserving indigenous fauna and flora.
- Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited.
- Ensure that all site disturbances are limited to areas where structures will be constructed / removed.

- If any faunal species of conservation importance are recorded during construction, activities should temporarily cease and an appropriate specialist should be consulted to identify the correct course of action.
- 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 ploughed, or specially burned firebreaks.
- RPM-US must limit, as far as practical, the area of land disturbed and isolated for the purpose of construction, mining and processing activities, to the minimum required for safe and efficient operation.
- The disturbed areas must be rehabilitated.

AIR QUALITY

Mortimer Smelter SO2 Abatement Air Quality Impact Assessment, undertaken by WSP | Parsons Brinckerhoff, dated April 2017 (attached in **Appendix 6-2**).

Results of Modelling

Emissions were calculated with respect to each of the five modelling scenarios:

- **Scenario 1: Existing Activities (Status Quo)**
  - Contributions from the existing facility including emissions from two point sources, vehicle emissions and fugitive emissions from crushing, materials handling and storage, paved and unpaved roads and wind erosion.
- **Scenario 2a: Construction Phase of Proposed Development (without mitigation)**
  - Combined assessment of existing activities together with the construction of the proposed site development.
- **Scenario 2b: Construction Phase of Proposed Development (with mitigation)**
  - Combined assessment of existing activities, as well as construction of the proposed site using wet suppression.
- **Scenario 3: Operational Phase of Proposed Activities (80m Stack Height)**
  - Incremental contributions from the proposed activities, including emissions from one point source of 80 m stack height, vehicle emissions and fugitive emissions from paved roads.
- **Scenario 4: Cumulative Assessment (Existing + Proposed Activities)**
  - Total contributions from the proposed plant including emissions from two point sources, vehicle emissions and fugitive emissions from crushing, materials handling and storage, paved and unpaved roads and wind erosion.
- **Scenario 5: Operational Phase of Proposed Activities (60m Stack Height)**
  - Incremental contributions from the proposed activities, including emissions from one point source of 60 m stack height, vehicle emissions and fugitive emissions from paved roads.

PM_{10} and $PM_{2.5}$ Concentrations

Ambient PM_{10} and $PM_{2.5}$ concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for all scenarios.

Similar particulate concentrations are predicted for Scenario 1 and Scenario 4 due to fugitive furnace building emissions being the main contributor to particulate concentrations. Scenarios 2a and 2b showed notable variation in maximum predicted concentrations, as is expected. However, both scenarios predict compliance beyond the RPM-US boundary and at the surrounding sensitive receptors. For Scenarios 3 and 5, similar concentrations are predicted with a proposed stack height of 80 m and 60 m, respectively. Maximum predicted daily and annual average PM_{10} concentrations for Scenario 3 were 6.783 and 3.288 µg/m^3, respectively, while maximum predicted daily and annual average concentrations for Scenario 5 were 6.877 and 3.363 µg/m^3, respectively. Similar results are noted for $PM_{2.5}$ concentrations.

Sulphur Dioxide Concentrations

Annual, daily and hourly average SO_2 concentrations are predicted to be compliant with their respective standards at all sensitive receptor locations, but exceed the National standards in the vicinity of Mortimer Smelter for Scenario 1 (Airshed, 2017). Predicted SO_2 concentrations are compliant at all averaging periods for Scenarios 3, 4 and 5 at all sensitive receptors and across the modelling domain.

Concentrations predicted for all future scenarios show a reduction of more than 80% in ground level SO_2 concentrations predicted for the current (Scenario 1) over the entire modelling domain and at all sensitive receptor locations.

Nitrogen Dioxide Concentrations

Annual and hourly average NO_X concentrations are predicted to be compliant beyond the RPM-US boundary and at all receptor locations for all scenarios.

Similar concentrations are observed for Scenario 1 and 4; this is likely due to vehicle emission being the main contributors to ambient NO_X. Additionally, similar NO_X concentrations are predicted for proposed stack heights of 80 and 60 m, respectively.

Construction Phase

Heavy construction is a source of dust emissions that can have a substantial temporary impact on the local air quality situation. Emissions during construction are associated with land clearing, drilling and blasting, ground excavation and cut and fill operations. Dust emissions often vary substantially on a daily basis, depending on the level of activity, the specific operations and the prevailing meteorological conditions. A large portion of the emissions results from equipment traffic over temporary roads at the construction site (US EPA, 1995).

Construction consists of a series of different operations, each with its own duration and potential for dust generation. Construction operations are of a temporary nature, with a definable beginning and end. Dust emissions vary substantially over different phases of the construction process (US EPA, 1995).

It is expected that fugitive dust emissions will result from the construction of new infrastructure associated with the proposed project.

Atmospheric pollutants emitted from vehicles include hydrocarbons, CO, CO_2, NO_x, SO_2 and particulates. These pollutants are emitted from the tailpipe, from the engine and fuel supply system, and from brake linings, clutch plates and tyres. Hydrocarbon emissions, such as benzene, result from the incomplete combustion of fuel molecules in the engine. Carbon monoxide is a product of incomplete combustion and occurs when carbon in the fuel is only partially oxidized to carbon dioxide. Nitrogen oxides are formed by the reaction of nitrogen and oxygen under high pressure and temperature conditions in the engine. Sulphur dioxide is emitted due to the high sulphur content of the fuel. Particulates such as lead originate from the combustion process as well as from brake and clutch linings wear (Samaras and Sorensen, 1999).

Impact AQ 1: Impact of PM_{10} Concentrations on Receptors

Ambient PM_{10} concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for Scenario 2a, refer to **Figure 51** and **Figure 52** for the modelled concentrations of PM_{10} for the construction phase without mitigation measures.

Ambient PM_{10} concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for Scenario 2b however some mitigation measures have been proposed, refer to **Figure 53** and **Figure 54** for the modelled concentrations of PM_{10} for the construction phase with mitigation measures.

Figure 51: Scenario 2a – Annual Average PM_{10} Concentrations

Figure 52: Scenario 2a – Daily Average PM_{10} Concentrations

Figure 53: Scenario 2b – Annual Average PM_{10} Concentrations

Figure 54: Scenario 2b – Daily Average PM_{10} Concentrations

Table 42: Impact AQ 1: Impact of PM_{10} Concentrations on Receptors

POTENTIAL IMPACT: AQ 1: IMPACT OF PM10 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Impact AQ 2: Impact of $PM_{2.5}$ Concentrations on Receptors

Ambient $PM_{2.5}$ concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for Scenario 2a, refer to **Figure 55** and **Figure 56** for the modelled concentrations of $PM_{2.5}$ for the construction phase without mitigation measures.

Ambient $PM_{2.5}$ concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for Scenario 2b however some mitigation measures have been proposed, refer to **Figure 57** and **Figure 58** for the modelled concentrations of $PM_{2.5}$ for the construction phase with mitigation measures.

Figure 55: Scenario 2a – Annual Average PM2.5 Concentrations

Figure 56: Scenario 2a – Daily Average $PM_{2.5}$ Concentrations

Figure 57: Scenario 2b – Annual Average $PM_{2.5}$ Concentrations

Figure 58: Scenario 2b – Daily Average $PM_{2.5}$ Concentrations

Table 43: Impact AQ 2: Impact of PM2.5 Concentrations on Receptors

POTENTIAL IMPACT: AQ 2: IMPACT OF PM2.5 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Operational Phase

Physical characteristics and emission rates for all point sources were provided by the Client, obtained from the stack emissions test report (SGS, 2016), and the Atmospheric Emissions License (AEL). The proposed WSA Stack NO_x emission rates were assumed to remain the same as that of EF, while SO_2 and PM emissions were assumed to equal the MES for Subcategory 4.16: Smelting and Converting of Sulphide Ores (Government Gazette 893, 2013). For a conservative assessment, all NO_x emissions were assumed to comprise totally of NO_2. Similarly, PM_{10} emissions were assumed to comprise 100% of total particulate emissions, while $PM_{2.5}$ emissions were assumed to be 60% of total particulates (Ehrlich et al., 2007).

Particulate emissions from paved and unpaved roads are due to direct emissions from vehicles in the form of exhaust, brake wear, tire wear emissions and the re-suspension of loose material on the road surface.

Atmospheric pollutants emitted from vehicles include hydrocarbons, CO, CO_2, NO_x, SO_2 and particulates. These pollutants are emitted from the tailpipe, from the engine and fuel supply system, and from brake linings, clutch plates and tyres. Hydrocarbon emissions, such as benzene, result from the incomplete combustion of fuel molecules in the engine. Carbon monoxide is a product of incomplete combustion and occurs when carbon in the fuel is only partially oxidized to carbon dioxide. Nitrogen oxides are formed by the reaction of nitrogen and oxygen under high pressure and temperature conditions in the engine. Sulphur dioxide is emitted due to the high sulphur content of the fuel. Particulates such as lead originate from the combustion process as well as from brake and clutch linings wear (Samaras and Sorensen, 1999).

During upset/abnormal conditions the WSA Plant will be bypassed and the existing stack used, the minimum control efficiency and minimum utilisation of the WSA Plant will be specified in the AEL.

Impact AQ 3: Impact of PM_{10} Concentrations on Receptors

Ambient PM_{10} concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for Scenario 3 and 5, refer to **Figure 59** to **Figure 62** for the modelled concentrations of PM_{10} for the operational phase without mitigation measures.

Figure 59: Scenario 3 – Annual Average PM_{10} Concentrations

Figure 60: Scenario 3 – Daily Average PM_{10} Concentrations

Figure 61: Scenario 5 – Annual Average PM_{10} Concentrations

Figure 62: Scenario 5 – Daily Average PM_{10} Concentrations

Table 44: Impact AQ 3: Impact of PM_{10} Concentrations on Receptors

POTENTIAL IMPACT: AQ 3: IMPACT OF PM10 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	2	3	27	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	5	2	2	18	Low	(-)	High

Impact AQ 4: Impact of $PM_{2.5}$ Concentrations on Receptors

Ambient $PM_{2.5}$ concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors for Scenario 3 and 5, refer to **Figure 63** and **Figure 66** for the modelled concentrations of $PM_{2.5}$ for the operational phase without mitigation measures.

Figure 63: Scenario 3 – Annual Average $PM_{2.5}$ Concentrations

Figure 64: Scenario 3 – Daily Average PM2.5 Concentrations

Figure 65: Scenario 5 – Annual Average $PM_{2.5}$ Concentrations

Figure 66: Scenario 5 – Daily Average $PM_{2.5}$ Concentrations

Table 45: Impact AQ 4: Impact of $PM_{2.5}$ Concentrations on Receptors

POTENTIAL IMPACT: AQ 4: IMPACT OF PM2.5 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	2	2	18	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	5	2	1	8	Low	(-)	High

Impact AQ 5: Impact of SO_2 Concentrations on Receptors

Table 46 presents the predicted SO_2 concentrations at receptor locations for all scenarios, as provided by Airshed (2017) in their Report: 17AAP01-01. Annual, daily and hourly average SO_2 concentrations are predicted to be compliant with their respective standards at all sensitive receptor locations, but exceed the National standards in the vicinity of Mortimer Smelter for Scenario 1 (Airshed, 2017). Predicted SO_2 concentrations are compliant at all averaging periods for Scenarios 3 and 5 at all sensitive receptors and across the modelling domain (Airshed, 2017) (**Figure 67** – **Figure 72**).

The percentage reduction in SO_2 concentrations for each future scenario (Scenarios 3 and 5) in comparison to the current (Scenario 1) is shown in **Table 47** as determined by Airshed (2017). Concentrations predicted for all future scenarios show a reduction of more than 80% in ground level SO_2 concentrations predicted for the current (Scenario 1) over the entire modelling domain and at all sensitive receptor locations (Airshed, 2017).

Table 46: Predicted ambient SO_2 concentrations at surrounding receptors. Values highlighted in blue bold exceed their respective standards

Receptor	SO_2 Concentration (µg/m³)		
	Annual Average	Daily Maximum	Hourly Maximum
Scenario 1 – Existing Plant			
Mantserre	8.7	63	249
Mantserre Primary School	10.0	64	281
Laerskool Platina Primary	2.6	30	51
Platinum Health Hospital	3.0	37	62
Ga-Ramosidi	8.7	72	206
Sefikile	6.3	63	148
Sefikile Clinic	5.9	50	143
Sefikile Primary School	5.8	67	145
Informal Settlement	9.3	80	243
Max. UM Boundary	23.2	123	**528**[1]
Max. modelling domain	**72.3**[1]	**300**[1]	**1145**[1]
Scenario 3 – Proposed Development (80 m stack height)			
Mantserre	1.1	7.9	32.0
Mantserre Primary School	1.2	7.6	34.2
Laerskool Platina Primary	0.3	3.6	5.4
Platinum Health Hospital	0.3	4.0	6.8
Ga-Ramosidi	0.9	7.7	21.3

Receptor	SO_2 Concentration (µg/m³)		
	Annual Average	Daily Maximum	Hourly Maximum
Sefikile	0.7	6.2	14.9
Sefikile Clinic	0.6	5.2	14.6
Sefikile Primary School	0.6	7.1	14.3
Informal Settlement	1.0	9.7	23.9
Max. UM Boundary	2.5	13.8	63.9
Max. modelling domain	9.3	42.6	162.3
Scenario 4 – Cumulative Assessment			
Mantserre	1.4	9.5	38.1
Mantserre Primary School	1.5	8.8	39.8
Laerskool Platina Primary	0.3	4.0	7.2
Platinum Health Hospital	0.4	4.7	8.8
Ga-Ramosidi	1.1	9.5	25.4
Sefikile	0.8	7.7	19.2
Sefikile Clinic	0.8	6.6	18.3
Sefikile Primary School	0.7	8.9	19.5
Informal Settlement	1.3	11.1	32.0
Max. UM Boundary	3.2	15.9	73.5
Max. modelling domain	11.5	45.6	177.5
Scenario 5 – Proposed development (60 m stack height)			
Mantserre	1.6	11.0	47.2
Mantserre Primary School	1.6	9.5	45.7
Laerskool Platina Primary	0.4	4.2	6.4
Platinum Health Hospital	0.4	5.4	7.4
Ga-Ramosidi	1.0	8.9	24.3
Sefikile	0.8	8.2	16.1
Sefikile Clinic	0.7	6.6	16.2
Sefikile Primary School	0.7	8.5	17.6
Informal Settlement	1.2	14.1	26.6
Max. UM Boundary	3.4	19.6	95.8
Max. modelling domain	15.4	63.8	232.9

Notes:
[1]Predicted on-site where ambient air quality objectives do not apply

Table 47: Reduction in SO2 concentrations for each proposed future scenario (Airshed, 2017)

Receptors	Reduction in SO_2 concentrations (%)		
	Annual	Daily	Hourly
Mantserre	84.0	85.0	84.7
Mantserre Primary School	85.3	86.1	85.9
Laerskool Platina Primary	86.8	86.7	85.9
Platinum Health Hospital	86.2	87.3	85.8
Ga-Ramosidi	87.9	86.9	87.7
Sefikile	87.1	87.9	87.0
Sefikile Clinic	87.1	86.9	87.2

Receptors	Reduction in SO_2 concentrations (%)		
	Annual	Daily	Hourly
Sefikile Primary School	87.2	86.7	86.5
Informal Settlement	86.5	86.2	86.8
Max. UM Boundary	86.4	87.1	86.1
Max. modelling domain	84.1	84.8	84.5

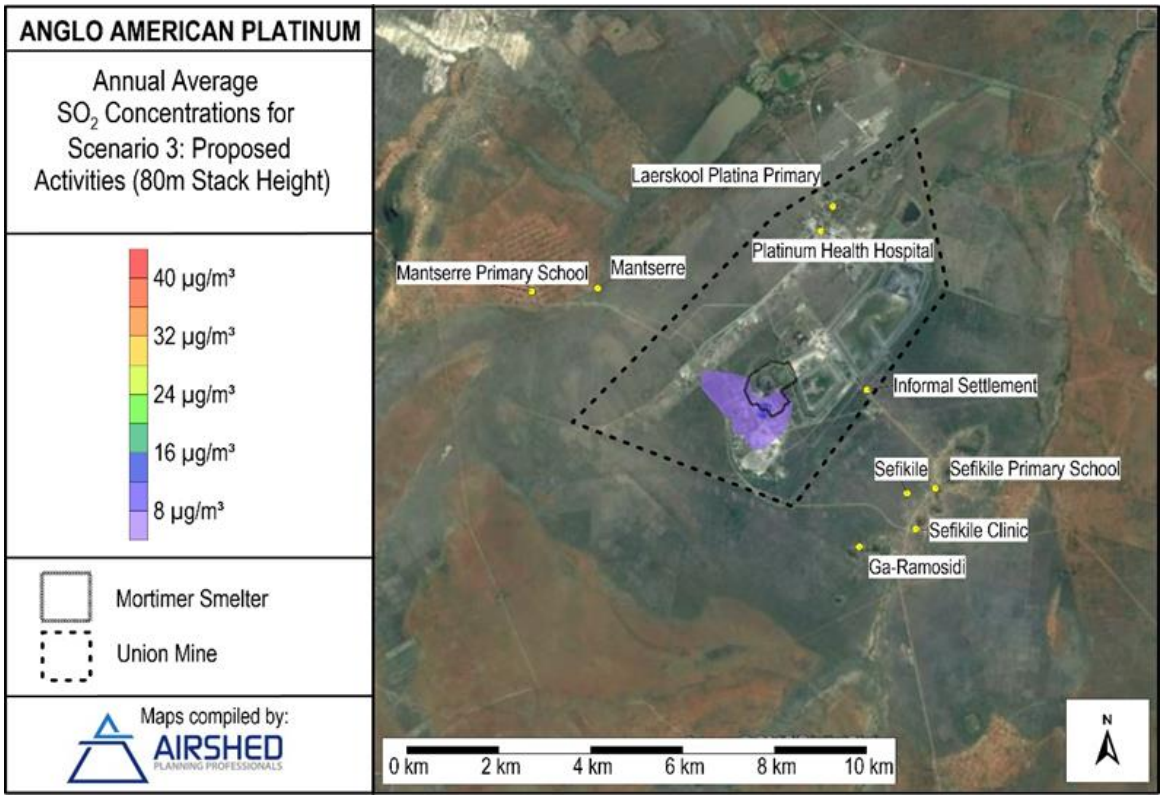


Figure 67: Scenario 3 – Annual Average SO_2 Concentrations

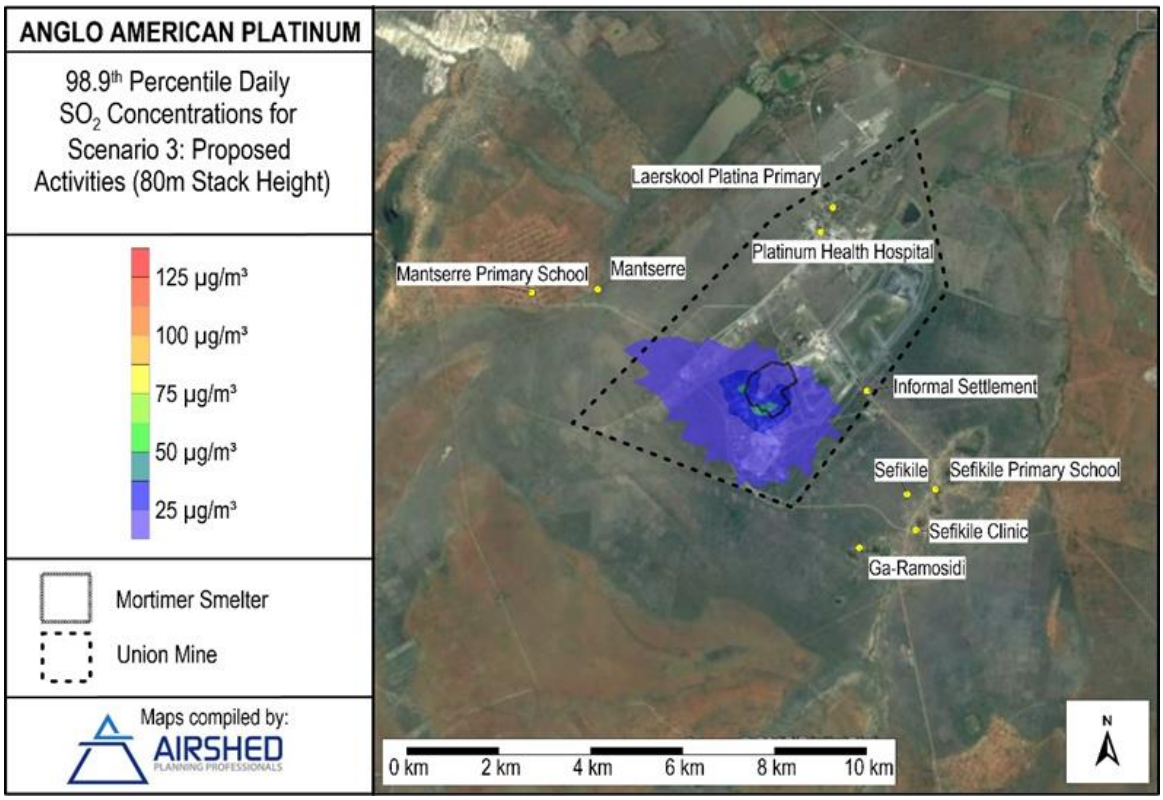


Figure 68: Scenario 3 – Daily Average SO_2 Concentrations

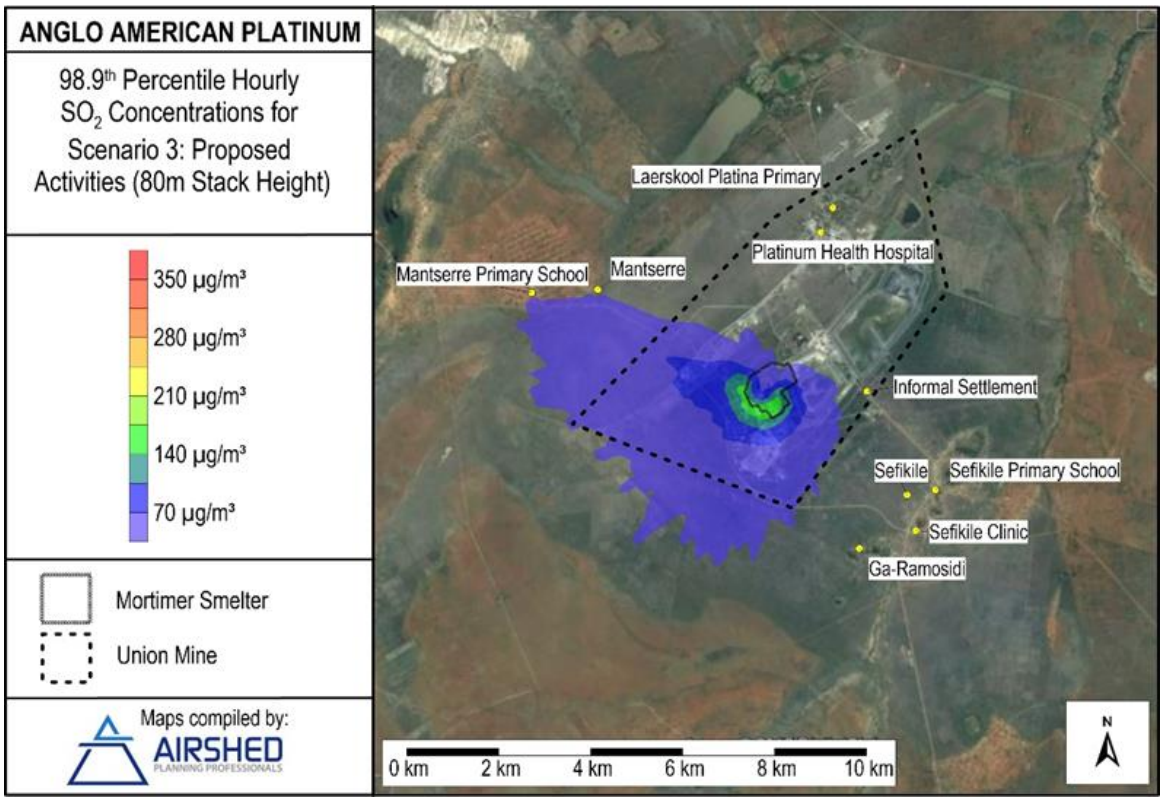


Figure 69: Scenario 3 – Hourly Average SO_2 Concentrations

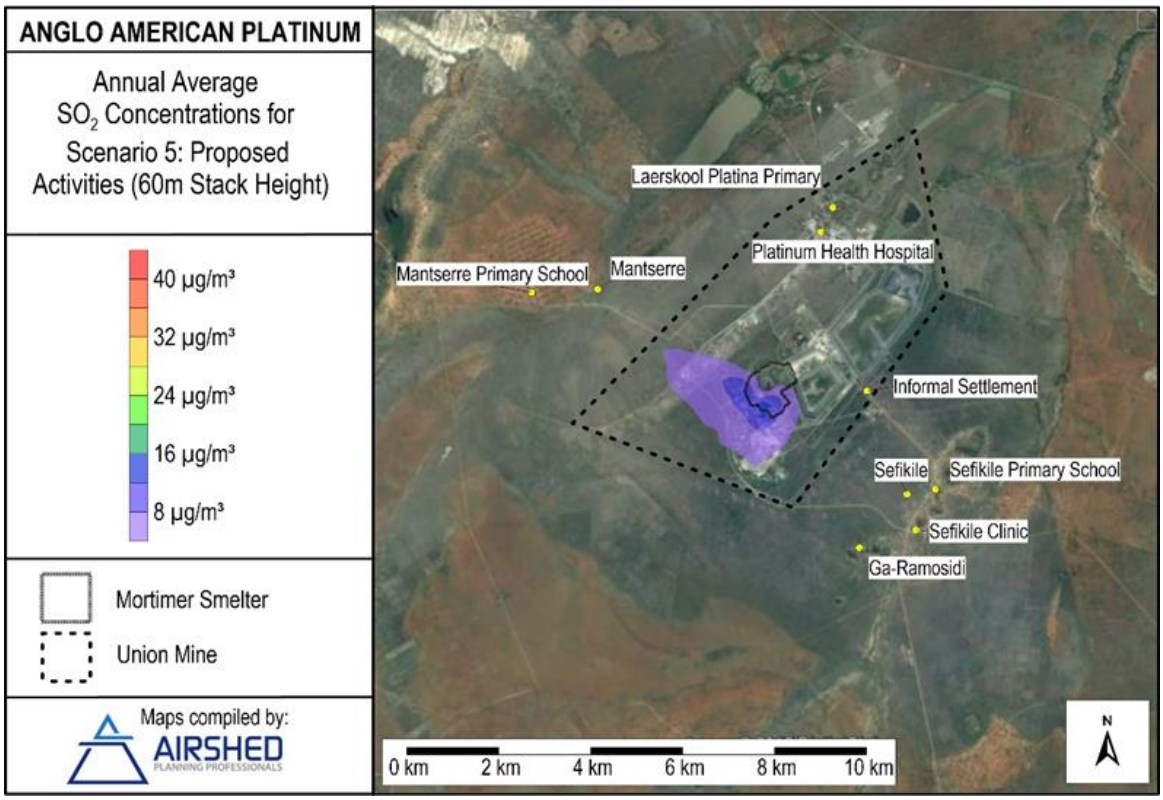


Figure 70: Scenario 5 – Annual Average SO_2 Concentrations

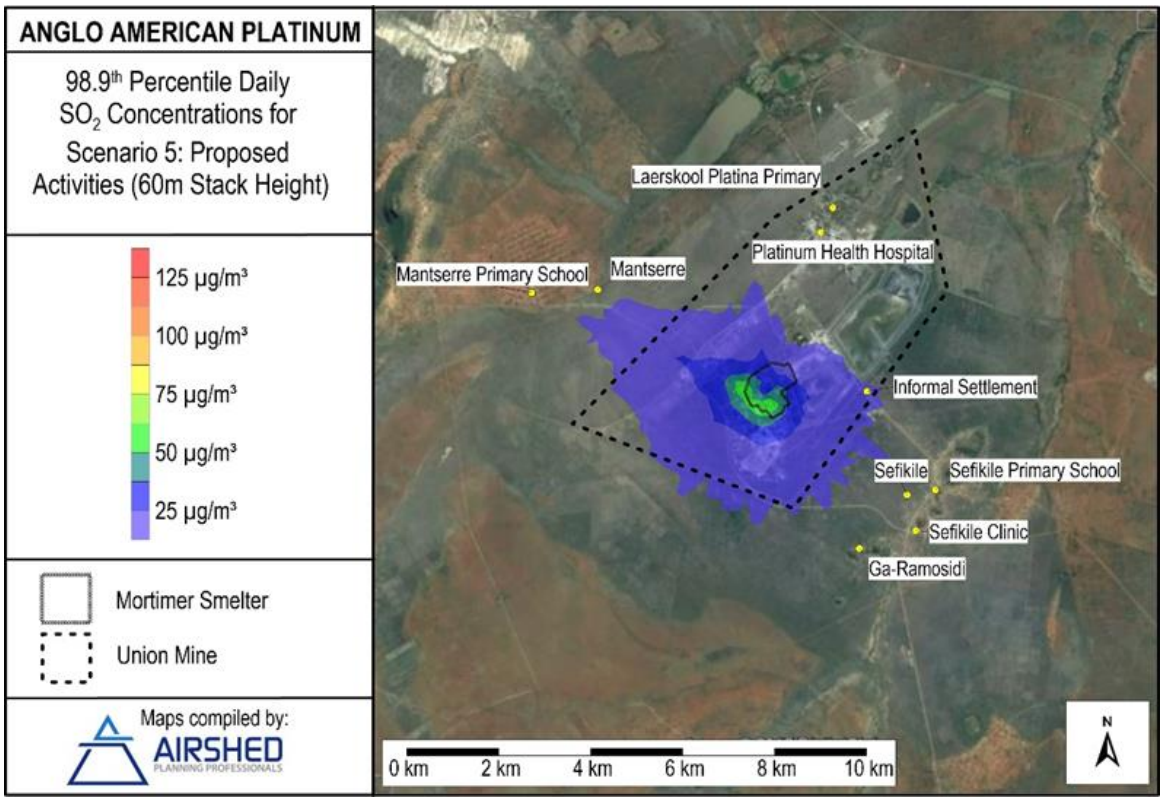


Figure 71: Scenario 5 – Daily Average SO_2 Concentrations

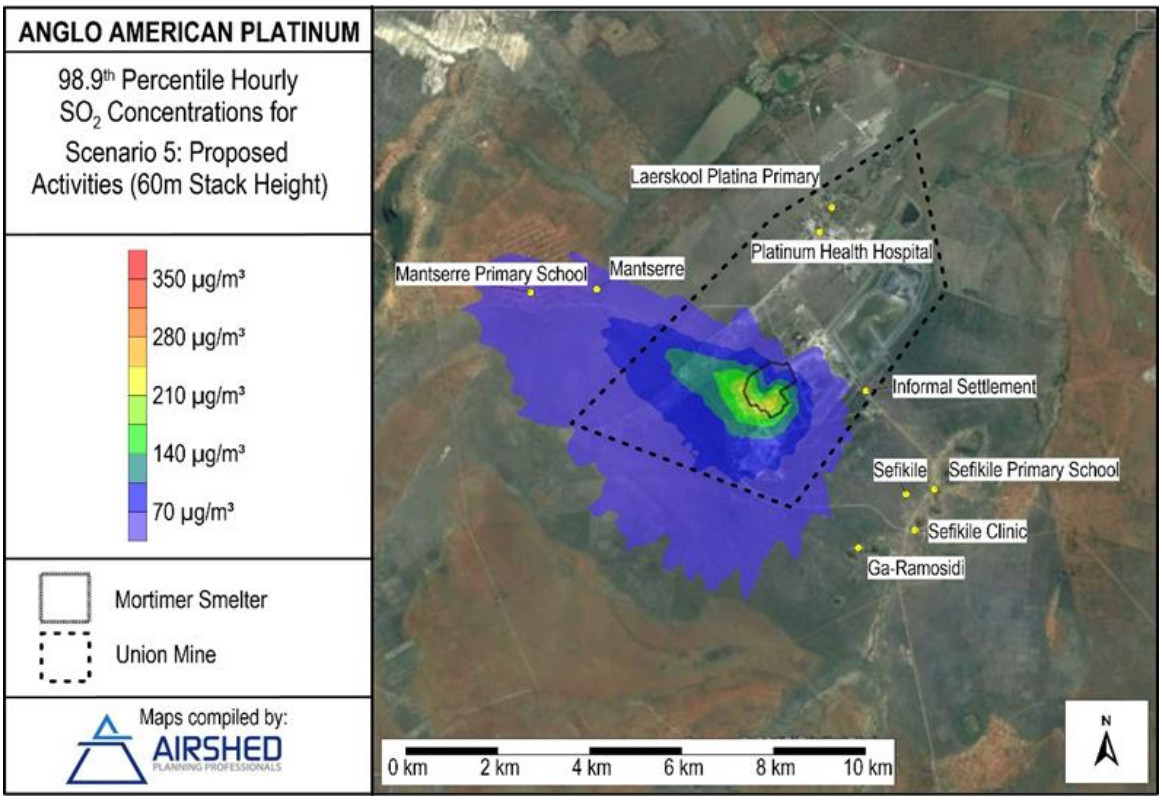


Figure 72: Scenario 5 – Hourly Average SO_2 Concentrations

Table 48: Impact AQ 5: Impact of SO_2 Concentrations on Receptors

POTENTIAL IMPACT: AQ 5: IMPACT OF SO2 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	4	3	33	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	5	2	2	16	Low	(-)	High

Impact AQ 6: Impact of NO_x Concentrations on Receptors

Annual and hourly average NO_X concentrations are predicted to be compliant beyond the RPM-US boundary and at all receptor locations for all scenarios.

Similar concentrations are observed for Scenario 1 and 4; this is likely due to vehicle emission being the main contributors to ambient NO_X. Additionally, similar NO_X concentrations are predicted for proposed stack heights of 80 and 60 m, respectively.

Table 49: Impact AQ 6: Impact of NO_x Concentrations on Receptors

POTENTIAL IMPACT: AQ 6: IMPACT OF NOX CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	2	1	8	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	5	0	1	6	Low	(-)	High

Closure Phase

The impacts associated with the closure phase will be the same as the impact associated with the construction phase.

Impact AQ 7: Impact of PM_{10} Concentrations on Receptors

Ambient PM_{10} concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors.

Table 50: Impact AQ 7: Impact of PM_{10} Concentrations on Receptors

POTENTIAL IMPACT: AQ 7: IMPACT OF PM10 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Impact AQ 8: Impact of $PM_{2.5}$ Concentrations on Receptors

Ambient $PM_{2.5}$ concentrations are predicted to be compliant with their respective daily and annual average standards beyond the RPM-US boundary and all sensitive receptors.

Table 51: Impact AQ 8: Impact of $PM_{2.5}$ Concentrations on Receptors

POTENTIAL IMPACT: AQ 8: IMPACT OF PM2.5 CONCENTRATIONS ON RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Cumulative Impact

A summary of percent contributions (calculated based on total emissions (tons/annum) for all identified sources associated with Scenario 1 and Scenario 4 are illustrated in **Figure 73**- **Figure 74**.

Point sources are currently the main source of NO_X, SO_2, PM_{10} and $PM_{2.5}$ emissions (**Figure 73**). Fugitive furnace building emissions are the second highest contributors of PM_{10} and $PM_{2.5}$ emissions (19 and 21%, respectively), with wind erosion being the third highest contributor (10 and 3%, respectively). Particulate emissions associated with crushing, aggregate handling and stockpiles, vehicles and paved and unpaved roads are comparatively insignificant.

Following the proposed expansion, point sources continue to be the main source of NO_X, SO_2, PM_{10} and $PM_{2.5}$ emissions (**Figure 74**). Though PM_{10} and $PM_{2.5}$ contributions from fugitive building emissions (22 and 24%, respectively) and wind erosion (11 and 3%, respectively) are slightly higher, the distribution remains similar to that of Scenario 1. Fugitive particulate emissions associated with crushing, aggregate handling and stockpiles, vehicles and paved and unpaved roads remain relatively insignificant.

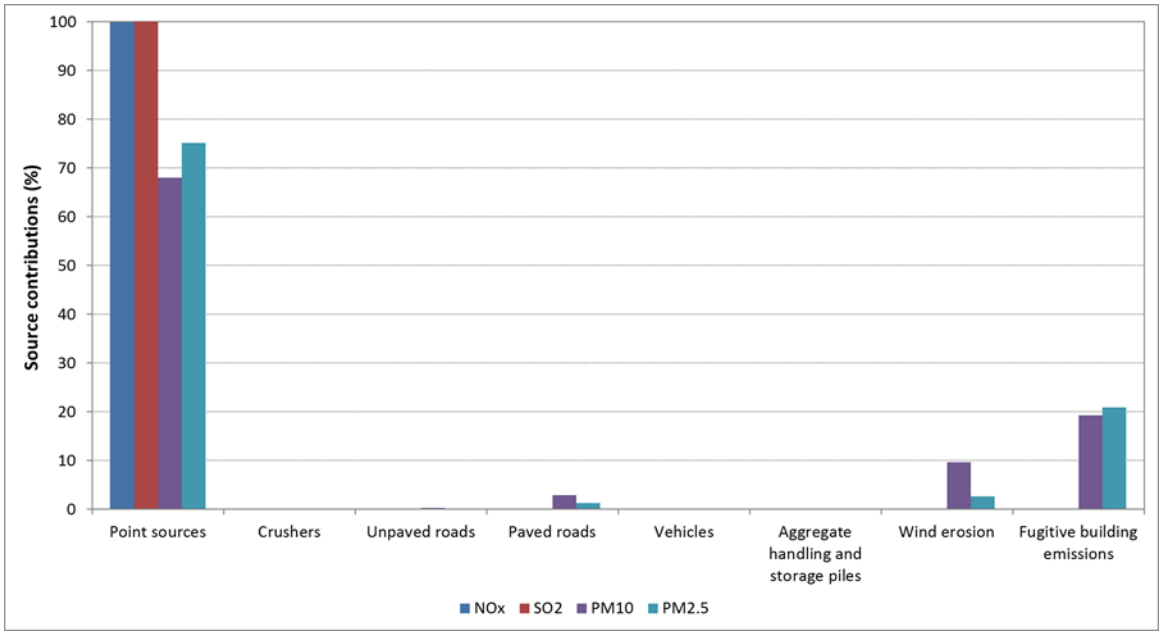


Figure 73: Source Contributions (%) to Total Emissions for Scenario 1 - Existing Activities

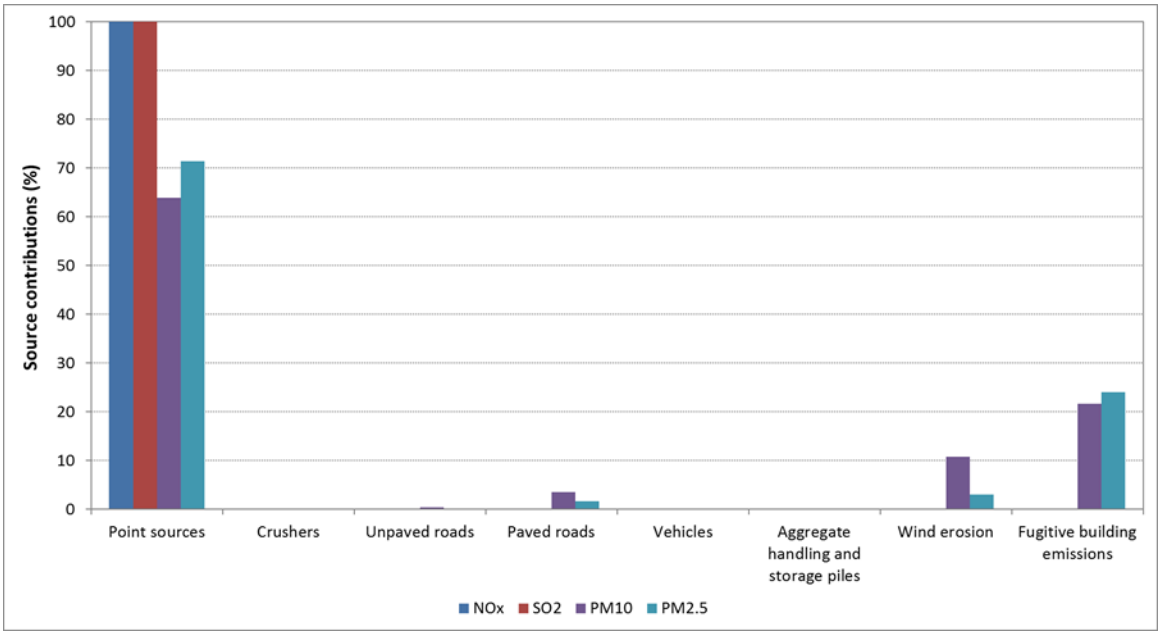


Figure 74: Source Contributions (%) to Total Emissions for Scenario 4 – Cumulative Assessment of Proposed Plant

Impact AQ9: Cumulative PM_{10} Concentrations

Cumulative PM_{10} concentrations exceed the daily average standard at the RPM-US boundary and at all sensitive receptors (**Table 52**). However, it is noted that background PM_{10} concentrations are already high, causing elevated cumulative concentrations. However, cumulative annual concentrations fall below the annual average standard at the RPM-US boundary and at all receptors. Refer to **Figure 75** and **Figure 76**.

Table 52: Scenario 4 - Cumulative Assessment Including Background Concentrations. Values Highlighted in Blue Bold Exceed their Respective Standards

Receptor	PM_{10} Concentration (µg/m^3)	
	Annual Average	Daily Maximum
Background concentrations		
All receptors	25.5	73.8
Scenario 4 – Cumulative Assessment (predicted concentrations)		
Mantserre	0.710	5.551
Mantserre Primary School	0.530	5.268
Laerskool Platina Primary	0.626	8.984
Platinum Health Hospital	0.771	11.055
Ga-Ramosidi	0.616	8.473
Sefikile	0.432	4.977
Sefikile Clinic	0.382	5.804
Sefikile Primary School	0.402	4.941
Informal Settlement	1.071	11.636
Max. UM Boundary	2.055	28.949
Max. modelling domain	**122.578**[1]	**358.103**[1]
Scenario 4 – Cumulative Assessment (including background concentrations)		
Mantserre	26.2	**79.4**
Mantserre Primary School	26.0	**79.1**
Laerskool Platina Primary	26.1	**82.8**
Platinum Health Hospital	26.2	**84.9**
Ga-Ramosidi	26.1	**82.3**
Sefikile	25.9	**78.8**

Sefikile Clinic	25.8	**79.6**
Sefikile Primary School	25.9	**78.8**
Informal Settlement	26.5	**85.5**
Max. UM Boundary	27.5	**102.8**[1]
Max. modelling domain	**148.0**[1]	**431.9**[1]
Notes: **[1]Predicted on-site where ambient air quality objectives do not apply**		

Figure 75: Scenario 4 – Annual Average PM_{10} Concentrations

Figure 76: Scenario 4 – Daily Average PM_{10} Concentrations

Table 53: Impact AQ9: Cumulative PM_{10} Concentrations

POTENTIAL IMPACT: AQ9: CUMULATIVE PM10 CONCENTRATIONS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Impact AQ10: Cumulative $PM_{2.5}$ Concentrations

Cumulative $PM_{2.5}$ concentrations exceed the daily average standard at the RPM-US boundary. However, it is noted that background $PM_{2.5}$ concentrations are already high, causing elevated cumulative concentrations. However, cumulative annual concentrations fall below the annual average standard at the RPM-US boundary and at all receptors. Refer to **Figure 77** and **Figure 78**.

Figure 77: Scenario 4 – Annual Average PM2.5 Concentrations

Figure 78: Scenario 4 – Daily Average PM2.5 Concentrations

Table 54: Impact AQ10: Cumulative $PM_{2.5}$ Concentrations

POTENTIAL IMPACT: AQ10: CUMULATIVE PM2.5 CONCENTRATIONS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Impact AQ11: Cumulative SO_2 Concentrations

Predicted SO_2 concentrations are compliant at all averaging periods for Scenario 4 at all sensitive receptors and across the modelling domain (Airshed, 2017) (**Table 55** and **Figure 79** – **Figure 81**).

Concentrations predicted for all future scenarios show a reduction of more than 80% in ground level SO_2 concentrations predicted for the current (Scenario 1) over the entire modelling domain and at all sensitive receptor locations (Airshed, 2017).

Table 55: Predicted ambient SO_2 concentrations at surrounding receptors. Values highlighted in blue bold exceed their respective standards

Receptor	SO_2 Concentration (µg/m^3)		
	Annual Average	Daily Maximum	Hourly Maximum
Scenario 1 – Existing Plant			
Mantserre	8.7	63	249
Mantserre Primary School	10.0	64	281
Laerskool Platina Primary	2.6	30	51
Platinum Health Hospital	3.0	37	62
Ga-Ramosidi	8.7	72	206
Sefikile	6.3	63	148
Sefikile Clinic	5.9	50	143
Sefikile Primary School	5.8	67	145
Informal Settlement	9.3	80	243
Max. UM Boundary	23.2	123	**528**[1]
Max. modelling domain	**72.3**[1]	**300**[1]	**1145**[1]
Scenario 4 – Cumulative Assessment			
Mantserre	1.4	9.5	38.1
Mantserre Primary School	1.5	8.8	39.8
Laerskool Platina Primary	0.3	4.0	7.2
Platinum Health Hospital	0.4	4.7	8.8
Ga-Ramosidi	1.1	9.5	25.4
Sefikile	0.8	7.7	19.2
Sefikile Clinic	0.8	6.6	18.3
Sefikile Primary School	0.7	8.9	19.5
Informal Settlement	1.3	11.1	32.0
Max. UM Boundary	3.2	15.9	73.5

Receptor	SO_2 Concentration (µg/m³)		
	Annual Average	Daily Maximum	Hourly Maximum
Max. modelling domain	11.5	45.6	177.5

Notes:
[1]Predicted on-site where ambient air quality objectives do not apply

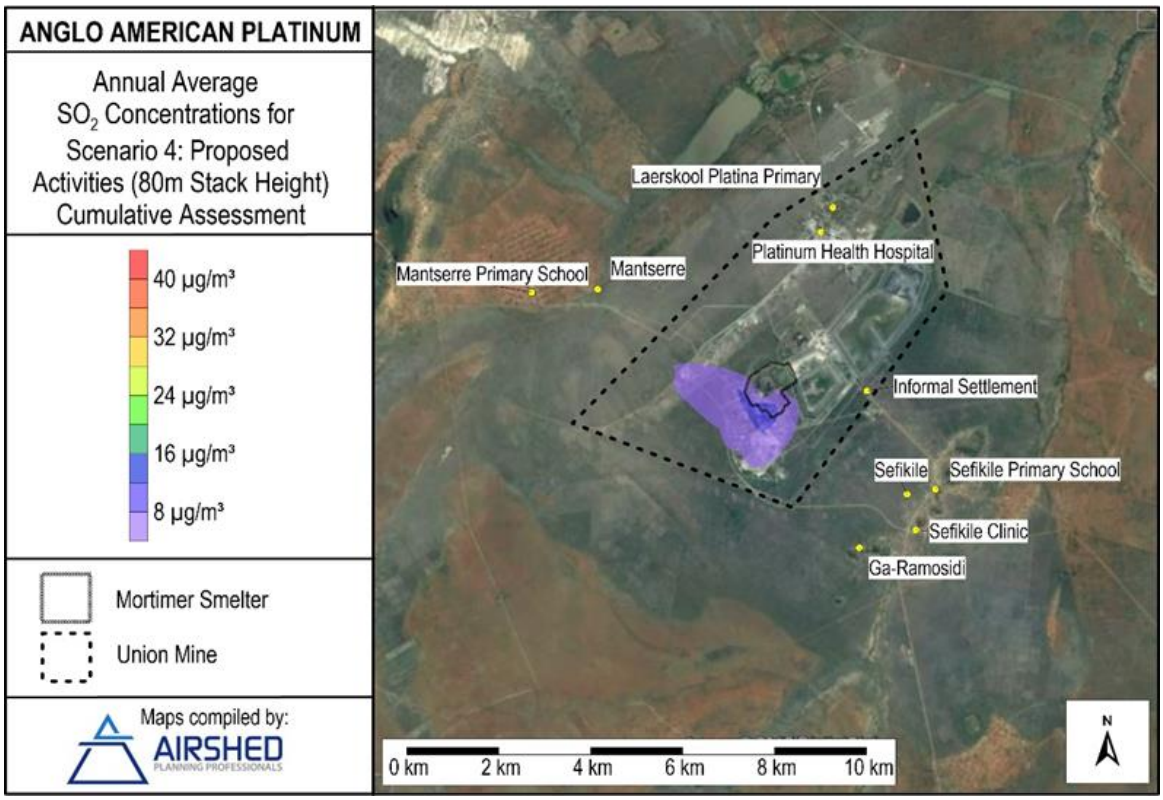


Figure 79: Scenario 4 – Annual Average SO_2 Concentrations

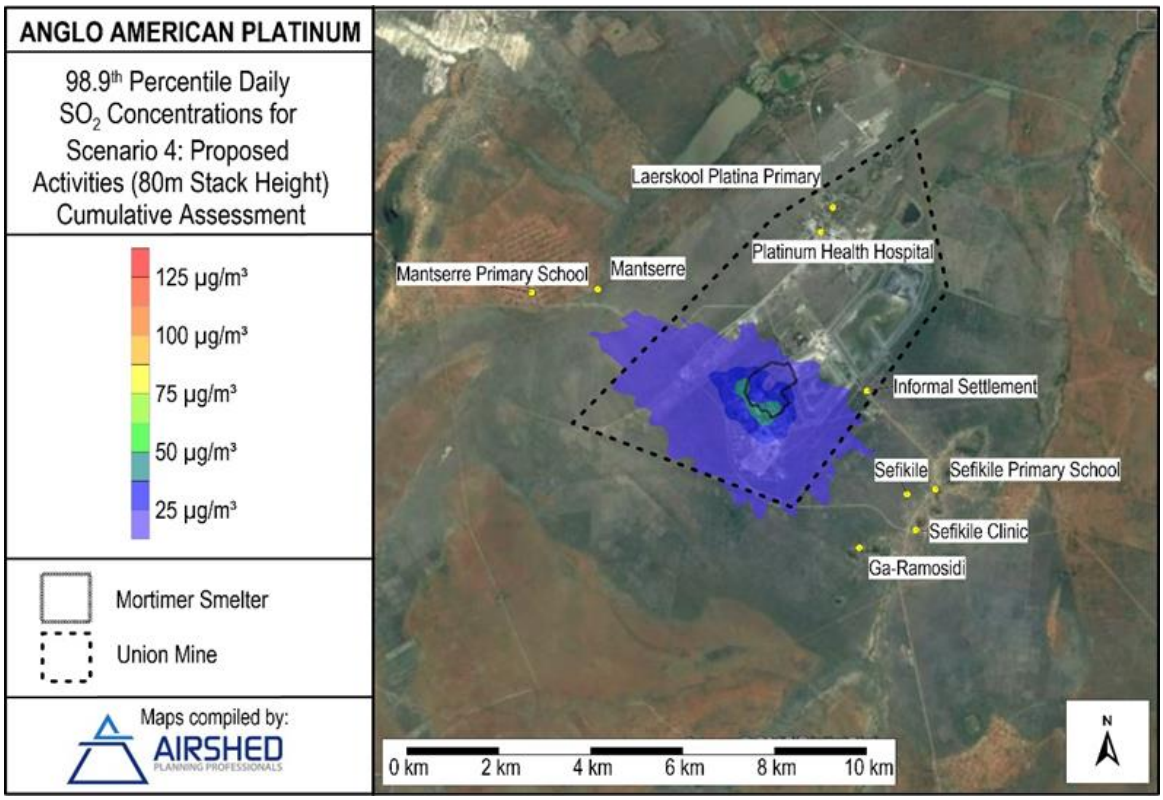


Figure 80: Scenario 4 – Daily Average SO_2 Concentrations

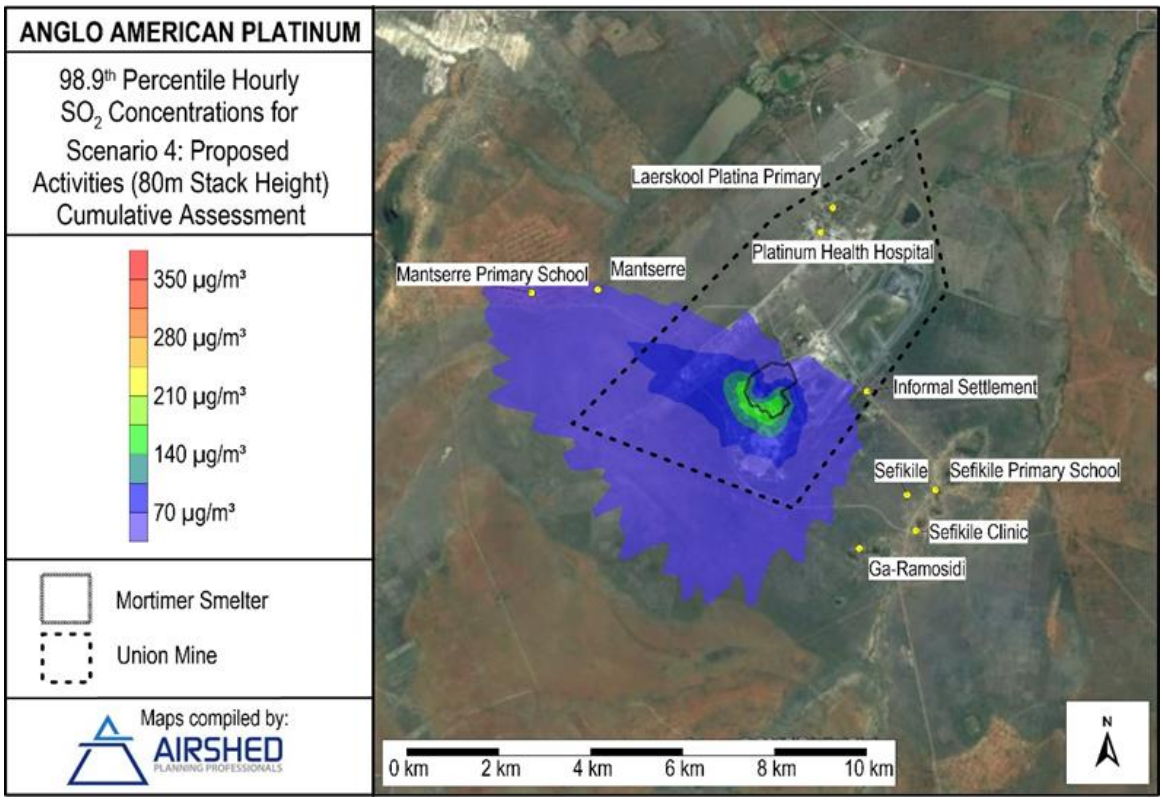


Figure 81: Scenario 4 – Hourly Average SO_2 Concentrations

Table 56: Cumulative SO_2 Concentrations

POTENTIAL IMPACT: CUMULATIVE SO2 CONCENTRATIONS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	4	3	33	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	5	2	2	16	Low	(-)	High

Management Measures

The following mitigation measures are proposed:

- All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability.
- There must be strict speed limits on dust roads to prevent dust entrainment into the atmosphere.
- Management procedures to ensure minimal disturbance can be employed during the construction and decommissioning phase to mitigate dust.
- Employees must be issued with appropriate PPE.
- Performing construction and remediation activities over separate portions will reduce wind erosion of open land.
- Wet suppression and wind speed reduction are common methods used to control open dust sources at construction sites, as a source of water and material for wind barriers tend to be readily available.
- Sustainable erosion control measures (for wind and water erosion) must be implemented and maintained where necessary in areas disturbed by the construction / demolition operations.
- 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.
- It is recommended that wet suppression and wind speed (windbreaks, wind covers or barriers) reduction mitigation techniques are employed throughput the duration of the construction and decommissioning phases.
- General control methods for open dust sources, as recommended by the US EPA, are given in **Table 44**.
- It is recommended that existing and proposed mitigation techniques are maintained and that abatement machinery is regularly serviced according to supplier specifications.
- It is recommended that PM_{10}, SO_2 and dust fallout monitoring is continued to assess ambient concentrations and dust fallout levels.
- It is recommended that fugitive emissions from the furnace building are monitored to accurately determine, and better understand, the potential impacts of this source.

Table 57: Mitigation Measures for General Construction

Emission source	Recommended control method
Debris handling	Wind speed reduction

	Wet suppression(1)
Truck transport(2)	Wet suppression
	Paving
	Chemical stabilisation(3)
Bulldozers	Wet suppression(4)
Pan scrapers	Wet suppression
Cut/fill material handling	Wind speed reduction
	Wet suppression
Cut/fill haulage	Wet suppression
	Paving
	Chemical stabilisation
General construction	Wind speed reduction
	Wet suppression
	Early paving of permanent roads

Notes:

(1) Dust control plans should contain precautions against watering programs that confound trackout problems.
(2) Loads could be covered to avoid loss of material in transport, especially if material is transported offsite.
(3) Chemical stabilisation usually cost-effective for relatively long-term or semi-permanent unpaved roads
(4) Excavated materials may already be moist and may not require additional wetting.

HYDROLOGY

Due to the historical nature of RPM-US and use of in-stream return water dams, the Mortimer Spruit within the mine lease area is operated as a dirty water channel and flows to the Barbers return water dam where dirty water is contained under normal operating conditions. Overflows from Fraser Alexander return water dam will drain to Barbers return water dam via Mortimer Spruit.

Mortimer Smelter has an existing stormwater management system and all runoff generated in the area is drained to the tailings return water dams.

Construction Phase

Impact H1: Surface Water Contamination

During the construction phase there is the potential of surface water contamination due to the incorrect handling, storage and disposal of hazardous waste. In addition there is the potential of surface water contamination should the required ablution facilities not be provided for labourers. During the construction phase the stormwater management system will be upgraded to ensure that runoff from the SO_2 Abatement Plant area also reports to the tailings return water dams during the operational phase.

Table 58: Impact H1: Surface Water Contamination

POTENTIAL IMPACT: H1: SURFACE WATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	6	4	40	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	2	4	3	21	Low	(-)	High

Operational Phase

Impact H2: Surface Water Contamination

During the operational phase runoff from the SO_2 Abatement Plant area will report to the tailings return water dams during the operational phase. However should the stormwater management system not be maintained there is the potential of surface water contamination due to the incorrect handling, storage and disposal of hazardous materials.

Table 59: Impact H2: Surface Water Contamination

POTENTIAL IMPACT: H2: SURFACE WATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	3	4	4	32	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	2	2	3	15	Low	(-)	High

Closure Phase

Impact H3: Surface Water Contamination

Potential surface and groundwater contamination as a result of residual organic and inorganic contamination that may be present after rehabilitation of the SO_2 Abatement Plant.

Table 60: Impact H3: Surface Water Contamination

POTENTIAL IMPACT: H3: SURFACE WATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	4	6	4	52	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	1	4	2	12	Low	(-)	High

Cumulative Impact

Additional impacts are not considered to be substantive enough to affect the status quo.

Management Measures

The following mitigation measures are proposed:

- All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor lay down area. All repairs are to be performed on an impervious surface.
- The SO_2 Abatement Plant must be underlain by concrete to minimise seepage.
- Storage areas and vehicle maintenance areas must have appropriate containment measures in place, including bunds, concrete, canals, collector drains and interception trenches.
- 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.
- 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.
- 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.
- Spilled material must be cleaned up and disposed of appropriately as soon as practically possible.
- All hazardous waste must be disposed of at a registered hazardous waste disposal facility or stored in designated, lined and bunded areas (for no longer than 90 days).
- Records of all waste being taken off site must be recorded and kept as evidence.

GROUNDWATER

The aquifer characteristics are consistent with the regional description provided above. The rest groundwater level in the vicinity of the Mortimer Concentrator Complex is approximately 3m below ground level. The aquifer characteristics are consistent with the regional description provided above. The rest groundwater level in the vicinity of the Mortimer Concentrator Complex is approximately 3m below ground level.

Construction Phase

Impact GW1: Groundwater Contamination

There is the potential contamination of groundwater due to the incorrect handling, storage and disposal of hazardous materials.

Table 61: Impact GW1: Groundwater Contamination

POTENTIAL IMPACT: GW1: GROUNDWATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	3	6	4	44	Medium	(-)	High
Degree to which Impact can be Reversed	Low							

POTENTIAL IMPACT: GW1: GROUNDWATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	1	4	4	24	Low	(-)	High

Operational Phase

Impact GW2: Groundwater Contamination

There is the potential contamination of groundwater due to the incorrect handling, storage and disposal of hazardous materials.

Table 62: Impact GW2: Groundwater Contamination

POTENTIAL IMPACT: GW2: GROUNDWATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	3	6	4	48	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	2	4	4	28	Low	(-)	High

Closure Phase

Impact GW3: Groundwater Contamination

Potential surface and groundwater contamination as a result of residual organic and inorganic contamination that may be present after rehabilitation of the SO_2 Abatement Plant.

Table 63: Impact GW3: Groundwater Contamination

POTENTIAL IMPACT: GW3: GROUNDWATER CONTAMINATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	4	6	4	52	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Medium							
With Mitigation	1	1	4	2	12	Low	(-)	High

Cumulative Impact

Additional impacts are not considered to be substantive enough to affect the status quo.

Management Measures

The following mitigation measures are proposed:

- All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor lay down area. All repairs are to be performed on an impervious surface.
- The SO_2 Abatement Plant must be underlain by concrete to minimise seepage.
- Polluted water (effluent and contaminated runoff) must be directed to a containment pond.
- Seepage must be collected in perimeter drains, which flow to the return water dams for reuse.
- Storage areas and vehicle maintenance areas must have appropriate containment measures in place, including bunds, concrete, canals, collector drains and interception trenches.
- 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.
- 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.
- 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.
- Spilled material must be cleaned up and disposed of appropriately as soon as practically possible.
- All hazardous waste must be disposed of at a registered hazardous waste disposal facility or stored in designated, lined and bunded areas (for no longer than 90 days)
- Records of all waste being taken off site must be recorded and kept as evidence.
- The infrastructure must be dismantled and removed on closure.

ENVIRONMENTAL NOISE

Environmental Acoustic Impact Assessment, undertaken by WSP | Parsons Brinckerhoff, dated May 2017 (attached in **Appendix 6-1**).

The noise within the RPM-US lease area can be described as generally quiet. Although intruding noises from a number of sources (main roads and mechanisation) occur, these are not perceived to be particularly disturbing.

The Mortimer Smelter noise climate can be described as predominantly industrial. The day-time monitored levels are considered an accurate representation of ambient conditions, with limited impact from external sources.

During the night-time, existing ambient sound levels at all locations did not adhere to the relevant SANS 10103 industrial guideline (60 dB(A)), except for NS 09 which is located 50 m from the fence line of the site. The flash dryer and other plant operations contributed to the elevated ambient levels recorded at night at all locations.

Construction Phase

Impact EN1: Noise as a Result of Construction Activities

The construction phase is only expected to occur during the daytime. Construction noise is considered to be transient and as such, is not expected to be continuous or constant in terms of its origin. However, insufficient information is available for the construction phase and therefore a detailed assessment could not be carried out. Based on similar construction works and given the

proximity of the surrounding receptors to the construction site, it is not expected that construction noise will cause any significant impact to the surrounding area.

Table 64: Impact EN1: Noise as a Result of Construction Activities

POTENTIAL IMPACT: EN1: NOISE AS A RESULT OF CONSTRUCTION ACTIVITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	2	4	3	21	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	3	15	Low	(-)	High

Operational Phase

The following proposed noise sources were identified:

- Gas Cooling Tower (x1) – the cooling tower is an enclosed vessel, which features internal water sprays that are used to cool down the process gas to the desired WSA inlet temperature
- Wet Electrostatic Precipitator (WESP) (x2) – uses electrostatic forces to remove particulates and contains four-off small purge air blowers fitted to each WESP
- Acid Plant Cooling Water Tower (x6) – a heat rejection device through the cooling of a water stream to a lower temperature
- WSA Plant Feed Fan (x1) – a mechanical device for moving gases
- WSA Recirculating Gas Fan (x1) – involves the recirculation of gas in the fan
- WSA Cold Air Intake Fan (x1) – used for the circulation of air
- WSA Clean Gas Fan (x1) – device for moving gases
- LPG Burner (x2) – the burner is a gas heater that is mounted internal to the ductwork
- Lime Silo (x1) – method used for the storage of lime
- Lime Delivery Truck (x1) – truck which is predominantly used for the transportation of lime
- Acid Dispatch Truck (x1) – truck which involves dispatching of acid

Impact EN2: Acoustic Impact on Neighbouring Workers Accommodation

During the operational phase, all activities will be operational 24 hours a day, seven days a week with the exception of the trucks, which operate from 08:00 to 17:00. Predicted noise levels are compared with the existing baseline noise levels to assess the change in sound levels as a result of the proposed SO_2 abatement plant.

Graphical outputs of the modelled results for the operational phase are presented in **Figure 82** and **Figure 83**.

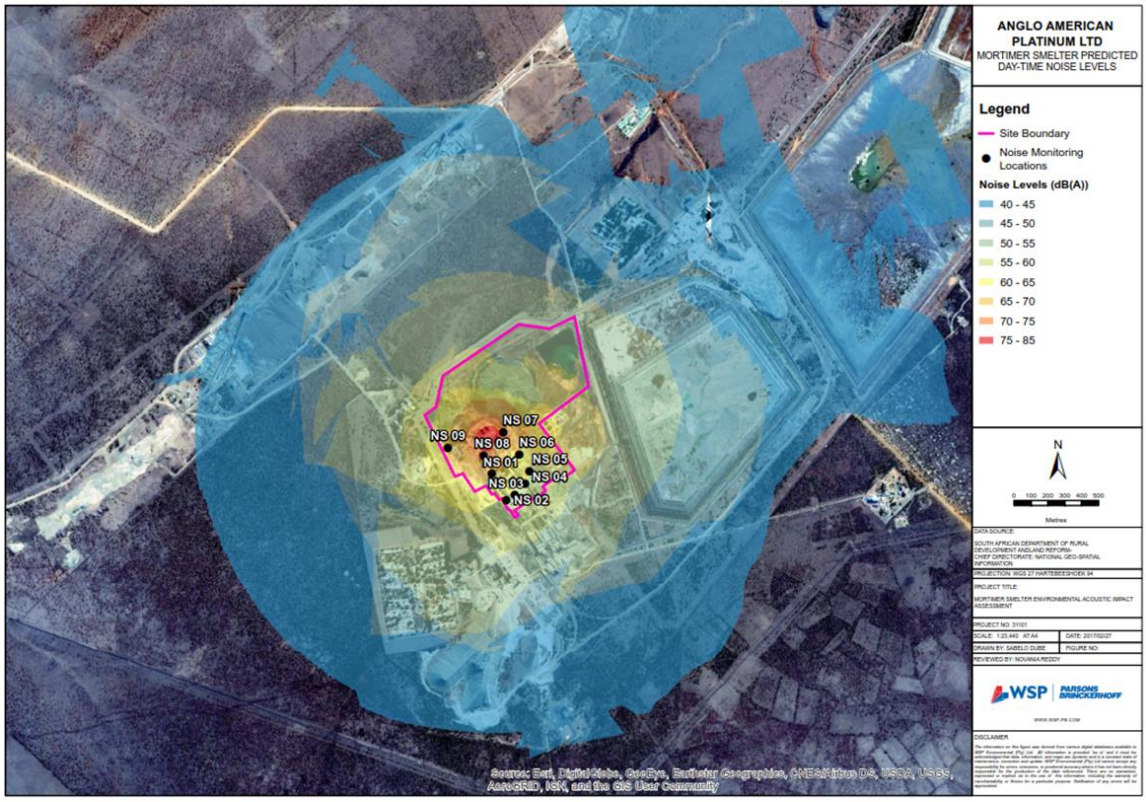


Figure 82: Predicted Day-time Noise Levels During the Operational Phase

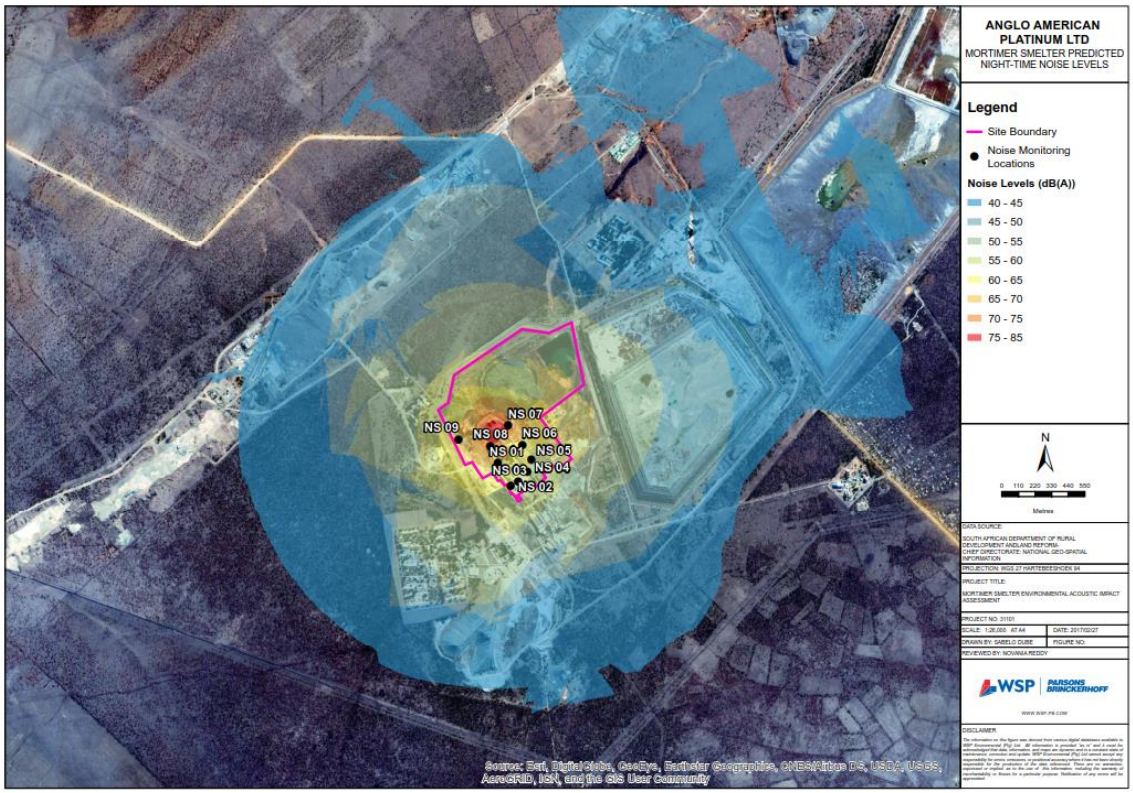


Figure 83: Predicted Night-time Noise Levels During the Operational Phase

Table 65: Impact EN2: Acoustic Impact on Neighbouring Workers Accommodation

POTENTIAL IMPACT: EN2: ACOUSTIC IMPACT ON NEIGHBOURING WORKERS ACCOMMODATION	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	4	4	3	30	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	4	4	3	30	Low	(-)	High

Impact EN3: Acoustic Impact on Residential Receptors

Table 66: Impact EN3: Acoustic Impact on Residential Receptors

POTENTIAL IMPACT: EN3: ACOUSTIC IMPACT ON RESIDENTIAL RECEPTORS	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	4	4	2	20	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	4	4	2	20	Low	(-)	High

Closure Phase

Impact EN4: Noise as a Result of Closure Phase

There will be an impact to environmental noise during the closure phase which will be similar to the impacts anticipate during the construction phase.

Table 67: Impact EN4: Noise as a Result of Closure Activities

POTENTIAL IMPACT: EN4: NOISE AS A RESULT OF CLOSURE ACTIVITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	2	4	3	21	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	3	15	Low	(-)	High

Cumulative Impact

Impact EN5: Cumulative Noise

Cumulative sound levels (existing and predicted together) are also presented for each monitoring location, however, it must be noted that since sound levels are represented in logarithmic units, simple addition cannot be applied to obtain the cumulative sound levels, but rather logarithmic addition. Predicted day-time and night-time noise levels from the proposed SO_2 abatement plant at the nine monitoring locations during the operational phase are presented in **Table 68** and **Table 69.**

Cumulative day-time noise levels in the immediate vicinity of the site are predicted to be high, in excess of the SANS industrial district rating level of 70 dB(A). Changes in noise levels ranging from +0.1 to +11.6 dB(A) are anticipated at the monitoring locations, with the largest change predicted at NS 08, located approximately 50 m southwest of the proposed SO2 abatement plant. Such increases in noise can be attributed to the gas cooling tower and the proposed WESPs located in close proximity to this monitoring location. In line with the SANS categories of community/group responses, such increases are considered to have “little to medium” impact for the proposed development, with the exception of NS 08 which resulted in a “medium to strong” estimated community response. Furthermore, increases in noise levels at NS 07 and NS 08 exceed the 7 dB(A) threshold for annoyance as per the Noise Control Regulations. However, such receivers are industrial in nature and would not be perceptible to such annoyance. From ±80 m from the proposed SO2 abatement plant, noise levels will reduce considerably, remaining below the industrial district rating level. Predicted noise levels at the nearest residential receptor (Workers’ Accommodation), located approximately 670 m from the proposed SO2 abatement plant, are expected to be below the urban day-time guideline rating level of 55 dB(A). However, it must be noted that these noise levels are from proposed activities only and do not include baseline existing noise levels. Due to the proximity of the remaining sensitive receptors identified within a 10 km radius of the proposed development, the resultant impact on these receptors, will likely be insignificant.

During the night-time, predicted noise levels (cumulative sound levels) are expected to be in excess of the SANS industrial district rating level of 60 dB(A). Changes in noise levels ranging from +0.1 to +11.8 dB(A) are anticipated at the monitoring locations, with the largest change predicted at NS 08, located approximately 50 m southwest of the proposed SO2 abatement plant. Again, this can be attributed to the gas cooling tower and the proposed WESPs located in close proximity to the monitoring location. The change in noise levels will result in “little to medium” estimated community response at all monitoring locations with the exception of NS 08 which resulted in a “medium to strong” estimated community response. Furthermore, increases in noise levels at NS 07 and NS

08 exceed the 7 dB(A) threshold for annoyance as per the Noise Control Regulations, however, such receptors are industrial in nature and would not be perceptible to such annoyance. From ±80 m from the proposed SO2 abatement plant, noise levels will reduce considerably, remaining below the industrial district rating level. Predicted noise levels at the nearest residential receptor (Workers' Accommodation), located approximately 670 m from the proposed SO2 abatement plant, are expected to be slightly above the urban night-time guideline rating level of 45 dB(A). However, it must be noted that these noise levels are from proposed activities only and do not include baseline existing noise levels. Due to the proximity of the remaining sensitive receptors identified within a 10 km radius of the proposed development, the resultant impact on these receptors, will likely be insignificant.

Table 68: Cumulative Day-time Acoustic Model Results

Receiver	Predicted Noise Level associated with the SO_2 abatement plant (dB(A))	Existing Day-time Noise Level (dB(A))	Cumulative Noise Level (dB(A))	Change in Noise Level(dB(A))	Estimated Community Response
NS 01	66.0	69.1	70.8	+1.7	Little
NS 02	59.5	64.9	66.0	+1.1	Little
NS 03	59.4	65.8	66.7	+0.9	Little
NS 04	59.4	67.4	68.0	+0.6	Little
NS 05	59.8	65.4	66.5	+1.1	Little
NS 06	63.7	79.0	79.1	+0.1	Little
NS 07	72.4	65.6	73.2	+7.6	Little to medium
NS 08	73.2	61.9	73.5	+11.6	Medium to strong
NS 09	65.6	62.7	67.4	+4.7	Little

Table 69: Cumulative Night-time Acoustic Model Results

Receiver	Predicted Noise Level associated with the SO_2 abatement plant (dB(A))	Existing Night-time Noise Level (dB(A))	Cumulative Noise Level (dB(A))	Change (dB(A))	Estimated Community Response
NS 01	66.0	69.4	71.0	+1.6	Little
NS 02	59.4	63.1	64.6	+1.5	Little
NS 03	58.9	64.2	65.3	+1.1	Little
NS 04	58.8	66.1	66.8	+0.7	Little
NS 05	59.1	64.2	65.4	+1.2	Little
NS 06	63.0	77.7	77.8	+0.1	Little
NS 07	71.8	65.0	72.6	+7.6	Little to medium
NS 08	73.1	61.6	73.4	+11.8	Medium to strong
NS 09	65.4	58.9	66.3	+7.4	Little to medium

Table 70: Impact EN5: Cumulative Noise

POTENTIAL IMPACT: EN5: CUMULATIVE NOISE	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	6	4	40	Medium	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	4	4	28	Low	(-)	High

Management Measures

The following mitigation measures are proposed:

- → Additional (i.e. more recent) monitoring, on the fence line and at receptors, are to be undertaken, as the data is not fully representative of the current baseline (i.e. outdated).
- → Employees must be issued with appropriate PPE.

ARCHAEOLOGY AND CULTURAL HERITAGE

A Report on Cultural heritage Impact Assessment for the Proposed Mortimer Smelter SO_2 Abataamenet Project, North West, undertaken by Archaetnos Culture & Cultural, dated April 2017 (attached in **Appendix 6-4**).

Construction Phase

Impact ACH 1: Impact on Archaeological and Cultural Heritage

The site is heavily impacted by existing industrial activities and during the site investigation no sites of cultural heritage significance were located. There however remains a possibility that unearthed artefacts may be discovered during the construction phase.

Table 71: Impact ACH 1: Impact on Archaeological and Cultural Heritage

POTENTIAL IMPACT: ACH 1: IMPACT ON ARCHAEOLOGICAL AND CULTURAL HERITAGE	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	4	2	20	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	High							
With Mitigation	1	1	2	2	8	Low	(-)	High

Operational Phase

There is no impact anticipated during the operational phase.

Closure Phase

Impact ACH 2: Impact on Archaeological and Cultural Heritage

At the time of closure there is the potential that some of the structures may be older than 60 years and if they are removed this will have an impact on heritage resources.

Table 72: Impact ACH 2: Impact on Archaeological and Cultural Heritage

POTENTIAL IMPACT: ACH 2: IMPACT ON ARCHAEOLOGICAL AND CULTURAL HERITAGE	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	4	3	30	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	0	2	4	Low	(-)	High

Cumulative Impact

There is no cumulative impact anticipated.

Management Measures

The following mitigation measures are proposed:

- Should any archaeological artefacts be exposed during construction, 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. If these appear to be human remains the South African Police Service will also be contacted.
- Prior to closure an assessment of all structures on site must be undertaken in order to determine their heritage importance.

SOCIO-ECONOMIC STRUCTURE

Proposed Installation of Sulphur Dioxide Abatement Equipment at Mortimer Smelter – Social Impact Assessment, undertaken by WSP | Parsons Brinckerhoff, dated May 2017 (attached in **Appendix 6-5**).

Various current social and socio-economic issues exist within the MKL. These include the current social, cultural and political landscape and the existing mining activities. An overview of these issues, as identified through the SIA process, is provided below:

- Unemployment
- Community Public Safety
- Water Resources
- Lack of service provision
- Social conflict

Construction Phase

No significant socio-economic implications are anticipated during the construction phase of the proposed Mortimer Smelter SO_2 abatement project.

The positive impacts associated with the construction phase are the potential for employment and economic development opportunities, both of which are considered to be of low significance. There are a number of recommendations that can enhance of these impacts including appointment of local contractors and use of local labour as far as possible; and use of local suppliers and manufacturers.

The potential negative impacts are limited to minor nuisance factors such as noise, dust and traffic disturbances, all of which can be adequately addressed through the implementation of the EMPr.

Impact SES 1: Employment Opportunities

Table 73: Impact SES 1: Employment Opportunities

POTENTIAL IMPACT: SES 1: EMPLOYMENT OPPORTUNITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	2	4	3	27	Low	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	N/A							
With Mitigation	3	2	4	4	36	Medium	(+)	High

Impact SES 2: Local Economic Development Opportunities

Table 74: Impact SES 2: Local Economic Development Opportunities

POTENTIAL IMPACT: SES 2: LOCAL ECONOMIC DEVELOPMENT OPPORTUNITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	2	4	3	27	Low	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	N/A							
With Mitigation	3	2	4	4	36	Medium	(+)	High

Impact SES 3: Nuisances

Table 75: Impact SES 3: Nuisances

POTENTIAL IMPACT: SES 3: NUISANCES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	2	4	3	24	Low	(-)	High
Degree to which Impact can be Reversed	Medium							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	2	12	Low	(-)	High

Operational Phase

No significant socio-economic impacts associated with the operational phase of the proposed project have been identified.

The operational phase of the proposed project will result in minimal new employment opportunities (3 to 4), in addition the existing jobs will be retained at the Mortimer Smelter. Should the project not be implemented the facility is at risk of potential closure.

The proposed SO_2 project will contribute positively by improving the ambient air quality for the surrounding communities and contribute towards the combating of climate change.

Impact SES 4: Retention of Existing Employees

Table 76: Impact SES 4: Retention of Existing Employees

POTENTIAL IMPACT: SES 4: RETENTION OF EXISTING EMPLOYEES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	4	4	4	40	Medium	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	N/A							
With Mitigation	2	4	6	4	48	Medium	(+)	High

Impact SES 5: Improvement in Ambient Air Quality

Table 77: Impact SES 5: Improvement in Ambient Air Quality

POTENTIAL IMPACT: SES 5: IMPROVEMENT IN AMBIENT AIR QUALITY	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	4	2	3	24	Low	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	N/A							
With Mitigation	2	4	2	3	24	Low	(+)	High

Closure Phase

Impact SES 6: Loss of Employment Opportunities

During the closure phase employment opportunities associated with the existing operations will be lost.

Table 78: Impact SES 6: Loss of Employment Opportunities

POTENTIAL IMPACT: SES 6: LOSS OF EMPLOYMENT OPPORTUNITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	3	4	4	3		Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	N/A							
With Mitigation	3	4	4	3		Medium	(-)	High

Cumulative Impact

The cumulative impact will be the same as for the operational phase.

Management Measures

The following mitigation measures are proposed:

- Should unskilled labour be required during the construction phase, this should be sourced from the local communities. This requirement must be specified within the contract signed by the contractor.
- AAP is to ensure that any new or replacement employment and procurement opportunities maximise benefits to local communities.
- Local entrepreneurs and previously disadvantaged contractors must be provided preferential opportunities to tender for contracts.
- Local recruitment must take place through the tribal recruitment office and with the knowledge of mutually agreed community structures and recruitment channels / mechanisms.
- Sub-contractors must sign a compliance agreement with regards to local employment.
- Sub-contractors must submit labour returns to verify local recruitment.
- RPM-US must keep records of the number of local people employed, place of residence, recruitment office, job descriptions, length of service and opportunities for career development. Sub-contractors to RPM-US must keep similar records for all placements of local people.
- 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.
- RPM-US must assist with the administration of the tribal recruitment office. This includes the facilitation of local skills audits, baseline data and the development of socio-economic databases.
- Currently, AAP has a local recruitment and procurement policy in place, which their contractors must adhere to and provide evidence thereof. This may be enhanced through consultation with local communities and leadership, as well as the Department of Labour. This engagement may include ascertaining the local skills levels and providing information on general and scarce skills needs, as well as procurement opportunities available at the AAP facility. This process would aim at encouraging local communities to develop skills for future employment at the Mortimer Smelter operations.
- The establishment of a Stakeholder Engagement Forum, with representatives from local community (including informal communities) is recommended. This should be developed into a structure to promote on-going discussions, and ensure actions are taken by AAP, the local communities, traditional leadership and the local municipality to ensure that issues raised are resolved over time.
- The outcomes of regular meetings should be tracked and managed to ensure that the information shared at forum meetings is meaningful and actions are implemented by the relevant parties.
- AAP must identify ways in which they can improve their engagement with stakeholder through other existing forums, improved communication and regular feedback mechanisms.
- Principles of equality, BEE, gender equality and non-discrimination must be implemented.

VISUAL

The SO_2 Abatement Plant will be situated within the existing Mortimer Smelter Complex which is situated with the boundary of RPM-US. The existing sense of place has already been altered by the exiting infrastructure which is of a highly industrial nature and therefore the proposed project

will be within context of its surroundings. The SO_2 Abatement Plant will be shielded by existing infrastructure at RPM-US.

Construction Phase

Impact V1: Visual Impact

A visual impact may occur as a result of construction activities, which include the presence of construction vehicles and equipment and potential dust generation.

Table 79: Impact V1: Visual Impact

POTENTIAL IMPACT: V1: VISUAL IMPACT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	2	2	4	20	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	4	20	Low	(-)	High

Operational Phase

Impact V2: Visual Impact

During the operational phase there is the potential that emissions will be present from the stack, however there is already existing sources of emissions and this will not result in a markable change.

It is however possible that a white plume may be visible under certain wherther conditions, as the clean off-gas from the WSA Plant will contain more moisture than the existing process.

Table 80: Impact V2: Visual Impact

POTENTIAL IMPACT: V2: VISUAL IMPACT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	3	2	4	28	Low	(-)	High
Degree to which Impact can be Reversed	High							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Closure Phase

Impact V3: Visual Impact

During the closure phase the existing structures and infrastructures will be removed which will likely change the current sense of place.

Table 81: Impact V3: Visual Impact

POTENTIAL IMPACT: V3: VISUAL IMPACT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	5	6	4	52	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	2	2	3	18	Low	(-)	High

Cumulative Impact

The cumulative impact will remain as per the operational phase.

Management Measures

The following mitigation measures are proposed:

- Use low wattage light bulbs where possible to reduce potential for light pollution.
- Place focused lighting at low levels and direct on specific objects, areas, or activities to reduce potential for light pollution.
- Use exterior paints and non-reflective finishes to minimise glare and reflection from built surfaces.
- Waste heat in the WSA Process will be used to heat the final, clean off-gas to help prevent a white plume due to moisture.
- The plant infrastructure must be dismantled at closure and the plant area rehabilitated in line with the rehabilitation plan.

HAZARDMANAGEMENT

A Quantitative Risk Assessment of the Proposed SO2 Abatement Project at Anglo Platinums Mortimer Smelter near Northam in the North West Province was undertaken by Riscom (Pty) Ltd, dated 17 May 2017 (attached in **Appendix 6-8)**.

Construction Phase

Impact HM 1: Hazardous Materials Management

Small quantities of hazardous materials such as diesel, gasoline, lubricants and paints and solvents will be stored on site during construction. These result in minimal potential for impacts to the environment and the public.

The Mortimer Smelter is an operational site and will continue to produce off-gas containing sulphur dioxide during the construction phase of the project. A loss of containment would impact the construction site, but would not impact the public.

No additional acutely hazardous materials will be produced (sulphur trioxide and sulphuric acid) or stored (sulphuric acid) in bulk during the construction phase.

Table 82: Impact HM 1: Hazardous Materials Management

Potential Impact: HM 1: Hazardous Materials Management	Extent	Duration	Magnitude	Provability	Overall Significance		Character	Confidence
Without Mitigation	2	2	6	4	40	Medium	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	2	2	3	15	Low	(-)	High

Operational Phase

Hazardous materials will be produced and stored as the result of the implementation of the SO_2 Abatement project. Sulphur dioxide contained in the furnace off-gas will be converted to a sulphur trioxide intermediate (no storage) which will be used to produce sulphuric acid which will be stored in storage tanks. Losses of containment of process gases could result in toxic releases that could impact the environment.

Impact HM 2: Loss of Primary Containment of SO_3 Gas in the WSA Plant

Table 83: Impact HM 2: Loss of Primary Containment of SO_3 Gas in the WSA Plant

Potential Impact: HM 2: Loss of Primary Containment of SO_3 Gas in the WSA Plant	Extent	Duration	Magnitude	Provability	Overall Significance		Character	Confidence
Without Mitigation	2	1	4	2	14	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	2	8	Low	(-)	High

Impact HM 3: Loss of Primary Containment of SO_2 Gas in the WSA Plant

Potential Impact: HM 3: Loss of Primary Containment of SO2 Gas in the WSA Plant	Extent	Duration	Magnitude	Provability	Overall Significance		Character	Confidence
Without Mitigation	1	1	4	2	12	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	2	8	Low	(-)	High

Impact HM 4: Loss of Secondary Containment of Sulphuric Acid

Table 84: Impact HM 4: Loss of Secondary Containment of Sulphuric Acid

POTENTIAL IMPACT: HM 4: LOSS OF SECONDARY CONTAINMENT OF SULPHURIC ACID	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	1	2	2	8	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	1	4	Low	(-)	High

Impact HM 5: Loss of Secondary Containment of Hydrated Lime / Effluent

Table 85: Impact HM 5: Loss of Secondary Containment of Hydrated Lime / Effluent

POTENTIAL IMPACT: HM 5: LOSS OF SECONDARY CONTAINMENT OF HYDRATED LIME / EFFLUENT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	1	2	2	8	Low	(-)	High
Degree to which Impact can be Reversed	Low							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	1	1	2	1	4	Low	(-)	High

Closure Phase

Impact HM 6: Cessation of Hazardous Activities

Once the facility is decommissioned all activities will cease. There is a requirement to minimise the risk of environmental impacts that may result from the decommissioning and closure of the site.

On decommissioning the production and storage of hazardous materials would be discontinued. All hazardous material storages would be drained, cleaned and dismantled, as per the closure plan.

Table 86: Impact HM 6: Cessation of Hazardous Activities

POTENTIAL IMPACT: HM 6: CESSATION OF HAZARDOUS ACTIVITIES	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	1	5	4	3	30	Low	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	2	5	4	3	33	Medium	(+)	High

Cumulative Impact

Impact HM 7: Implementation of Proposed Project

The Bojanala-Waterberg is an area where emissions from mining operations have been identified as having a very significant impact on ambient air quality.

The cumulative impact of the SO_2 Abatement Project would be a positive resulting in an overall reduction in sulphur emissions as toxic sulphur dioxide gas. This is a requirement given the Bojanala-Waterberg area has priority status, for the roll out of an ambient air management plan.

Sulphur trioxide is an acutely toxic component that would be produced as a direct result of the project, but it is anticipated that the additional impact would be negligible, as it will be limited to a very small section of the WSA plant.

Table 87: Impact HM 7: Implementation of Proposed Project

POTENTIAL IMPACT: HM 7: IMPLEMENTATION OF PROPOSED PROJECT	EXTENT	DURATION	MAGNITUDE	PROVABILITY	OVERALL SIGNIFICANCE		CHARACTER	CONFIDENCE
Without Mitigation	2	4	4	4	40	Medium	(+)	High
Degree to which Impact can be Reversed	N/A							
Degree of impact on Irreplaceable Resources	Low							
With Mitigation	3	4	6	4	52	Medium	(+)	High

Management Measures

The following mitigation measures are proposed:

- Compliance with applicable SANS codes, i.e. SANS 10087-3 (LPG), SANS 10400, SANS 10108, etc. must be demonstrated.
- Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.
- Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) for the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place.
- Preparation and issue of a safety document detailing safety and design features of the design for reducing the impacts from toxic releases, loss of containment, fires, explosions and flammable atmospheres to form part of the required input to a quantitative risk assessment:
  - including compliance to statutory laws, applicable codes and standards and world's best practice;
  - including the listing of statutory and non-statutory inspections, giving frequency of inspections;
  - including the auditing of the built facility against the safety document; and,
  - noting that codes such as IEC 61511 can be used to achieve these requirements.
- Demonstration by AAP or their contractor that the final designs would reduce the risks posed by the installation to internationally acceptable guidelines.
- Sign-off for all SO_2 Abatement Project designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs.
- Completion of an emergency preparedness and response document for on-site and off-site scenarios.
- Permission not being granted for increases to the product list or product inventories without redoing part of or the full EIA. This will only be applicable should a new listed activity trigger.

- Final acceptance of the facility risks for all the retained AAP operations at Mortimer with a quantitative risk assessment that must be completed in according to a process based on a process similar to the one required for to the MHI regulations.
- The sulphuric acid storage, pumping and road tanker loading areas must be provided with bunds (secondary containment) to contain spillages.
- Level indication and controls are to be installed to prevent overfilling of the acid storage tanks and when loading acid road tankers.
- Gantries and loading arms for the loading of sulphuric acid tankers are to be maintained.
- The effluent plant must be bunded to prevent lime slurry and untreated effluent streams from entering the environment.
- The bypass of furnace off-gas to the stack in extreme instances must be considered to reduce the impact of loss of primary containment of process gases in the WSA.
- SO_2/SO_3 monitoring and shutdown procedures must be developed and implemented as per the HAZOP.
- Regular inspection and maintenance of ducting and equipment must be undertaken.
- Regular inspection of bunded areas must be undertaken to ensure integrity and that are they are kept free of spillage and rainwater. Sulphuric acid bunded areas to be kept clear of rainwater, to prevent violent reaction with acid spillages which may be accompanied by the generation of toxic vapours.
- Routine monitoring of plant effluent streams must be undertaken to identify possible losses of hazardous chemicals in the process.

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

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Issues and Concerns Raised	Mitigations or site layout alternatives available to accommodate or address their concerns	Assessment of the impacts or risks associated with the mitigation or alternatives considered
Requested that local community members be employed on the project. Requested that a skills development program be established to empower the communities. Majority of the local woman are unemployed and hence get into relationships with the migrant workers. There is an increase in children with no fathers and other social problems. Requested that local community members be employed on the project. Requested that employment opportunities are communicated directly with the community representatives and not only to the tribal authorities.	The following mitigation measures are proposed: → Should unskilled labour be required during the construction phase, this should be sourced from the local communities. This requirement must be specified within the contract signed by the contractor. → AAP is to ensure that any new or replacement employment and procurement opportunities maximise benefits to local communities. → Local entrepreneurs and previously disadvantaged contractors must be provided preferential opportunities to tender for contracts. → Local recruitment must take place through the tribal recruitment office and with the knowledge of mutually agreed community structures and recruitment channels / mechanisms. → Sub-contractors must sign a compliance agreement with regards to local employment. → Sub-contractors must submit labour returns to verify local recruitment. → RPM-US must keep records of the number of local people employed, place of residence, recruitment office, job descriptions, length of service and opportunities for career development. Sub-contractors to RPM-US must keep similar records for all placements of local people. → 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	Medium +

Issues and Concerns Raised	Mitigations or site layout alternatives available to accommodate or address their concerns	Assessment of the impacts or risks associated with the mitigation or alternatives considered
	promote small, medium and meicro enterprise (SMME) development. → RPM-US must assist with the administration of the tribal recruitment office. This includes the facilitation of local skills audits, baseline data and the development of socio-economic databases. → Currently, AAP has a local recruitment and procurement policy in place, which their contractors must adhere to and provide evidence thereof. This may be enhanced through consultation with local communities and leadership, as well as the Department of Labour. This engagement may include ascertaining the local skills levels and providing information on general and scarce skills needs, as well as procurement opportunities available at the AAP facility. This process would aim at encouraging local communities to develop skills for future employment at the Mortimer Smelter operations. → The establishment of a Stakeholder Engagement Forum, with representatives from local community (including informal communities) is recommended. This should be developed into a structure to promote on-going discussions, and ensure actions are taken by AAP, the local communities, traditional leadership and the local municipality to ensure that issues raised are resolved over time. → The outcomes of regular meetings should be tracked and managed to ensure that the information shared at forum meetings is meaningful and actions are implemented by the relevant parties. → AAP must identify ways in which they can improve their engagement with stakeholder through other existing forums,	

Issues and Concerns Raised	Mitigations or site layout alternatives available to accommodate or address their concerns	Assessment of the impacts or risks associated with the mitigation or alternatives considered
	improved communication and regular feedback mechanisms. → Principles of equality, BEE, gender equality and non-discrimination must be implemented.	

ix) Motivation where no alternative sites were considered.

The development will be located at the existing Mortimer Smelter, because the technology needs to be installed and connected to the existing gas cleaning equipment. As such, no site alternatives were considered.

x) Statement motivating the alternative development location within the overall site. (Provide a statement motivating the final site layout that is proposed)

The development is being located at the existing Mortimer Smelter because the technology needs to be installed and connected to the existing gas cleaning equipment. As such, no site alternatives were considered.

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

(Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) 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.)

Impacts were assessed in terms of the following criteria:

The nature, a description of what causes the effect, what will be affected and how it will be affected

NATURE OR TYPE OF IMPACT	DEFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

The physical extent:

SCORE	DESCRIPTION
1	the impact will be limited to the site
2	the impact will be limited to the local area
3	the impact will be limited to the region
4	the impact will be national
5	the impact will be international

The duration, wherein it is indicated whether the lifetime of the impact will be:

SCORE	DESCRIPTION
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned:

SCORE	DESCRIPTION
0	small and will have no effect on the environment
2	minor and will not result in an impact on processes
4	low and will cause a slight impact on processes
6	moderate and will result in processes continuing but in a modified way
8	high (processes are altered to the extent that they temporarily cease)
10	very high and results in complete destruction of patterns and permanent cessation of processes

The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

SCORE	DESCRIPTION
1	very improbable (probably will not happen
2	improbable (some possibility, but low likelihood)
3	probable (distinct possibility)
4	highly probable (most likely)
5	definite (impact will occur regardless of any prevention measures)

- → The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- → The status, which is described as either positive, negative or neutral;
- → The degree to which the impact can be reversed;
- → The degree to which the impact may cause irreplaceable loss of resources; and
- → The degree to which the impact can be mitigated.

The significance is determined by combining the criteria in the following formula: S = (E+D+M)*P, where:

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The significance weightings for each potential impact are as follows:

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	Low	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	High	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

i) Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

ACTIVITY[1] whether listed or not listed.	**POTENTIAL IMPACT**[2]	**ASPECTS AFFECTED**	**PHASE**[3] In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE**[4]	**SIGNIFICANCE** if mitigated
Clearance and Construction	Alteration of Topography	Topography	Construction	Medium -	Control with restriction of activities and ongoing rehabilitation	Low -
Rehabilitation of area following closure	Restoration of Topography		Closure	Medium +	Modify with Rehabilitation	Medium +
Carbon emissions of activities	Carbon Footprint	Climate	Construction	Low -	Modify through alternative	Low -
			Operational	Medium -	Control with Climate Change Programme	Medium -
	Local Climate Change		Operation	Medium -	Control through design	Medium -
	Project Emissions for the National Inventory and Climate Change		Operational	Medium -		Medium -
	Contamination of Soils	Soil and Land Capability	Construction	Low -	Control with containment measures	Low -
			Operational	Medium -		Low -

1 *(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.).*

2 *(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)*

3 *(e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)*

4 *(modify, remedy, control, or stop)through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc) E.g.Modify through alternative method. Control through noise control. Control through management and monitoring through rehabilitation..*

ACTIVITY[1] whether listed or not listed.	**POTENTIAL IMPACT**[2]	**ASPECTS AFFECTED**	**PHASE**[3] In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE**[4]	**SIGNIFICANCE** if mitigated
Incorrect storage and handling of hazardous materials			Closure	Medium -	Control with ongoing maintenance and inspections Control through Rehabilitation Plan	Low -
Clearance of vegetation and construction	Change in land capability		Construction	Low -		Low -
Quantity and/or quality of topsoil is not adequate for successful rehabilitation	Rehabilitation not efficient		Closure	Medium -		Low -
Ongoing Rehabilitation not to Standard			Closure	Medium -		Low -
Contradiction of SDF's for final land use			Closure	Medium -		Low -
Rehabilitation plans not aligned site-wide			Closure	Medium -		Low -
Clearance of vegetation and construction	Loss of Diversity of Indigenous Floral Communities	Flora	Construction	Medium -	Control with alien Invasive Control Plant Control through access Control Control with training	Low -
Access into areas with natural vegetation			Operational	Low -		Low -
Clearance of natural vegetation and natural growth	Establishment of invasive species		Closure	Medium -		Low -
Trampling and grazing by large herbivores	Land Degradation		Closure	Low -		Low -
Clearance of vegetation and construction	Loss of Habitat for Faunal Communities Including Species of Conservation Concern	Fauna	Construction	Medium -	Control through access control Control with training	Medium -

ACTIVITY[1] whether listed or not listed.	**POTENTIAL IMPACT**[2]	**ASPECTS AFFECTED**	**PHASE**[3] In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE**[4]	**SIGNIFICANCE** if mitigated
Access into areas with fauna	Loss of Fauna		Operational	Low -		Low -
Clearance of vegetation and construction activities	Air pollution at receptors	Air Quality	Construction	Medium -	Control with WSA Plant Control with fugitive management Control with ongoing maintenance Control through management and monitoring	Low -
Operation of the SO_2 Abatement Plant	Air pollution at receptors		Operational	Medium -		Low -
Demolition activities	Air pollution at receptors		Closure	Medium -		Low -
Incorrect storage and handling of hazardous materials	Surface water contamination	Hydrology	Construction Operation Closure	Medium -	Control through design Remedy with emergency response	Low -
Incorrect storage and handling of hazardous materials	Groundwater contamination	Groundwater	Construction Operation Closure	Medium -	Control through design Remedy with emergency response	Low -
Noise generated by activities	Noise pollution	Environmental Noise	Construction	Low -	Control through design Control through management and monitoring	Low -
			Operational	Low -		Low -
			Closure	Low -		Low -
Clearance and construction	Destruction of artefacts with historical importance	Archaeology and Cultural Heritage	Construction Closure	Low -	Control through training Control through Heritage Assessment	Low -
Construction requiring labourers	Additional employment opportunities	Socio-Economic Structure	Construction	Low +	Control through design	Medium +

ACTIVITY[1] whether listed or not listed.	**POTENTIAL IMPACT[2]**	**ASPECTS AFFECTED**	**PHASE[3]** In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE[4]**	**SIGNIFICANCE** if mitigated
Construction activities creating economic development	Local Economic Development Opportunities			Low +	Control through management and monitoring Modify through SO 2 Abatement Plant	Medium +
Construction creating a nuisance (dust and noise) for receptors	Nuisance for receptors			Low -		Low -
Retaining existing employees for operations	Employment opportunities for existing employees		Operational	Medium +		Medium +
Operation of SO_2 Abatement Plant	Improvement in ambient air quality			Low +		Low +
Closure will result in a loss of all employment opportunities	Loss of employment		Closure	Medium -		Medium -
Clearance and construction	Visual intrusion (sense of place)	Visual	Construction	Low -	Control through design Control through operation Modify through rehabilitation	Low -
Operation (emissions) of SO^2 Abatement Plant			Operational	Low -		Low -
Removal of existing structures and rehabilitation			Closure	Medium -		Low -
Hazardous materials management, handling and storage	Surface water, groundwater and soil pollution	Hazardous Management	Construction	Medium -	Control through design Remedy with emergency response	Low -
Loss of primary containment of hazardous material			Operational	Low -		Low -

ACTIVITY[1] whether listed or not listed.	**POTENTIAL IMPACT[2]**	**ASPECTS AFFECTED**	**PHASE[3]** In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE[4]**	**SIGNIFICANCE** if mitigated
Cessation of hazardous material management at closure			Closure	Low +		Medium +

The supporting impact assessment conducted by the EAP must be attached as an appendix, marked **Appendix 7**.

j) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Environmental Acoustic Impact Assessment, undertaken by WSP | Parsons Brinckerhoff, dated May 2017 (**Appendix 6-1**)	→ Additional (i.e. more recent) monitoring, on the fence line and at receptors, are to be undertaken, as the data is not fully representative of the current baseline (i.e. outdated). → Bi-annual noise monitoring is to be undertaken on the fence line and at receptors. Since noise associated with the operation of the proposed development will not impact significantly on any surrounding receptors, no specific noise mitigation interventions are recommended.	X	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)
Mortimer Smelter SO_2 Abatement Air Quality Impact Assessment, undertaken by WSP | Parsons Brinckerhoff, dated April 2017 (**Appendix 6-2**)	**Construction and Decomissioning Phase** Management procedures to ensure minimal disturbance can be employed during the construction and decommissioning phase to mitigate dust. Performing construction and remediation activities over separate portions will reduce wind erosion of open land. Wet suppression and wind speed reduction are common methods used to control open dust sources at construction sites, as a source of water and material for wind barriers tend to be readily available. General control methods for open dust sources, as recommended by the US EPA. **Operational Phase** → It is recommended that existing and proposed mitigation techniques are maintained and that abatement machinery is regularly serviced according to supplier specifications. → It is recommended that PM_{10}, SO_2 and dust fallout monitoring is continued to assess ambient concentrations and dust fallout levels. → It is recommended that fugitive emissions from the furnace building are monitored to accurately determine, and better understand, the potential impacts of this source.	X	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)
Biodiversity Assessment Mortimer Smelter, undertaken by the	**Potential mitigation measures**	X	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Biodiversity Company, dated April 2017 (**Appendix 6-3**)	The focus of mitigation measures should be to reduce the significance of potential impacts associated with the development and thereby to: → Prevent the loss of floral species of conservation concern. → Prevent the loss of faunal species of conservation concern and to prevent the further reduction of faunal biodiversity. **Mitigation Measures for Impacts on Vegetation Communities** Recommended mitigation and rehabilitation measures include the following: → Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species. → Compilation of and implementation of an alien vegetation management plan for the entire site. **Mitigation Measures for Impacts on Faunal Communities** Recommended mitigation and rehabilitation measures include the following: → If any faunal species of conservation importance are recorded during construction, activities should temporarily cease and an appropriate specialist should be consulted to identify the correct course of action. → Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited;		
A Report on Cultural heritage Impact Assessment for the Proposed Mortimer Smelter SO_2 Abataamenet Project, North West, undertaken by	The following is recommended: From a heritage perspective, no further work is necessary. The proposed development may therefore continue. → It should be noted that the subterranean presence of archaeological and/or historical sites, features or artifacts is always a distinct possibility. Due to the density of vegetation	x	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Archaetnos Culture & Cultural, dated April 2017 (**Appendix 6-4**)	it also is possible that some sites may only become known later on. Operating controls and monitoring should therefore be aimed at the possible unearthing of such features. Care should therefore be taken when development commences that if any of these are discovered, a qualified archaeologist be called in to investigate the occurrence.		
Proposed Installation of Sulphur Dioxide Abatement Equipment at Mortimer Smelter – Social Impact Assessment, undertaken by WSP | Parsons Brinckerhoff, dated May 2017 (**Appendix 6-5**)	The proposed Mortimer Smelter SO2 abatement project is not anticipated to result in any significant socio-economic impacts. Socio-economic recommendation in respect of the proposed project have been identified in order to enhance the potential benefits of the project. It is recommended that these measures, outlined below, are included in the EMPr. **Ensuring Local Employment and Recruitment** Should unskilled labour be required during the construction phase, this should be sourced from the local communities. This requirement must be specified within the contract signed by the contractor. AAP is to ensure that any new or replacement employment and procurement opportunities maximise benefits to local communities. Currently, AAP has a local recruitment and procurement policy in place, which their contractors must adhere to and provide evidence thereof. This may be enhanced through consultation with local communities and leadership, as well as the Department of Labour. This engagement may include ascertaining the local skills levels and providing information on general and scarce skills needs, as well as procurement opportunities available at the AAP facility. This process would aim at encouraging local communities to develop skills for future employment at the Mortimer Smelter operations. **Stakeholder Engagement Forum** The establishment of a Stakeholder Engagement Forum, with representatives from local community (including informal communities) is recommended. This should be developed into a structure to promote on-going discussions, and ensure actions are taken by AAP, the local communities, traditional leadership and the local municipality to ensure that issues raised are resolved over time. The outcomes of regular meetings should be tracked and managed to	X	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	ensure that the information shared at forum meetings is meaningful and actions are implemented by the relevant parties. In the event that a forum of this nature is not possible, it is recommended that AAP identify ways in which they can improve their engagement with stakeholder through other existing forums, improved communication and regular feedback mechanisms.		
Specialist Climate Change Assessment of the Proposed Installation of Sulphur Dioxide (SO_2) Abatement Equipment at the Mortimer Smelter, undertaken by Promethium Carbon, dated May 2017 (**Appendix 6-6**)	It is recommended that the operations of the SO_2 abatement equipment at the Mortimer Smelter are incorporated within the ECO_2MAN programme and that a greenhouse gas management hand book is developed for the smelting facility.	X	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)
Mortimer Smelter SO_2 Abatement Plant Closure Assessment, undertaken by The MSA Group, dated May 2017 (**Appenix 6-7**)	Closure and rehabilitation actions that AAP intends undertaking at the end of the life of the SO2 Abatement Plant are described below. These actions are aligned with the Union Section Liability Assessment (SRK, 2016) and the Mortimer Smelter EMPr (WSP, 2009). These actions are designed to comply with the requirements for the development of risk mitigation closure strategies identified during the environmental risk assessment (Section 3). **Infrastructure Areas** On closure of the SO_2 Abatement Plant, all disused infrastructure will be demolished. Building foundations will be removed to a depth of I m or will be suitably covered. All land exposed by the demolition of infrastructure and other land distributed by the plant's activities will be rehabilitated as outlined in the EMPr for the SO_2 Abatement Plant, but will include: → Salvageable equipment will be removed and transported offsite prior to the commencement of demolition.	X	Part B, Section 1 (d) Appendix 6-7

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	→ The excavations will be filled in with soil, the top 0.15m being topsoil or alternative methods. → Inert ceramics such as bricks, concrete, gravel etc. will be used as backfill or disposed of in a permitted waste disposal site. → Inert waste, which is more than 0.5m underground, such as pipes will be left in place. → Inert ceramic and buried waste with a salvage value to individuals such as scrap metal, building materials, etc. will be removed and disposed of at a proper facility. → All disturbed and exposed surfaces will be covered with at least 25cm of topsoil, or alternative methods and re-vegetation must be allowed to take place naturally. → The contractor lay down area will be demolished and rehabilitated. → All power and water services to be disconnected and certified as safe prior to commencement of any demolition works. These services will then be demolished. → All remaining inert equipment and demolition debris will be placed in the nearest general waste disposal facility. → All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards. → All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains. → All above ground electrical, water and other service infrastructure and equipment to be removed and placed in the designated temporary salvage yards. → Electrical, water and other services that are more than 400 mm below ground surface will remain. → All pipes and structures deeper than 400 mm need to be sealed to prevent possible ingress and ponding of water.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	→ Non-hazardous concrete slabs and footings will be broken. This concrete (and metal) will be broken up and disposed of in a proximate mining void. → All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water. → Soils beneath the plant, storage tanks and chemical storage areas will be sampled. Any contaminated soils found will be removed for disposal. → All excavations resulting from demolition of plant, buildings, roads, conveyor platforms, etc. and earth structures will be left in a safe manner. **Roads and Parking Areas** The following closure actions related to roads and parking areas are taken from the Union Section Liability Assessment (SRK, 2016). The access road to the SO_2 Abatement Plant that is not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed. Closure actions will include: → Removal of all signage, fencing, shade structures, traffic barriers, etc.. → All 'hard top' surfaces to be ripped and bitumen/concrete removed along with any culverts and concrete structures. → The disturbed surfaces will be covered with at least 25cm of topsoil, or alternative methods, and re-vegetation must be allowed to take place naturally. → All concrete lined drainage channels and sumps will be broken up and removed. **Stormwater Management** Hardstanding areas and roads will be concreted as per Mortimer Smelter requirements, but the water captured in these areas will report to normal pollution control dams via the existing stormwater system. Therefore, stormwater management closure actions will be as per the Union Section Liability Assessment (SRK, 2016) which states that prior to closure a water management plan will be prepared to identify which structures are required at closure and which can be decommissioned. No new stormwater management infrastructure will be constructed as part of the SO_2 abatement plant.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	Fencing The fencing that will be installed for contractor laydown areas will be removed as the areas are reclaimed. The fence will not be retained due to the associated maintenance costs. Removal of the fencing includes dismantling the fencing for salvage and the fence line will be ripped to de-compact the soil. **Remediation of Contaminated Areas** → All tanks, sumps and pipes containing non-biodegradable chemicals (liquid, solid or gas) will be flushed to ensure that chemical residues are removed from the site. → Liquid storage tanks (including septic tanks) will be emptied, the structure demolished and sub-surface holes filled. → All equipment and plant in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility. **Vegetation** Successful revegetation will help control erosion of soil resources, maintain soil productivity and reduce sediment loading in streams utilizing non-invasive plants that fit the criteria of the habitat (e.g. soils, water availability, slope and other appropriate environmental factors). Invasive species will be controlled and managed to prevent the spread of these species in accordance with the Biodiversity Action Plan (BAP). **Waste Management** Closure actions related to waste management activities includes: → Hazardous waste will be managed as per the operational Waste Management Plan and will be disposed of off-site. → Non-hazardous demolition rubble will be disposed of as per the operational Waste Management Plan.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	→ The waste and scrap yard will be retained for the disposal of mobile equipment, structural steel and mechanical equipment. Only once this material has been taken out of the yard will the yard be demolished. → It may be necessary to fence temporary salvage yards for security reasons, particularly where these are located close to public roads. **Post-Rehabilitation Monitoring and Maintenance** Post rehabilitation and monitoring of the development site will be done in accordance with the RPM-US monitoring programme. The objective of this monitoring programme is to track the recovery of the site towards the long-term post-closure land use goals, in accordance with the overall closure objectives. The monitoring programme will be designed to collect information to demonstrate that the relinquishment criteria have been achieved for the entire mining area including the Mortimer Smelter and SO2 Abatement Plant. The closure monitoring programme outlined in the current closure plan includes: → Surface Water – Quality monitoring against parameters as required by the Water Use Licence (WUL). Sampled monthly for a three-year post-closure period, or as per the Closure Plan. → Groundwater – Quality monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Sampled quarterly for a three-year post-closure period, or as per the Closure Plan. → Erosion monitoring. This will take the form of developing a representative reference site on the disturbed both footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a three-year post-closure period, or as per the Closure Plan. → Vegetation establishment: Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, for a three-year post-closure period.		

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	→ Bio-monitoring: upstream and downstream of the mining activities. A long-term bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity.		
A Quantitative Risk Assessment of the Proposed SO_2 Abatement Project at Anglo Platinums Mortimer Smelter near Northam in the North West Province was undertaken by Riscom (Pty) Ltd, dated 17 May 2017 (**Appendix 6-8**)	These would largely be organisational in nature and might include: → The bypass of furnace off-gas to the stack in extreme instances to reduce the impact of loss of primary containment of process gases in the WSA. → SO_2/SO_3 monitoring and shutdown procedures. → • regular inspection and maintenance of ducting and equipment (WSA is a wet plant with the potential for corrosion). → Regular inspection of bunded areas to ensure integrity and that are they are kept free of spillage and rainwater. Sulphuric acid bunded areas to be kept clear of rainwater, to prevent violent reaction with acid spillages which may be accompanied by the generation of toxic vapours. → Routine monitoring of plant effluent streams to identify possible losses of hazardous chemicals in the process. RISCOM would support the project with the following conditions: → Full compliance with all statutory requirements. → Compliance with applicable SANS codes, i.e. SANS 10087-3 (LPG), SANS 10400, SANS 10108, etc.. → Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs.	X	Part A, Section 3 (g) (v) Part A, Section 3 (g) (ix)

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	→ Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) for the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place. → Preparation and issue of a safety document detailing safety and design features of the design for reducing the impacts from toxic releases, loss of containment, fires, explosions and flammable atmospheres to form part of the required input to a quantitative risk assessment: ▪ including compliance to statutory laws, applicable codes and standards and world's best practice. ▪ including the listing of statutory and non-statutory inspections, giving frequency of inspections. ▪ including the auditing of the built facility against the safety document. ▪ noting that codes such as IEC 61511 can be used to achieve these requirements. → Demonstration by AAP or their contractor that the final designs would reduce the risks posed by the installation to internationally acceptable guidelines. → Sign-off for all SO_2 Abatement Project designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs. → Completion of an emergency preparedness and response document for on-site and off-site scenarios prior. → Permission not being granted for increases to the product list or product inventories without redoing part of or the full EIA. → Final acceptance of the facility risks for all the retained AAP operations at Mortimer with a quantitative risk assessment that must be completed in according to a process based on a process similar to the one required for to the MHI regulations: ▪ Basing such a risk assessment on the final design and including engineering mitigation.		

Attach copies of Specialist Reports as appendices in **Appendix 6**

k) Environmental impact statement

(i) Summary of the key findings of the environmental impact assessment;

The impact assessment identified impacts associated with the following:

- Topography
- Climate
- Soil and land capability
- Flora
- Fauna
- Air Quality
- Hydrology
- Groundwater
- Environmental noise
- Archaeology and Cultural Heritage
- Socio-Economic Structure
- Visual
- Hazardous Management

It was determined that during the construction phase there will be 17 potential impacts. Of these seven have a low negative significance and eight have a medium negative significance. Following the implementation of mitigation measures it was determined that there will only be one impact remaining with a medium negative significance. It was also determined that there will be two impacts with a low positive significance without mitigation measures and medium positive with mitigation measures.

During the operational phase there will be 21 potential impacts. Of these 12 have a low negative significance and seven have a medium negative significance. Following the implementation of mitigation measures it was determined that there will only be two impacts remaining with a medium negative significance and the other impacts will have a low negative significance. There will be two impacts with a medium positive significance, with and without mitigation measures.

During the closure phase there will be 17 potential impacts. Of these three have a low negative significance and 12 has a medium negative significance. Following the implementation of mitigation measures it was determined that there will only be one impact remaining with a medium negative significance. There will also be one impact with a medium positive significance and one with a low positive significance, following the implementation of mitigation measures both impacts will have a medium positive significance.

Six cumulative potential impacts were identified all with a medium negative significance. Following the implementation of mitigation measures it was determined that there will only be two impacts remaining with a medium negative significance and the other impacts will have a low negative significance.

The following regarding the proposed project must be noted:

- The project will result in a significant reduction in SO_2 emissions. Even though there will be a remaining air quality impact this is considered a significant improvement and will be in compliance with the 2020 MES for SO_2

- Several sources of existing impacts were identified; these include the existing Mortimer Smelter Plant infrastructure, roads, Fraser Dam, Slag Stockpile and Excess Water Dams
- The construction of the proposed abatement equipment will be accommodated within an area that has already been cleared and levelled and on which industrial activities have been taking place
- The proposed road expansion and contractors laydown area will be situated on area not yet cleared or levelled
- The construction phase of the proposed project will result in significant employment opportunities

Considering the above-mentioned, it is the opinion of the EAP that the project be authorised but that all mitigation measures should be strictly adhered to.

(ii) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers .Attach as **Appendix 4.**

Construction Phase

The location of the contractor's facilities (offices, lay-down areas, ablutions etc.) was based on the required space, and providing efficient access to and from the construction site. In addition the site was selected to ensure that the impact on existing operations is minimal i.e. the layout will enable the construction site to be fenced off from existing facilities (i.e. away from current operations).

A separate project entrance will be established via an existing road and will thus be within an area that is already disturbed and has previously been impacted on. The contractor's laydown areas will be within the Mortimer Smelter boundary, however vegetation clearance will have to take place for the establishment of the laydown area. The proposed contractor facilities and project access road are illustrated in the layout attached in **Appendix 4**.

Operational Phase

Several preliminary interdisciplinary layout reviews have been conducted to validate and optimise the layout of the project. The layout of the project was based on the following design criteria:

- The existing plant would remain operable during construction of the new facilities;
- The new acid storage facility is required to allow 20 days' storage for acid; and
- The boundaries of the plant were based on the consideration of the following:
  - Existing plant boundaries (i.e. the existing plant footprint cannot be extended);
  - Location of existing ESP and stack;
  - Existing plant buildings (furnace building, workshops, etc.); and
  - Existing granulated slag conveyor leading to slag dump.

The plant areas were developed on an "island" approach, with a dedicated bund(s) for each area. This minimises the affected areas in terms of water treatment as only the spillage from the bunded areas has to be treated. The rest of the areas and roads will be surfaced as per Mortimer Smelter

requirements, and the water captured in these areas will report to normal pollution control dams via the existing stormwater system.

(iii)Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

Table 88: Positive and Negative Implications and Risks

No.	Impact Description	Phase	Without Mitigation		With Mitigation	
			Significance	Status	Significance	Status
T1	Alteration of Topography	Construction	Medium	Ve -	Low	Ve -
T2	Restoration of Topography	Closure	Medium	Ve +	No Mitigation	
C1	Carbon Footprint	Construction	Low	Ve -	No mitigation	
C2	Carbon Footprint	Operational	Medium	Ve -	Medium	Ve -
C3	Local Climate Change	Operational	Medium	Ve -	Medium	Ve -
C4	Project Emissions for the National Inventory and Climate Change	Cumulative	Medium	Ve -	Medium	Ve -
SL1	Contamination of soils	Construction	Low	Ve -	Low	Ve -
SL2	Change in Land Capability	Construction	Low	Ve -	Low	Ve -
SL3	Contamination of soils	Operational	Medium	Ve -	Low	Ve -
SL4	Contamination of soils	Closure	Medium	Ve -	Low	Ve -
SL5	Quantity and Quality of Topsoil	Closure	Medium	Ve -	Low	Ve -
SL6	Ongoing Rehabilitation not to Standard	Closure	Medium	Ve -	Low	Ve -
SL7	Contradiction of SDF's	Closure	Medium	Ve -	Low	Ve -
SL8	Site-wide Rehabilitation	Closure	Medium	Ve -	Low	Ve -
FL1	Loss of Diversity of Indigenous Floral Communities	Construction	Medium	Ve -	Low	Ve -
FL2	Loss of Diversity of Indigenous Floral Communities	Operational	Low	Ve -	Low	Ve -
FL3	Invasive Species	Closure	Medium	Ve -	Low	Ve -
FL4	Land Degradation	Closure	Low	Ve -	Low	Ve -
FA1	Loss of Habitat for Faunal Communities Including Species of	Construction	Medium	Ve -	Medium	Ve -

No.	Impact Description	Phase	Without Mitigation		With Mitigation	
			Significance	Status	Significance	Status
	Conservation Concern					
FA2	Loss of Fauna	Operational	Low	Ve -	Low	Ve -
AQ1	Impact of PM_{10} Concentrations on Receptors	Construction	Medium	Ve -	Low	Ve -
AQ2	Impact of $PM_{2.5}$ Concentrations on Receptors	Construction	Medium	Ve -	Low	Ve -
AQ3	Impact of PM_{10} Concentrations on Receptors	Operational	Low	Ve -	Low	Ve -
AQ4	Impact of $PM_{2.5}$ Concentrations on Receptors	Operational	Low	Ve -	Low	Ve -
AQ5*	Impact of SO_2 Concentrations on Receptors	Operational	Medium	Ve -	Low	Ve -
AQ6	Impact of NOx Concentrations on Receptors	Operational	Low	Ve -	Low	Ve -
AQ7	Impact of PM_{10} Concentrations on Receptors	Closure	Medium	Ve -	Low	Ve -
AQ8	Impact of $PM_{2.5}$ Concentrations on Receptors	Closure	Medium	Ve -	Low	Ve -
AQ9	Cumulative PM_{10} Concentrations	Cumulative	Medium	Ve -	Low	Ve -
AQ10	Cumulative $PM_{2.5}$ Concentrations	Cumulative	Medium	Ve -	Low	Ve -
AQ11*	Cumulative SO_2 Concentrations	Cumulative	Medium	Ve -	Low	Ve -
H1	Surface Water Contamination	Construction	Medium	Ve -	Low	Ve -
H2	Surface Water Contamination	Operational	Medium	Ve -	Low	Ve -
H3	Surface Water Contamination	Closure	Medium	Ve -	Low	Ve -
GW1	Groundwater Contamination	Construction	Medium	Ve -	Low	Ve -
GW2	Groundwater Contamination	Operational	Medium	Ve -	Low	Ve -
GW3	Groundwater Contamination	Closure	Medium	Ve -	Low	Ve -
EN1	Noise as a Result of Construction Activities	Construction	Low	Ve -	Low	Ve -
EN2	Acoustic Impact on Neighbouring Workers Accommodation	Operational	Low	Ve -	Low	Ve -

No.	Impact Description	Phase	Without Mitigation		With Mitigation	
			Significance	Status	Significance	Status
EN3	Acoustic Impact on Residential Receptors	Operational	Low	Ve -	Low	Ve -
EN4	Noise as a Result of Closure Phase	Closure	Low	Ve -	Low	Ve -
EN5	Cumulative Noise	Cumulative	Medium	Ve -	Low	Ve -
ACH1	Impact on Archaeological and Cultural Heritage	Construction	Low	Ve -	Low	Ve -
ACH2	Impact on Archaeological and Cultural Heritage	Closure	Low	Ve -	Low	Ve -
SES1	Employment Opportunities	Construction	Low	Ve+	Medium	Ve+
SES2	Local Economic Development Opportunities	Construction	Low	Ve+	Medium	Ve+
SES3	Nuisances	Construction	Low	Ve -	Low	Ve -
SES4	Retention of Existing Employees	Operational	Medium	Ve+	Medium	Ve+
SES5	Improvement in Ambient Air Quality	Operational	Low	Ve+	Low	Ve+
SES6	Loss of Employment Opportunities	Closure	Medium	Ve -	Medium	Ve -
V1	Visual Impact	Construction	Low	Ve -	Low	Ve -
V2	Visual Impact	Operational	Low	Ve -	Low	Ve -
V3	Visual Impact	Closure	Medium	Ve -	Low	Ve -
HM1	Hazardous Materials Management	Construction	Medium	Ve -	Low	Ve -
HM2	Loss of Primary Containment of SO_3 Gas in the WSA Plant	Operational	Low	Ve -	Low	Ve -
HM3	Loss of Primary Containment of SO_2 Gas in the WSA Plant	Operational	Low	Ve -	Low	Ve -
HM4	Loss of Secondary Containment of Sulphuric Acid	Operational	Low	Ve -	Low	Ve -
HM5	Loss of Secondary Containment of Hydrated Lime / Effluent	Operational	Low	Ve -	Low	Ve -
HM6	Cessation of Hazardous Activities	Closure	Low	Ve+	Medium	Ve+
HM7	Implementation of Proposed Project	Cumulative	Medium	Ve+	Medium	Ve+

* The percentage reduction in SO_2 concentrations for each future scenario (Scenarios 3 and 5) in comparison to the current (Scenario 1) is shown in **Table 47** as determined by Airshed (2017). Concentrations predicted for all future scenarios show a reduction of more than 80% in ground level

SO_2 concentrations predicted for the current (Scenario 1) over the entire modelling domain and at all sensitive receptor locations (Airshed, 2017).

l) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr;

Based on the assessment and where applicable the 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.

Refer to Part A, Section 3 (g) (v)

m) Final proposed alternatives.

(Provide an explanation for the final layout of the infrastructure and activities on the overall site as shown on the final site map together with the reasons why they are the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment)

The overall project objective is to install and operate an efficient SO_2 removal system at the Mortimer Smelter in order to achieve environmental compliance levels according to the NEM:AQA. As such no activity alternatives were considered.

The development will be located at the existing Mortimer Smelter, because the technology needs to be installed and connected to the existing gas cleaning equipment. As such, no site alternatives were considered.

Several preliminary interdisciplinary layout reviews have been conducted to validate and optimise the layout of the project. The layout of the project was based on the following design criteria:

- → The existing plant would remain operable during construction of the new facilities;
- → The new acid storage facility is required to allow 20 days' storage for acid; and
- → The boundaries of the plant were based on the consideration of the following:
  - Existing plant boundaries (i.e. the existing plant footprint cannot be extended);
  - Location of existing ESP and stack;
  - Existing plant buildings (furnace building, workshops, etc.); and
  - Existing granulated slag conveyor leading to slag dump.

The only operational alternative which was considered is that of the stack height. The Air Quality Impact Assessment was used as a toll to determine whether a stack height of 80m (as proposed in the Scoping Report) will result in MES compliance rather than a 60m stack.

It was determined that there is no difference of impact at receptors with a 60m stack height and as such this is the preferred alternative.

In the Climate Change Assessment (attached in **Appendix 6**), PV and fuel switching were considered as alternatives, however as per the specialist report these were not considered feasible and weren't assessed.

n) Aspects for inclusion as conditions of Authorisation.

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

No additional aspects have been identified that are not contained within the EMPr.

o) Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

Biodiversity Assessment

- Due to the disturbed nature of the site, the limited project footprint and time constraints, intensive sampling and trapping was not implemented for this study. Despite this, the confidence of the findings is high due to the status of the project area, the extent of area ground truthed for the study and the information available to supplement the study
- The extent of habitat units that will be directly affected by the proposed project was ground truthed
- No alternatives were identified for the proposed development.

Air Quality Impact Assessment

- Modelled MM5 meteorological data was assumed to be representative of the study area;
- All NO_x emissions were assumed to comprise totally of NO_2;
- The surplus coal storage area was assumed to receive 40% of all coal delivered before being transferred to the coal bunker;
- Particulate emission factors for charging, tapping and slagging from an electric arc furnace for iron and steel production were assumed to be applicable to Mortimer Smelter's production operations;
- Fugitive SO_2 emissions from furnace matte tapping, ladle transfer and matte casting were not considered;
- PM_{10} emissions from point sources and furnace building emissions were assumed to comprise 100% TSP, while $PM_{2.5}$ emissions were assumed to be 60% TSP (Ehrlich *et al.*, 2007); and
- Cumulative impacts associated with $PM_{2.5}$ and NO_X concentrations were not assessed as background concentrations for these pollutants were not measured; and
- Cumulative impacts were assessed for PM_{10} and SO_2 by summing predicted concentrations with background concentrations. This is based on the assumption that short and long-term average ambient concentrations remain constant across the modelling domain.

Environmental Acoustic Impact Assessment

- It must be noted that the operational phase noise sources are based on estimated quantities using sound level data supplied from the Project Engineers (Hatch Africa (Pty) Ltd)) and the BSI British Standards (BS 5228-1:2009) (BSI, 2009) where no engineering data was available;
- The information provided regarding the operational phase are assumed to be representative of what will occur in reality;

- The proposed SO_2 abatement plant will be operational 24 hours a day, seven days a week with the exception of the trucks which operate from 08:00 to 17:00;
- Noise associated with roads has not been considered in this assessment as the increase in traffic along the roads will be minimal and as such, the acoustic impact is negligible;
- The PWL from all WSA equipment, were summed (logarithmically) to obtain a cumulative PWL for the WSA cover structure; and
- The PWL from the cooling water towers, were summed (logarithmically) to obtain a cumulative PWL for the cooling water tower.

Cultural Heritage Impact Assessment

- Cultural Resources are all non-physical and physical man-made occurrences, as well as natural occurrences associated with human activity. These include all sites, structures and artefacts of importance, either individually or in groups, in the history, architecture and archaeology of human (cultural) development. Graves and cemeteries are included in this.
- The significance of the sites, structures and artefacts is determined by means of their historical, social, aesthetic, technological and scientific value in relation to their uniqueness, condition of preservation and research potential. The various aspects are not mutually exclusive, and the evaluation of any site is done with reference to any number of these aspects.
- Cultural significance is site-specific and relates to the content and context of the site. Sites regarded as having low cultural significance have already been recorded in full and require no further mitigation. Sites with medium cultural significance may or may not require mitigation depending on other factors such as the significance of impact on the site.
- The latitude and longitude of any archaeological or historical site or feature, is to be treated as sensitive information by the developer and should not be disclosed to members of the public.
- All recommendations are made with full cognizance of the relevant legislation.
- It is almost impossible to locate all the cultural resources in a given area, as it will be very time consuming. Developers should however note that the report should make it clear how to handle any other finds that might occur.
- In this particular case the entire surveyed area has been disturbed by recent human activities, mainly mining infrastructure development. Accordingly these areas are seen as a low risk areas to reveal heritage sites due to it being almost entirely disturbed.
- The vegetation cover in certain areas was high and dense, which had a negative effect on both the vertical and the horizontal archaeological visibility

Social Impact Assessment

- Census and municipal data used for baseline information is assumed to be reflective the current situation (e.g. employment, household services).
- The primary data collected (i.e. issues raised) is assumed to be representative of the sentiments of the broader stakeholders and communities in the vicinity of the site;
- It is assumed that the proposed project represents the most technically suitable option for reducing emissions from the Mortimer Smelter.
- The SIA was undertaken within a short timeframe, which limited the level of engagement that could be achieved, including engaging with a wider variety of stakeholders. This potentially limits the specialist's understanding of the local social context.

- Representatives of the Bagkatla Ba Kgafela Tribal Authority were not interviewed. These representatives were not available to discuss the project during the site visit period (03 to 05 April 2017). During the fieldwork contact was made with the Head of Administration of the Bagkatla Ba Kgafela Tribal Authority who advised which representative of the Tribal Authority should be approached. Considerable effort was made to make contact telephonically after the site visit but unfortunately, these efforts were unsuccessful.
- A meeting was scheduled with the Local Economic Development Manager of the Moses Kotane Local Municipality; however, the meeting was unfortunately cancelled. Contact was made after the site visit via email, however to date no response has been received.
- Representatives of AAP were present (as observers, rather than participants) at the meeting with the ward councillors. This may have had an impact on the ward councillors' ability to speak freely or may have changed the manner in which they responded to questions posed.

Hazardous Management

The risk assessment was based on the feasibility (FEL3) designs of the project, as proposed by AAP in December 2012. EIAs are intended to suggest mitigation which may alter the design and layout of the project. It is therefore understood that detailed designs would be required to be completed after an EIA. A Record of Decision to complete the project with a view to construction commencing would also be required.

RISCOM used the information provided and made engineering assumptions as described in the document. The accuracy of the document would be limited to the available documents presented at the EIA.

The risk assessment excludes the following aspects:

- Other processes and equipment outside of the Mortimer SO_2 Abatement Project.
- Natural events such as earthquakes and floods.
- The development of an emergency plan.

Closure Assessment

- Although the proposed SO_2 Abatement Plant and related surface infrastructure could have a salvage or resale value at closure, this could not be determined and hence no cost off-sets due to possible salvage values have been considered as part of this costing.
- Once the infrastructure has been removed, the remaining footprint areas will be shaped so that they are free draining to ensure a productive landscape.
- It is assumed that the storage containers, contractor's offices and ablution facilities will be mobile containers which will be removed from the site at closure. The cost of removing the mobile facilities have been excluded.
- Only the access road to the SO_2 Abatement Plant site has been costed for in terms of Closure Component (3). All internal roads within the Plant are costed for in the rehabilitation of the footprint of the plant.
- Allowance has been made for care and maintenance as well as surface and groundwater quality monitoring to be conducted for a minimum period of 2-3 years to ensure and assess success of the implemented rehabilitation and closure measures.

- The cost for dismantling of the fence around the SO_2 abatement plant and the laydown area has been excluded and is assumed to be considered as part of the overall decommissioning cost for the Mortimer Smelter.
- Risks associated with the socio-economic environment during closure are excluded from this closure assessment. It is assumed that socio-economic aspects are addressed in the closure plan of the RPM-Us.
- The cost for the demolition of existing infrastructure for the development of the SO_2 Abatement Plant is excluded from this study. It is assumed that this costing is included as part of the capital start-up cost for the Project.
- Potential impacts to surface and groundwater resources from the SO_2 Abatement Plant will be negligible (WSP, 2017). Water management has therefore been excluded from this Closure Plan; however, any residual impacts on groundwater and surface water resulting from mining activities will be accounted for in the RPM-US Closure Plan.
- The Socio-Economic Closure cost have been excluded from this closure assessment for the SO_2 Abatement Plant and will be considered as part of the RPM-US Closure Cost.

Climate Change Assessment

None

p) Reasoned opinion as to whether the proposed activity should or should not be authorised

i) Reasons why the activity should be authorized or not.

During the impact assessment positive and negative impacts were identified. The proposed project will however be situated in an area which has already been disturbed and which forms part of the existing industrial nature of RPM-US.

The proposed project will result in a significant reduction of SO2 emissions and will ensure a reduced environmental impact. This will inturn result in compliance with the 2020 MES for SO_2 which will ensure legal compliance for Mortimer Smelter.

Considering the above-mentioned, it is the opinion of the EAP that the project be authorised but that all mitigation measures should be strictly adhered to.

ii) Conditions that must be included in the authorisation

(1) Specific conditions to be included into the compilation and approval of EMPr

Refer to Part A, Section 3 (g) (v) which identifies the recommendations/mitigation measures to be included in the compilation and approval of the EMPr.

In addition, it is the EAP's opinion that the following be incorporated into the approval:

- An Amended AEL needs to be obtained prior to commissioning of the operation of the SO_2 Abatement Plant

(2) Rehabilitation requirements

Rehabilitation must be undertaken as per the Rehabilitation Performance Standard. The purpose of this standard is to ensure that all Anglo American projects rehabilitate disturbed land safely and responsibly to avoid or mitigate potential adverse impacts on the environment (Anglo American 2009). Rehabilitation of on-site disturbances needs to ensure that there is no detrimental effect on future land use, resource access, ground and surface water quality and quantity. Anglo American shall ensure, where possible, that no residual risks remain without an on-going and sustainable management plan. For the purpose of annual rehabilitation plans, the implementation of environmental programmes and operational controls will include, as appropriate:

- Progressive rehabilitation maintenance, in accordance with the approved closure and post closure plan.
- Measures to prevent rehabilitation being used for purposes other than its intended use/capability.
- Monitoring programmes to confirm the rehabilitation stability and effectiveness.
- Soil fertility and content for deterioration, vegetation and soil covers will be monitored where appropriate for stability, land use and productivity.
- Progress of, and expenditure on, rehabilitation activities should be monitored.

q) Period for which the Environmental Authorisation is required.

30 Years.

r) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Basic assessment report and the Environmental Management Programme report.

It is hereby confirmed that the undertaking, as per Part B, Section 2, is applicable to both the EIA/EMPR Report.

s) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

A detailed specialist study is included in **Appendix 5**. A total value of R 2,702,799.14 should be provided for in the financial guarantees. Refer to the attached specialist study for details (**Appendix 5**).

i) Explain how the aforesaid amount was derived.

The existing financial provision for RPM-US was calculated based on the DME 2005 published "Guideline Document for The Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine". Prior to the Financial Provisioning Regulations published in November 2015 (GN R1147), the DME Guideline document was considered to be an industry accepted approach of calculating closure liability. However, a holder of an existing Mining Right is only legally required to review and update the closure liability in terms of GN R1147 by February 2019. Therefore, the DME Guideline document has been used to determine the he closure liability for the SO_2 Abatement Plant and associated infrastructure. The step-by-step methodology for closure as prescribed by this document is provided in **Table 89**, while the closure costs are determined in the sections that follow.

Table 89: Step-by-step Methodology for Closure Cost Determination

Step No.	Description
1	Determine mineral mined and saleable by-products
2	Determine primary risk class
3	Determine environmental sensitivity of mine area
4.1	Determine level of information available to calculate quantum
4.2	Identify closure components
4.3	Identify unit rates for closure components
4.4	Identify and apply weighting factors
4.5	Identify areas of disturbance
4.6	Identify closure costs from specialist studies
4.7	Calculate closure costs

A detailed specialist study is included in **Appendix 5**.

ii) Confirm that this amount can be provided for from operating expenditure.

(Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

Once the DMR has considered that calculations, the Department may or may not request amendments. Once accepted, AAP will provide the guarantee updates to match the additional amount required through one of the following mechanisms:

- An approved contribution to a trust fund as required in terms of section 10(1)(cH) of the Income Tax Act, 1962 (Act No. 58 of 1962) and must be in the format as approved by the Director-General from time to time;
- A financial guarantee from a South African registered bank or any other bank or financial institution approved by the Director-General guaranteeing the financial provision relating to the environmental management programme or plan in the format as approved by the Director-General from time to time;
- A deposit into the account specified by the Director-General in the format as approved by the Director-General from time to time; and/or
- Any other method as the Director-General may determine.

t) Deviations from the approved scoping report and plan of study.

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

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

The only deviation which was considered is that of the stack height. The Air Quality Impact Assessment was used as a tool to determine whether a stack height of 80m (as proposed in the Scoping Report) will result in MES compliance rather than a 60m stack.

It was determined that there is no difference of impact at receptors with a 60m stack height and as such this is the preferred alternative.

ii) Motivation for the deviation.

It was determined that significant cost can be saved should the stack not be required to be 80 m but rather 60m.

u) Other Information required by the competent Authority

i) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

(1) Impact on the socio-economic conditions of any directly affected person.

(1) (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation

report as Appendix 2.19.1 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

Refer to Part A, Section (g)(v) for relevant socio-economic information.

(2) Impact on any national estate referred to in section 3(2) of the National

(2) Heritage Resources Act. (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6. and 2.12. herein).

Refer to Part A, Section (g)(v) and Part A, Section (g)(iv)(1) for relevant archaeology and cultural heritage information.

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

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. The EAP must attach such motivation as **Appendix 4**).

The motivation for lack of site alternatives is presented within this report. The motivation is not presented as a separate stand-alone appendix.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME.

a) Details of the EAP,

a) (Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

It is confirmed that PART A, section 1(a) herein contains the details of the EAP.

b) Description of the Aspects of the Activity

(Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).

It is confirmed that PART A, section 1(f) herein contains a description of the aspects of the activity.

c) Composite Map

(Provide a map (Attached as an Appendix) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

Refer to **Appendix 4** for a composite map.

d) Description of Impact management objectives including management statements

i) Determination of closure objectives. (ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

The overall closure goal for the RPM-US, and therefore the development site for the SO_2 Abatement Plant is to progressively re-instate an area that is safe, stable, and non-polluting with the final landform not adversely affecting water resources.

The closure objectives for the SO_2 Abatement Plant are in line with the RPM-US's closure objectives (SRK, 2016), which are as follows:

- → Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding landowners and land users (this is to be done during the operational phase). Should a suitable use for mine infrastructure not be found, it will be removed.
- → Rehabilitate all disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines).
- → Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits.
- → Rehabilitate all disturbed land and residue deposits to a state where limited post-closure management is required.
- → Limit the impact on staff whose positions become redundant on closure of the mine.

- Keep relevant authorities informed of the progress of the decommissioning phase.
- Submit monitoring data to the relevant authorities.
- Maintain required pollution-control facilities and rehabilitated land until closure.
- Preparation of a closure EMPr.

To meet the objectives the following general measures will apply:

- Chemical reagent residues will either be sold to another mine or will be collected by registered waste disposal companies and transported for final neutralization and disposal at permitted hazardous waste sites.
- Soil that has been contaminated by spillage, seepage, leachates, waste and tailings dust will be sampled and analysed. If necessary, it will be treated, ameliorated or removed to a suitable site.
- Disturbed areas will be rehabilitated through landscaping, soil replacement and the establishment of vegetation in these areas. Where practical, rehabilitation will take place during the life of the mine (construction, operational and decommissioning phases). On closure, all disturbed areas will have been rehabilitated.
- Landscaping will be undertaken to restore the natural topography of the areas that have been disturbed or, at least, to reduce slopes to stable gradients (no steeper than 1:3).
- The soil, which has been conserved in stockpiles, will be used strategically in the rehabilitation of disturbed land.
- Vegetation establishment in disturbed areas will be undertaken as soon as is practical, with growing season and water availability being the primary time constraints. Indigenous pasture species will be used where possible but emphasis will be on commercially available seeds that will germinate reliably (high seed viability). The species used will 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.
- Prior to re-vegetating soil samples will be collected and analysed and if necessary the soil will be fertilized in accordance with the findings of the soil analysis.
- Following re-vegetation, the site will be monitored and maintained until an acceptable cover has been achieved. The spread of invader species on disturbed land will be controlled until the vegetation cover is capable of providing sufficient natural weed control.

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

PART B, section 1(h) herein contains provides the management measures.

iii) Potential risk of Acid Mine Drainage. (Indicate whether or not the mining can result in acid mine drainage).

Not Applicable. The SO_2 Abatement Plant cannot result in potential acid mine drainage.

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

Not Applicable. The SO_2 Abatement Plant will not generate acid mine drainage.

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

Not Applicable. The SO_2 Abatement Plant will not generate acid mine drainage.

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

Not Applicable. The SO_2 Abatement Plant will not generate acid mine drainage.

vii) Volumes and rate of water use required for the mining, trenching or bulk sampling operation.

The development will require 468m^3/day of water. It is envisaged that the water will be obtained from the existing allocation of 15 000m^3/day of potable water to RPM-US. The Mortimer Smelter currently utilises 400m^3/day water.

viii) Has a water use licence has been applied for?

The existing water use licence will potentially have to be amended to include a section 21c and I water use due to the proximity to the dirty water Mortimerspruit. This will be confirmed by the Department of Water and Sanitation (DWS).

ix) Impacts to be mitigated in their respective phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES		**PHASE**	**SIZE AND SCALE of disturbance**	**MITIGATION MEASURES**	**COMPLIANCE WITH STANDARDS**	**TIME PERIOD FOR IMPLEMENTATION**
(as listed in 2.11.1)		of operation in which activity will take place. State; Planning and design, Pre-Construction' Construction, Operational, Rehabilitation, Closure, Post closure.	(volumes, tonnages and hectares or m²)	(describe how each of the recommendations in herein will remedy the cause of pollution or degradation and migration of pollutants)	(A description of how each of the recommendations herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)	Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:-.. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.
Clearance and Construction	Alteration of Topography	Construction	Secondary Gas Cleaning - 500m^2	→ Restrict all activities, materials, equipment and persons within the area/s specified	NEMA	Construction Phase (18 to 24 months

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Rehabilitation of area following closure	Restoration of Topography	Closure	WSA Acid Plant – 1 305m^2 Effluent Treatment Plant – 1 55m^2 Acid Plant Cooling Water - 1 012m^2 Acid Storage and Load Out - 500m^3 (450m^2) LPG storage - 22.5m^3 Lime storage and preparation Silo - 60m^2 Potable water storage tank – 2 500m^3 Construction laydown area 3.95 ha Resurfacing and expansion of existing roads - 136 391 m^2	→ Erect and maintain permanent and/or temporary barricading prior to starting construction → Maintain all demarcation barriers for the duration of construction activities → 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 → Stockpiles created during the construction phase must not remain in the operation phase of the project → Sustainable erosion control measures (for wind and water erosion) must be implemented and maintained where necessary in areas disturbed by the construction / demolition operations → All structures comprising the site establishment are removed from the site and surrounding areas → All rubble is removed from the site to an approved licensed landfill site → Fences, barriers and demarcations associated with the construction phase are removed from the site.		Closure and Rehabilitation
Carbon emissions of activities	Carbon Footprint	Construction		→ Fuel switching, substituting LPG for biodiesel must be investigated → Solar Photovoltaic as an energy source must be investigated → Operations of the SO2 Abatement Plant must be incorporated within the ECO2MAN programme and that a greenhouse gas management hand book is developed for the smelting facility as a whole, this	SANS 14064-1	Construction Phase (18 to 24 months
		Operational				Throughout Operation
	Local Climate Change	Operation				Throughout Operation
	Project Emissions for the National Inventory and	Operational				Throughout Operation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
	Climate Change			will not be a standalone document and will be as per the ECO_2MAN* programme		
Incorrect storage and handling of hazardous materials	Contamination of Soils	Construction		→ Environmental conditions must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages by the implementation ISO 14001 practices → All incidents must be reported to the responsible site officer as soon as they occur → In the event of an incident the Emergency Preparedness and Response Plan must be followed → Adherence to RPM-US's Environmental policy, Environmental procedures and values must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages by the implementation of good housekeeping practices → All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor lay down area. All repairs are to be performed on an impervious surface → Storage areas and vehicle maintenance areas must have appropriate containment measures in place, including bunds, concrete, canals, collector drains and interception trenches → 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	NEMA	Construction Phase (18 to 24 months
		Operational				Throughout Operation
		Closure				Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ 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 → 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 → Spilled material must be cleaned up and disposed of appropriately as soon as practically possible → All hazardous waste must be disposed of at a registered hazardous waste disposal facility or stored in designated, lined and bunded areas (for no longer than 90 days) → Records of all waste being taken off site must be recorded and kept as evidence → Sustainable erosion control measures (for wind and water erosion) must be implemented and maintained where necessary in areas disturbed by the construction / demolition operations → 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. → Volumes of stockpiled materials must be accurately recorded. Records must be made available on request → The Rehabilitation Plan must be aligned to the local SDF's		

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ Ensure closure and rehabilitation is undertaken as part the closure and rehabilitation plans → The rehabilitation fund must be upgraded or revised on an annual basis according to the surveyed plan, which indicates the progress in rehabilitation		
Clearance of vegetation and construction	Change in land capability	Construction		→ Contractors are to be trained on environmental awareness and the importance of preserving indigenous fauna and flora → Ensure that all site disturbances are limited to areas where structures will be constructed / removed → Natural flora species are not to be used as firewood → Following construction, exposed areas must be rehabilitated with topsoil / subsoil, or a suitable alternative and re-vegetated → On completion of the construction phase, disturbed areas must be graded and topsoiled, or covered with a suitbale alternative. 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 geminate 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 → Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also	NEMA	Construction Phase (18 to 24 months
Quantity and/or quality of topsoil is not adequate for successful rehabilitation	Rehabilitation not efficient	Closure			NEMA NEM:BA	Closure and Rehabilitation
Ongoing Rehabilitation not to Standard		Closure				Closure and Rehabilitation
Contradiction of SDF's for final land use		Closure				Closure and Rehabilitation
Rehabilitation plans not aligned site-wide		Closure				Closure and Rehabilitation
Clearance of vegetation and construction	Loss of Diversity of Indigenous	Construction				Construction Phase (18 to 24 months

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
Access into areas with natural vegetation	Floral Communities	Operational		reduce the likelihood of encroachment by alien invasive plant species; → 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 RPM-US or the contractor → Following re-vegetation the site must be monitored and maintained until a sound vegetation cover that will prevent erosion, has been achieved → Compilation of and implementation of an alien vegetation management plan for the entire site. → 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. → 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 → 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 ploughed, or specially burned firebreaks		Throughout Operation
Clearance of natural vegetation and natural growth	Establishment of invasive species	Closure				Closure and Rehabilitation
Trampling and grazing by large herbivores	Land Degradation	Closure				Closure and Rehabilitation
Clearance of vegetation and construction	Loss of Habitat for Faunal Communities Including Species of Conservation Concern	Construction				Construction Phase (18 to 24 months

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ 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. → RPM-US must limit, as far as practical, the area of land disturbed and isolated for the purpose of construction, mining and processing activities, to the minimum required for safe and efficient operation → The disturbed areas must be rehabilitated		
Access into areas with fauna	Loss of Fauna	Operational		→ Contractors are to be trained on environmental awareness and the importance of preserving indigenous fauna and flora → Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, lizards, birds or other animals should be strictly prohibited; → Ensure that all site disturbances are limited to areas where structures will be constructed / removed → If any faunal species of conservation importance are recorded during construction, activities should temporarily cease and an appropriate specialist should be consulted to identify the correct course of action → 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	NEMA NEM:BA	Throughout Operation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				season. These could either be strips approximately 6m wide which have been mowed (or grazed) and ploughed, or specially burned firebreaks → RPM-US must limit, as far as practical, the area of land disturbed and isolated for the purpose of construction, mining and processing activities, to the minimum required for safe and efficient operation → The disturbed areas must be rehabilitated		
Clearance of vegetation and construction activities	Air pollution at receptors	Construction		→ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. → There must be strict speed limits on dust roads to prevent dust entrainment into the atmosphere → Management procedures to ensure minimal disturbance can be employed during the construction and decommissioning phase to mitigate dust. → Employees must be issued with appropriate PPE → Performing construction and remediation activities over separate portions will reduce wind erosion of open land. → Wet suppression and wind speed reduction are common methods used to control open dust sources at construction sites, as a source of water and material for wind barriers tend to be readily available. → Sustainable erosion control measures (for wind and water erosion) must be implemented and	NEMA NEM:AQA MES	Construction Phase (18 to 24 months
Operation of the SO_2 Abatement Plant	Air pollution at receptors	Operational				Throughout Operation
Demolition activities	Air pollution at receptors	Closure				Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				maintained where necessary in areas disturbed by the construction / demolition operations → 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 → It is recommended that wet suppression and wind speed (windbreaks, wind covers or barriers) reduction mitigation techniques are employed throughput the duration of the construction and decommissioning phases. → General control methods for open dust sources, as recommended by the US EPA, are given in Table 44. → It is recommended that existing and proposed mitigation techniques are maintained and that abatement machinery is regularly serviced according to supplier specifications. → It is recommended that PM_{10}, SO_2 and dust fallout monitoring is continued to assess ambient concentrations and dust fallout levels. → It is recommended that fugitive emissions from the furnace building are monitored to accurately determine, and better understand, the potential impacts of this source.		
Incorrect storage and handling of hazardous materials	Surface water contamination	Construction Operational Closure		→ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor lay down area. All repairs are to be performed on an impervious surfaces	NEMA NWA	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ The SO2 Abatement Plant must be underlain by concrete to minimise seepage → Polluted water (effluent and contaminated runoff) must be directed to a containment pond → Seepage must be collected in perimeter drains, which flow to the return water dams for reuse → Storage areas and vehicle maintenance areas must have appropriate containment measures in place, including bunds, concrete, canals, collector drains and interception trenches → 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 → 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 → 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 → Spilled material must be cleaned up and disposed of appropriately as soon as practically possible → All hazardous waste must be disposed of at a registered hazardous waste disposal facility or stored in designated, lined and bunded areas (for no longer than 90 days)		

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ Records of all waste being taken off site must be recorded and kept as evidence		
Incorrect storage and handling of hazardous materials	Groundwater contamination	Construction Operation Closure		→ All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability. No repairs may be undertaken beyond the contractor lay down area. All repairs are to be performed on an impervious surface → The SO2 Abatement Plant must be underlain by concrete to minimise seepage → Polluted water (effluent and contaminated runoff) must be directed to a containment pond → Seepage must be collected in perimeter drains, which flow to the return water dams for reuse → Storage areas and vehicle maintenance areas must have appropriate containment measures in place, including bunds, concrete, canals, collector drains and interception trenches → 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 → 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 → Any incidents must be reported as soon as possible. Measures must be put in place to prevent similar incidences from occurring. If necessary,	NEMA NWA	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				remediation of any contamination must be carried out → Spilled material must be cleaned up and disposed of appropriately as soon as practically possible → All hazardous waste must be disposed of at a registered hazardous waste disposal facility or stored in designated, lined and bunded areas (for no longer than 90 days) → Records of all waste being taken off site must be recorded and kept as evidence → The infrastructure must be dismantled and removed on closure		
Noise generated by activities	Noise pollution	Construction Operational Closure		→ Additional (i.e more recent) monitoring, on the fence line and at receptors, are to be undertaken, as the data is not fully representative of the current baseline (i.e outdated) → Bi-annual noise monitoring is to be undertaken on the fence line and at receptors → Employees must be issued with appropriate PPE	NEMA NEM:AQA	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation
Clearance and construction	Destruction of artefacts with historical importance	Construction Closure		→ Should any archaeological artefacts be exposed during construction, 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. If these appear to be human remains the South African Police Service will also be contacted.	NEMA SAHRA	Construction Phase (18 to 24 months Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ Prior to closure an assessment of all structures on site must be undertaken in order to determine their heritage importance.		
Construction requiring labourers	Additional employment opportunities	Construction		→ Should unskilled labour be required during the construction phase, this should be sourced from the local communities. This requirement must be specified within the contract signed by the contractor → AAP is to ensure that any new or replacement employment and procurement opportunities maximise benefits to local communities → Local entrepreneurs and previously disadvantaged contractors must be provided preferential opportunities to tender for contracts → Local recruitment must take place through the tribal recruitment office and with the knowledge of mutually agreed community structures and recruitment channels / mechanisms → Sub-contractors must sign a compliance agreement with regards to local employment → Sub-contractors must submit labour returns to verify local recruitment → RPM-US must keep records of the number of local people employed, place of residence, recruitment office, job descriptions, length of service and opportunities for career development. Sub-contractors to RPM-US must keep similar records for all placements of local people → Recruitment must favour local employment and skills training. RPM-US must establish skills training programmes for locals to address RPM-	NEMA	Construction Phase (18 to 24 months
Construction activities creating economic development	Local Economic Development Opportunities					Construction Phase (18 to 24 months
Construction creating a nuisance (dust and noise) for receptors	Nuisance for receptors					Construction Phase (18 to 24 months
Retaining existing employees for operations	Employment opportunities for existing employees	Operational				Throughout Operation
Operation of SO_2 Abatement Plant	Improvement in ambient air quality					Throughout Operation
Closure will result in a loss of all employment opportunities	Loss of employment	Closure				Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				US's needs and to promote small, medium and micro enterprise (SMME) development → RPM-US must assist with the administration of the tribal recruitment office. This includes the facilitation of local skills audits, baseline data and the development of socio-economic databases → Currently, AAP has a local recruitment and procurement policy in place, which their contractors must adhere to and provide evidence thereof. This may be enhanced through consultation with local communities and leadership, as well as the Department of Labour. This engagement may include ascertaining the local skills levels and providing information on general and scarce skills needs, as well as procurement opportunities available at the AAP facility. This process would aim at encouraging local communities to develop skills for future employment at the Mortimer Smelter operations → The establishment of a Stakeholder Engagement Forum, with representatives from local community (including informal communities) is recommended. This should be developed into a structure to promote on-going discussions, and ensure actions are taken by AAP, the local communities, traditional leadership and the local municipality to ensure that issues raised are resolved over time. → The outcomes of regular meetings should be tracked and managed to ensure that the information shared at forum meetings is meaningful and actions are implemented by the relevant parties → AAP must identify ways in which they can improve their engagement with stakeholder through other		

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				existing forums, improved communication and regular feedback mechanisms → Principles of equality, BEE, gender equality and non-discrimination must be implemented		
Clearance and construction	Visual intrusion (sense of place)	Construction		→ Use low wattage light bulbs where possible to reduce potential for light pollution → Place focused lighting at low levels and direct on specific objects, areas, or activities to reduce potential for light pollution → Use exterior paints and non-reflective finishes to minimise glare and reflection from built surfaces → The plant infrastructure must be dismantled at closure and the plant area rehabilitated in line with the rehabilitation plan	NEMA	Construction Phase (18 to 24 months
Operation (emissions) of SO^2 Abatement Plant		Operational				Throughout Operation
Removal of existing structures and rehabilitation		Closure				Closure and Rehabilitation
Hazardous materials management, handling and storage	Surface water, groundwater and soil pollution	Construction		→ Compliance with applicable SANS codes, i.e. SANS 10087-3 (LPG), SANS 10400, SANS 10108, etc. must be demonstrated → Incorporation of applicable guidelines or equivalent international recognised codes of good design and practice into the designs; → Completion of a recognised process hazard analysis (such as a HAZOP study, FMEA, etc.) for the proposed facility prior to construction to ensure design and operational hazards have been identified and adequate mitigation put in place → Preparation and issue of a safety document detailing safety and design features of the design for reducing the impacts from toxic releases, loss of	SANS codes, i.e. SANS 10087-3 (LPG), SANS 10400, SANS 10108 Major Hazardous Installation Regulations	Construction Phase (18 to 24 months
Loss of primary containment of hazardous material		Operational				Throughout Operation
Cessation of hazardous material management at closure		Closure				Closure and Rehabilitation

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				containment, fires, explosions and flammable atmospheres to form part of the required input to a quantitative risk assessment: → including compliance to statutory laws, applicable codes and standards and world's best practice → including the listing of statutory and non-statutory inspections, giving frequency of inspections → including the auditing of the built facility against the safety document → noting that codes such as IEC 61511 can be used to achieve these requirements → Demonstration by AAP or their contractor that the final designs would reduce the risks posed by the installation to internationally acceptable guidelines → Sign-off for all SO2 Abatement Project designs by a professional engineer registered in South Africa in accordance with the Professional Engineers Act, who takes responsibility for suitable designs → Completion of an emergency preparedness and response document for on-site and off-site scenarios prior → Permission not being granted for increases to the product list or product inventories without redoing part of or the full EIA → Final acceptance of the facility risks for all the retained AAP operations at Mortimer with a quantitative risk assessment that must be completed in according to a process based on a process similar to the one required for to the MHI regulations		

ACTIVITIES		PHASE	SIZE AND SCALE of disturbance	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME PERIOD FOR IMPLEMENTATION
				→ The sulphuric acid storage, pumping and road tanker loading areas must be provided with bunds (secondary containment) to contain spillages → Level indication and controls are to be installed to prevent overfilling of the acid storage tanks and when loading acid road tankers → Gantries and loading arms for the loading of sulphuric acid tankers are to be maintained → The effluent plant must be bunded to prevent lime slurry and untreated effluent streams from entering the environment → The bypass of furnace off-gas to the stack in extreme instances must be considered to reduce the impact of loss of primary containment of process gases in the WSA → SO2/SO3 monitoring and shutdown procedures must be developed and implemented as per the HAZOP → Regular inspection and maintenance of ducting and equipment must be undertaken → Regular inspection of bunded areas must be undertaken to ensure integrity and that are they are kept free of spillage and rainwater. Sulphuric acid bunded areas to be kept clear of rainwater, to prevent violent reaction with acid spillages which may be accompanied by the generation of toxic vapours → Routine monitoring of plant effluent streams must be undertaken to identify possible losses of hazardous chemicals in the process		

e) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ();

ACTIVITY whether listed or not listed. **(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)**	**POTENTIAL IMPACT** **(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)**	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated **(e.g. Construction, commissioning, operational Decommissioning, closure, post- closure)**	**MITIGATION TYPE** **(modify, remedy, control, or stop) through (e.g. noise control measures, storm- water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)** **E.g.** • **Modify through alternative method.** • **Control through noise control** • **Control through management and** • **monitoring** **Remedy through rehabilitation..**	**STANDARD TO BE ACHIEVED** **(Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives)** **etc.**
Clearance and Construction	Alteration of Topography	Topography	Construction	Control with restriction of activities and ongoing rehabilitation	No specific standard to be achieved
Rehabilitation of area following closure	Restoration of Topography		Closure	Modify with Rehabilitation	
Carbon emissions of activities	Carbon Footprint	Climate	Construction	Modify through alternative	SANS 14064-1
			Operational	Control with Climate Change Programme	
	Local Climate Change		Operation	Control through design	
	Project Emissions for the National Inventory and Climate Change		Operational		

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Incorrect storage and handling of hazardous materials	Contamination of Soils	Soil and Land Capability	Construction Operational Closure	Control with containment measures Control with ongoing maintenance and inspections Control through Rehabilitation Plan	No specific standard to be achieved
Clearance of vegetation and construction	Change in land capability		Construction		
Quantity and/or quality of topsoil is not adequate for successful rehabilitation	Rehabilitation not efficient		Closure		
Ongoing Rehabilitation not to Standard			Closure		
Contradiction of SDF's for final land use			Closure		
Rehabilitation plans not aligned site-wide			Closure		
Clearance of vegetation and construction	Loss of Diversity of Indigenous Floral Communities	Flora	Construction	Control with alien Invasive Control Plant Control through access Control Control with training	NEM:BA
Access into areas with natural vegetation			Operational		
Clearance of natural vegetation and natural growth	Establishment of invasive species		Closure		
Trampling and grazing by large herbivores	Land Degradation		Closure		
Clearance of vegetation and construction	Loss of Habitat for Faunal Communities Including Species of Conservation Concern	Fauna	Construction	Control through access Control Control with training	NEM:BA

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Access into areas with fauna	Loss of Fauna		Operational		
Clearance of vegetation and construction activities	Air pollution at receptors	Air Quality	Construction	Control with WSA Plant Control with fugitive management Control with ongoing maintenance Control through management and monitoring	NEM:AQA MES
Operation of the SO_2 Abatement Plant	Air pollution at receptors		Operational		
Demolition activities	Air pollution at receptors		Closure		
Incorrect storage and handling of hazardous materials	Surface water contamination	Hydrology	Construction Operation Closure	Control through design Remedy with emergency response	NWA GNR 704
Incorrect storage and handling of hazardous materials	Groundwater contamination	Groundwater	Construction Operation Closure	Control through design Remedy with emergency response	NWA GNR 704
Noise generated by construction activities	Noise pollution	Environmental Noise	Construction Operational Closure	Control through design Control through management and monitoring	NEM:AQA
Clearance and construction	Destruction of artefacts with historical importance	Archaeology and Cultural Heritage	Construction Closure	Control through training Control through Heritage Assessment	SAHRA
Construction requiring labourers	Additional employment opportunities	Socio-Economic Structure	Construction	Control through design Control through management and monitoring Modify through SO 2 Abatement Plant	Mining Charter
Construction activities creating economic development	Local Economic Development Opportunities				

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Construction creating a nuisance (dust and noise) for receptors	Nuisance for receptors				
Retaining existing employees for operations	Employment opportunities for existing employees		Operational		
Operation of SO_2 Abatement Plant	Improvement in ambient air quality				
Closure will result in a loss of all employment opportunities	Loss of employment		Closure		
Clearance and construction	Visual intrusion (sense of place)	Visual	Construction	Control through design	No specific standard to be achieved
Operation (emissions) of SO^2 Abatement Plant			Operational	Control through operation	
Removal of existing structures and rehabilitation			Closure	Modify through rehabilitation	
Hazardous materials management, handling and storage	Surface water, groundwater and soil pollution	Hazardous Management	Construction	Control through design	SANS codes, i.e. SANS 10087-3 (LPG), SANS 10400, SANS 10108
Loss of primary containment of hazardous material			Operational	Remedy with emergency response	Major Hazardous Installation Regulations
Cessation of hazardous material management at closure			Closure		

f) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

ACTIVITY whether listed or not listed. **(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)**	**POTENTIAL IMPACT** **(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc….etc…)**	**MITIGATION TYPE** **(modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc)** **E.g.** • **Modify through alternative method.** • **Control through noise control** • **Control through management and monitoring** **Remedy through rehabilitation..**	**TIME PERIOD FOR IMPLEMENTATION** Describe the time period when the measures in the environmental management programme must be implemented Measures must be implemented when required. With regard to Rehabilitation specifically this must take place at the earliest opportunity. .With regard to Rehabilitation, therefore state either:-.. Upon cessation of the individual activity or. Upon the cessation of mining, bulk sampling or alluvial diamond prospecting as the case may be.	**COMPLIANCE WITH STANDARDS** (A description of how each of the recommendations in 2.11.6 read with 2.12 and 2.15.2 herein will comply with any prescribed environmental management standards or practices that have been identified by Competent Authorities)
Clearance and Construction	Alteration of Topography	Control with restriction of activities and ongoing rehabilitation	Construction Phase (18 to 24 months	No specific standard to be achieved
Rehabilitation of area following closure	Restoration of Topography	Modify with Rehabilitation	Closure and Rehabilitation	
Carbon emissions of activities	Carbon Footprint	Modify through alternative Control with Climate Change Programme Control through design	Construction Phase (18 to 24 months Throughout Operation	SANS 14064-1
	Local Climate Change		Throughout Operation	
	Project Emissions for the National Inventory and Climate Change		Throughout Operation	

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Incorrect storage and handling of hazardous materials	Contamination of Soils	Control with containment measures Control with ongoing maintenance and inspections Control through Rehabilitation Plan	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation	No specific standard to be achieved
Clearance of vegetation and construction	Change in land capability		Construction Phase (18 to 24 months	No specific standard to be achieved
Quantity and/or quality of topsoil is not adequate for successful rehabilitation	Rehabilitation not efficient		Closure and Rehabilitation	NEM:BA
Ongoing Rehabilitation not to Standard			Closure and Rehabilitation	
Contradiction of SDF's for final land use			Closure and Rehabilitation	
Rehabilitation plans not aligned site-wide			Closure and Rehabilitation	
Clearance of vegetation and construction	Loss of Diversity of Indigenous Floral Communities	Control with alien Invasive Control Plant Control through access Control Control with training	Construction Phase (18 to 24 months	NEM:BA
Access into areas with natural vegetation			Throughout Operation	
Clearance of natural vegetation and natural growth	Establishment of invasive species		Closure and Rehabilitation	
Trampling and grazing by large herbivores	Land Degradation		Closure and Rehabilitation	
Clearance of vegetation and construction	Loss of Habitat for Faunal Communities Including Species of Conservation Concern	Control through access Control Control with training	Construction Phase (18 to 24 months	NEM:BA

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Access into areas with fauna	Loss of Fauna	Control through access Control Control with training	Throughout Operation	NEM:BA
Clearance of vegetation and construction activities	Air pollution at receptors	Control with WSA Plant Control with fugitive management Control with ongoing maintenance Control through management and monitoring	Construction Phase (18 to 24 months	NEM:AQA MES
Operation of the SO_2 Abatement Plant			Throughout Operation	
Demolition activities			Closure and Rehabilitation	
Incorrect storage and handling of hazardous materials	Surface water contamination	Control through design Remedy with emergency response	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation	NWA GNR 704
Incorrect storage and handling of hazardous materials	Groundwater contamination	Control through design Remedy with emergency response	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation	NWA GNR 704
Noise generated by activities	Noise pollution	Control through design Control through management and monitoring	Construction Phase (18 to 24 months Throughout Operation Closure and Rehabilitation	NEM:AQA
Clearance and construction	Destruction of artefacts with historical importance	Control through training Control through Heritage Assessment	Construction Phase (18 to 24 months Closure and Rehabilitation	SAHRA
Construction requiring labourers	Additional employment opportunities	Control through design Control through management and monitoring Modify through SO 2 Abatement Plant	Construction Phase (18 to 24 months	Mining Charter
Construction activities creating economic development	Local Economic Development Opportunities		Construction Phase (18 to 24 months	

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
Construction creating a nuisance (dust and noise) for receptors	Nuisance for receptors		Construction Phase (18 to 24 months	
Retaining existing employees for operations	Employment opportunities for existing employees		Throughout Operation	
Operation of SO_2 Abatement Plant	Improvement in ambient air quality		Throughout Operation	
Closure will result in a loss of all employment opportunities	Loss of employment		Closure and Rehabilitation	
Clearance and construction	Visual intrusion (sense of place)	Control through design Control through operation Modify through rehabilitation	Construction Phase (18 to 24 months	No specific standard to be achieved
Operation (emissions) of SO^2 Abatement Plant			Throughout Operation	
Removal of existing structures and rehabilitation			Closure and Rehabilitation	
Hazardous materials management, handling and storage	Surface water, groundwater and soil pollution	Control through design Remedy with emergency response	Construction Phase (18 to 24 months	SANS codes, i.e. SANS 10087-3 (LPG), SANS 10400, SANS 10108 Major Hazardous Installation Regulations
Loss of primary containment of hazardous material			Throughout Operation	
Cessation of hazardous material management at closure			Closure and Rehabilitation	

g) Financial Provision

(1) Determination of the amount of Financial Provision.

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

The overall closure goal for the RPM-US, and therefore the development site for the SO_2 Abatement Plant is to progressively re-instate an area that is safe, stable, and non-polluting with the final landform not adversely affecting water resources.

The closure objectives for the SO_2 Abatement Plant are in line with the RPM-US's closure objectives (SRK, 2016), which are as follows:

- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding landowners and land users (this is to be done during the operational phase). Should a suitable use for mine infrastructure not be found, it will be removed.
- Rehabilitate all disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines).
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits.
- Rehabilitate all disturbed land and residue deposits to a state where limited post-closure management is required.
- Limit the impact on staff whose positions become redundant on closure of the mine.
- Keep relevant authorities informed of the progress of the decommissioning phase.
- Submit monitoring data to the relevant authorities.
- Maintain required pollution-control facilities and rehabilitated land until closure.
- Preparation of a closure EMPr.

To meet the objectives the following general measures will apply:

- Chemical reagent residues will either be sold to another mine or will be collected by registered waste disposal companies and transported for final neutralization and disposal at permitted hazardous waste sites.
- Soil that has been contaminated by spillage, seepage, leachates, waste and tailings dust will be sampled and analysed. If necessary, it will be treated, ameliorated or removed to a suitable site.
- Disturbed areas will be rehabilitated through landscaping, soil replacement and the establishment of vegetation in these areas. Where practical, rehabilitation will take place during the life of the mine (construction, operational and decommissioning phases). On closure, all disturbed areas will have been rehabilitated.
- Landscaping will be undertaken to restore the natural topography of the areas that have been disturbed or, at least, to reduce slopes to stable gradients (no steeper than 1:3).
- The soil, which has been conserved in stockpiles, will be used strategically in the rehabilitation of disturbed land.
- Vegetation establishment in disturbed areas will be undertaken as soon as is practical, with growing season and water availability being the primary time constraints. Indigenous pasture species will be used where possible but emphasis will be on commercially available seeds that will germinate reliably (high seed viability). The species used will 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.

- Prior to re-vegetating soil samples will be collected and analysed and if necessary the soil will be fertilized in accordance with the findings of the soil analysis.
- Following re-vegetation, the site will be monitored and maintained until an acceptable cover has been achieved. The spread of invader species on disturbed land will be controlled until the vegetation cover is capable of providing sufficient natural weed control.

(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

The specifications provided within the Draft EIA report were provided to the public for review. The final EIA Report will be made available for stakeholder review on the WSP | Parsons Brinckerhoff website to ensure all are registered I&APs can consider the provisions provided for the additional mining area and related pumping costs.

In addition it is proposed that a focus group meeting be held with the landowner (Bakgatla-Ba-Kgafela Tribe) during the review period of the Draft EIA.

Post closure land use (PCLU) is determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of the closure plan. This activity is undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation.

Note: a specific consultation regarding PCLU has not been undertaken at this stage of the closure process, for purposes of current planning and liability costing, the assumption is made that post rehabilitation and closure, the land capability developed on the footprints where covers are placed and vegetation established will be a land capability defined as grazing by the Chamber of Mines. This implies a growth medium cover of a minimum of 250 mm on average across the footprints rehabilitated.

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

A detailed Closure Assessment is included in **Appendix 5**.

Closure and rehabilitation actions that AAP intends undertaking at the end of the life of the SO_2 Abatement Plant are described below. These actions are aligned with the RPM-US Liability Assessment (SRK, 2016) and the Mortimer Smelter EMPr (WSP, 2009). These actions are designed to comply with the requirements for the development of risk mitigation closure strategies identified during the environmental risk assessment.

Infrastructure Areas

On closure of the SO_2 Abatement Plant, all disused infrastructure will be demolished. Building foundations will be removed to a depth of I m or will be suitably covered. All land exposed by the demolition of infrastructure and other land distributed by the plant's activities will be rehabilitated as outlined in the EMPr for the SO_2 Abatement Plant, but will include:

- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition.
- The excavations will be filled in with soil, the top 0.15m being topsoil or a suitable alternative.
- Inert ceramics such as bricks, concrete, gravel etc. will be used as backfill or disposed of in a permitted waste disposal site.
- Inert waste, which is more than 0.5m underground, such as pipes will be left in place.
- Inert ceramic and buried waste with a salvage value to individuals such as scrap metal, building materials, etc. will be removed and disposed of at a proper facility.
- All disturbed and exposed surfaces will be covered with at least 25cm of topsoil, or a suitable alternative, and re-vegetation must be allowed to take place naturally.
- The contractor lay down area will be demolished and rehabilitated.
- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works. These services will then be demolished.
- All remaining inert equipment and demolition debris will be placed in the nearest general waste disposal facility.
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards.
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains.
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed in the designated temporary salvage yards.
- Electrical, water and other services that are more than 400 mm below ground surface will remain.
- All pipes and structures deeper than 400 mm need to be sealed to prevent possible ingress and ponding of water.
- Non-hazardous concrete slabs and footings will be broken. This concrete (and metal) will be broken up and disposed of in a proximate mining void.
- All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water.
- Soils beneath the plant, storage tanks and chemical storage areas will be sampled. Any contaminated soils found will be removed for disposal.
- All excavations resulting from demolition of plant, buildings, roads, conveyor platforms, etc. and earth structures will be left in a safe manner.

Roads and Parking Areas

The following closure actions related to roads and parking areas are taken from the RPM-US Liability Assessment (SRK, 2016). The access road to the SO_2 Abatement Plant that is not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed. Closure actions will include:

- Removal of all signage, fencing, shade structures, traffic barriers, etc..
- All ‘hard top’ surfaces to be ripped and bitumen/concrete removed along with any culverts and concrete structures.

- The disturbed surfaces will be covered with at least 25cm of topsoil, or a suitable alternative and re-vegetation must be allowed to take place naturally.
- All concrete lined drainage channels and sumps will be broken up and removed.

Stormwater Management

Hardstanding areas and roads will be concreted as per Mortimer Smelter requirements, but the water captured in these areas will report to normal pollution control dams via the existing stormwater system. Therefore, stormwater management closure actions will be as per the RPM-US Liability Assessment (SRK, 2016) which states that prior to closure a water management plan will be prepared to identify which structures are required at closure and which can be decommissioned. No new stormwater management infrastructure will be constructed as part of the SO_2 abatement plant.

Fencing

The fencing that will be installed for contractor laydown areas will be removed as the areas are reclaimed. The fence will not be retained due to the associated maintenance costs. Removal of the fencing includes dismantling the fencing for salvage and the fence line will be ripped to de-compact the soil.

Remediation of Contaminated Areas

All tanks, sumps and pipes containing non-biodegradable chemicals (liquid, solid or gas) will be flushed to ensure that chemical residues are removed from the site. Liquid storage tanks (including septic tanks) will be emptied, the structure demolished and sub-surface holes filled.

All equipment and plant in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility.

Vegetation

Successful revegetation will help control erosion of soil resources, maintain soil productivity and reduce sediment loading in streams utilizing non-invasive plants that fit the criteria of the habitat (e.g. soils, water availability, slope and other appropriate environmental factors). Invasive species will be controlled and managed to prevent the spread of these species in accordance with the Biodiversity Action Plan (BAP).

Waste Management

Closure actions related to waste management activities includes:

- Hazardous waste will be managed as per the operational Waste Management Plan and will be disposed of off-site.
- Non-hazardous demolition rubble will be disposed of as per the operational Waste Management Plan.
- The waste and scrap yard will be retained for the disposal of mobile equipment, structural steel and mechanical equipment. Only once this material has been taken out of the yard will the yard be demolished.
- It may be necessary to fence temporary salvage yards for security reasons, particularly where these are located close to public roads.

Post Rehabilitation Monitoring and Maintenance

Post rehabilitation and monitoring of the development site will be done in accordance with the RPM-US monitoring programme. The objective of this monitoring programme is to track the recovery of the site towards the long-term post-closure land use goals, in accordance with the overall closure objectives. The monitoring programme will be designed to collect information to demonstrate that the relinquishment criteria have been achieved for the entire mining area including the Mortimer Smelter and SO_2 Abatement Plant. The closure monitoring programme outlined in the current closure plan includes:

- Surface Water – Quality monitoring against parameters as required by the Water Use Licence (WUL). Sampled monthly for a three-year post-closure period.
- Groundwater – Quality monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Sampled quarterly for a three-year post-closure period.
- Erosion monitoring. This will take the form of developing a representative reference site on the disturbed both footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a three-year post-closure period.
- Vegetation establishment: Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, for a three-year post-closure period.
- Bio-monitoring: upstream and downstream of the mining activities. A long-term bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity.

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

The closure and rehabilitation plan actions are aligned with the RPM-US Liability Assessment (SRK, 2016) and the Mortimer Smelter EMPr (WSP, 2009). These actions are designed to comply with the requirements for the development of risk mitigation closure strategies identified during the environmental risk assessment.

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

A detailed specialist study is included in **Appendix 5**. A total value of R 2,702,799.14 should be provided for in the financial guarantees. Kindly refer to the attached specialist study for details (**Appendix 5**).

(f) Confirm that the financial provision will be provided as determined.

Once the DMR has considered that calculations, the Department may or may not request amendments. Once accepted, AAP will provide the guarantee updates to match the additional amount required through one of the following mechanisms:

- An approved contribution to a trust fund as required in terms of section 10(1)(cH) of the Income Tax Act, 1962 (Act No. 58 of 1962) and must be in the format as approved by the Director-General from time to time;
- A financial guarantee from a South African registered bank or any other bank or financial institution approved by the Director-General guaranteeing the financial provision relating to the environmental management programme or plan in the format as approved by the Director-General from time to time;
- A deposit into the account specified by the Director-General in the format as approved by the Director-General from time to time; and/or
- -Any other method as the Director-General may determine.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

g) Monitoring of Impact Management Actions

h) Monitoring and reporting frequency

i) Responsible persons

j) Time period for implementing impact management actions

k) Mechanism for monitoring compliance

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
SO_2 Abatement Plant	Noise	Noise monitoring are to be undertaken on the fence line and at receptors	Mortimer Smelter Management	Bi-annual monitoring and reporting
SO_2 Abatement Plant	Air Quality	As per the Air Quality Monitoring Procedure	Mortimer Smelter Management	Quarterly dust fallout monitoring and annual reporting Annual Isokenetic sampling and monitoring
SO_2 Abatement Plant, hazardous material management	Ground Water	Existing Groundwater monitoring as per the Water Quality Monitoring Procedure	Mortimer Smelter Management	Quarterly groundwater monitoring and annual reporting
SO_2 Abatement Plant, hazardous material management	Surface Water	Existing surface water monitoring as per the Water Quality Monitoring Procedure	Mortimer Smelter Management	Bi-monthly monitoring and annual reporting
SO_2 Abatement Plant	Process Water	Existing process water monitoring as per the Water Quality Monitoring Procedure	Mortimer Smelter Management	Quarterly monitoring

Clearance Construction On-going Rehabilitation	Alien Vegetation Establishment	As per the BAP	Mortimer Smelter Management	Quarterly

h) Indicate the frequency of the submission of the performance assessment report.

Every two years in line with the MPRDA Regulations.

i) Environmental Awareness Plan

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

Regulation 1(m) of Appendix 4 of the NEMA EIA Regulations details the required content of an 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 Environmental Awareness Plan was developed as part of the development and implementation of the 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.

Internal Communication

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

- Meetings;
- Memos;
- Notice boards;
- Briefs;
- Reports;
- Monthly themes;
- Daily operational bulletin;
- Newsletter;
- E-mail;

- Telephone; and/or
- Induction training

Standard Meetings

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.

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; and,
- General Environmental Awareness (e.g. World Environment Day, National Arbour Day).

External Communication

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.

2. Publications

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

- Let's Talk newsletters;
- Annual Sustainable Development Report; and,
- AAP Annual Report.

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; and,
- 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 an appropriate selection of the following means:

- Fax or e-mail;
- Postal system;
- Telephone;
- Formal meetings; and/or,
- Open days.

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.

Training

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.

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; and,
- 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.

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.

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

The identified risks will be dealt with in line with the conditions of the relevant authorisations, relevant regulations, as well as industry best practice.

PART B, section 1(h) herein contains provides the management measures.

n) Specific information required by the Competent Authority

(Among others, Confirm that the financial provision will be reviewed annually).

A detailed Closure Assessment is included in **Appendix 5**. The provision will be reviewed annually.

2. UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports ☐

b) the inclusion of comments and inputs from stakeholders and I&APs ; ☐

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☐ and

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☐

-END-