ENVIRONMENTAL IMPACT ASSESSMENT
&
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

FINAL
SEPTEMBER 2017

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Amendments on Document

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20-Jun-17	21660_DEIR_1	21660_DEIR_2	Update with specialist input (Groundwater Assessment)
22-Jun-17	21660_DEIR_2	21660_DEIR_3	Internal review 2
28-Jun-17	21660_DEIR_3	21660_DEIR_4	CDH[1] review 1
03-Jul-17	21660_DEIR_4	21660_DEIR_5	Amendment 1
07-Jul-17	21660_DEIR_5	21660_DEIR_6	CDH review 2
31-Jul-17	21660_DEIR_6	21660_DEIR_7	Amendment 2 Update with specialist study (Archaeological and Heritage Resources Impact Assessment)
01-Aug-17	21660_DEIR_7	21660_DEIR_8	CDH review 3
04-Aug-17	21660_DEIR_8	21660_DEIR_9	CDH review 3
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19-Sep-17	21660_DEIR_11	21660_FEIR_12	Finalise for Submission

[1] CDH = Cliffe Dekker Hofmeyr

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Groundwater Assessment			
20-Jun-17	Version 0	Version 1	Compile Draft Groundwater Assessment (Version 1)
31-Jul-17	Version 1	Version 2	Amend Draft Groundwater Assessment (Version 2)
04-Aug-17	Version 2	Version 3	Amend Draft Groundwater Assessment (Version 3)
10-Aug-17	Version 3	Version 4	Groundwater Assessment Version 4
Archaeological and Heritage Resources Impact Assessment			
10-Jul-17	Version 0	Version 1	Compile Draft Heritage Impact Assessment (Version 1)
24-Jul-17	Version 1	Version 2	Amend Heritage Impact Assessment (Version 2)

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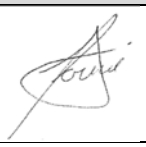
Mapping	Mr. A. Fourie (BSc. Hons. Env. Sci.) EAP		2017/06
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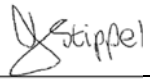
Report Co-Author	Ms. V. Stippel (MSc. Hons. Ecol. Env. & Cons.) Public Participation		2017/06
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mineral resources

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 IN RESPECT OF A LISTED ACTIVITY THAT HAS BEEN TRIGGERED BY AN APPLICATION IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED)

NAME OF APPLICANT:	Northam Platinum Limited ("**Northam**") Zondereinde Mine
TEL NO:	014 784 3004
FAX NO:	086 665 1226
ADDRESS (PHYSICAL AND POSTAL):	PO Box 441, Thabazimbi, 0380 Farm Zondereinde 384 KQ, Thabazimbi
FILE REFERENCE NO. SAMRAD:	LP 30/5/1/1/3/2/1 (36/37) EM

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.

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.

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ABBREVIATIONS

BID	Background Information Document
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
I&AP	Interested and Affected Party
LOM	Life of Mine
MPRDA	Mineral and Petroleum Resources Development Act, No. 28 of 2002
MRA	Mining Right Area
NEMA	National Environmental Management Act, No. 107 of 1998
NWA	National Water Act, Act No. 36 of 1998

PART A: SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1) Contact Person and correspondence address

a) Details of

i) Details of the EAP

Table 1: EAP Details.

Name of the Practitioner:	Candis Lubbe
Tel No.:	087 985 0951
Fax No.:	086 601 4800
E-mail Address:	candis@prismems.co.za

ii) Expertise of the EAP

(1) The qualifications of the EAP
(with evidence)

Table 2: Qualifications of EAP.

Qualifications:	BSc (Hons) Ecology, Environment & Conservation (2006)
Institution:	University of the Witwatersrand

(2) Summary of the EAP's past experience
(In carrying out the Environmental Impact Assessment Procedure)

Table 3: EAP's Experience.

Years' Experience:	11 years in the field of environmental consulting
Work Experience:	Candis Lubbe has been involved in the compilation of numerous Environmental Management Programmes and/or Environmental Management Plans, undertaken several Environmental Performance Assessment Audits, and been involved in the compilation of numerous mining/prospecting permit/rights and environmental authorisation applications
Accreditation:	SACNASP Pr.Sci.Nat. 116831

The EAPs experience and employment history is attached in APPENDIX A.

b) Description of the properties

Table 4: Details of the property.

Farm Name:	1. A part of the Remainder of Farm Elandsfontein 386-KQ 2. A part of Ptn 1 of Farm Elandsfontein 386-KQ 3. A part of Ptn 2 of Farm Moddergat 389-KQ 4. A part of the Remainder of Farm Moddergat 389-KQ 5. A part of the Remainder of Farm Goevernements Plaats 417-KQ

	6. A part of the Remainder of Ptn 1 of Farm Goevernements Plaats 417-KQ 7. A part of Ptn 2 of farm Goevernements Plaats 417-KQ 8. A part of the Remainder of Ptn 3 of Farm Goevernements Plaats 417-KQ 9. A part of Ptn 4 of Farm Goevernements Plaats 417-KQ 10. Ptn 7 of Farm Goevernements Plaats 417-KQ (collectively referred to as the "**Sale Portion**" or the "**Proposed Extended MRA**")
Application Area (Ha):	1632,2827 hectares in extent
Magisterial District:	Thabazimbi
Distance and Direction from Nearest Town:	18km northwest of Northam 35km south of Thabazimbi
21 Digit Surveyor General Code for each Farm Portion:	T0KQ00000000038600000 T0KQ00000000038600001 T0KQ00000000038600002 T0KQ00000000038600000 T0KQ00000000041700000 T0KQ00000000041700001 T0KQ00000000041700002 T0KQ00000000041700003 T0KQ00000000041700004 T0KQ00000000041700007

c) Locality map

(show nearest town, scale not smaller than 1:250000)

Refer to **Figure 1** below indicating the locality of the Proposed Extended MRA in relation to the existing area included under the mining rights held for Zondereinde Mine ("**Existing MRA**").

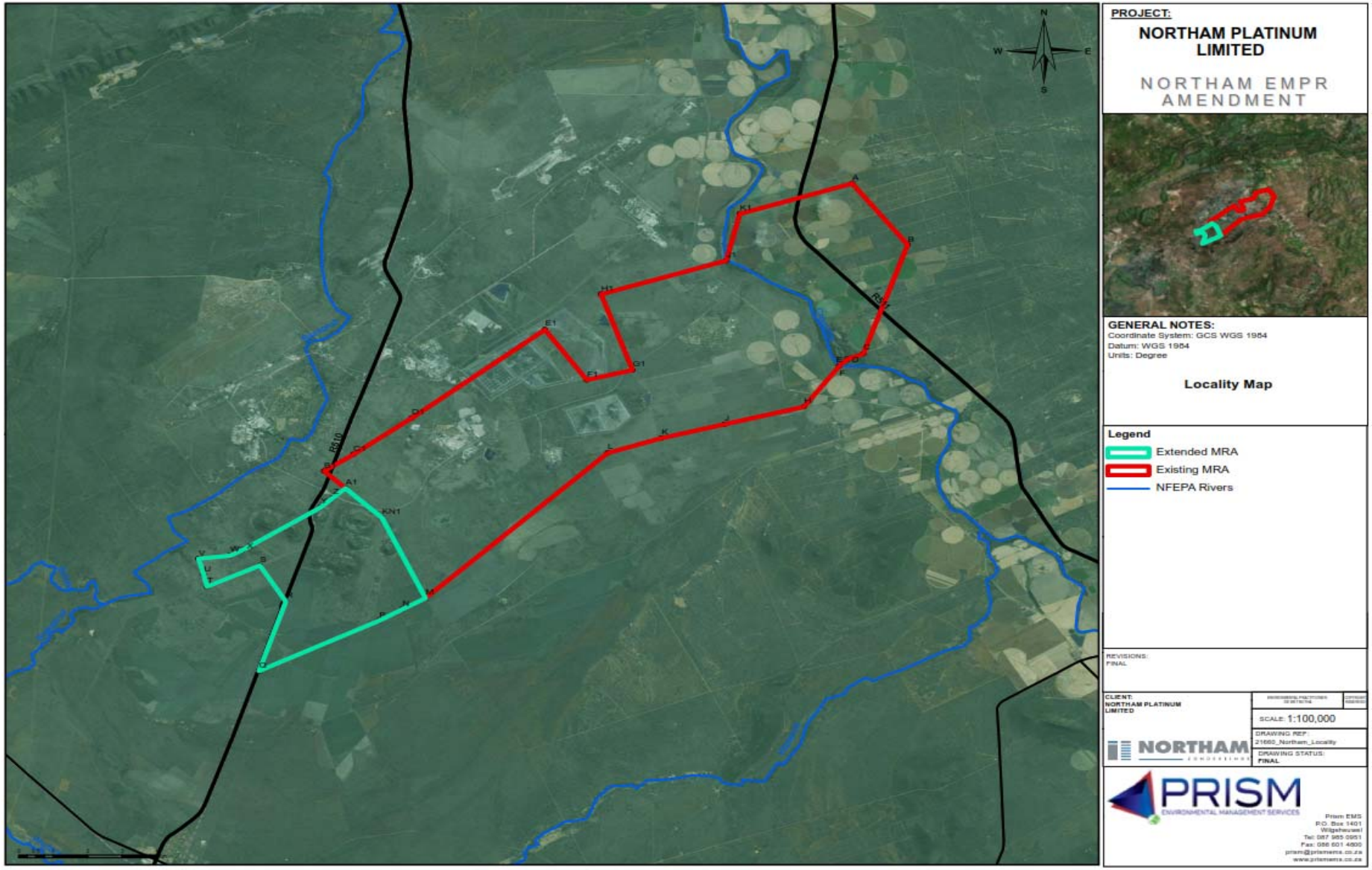

Figure 1: Locality map of the Proposed Extended MRA and Existing MRA in relation to major roads and towns.

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

Table 5 details the listed activities that trigger the requirement for an EIA and includes the aerial extent of each activity.

Northam currently has an approved EMPr for the Existing MRA. This EIA & EMPr is an Addendum and relates only to the Proposed Extended MRA.

i) Listed and specified activities

Table 5: Listed activities.

NAME OF ACTIVITY	AERIAL EXTENT OF THE ACTIVITY	LISTED ACTIVITY	APPLICABLE LISTING NOTICE
(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.)	*Ha or m²*	*Mark with an X where applicable or affected*	*(GNR 544, GNR 545 or GNR 546 / Not listed)*
Underground mining of Merensky and access the UG2 Reefs	1632,2827 Ha	Activity 17	GN R 984 (as amended)

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)

Northam is the holder of two converted mining rights, with DMR reference numbers LP30/5/1/2/2/36MR and LP30/5/1/2/2/37MR, both of which were executed on behalf of the Minister of Mineral Resources ("**Minister**") and Northam on 13 July 2011 and registered at the Mineral and Petroleum Titles Registration Office on 8 and 14 October 2014 under registration numbers 73/2014 and 75/2014 respectively, consisting of the sole and exclusive right to mine certain minerals in, on and under the properties listed in the mining rights and Annexure A thereto, situated in the Magisterial District of Thabazimbi, measuring 7627.5 hectares in combined extent ("**Zondereinde Mining Rights**").

Northam conducts mining, beneficiation, smelting and base metal removal process at Zondereinde Mine on the Existing MRA under the Zondereinde Mining Rights. Various associated infrastructure exists at the Zondereinde Mine to conduct these processes, all of which have been included in the consolidated EMPr for Zondereinde Mine, approved by the DMR on 12 December 2015 ("**Zondereinde EMPr**"). Mining is presently carried out at depths ranging between 1294mbsl and 2300mbsl to extract the platinum group metals ("**PGM**") from the Bushveld PGM Reefs.

Rustenburg Platinum Mines Limited ("**RPM**") is the holder of the converted mining right (DMR Ref. No.: LP 48 MR), consisting of the sole and exclusive right to mine certain minerals in, on and under certain portions of *inter alia* the Sale Portion ("**Amandelbult Mining Right**"). Northam and RPM have concluded a transaction in terms of which Northam will, subject to the necessary approvals being granted, acquire from RPM the

right to mine the Sale Portion, which is presently held under the Amandelbult Mining Right ("**Sale Agreement**").

Sale Agreement:
In terms of the Sale Agreement:

- RPM intends to amend the Amandelbult Mining Right to exclude the Sale Portion. An application by RPM, in terms of section 102 of the MPRDA ("**Section 102**"), to amend the Amandelbult Mining Right to exclude the Sale Portion has been submitted;
- Northam intends to amend the Zondereinde Mining Right to include the Sale Portion. An application by Northam in terms of Section 102 to amend the Zondereinde Mining Right to include the Sale Portion has been submitted; and
- subject to RPM and Northam obtaining the written consent of the Minister to the amendment of the Zondereinde Mining Right to include the Sale Portion, and to the amendment of the Amandelbult Mining Right to exclude the Sale Portion, respectively, in terms of Section 102, RPM will abandon the Sale Portion in terms of Section 56(f) of the MPRDA.

Planned Activities:

- Northam plans to:
    - conduct underground mining, with no additional surface infrastructure or expansions to existing facilities at the Zondereinde Mine;
    - preferentially mine the Merensky Reefs and access UG2 Reefs on the Sale Portion using the same underground infrastructure present at the Zondereinde Mine ("**Additional Mining Activities**");
    - use the existing conveyor system to transfer the ore and waste from the Sale Portion to the Concentrator Plants and waste facilities respectively; and
    - continue Merensky Reef production from the Zondereinde Mine. The addition of the Sale Portion will enable the Mine to maintain the production rate for at least 30 years.
- The Sale Portion is vital, not as an expansion project, but as an extension project and as means of reducing operational risk.
- No additional water abstraction will be required for the Additional Mining Activities. Furthermore, no major water bearing fissures will be intersected in the foreseeable future and dewatering is not anticipated to increase due to the Additional Mining Activities. Groundwater pollution is not foreseeable.
- The mining method for the Additional Mining Activities will be similar to what is currently successfully undertaken at the Zondereinde Mine, being scattered mining with crosscuts spaced 160 meters apart and standard breast panel layouts utilising hydropower equipment.
- A monthly average of 58, 000 tons (hoisted) of Merensky Reef will be mined form the Sale Portion for 39 years, at a mill head grade of 5.98g/t. UG2 mining in the Sale Portion is forecasted to start after 30 years, at a monthly average of 15, 000m^2 of UG2 reef to be mined by the Additional Mining Activities, generating approximately 90, 000 tons at a mill head grade of 4.16 grams per ton. An average of 1,117m of total development per month is planned, including UG2 development.
- The plan outlined above is expected to provide for at least a 30 years LoM at current production rates.

e) Policy and Legislative Context

This section provides a description of the policy and legislative context within which the triggered activities form part of the environmental authorisation application (i.e. the Proposed Extended MRA). The legislative context detailed below is only applicable to the activities proposed at the Proposed Extended MRA and does not include the legislation relating to activities within the Existing MRA.

Table 6: List of applicable legislation.

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
(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)	*(i.e. Where in this document has it been explained how the development complies with and responds to the legislation and policy context)*	*(E.g In terms of the National Water Act:-Water Use Licence has/has not been applied for)*
Constitution of the Republic of South Africa, 1996 Section 24 Everyone has the right to: a. an environment that is not harmful to their health or well-being; and b. have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: i. prevent pollution and ecological degradation; ii. promote conservation; and iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.	Part A Section (h) Subsection (v)–(viii) Section (i) Subsection (i)–(v)	This basic environmental right contained in the Constitution is included throughout the environmental legislation. The particulars regarding the impact assessment process is described in Section (h)(v) – (viii) and Section (i)(i) – (v) of this Report. To give effect to Section 24 of the Constitution, an application for environmental authorisation is being made in terms of reasonable legislative and other measures.
National Environmental Management Act (NEMA), Act No. 107 of 1998 Sections 24(2), 24(5), 24D and 44 Regulations pertaining to identification of activities which may not commence without authorisation and procedures to be followed. The NEMA is the umbrella legislation for which all environmental principles, concerns, issues or impacts must be addressed including: EIA Regulations (2014), as amended.	Part A Section g) Subsection (ii) Section i) Subsection (ii) Section h)	A scoping and EIA process is being followed in terms of the EIA Regulations for an activity listed under Listing Notice 2 (2014), as amended. This report constitutes the final Environmental Impact Assessment Report ("**FEIAR**") in the EIA process being undertaken.
Environmental Impact Assessment Regulations, GN R 982 of 4 December 2014 Regulation 21 – 26 and Regulation 39 - 44 These Regulations set out the process required to undertake the scoping and	Part A Section d) Subsection (i)	A scoping and EIA process is being followed in terms of the EIA Regulations for activities listed under Listing Notice 2 (2014), as amended. This report constitutes the FEIAR in

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
EIA process, including the public participation process that must be undertaken as part of the EIA.		the EIA process being undertaken.
National Water Act (NWA), Act No. 36 of 1998 Section 21(a) and (j) The NWA provides for fundamental reform of the law relating to water resources, where the ultimate aim of water resource management is to achieve the sustainable use of water for the benefit of all users. Water uses that are often associated with underground mining that require a water use licence ("**WUL**") include taking water from a water resource; and removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for safety of people.	Part B Section d) Subsection (vii) – (vii)	No WULs have been applied for in terms of Section 21(a) and (j) of the NWA as no water is being used or removed for the purposes of mining or for the purposes of safety. The Groundwater Study has also confirmed that there will be a low risk of water impacts due to Additional Mining Activities. The NWA will therefore not have relevance to the Project.
National Heritage Resources Act (NHRA), Act No. 25 of 1999 The NHRA promotes good management of the national estate, and to enable and encourage communities to nurture and conserve their legacy so that it may be bequeathed for future generations.	Part B Section u) Subsection (i)(2)	No permit applications relating to heritage resources will be required and the NHRA will therefore not have relevance to the Project.
Mineral and Petroleum Resources Development Act (MPRDA), Act No. 28 of 2002 The MPRDA makes provision for equitable access to and sustainable development of the nation's mineral and petroleum resources. The recent amendments to NEMA and the MPRDA resulted in changes to align specific environmental legislation associated with mining activities and sections of NEMA and MPRDA to provide for one environmental management system. NEMA is now the primary legislation for the environmental regulation of mining and associated activities.	Part A Section d) Subsection (ii)	Northam already holds the Zondereinde Mining Rights and EMPs granted and approved under the MPRDA. Stemming from the one environmental management system, the decision of the environmental authorisation application will be decided by the Minister, or a delegated authority.
2016 -2021 Integrated Development Plan 2016/17 ("IDP") Mine developments boost the local economy	Part A Section d) Subsection (ii) Part A Section f)	One of the opportunities listed within the IDP is the availability of mineral resources. The Project is aligned with such

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT
		opportunity to access mineral resources.

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 inclusion of the Sale Portion in the Zondereinde Mining Rights will not only add additional mineral resources but also provide the Northam with extensive mining flexibility associated with a high-quality resource that is well understood by Northam. Including the Sale Portion will reduce the overall average mining depth of the Zondereinde Mine, with associated potential savings, provide long-term optionality and significantly reduce the Zondereinde Mines' operational risk profile. These factors will also contribute to job preservation, business stability and the local and national socio-economic benefits that accrue from the Zondereinde Mine.

Northam plans to:

- preferentially mine the Merensky Reefs and access the UG2 Reefs on the Sale Portion, using the same underground infrastructure present at the Zondereinde Mine
- transfer the ore and waste from the Sale Portion to the Concentrator Plants and waste facilities respectively using the existing conveyor system
- continue Merensky Reef production from the Zondereinde Mine. The addition of the Sale Portion will enable the Zondereinde Mine to maintain the production for at least 30 years. The Sale Portion is vital as an extension project and as means of reducing operational risk.

A monthly average of 58, 000 tons (hoisted) of Merensky Reef will be mined form the Sale Portion for 39 years, at a mill head grade of 5.98g/t. UG2 mining in the Sale Portion is forecasted to start after 30 years, at a monthly average of 15, 000m^2 of UG2 reef to be mined by the Additional Mining Activities, generating approximately 90, 000 tons at a mill head grade of 4.16 grams per ton. An average of 1, 117m of total development per month is planned, including UG2 development.

The proposed plan outlined above is expected to provide for at least a 30 years LoM at current production rates.

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.

Northam plans to conduct the Additional Mining Activities by using the same underground infrastructure present at the Zondereinde Mine. The existing conveyor system will be utilised to transfer the ore and waste from the Sale Portion to the existing Concentrator Plant and waste facilities. There will be no surface activities or infrastructure for the

Additional Mining Activities on the Proposed Extended MRA or Existing MRA, therefore no layout alternatives are applicable.

i) Details of the development footprint alternatives considered

With reference to the site plan provided as APPENDIX B 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 properties on which the Additional Mining Activities are to be undertaken are listed in Table 5. Refer to Figure 1 for an indication of these properties in relation to the surrounding properties, Proposed Extended MRA and Existing MRA. No other properties have been considered as an alternative for the undertaking of the Additional Mining Activities because the location is dependent on the relative position of the mineral resource.

(b) The type of activity to be undertaken

The Additional Mining Activities on the Proposed Extended MRA are limited to underground mining activities. The alternative method to underground mining is to employ opencast methods, which is not feasible due to the depth of the mineral resources.

(c) The design or layout of the activity

As there will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or Existing MRA, no layout alternatives are applicable.

A standard breast mining layout is used at Zondereinde Mine. The vertical interval between levels is 63 meters. The orebody dips at 20°, thus providing a raise length of 180 meters and allowing for six panels of 30 meters each. Strike gullies are inclined at 10 degrees above strike. Dip gullies handle the ore transported via the strike gullies to the ore pass positions. Three pre-passes are utilised to serve the 180 meters back.

(d) The technology to be used in the activity

Mining is successfully conducted employing hydro-powered rock drills. Stope cleaning is facilitated by water-jets in the panels and scrapers in the gullies, transporting ore to the ore pass system. Ore is transported to the main shaft ore passes by battery powered locomotives pulling spans of 8 ton hoppers. Since this is the current method of mining at the existing operation, no alternative methods are considered feasible.

(e) The operational aspects of the activity

There are no alternative operational aspects for the proposed mining activities because the Zondereinde Mine is an operational mine, through which the Proposed Extended MRA will be accessed.

(f) The option of not implementing the activity

The option of not increasing the Existing MRA, also known as the "No-go option" will result in Northam not being authorised to extract the mineral resources from this area. The purpose of adding the Proposed Extended MRA is to enable Northam to provide for at least a thirty years' LoM at current production rates at the Zondereinde Mine. The inclusion of the Proposed Extended MRA is vital for this and also to reduce operational risk.

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.

The purpose of this section is to describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. It is important to note that 'affected parties' must be specifically consulted with regardless of whether 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.

Identification of Stakeholders and Interested and Affected Parties ("I&APs")

Various stakeholders and potential I&APs were identified through existing stakeholder databases held by Northam from other mining and environmental authorisation processes; Windeed searches of surrounding landowners; and desktop and online research. The identified stakeholders are listed in Table 7 below, including any additional I&APs that have been registered through the consultation process undertaken at the time of making the Draft Scoping Report ("**DSR**") available for comment.

Notification Phase

All identified I&APs were notified and provided with the following information:

- details of the process to register as an I&AP; and
- availability or a copy of the DSR for review and comment.

Notification of potential I&APs was implemented through the following avenues of communication:

Letters of Consent: The landowners of the properties of the Existing MRA and Proposed Extended MRA ("**MRA Landowners**") were notified in writing, through letters and the attached **BID**, containing information on the activities and process to be undertaken.

Written Notice: Various organs of state or municipalities, as listed in Table 7, have been notified of the environmental authorisation application in order to register their interest and/or provide comment on the application with reference to specific management of any environmental aspects or features. The surrounding landowners to the Proposed Extended MRA and Existing MRA were also notified in writing via email, postal and fax (whichever was preferable) on all the relevant surrounding farm portions of the Farms Elandsfontein 386-KQ, Moddergat 389-KQ, and Goevernements Plaats 417-KQ. Refer to APPENDIX B for an indication of the layout of these Farms in relation to the existing Zondereinde Mine.

Newspaper Advertisement: Other potential I&APs were informed of the process through the placement of an advertisement in the local newspaper, namely, the Platinum Bushvelder published/distributed on ***3 March 2017 (dated 4 March 2017)***.

Site Notice: Two site notices were appropriately displayed on the road and boundary of the Proposed Extended MRA on ***15 April 2017***.

BID: All individual registered I&APs, such as the MRA Landowners, organs of state, surrounding landowners and any other I&APs whose contact details were provided were

issued with a BID, providing more information on the location and details of the Additional Mining Activities.

Consultation Phase

Public Meeting: Due to the low level of interest in the proposed project and/or associated activities, no public meeting was deemed necessary.

Comment Period on DSR: The DSR was circulated to the various registered I&APs and made available online via a drop box link for review for 30 days, from **15 March to 18 April 2017** and extended to **25 April 2017** for the commenting authorities to review and provide comment on the DSR. No comments were received during the comment period. Please note that **no comments** were received from I&APs during the comment period and no potential I&AP has formally registered as an I&AP. However, two responses were received from the following commenting authorities:

- Limpopo Economic Development, Environment and Tourism ("**LEDET**") requested to be included in the public participation process; and
- Thabazimbi Local Municipality responded that it will provide comment in future (although no further comment has been received) ("**Authorities Correspondence**").

Refer to APPENDIX C for details of public participation and all correspondence received, which includes the Authorities Correspondence. The outcome of the consultation phase including the Authorities Correspondence was submitted to the DMR on ***8 June 2017***. The DMR accepted the Final Scoping Report on 28 June 2017.

Comment Period on DEIAR: The comment period was made available for 30 days, from ***15 August to 15 September 2017*** for all registered I&APs and/or commenting authorities to review and provide comment on the DEIAR. The outcome of the consultation phase, including all comments, issues or concerns, are contained in the Final EIA Report ("**FEIAR"**) (**this report**) which has been submitted to the DMR for review and assessment. Based on the information contained within the FEIAR, the DMR must grant or refuse environmental authorisation.

iii) Summary of issues raised by I&APs

(Complete the table summarising comments and issues raised, and reaction to those responses)

Table 7 comprises a summary of all identified I&APs. No comments and/or issues were received.

Table 7: List of I&APs notified and/or consulted with a summary of the issues raised.

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S 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						
J V R Personnell CC		Farm Goevernements Plaats KQ 417 Portion 7	No comments have been raised to date Comments received during the comment period on DEIAR will be included			
Transnet Ltd		Farm Elandsfontein 386 KQ Portion 1				
Smit Familie Trust		Farm Goevernements Plaats 417 KQ Portion 2				
Transnet Ltd		Farm Goevernements Plaats 417 KQ Portion 4				
RPM		Remainder of Farm				

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
		Elandsfontein 386 KQ				
Milton James Clifford		Remaining Extent of Farm Goevernements Plaats 417 KQ				
Cronimet Chrome Prop Pty Ltd		Remaining Extent of Farm Moddergat 389 KQ				
Willem Jacobus Albertus Van Schalkwyk		A part of the Remainder of Portion 1 of Farm Goevernements Plaats 417 KQ				
Waldi Inv Pty Ltd		A part of the Remainder of Portion 3 of Goevernements Plaats 417 KQ				

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
Shaun Hornby of SANRAL[2]		Farm Elandsfontein KQ Portion 2				
Lawful Occupier/s of the Land						
Same as landowners above						
Landowners or Lawful Occupiers on Adjacent Properties						
Mr. W. van Schalkwyk		Goevernements Plaats 417 KQ Portion 1				
Smit Family Trust		Goevernements Plaats 417 KQ Portion 2				
Mr. JC Milton		Goevernements Plaats 417 KQ				

[2] Please note that Portion 2 of the Farm Elandsfontein was previously part of the Remainder of Elandsfontein and an application for subdivision was approved but this has not yet been registered and the property has not been transferred yet to SANRAL

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
		Remaining Extent				
Waldi Inv (Pty) Ltd		Kopje Alleen 422 KQ Portion 2				
Waldi Inv (Pty) Ltd		Kopje Alleen 422 KQ Remaining Extent				
GJ Ehlers Boerdery (Pty) Ltd		Witvley 423 KQ Remaining Extent				
Leon Edmund Fourie		Witvley 423 KQ, Portion 1				
Quick Leap Inv 494 (Pty) Ltd		Witvley 423 KQ, Portion 2				
F & S Furstenburg Familie Trust		Witvley 423 KQ, Portion 3				
Mr. C. Elhers		Kromdraai 424 KQ. Portion 17				
Anmar Family Trust		Aapieskraal 377 KQ, Portion 6				
GJ Ehlers Boerdery (Pty) Ltd		Middeldrift 379 KQ, Portion 1				

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
Coetzee Marius Hugo		Elandskuil 378 KQ, Portion 3				
RPM		Elandskuil 378 KQ, Portions 1 & 2				
Buitendag Boerdery Eiendomme (Pty) Ltd		Elandskuil 378 KQ, Portion 4				
Riecor Boerdery (Pty) Ltd		Grootkuil 376 KQ, Portions 9				
Grootkuil Trust		Grootkuil 376 KQ, Portions 23				
Dari Trust		Grootkuil 376 KQ, Portions 10				
Riecor Boerdery (Pty) Ltd		Grootkuil 376 KQ, Portions 12				
Alfalfa Trust		Hakdoorndrift 373 KQ, Portion 3				
Mr J. P Coetzee		Hakdoorndrift 373 KQ, Portion 1				

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
Buitendag Boerdery Eiendomme (Pty) Ltd		Hakdoorndrift 374 KQ, Portion 2 of Portion 2				
Shauneen Coetzee		Hakdoorndrift 374 KQ, Portion 6				
Krokodilkraal Boerdery Trust		Hakdoorndrift 374 KQ, Portion 5				
Mr E Mouss Rooidam Familie Trust		Roodedam 368 KQ, Portion 1				
Mr Labuschagne		Roodedam 368 KQ, Portions 10 and 11				
Anna Sophia Muller		Roodedam 368 KQ Portion 12				
Crimson King Prop 21 (Pty) Ltd		Roodedam 368 KQ, Portion 5				
Mr MP Venter		Roodedam 368 KQ, Portion 16				
Imerys Refractory Minerals SA (Pty) Ltd		Roodedam 368 KQ, Portion 4 of Portion 9				

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
Anglo Platinum Amandebult (RPM)		Elandsfontein 386 KQ Remaining Extent				
Anglo Platinum Amandebult (RPM)		Amandebult 383 KQ, Remaining Extent				
Elizabeth Koekemoer		Middellaagte 382 KQ, Portions 1				
Baphalane Ba Mantserre Community Development Trust		Schildpadnest 385 KQ Remaining Extent				
Baphalane Ba Mantserre Community Development Trust		Schildpadnest 385 KQ Portion 1				
Ou Kraal Boerdery CC		Vlakplaats 427 KQ				
Schalla Schalkwyk Trust		Kaalvlakte 416 KQ Portion 6				

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
Schalla Schalkwyk Trust		Kaalvlakte 416 KQ Portion 7				
Kameeldraai Familie Trust		Kaalvlakte 416 KQ Portion 10				
National Government of the Republic of South Africa		Kaalvlakte 416 KQ Portion 11				
Vescom Twenty Two (Pty) Ltd		De Deur 419 KQ Portion 1				
Municipal Councillor	**x**					
Municipality	**x**					
Organs of State						
Mr Riaan Lategaan	**x**	Thabazimbi Local Municipality				
Mr Ruben Mashego		Waterberg District Municipality				
Communities						

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
Thabazimbi						
Jabulani						
Dept. of Land Affairs						
Mr Tele Maphoto		Department of Rural Development and Land Reform				
Traditional Leaders						
N/A						
Dept. of Environmental Affairs						
Ms Mokgadi Mogashoa		Limpopo Department of Economic Development, Conservation and Tourism				
Other Competent Authorities Affected						

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.*		PROPERTY NAME	DATE COMMENTS RECEIVED	ISSUES RAISED	EAP'S RESPONSE TO ISSUES AS MANDATED BY THE APPLICANT	SECTION AND PARAGRAPH REFERENCE IN THIS REPORT WHERE THE ISSUES AND OR RESPONSE WERE INCORPORATED
N/A						
OTHER AFFECTED PARTIES						
Mr Leon Fourie		Witvley 423 KQ, Portion 1 Olifantskop Boerdery				
Mrs L Du Plessis		Director Jonk Begin Environmental				
INTERESTED PARTIES						

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

This section describes the baseline environmental conditions and attributes including socio-economic, social, heritage, cultural, geographical, physical and biological aspects relevant to the site (including both the Existing MRA and the Proposed Extended MRA).

No infrastructure will be located on the Proposed Extended MRA. All Additional Mining Activities are underground and access will be obtained from the existing underground mining area at the Zondereinde Mine. There are no specific environmental features noted within the Proposed Extended MRA.

Please note that the following information has been extrapolated from the Zondereinde EMP, submitted in December 2013. The purpose of this section is to provide a baseline description for the area and also to identify the scope of work for the EIA phase.

(a) Type of environment affected by the proposed activity

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

Climate:

Regional: The climate of the region is typical of the arid north-western regions of South Africa, with hot and dry summers and cold winters with frost. Frost occurs mainly between May to mid- September, with an average of 51 frost days per years. Mean high daily maximum temperatures of more than 30°C are experienced from October to February. Temperatures during the winter months (May to August) are mild, varying on average between 12.6°C and 16.5°C. Average mean minimum temperatures do not drop below 17.7°C in summer and 2.6°C in winter.

Figure 2 below illustrates the temperature variation during November 2010 to November 2016 for the Limpopo Province. The hottest and most extreme temperatures for the area were recorded during the 2015 / 2016 December / January period, whilst the coldest temperature was recorded during July 2011 (www.worldweatheronline.com) [Date accessed: 12 June 2017].

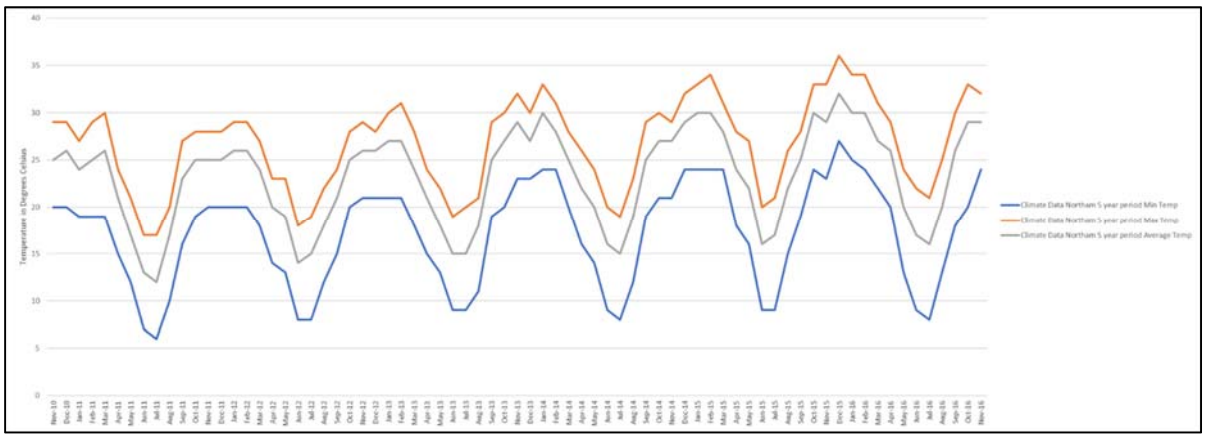

Figure 2: Minimum, maximum and average temperatures for Limpopo over a 5-year period (reproduced from www.worldweatheronline.com).

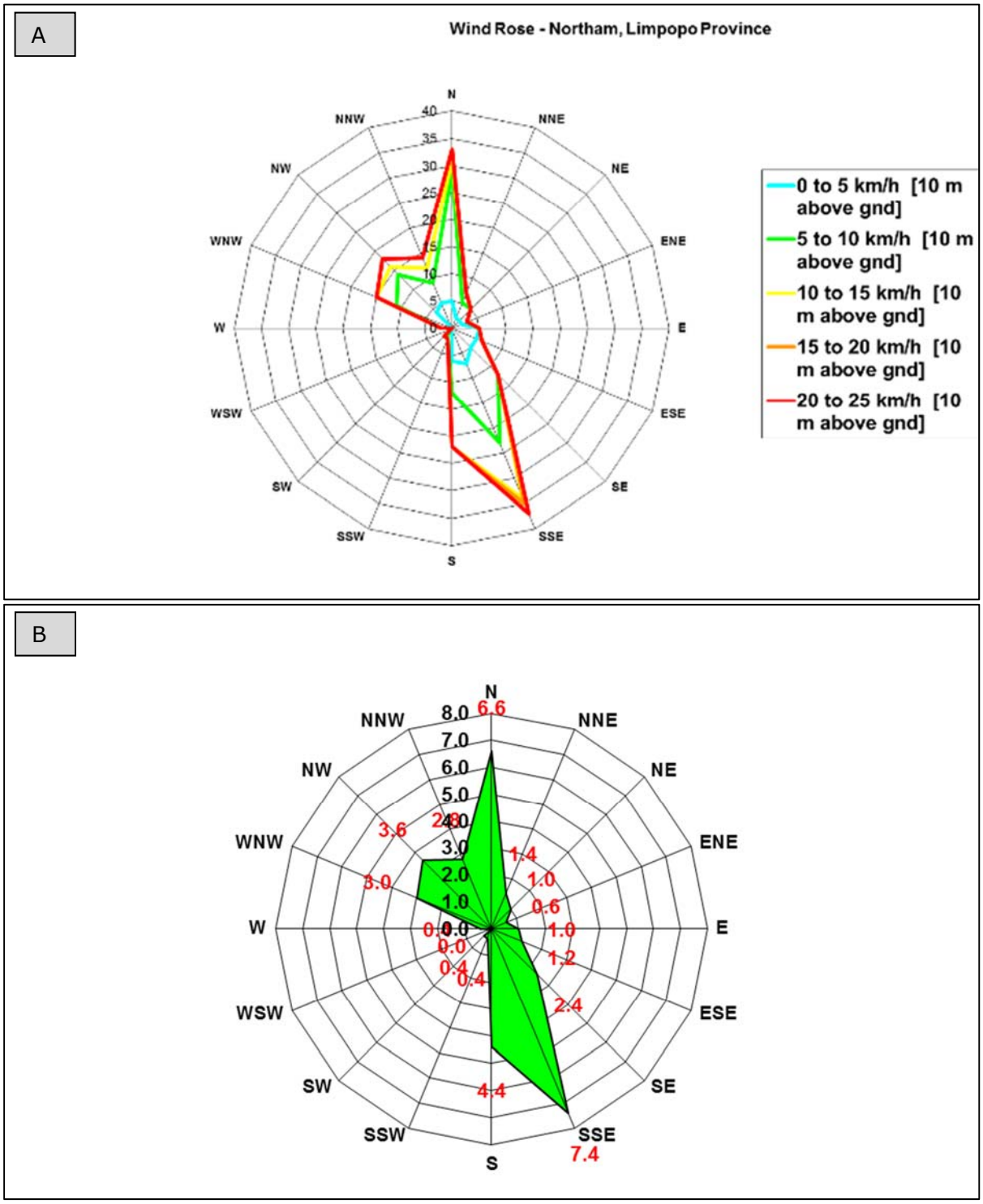

Figure 3: Wind rose for Limpopo Province based on hour sum; B. Average Wind Speed for Limpopo Province (reproduced from www.meteoblue.com).

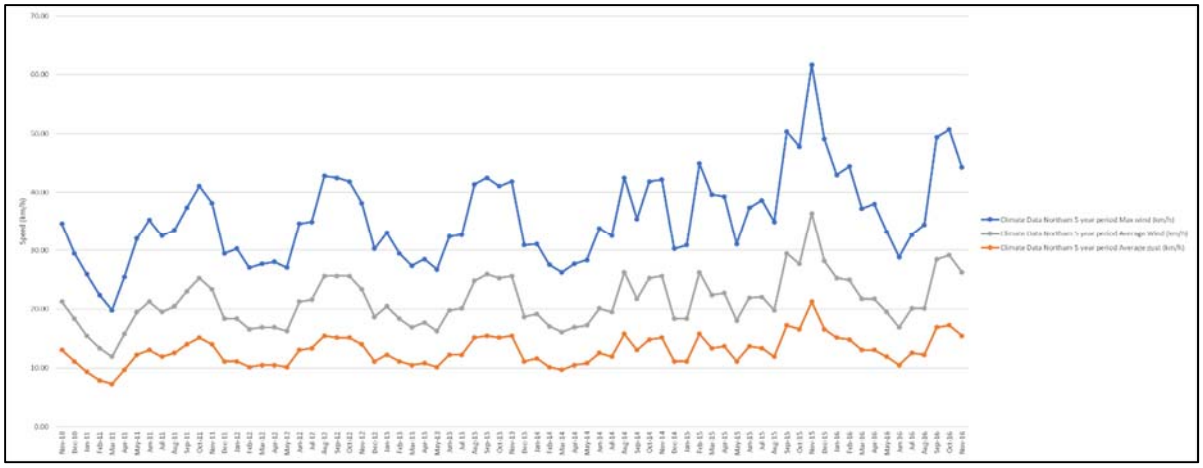

Figure 4: Gusts, average wind and maximum wind speeds recorded over a 5-year period for Limpopo (reproduced from www.worldweatheronline.com).

Winds are variable both in terms of the time of day as well as seasons. Wind (10m) blows mostly from the SSE with a 5%, while for 20 to 25 km/h (10m) 1%. In comparison, winds based on the hourly sum blow from the SSE and secondary wind blows from N and NW (refer to Figure 3). The predominant wind direction for the project area is N and SSE (www.meteoblue.com) [Date accessed: 13 June 2017].

When comparing the average wind, gusts and maximum wind speeds for Northam, (refer to Figure 4), it is evident that for the 5-year period the trend is that the average winds, gusts and maximum wind blows predominantly during October months. March months tend to indicate the lowest wind days (www.worldweatheronline.com) [Date accessed: 12 June 2017].

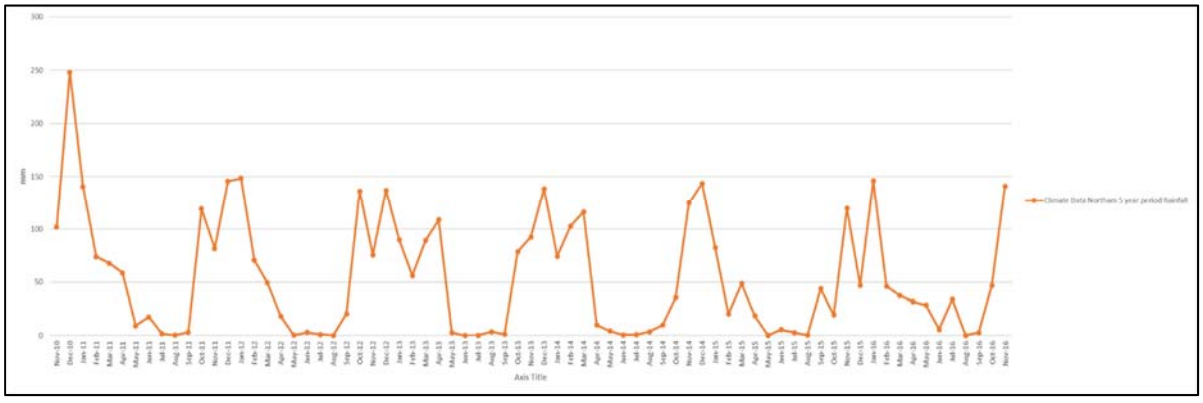

Figure 5: Average rainfall for Limpopo in millimetres for a period of 5years (reproduced from www.worldweatheronline.com).

Rainfall: Due to the warmer season, rainfall is usually in the form of convectional thunderstorms, which are usually accompanied by thunder and lightning, strong winds, heavy rainfall and the occasional hail. Rainfall varies significantly over short distances because of uneven surface heating and upward atmospheric streams. Figure 5 it is a clear indication that rainfall mainly occurs during the summer months in Northam, Limpopo Province (www.worldweatheronline.com) [Date accessed: 12 June 2017].

According to the rainfall data available for Northam, Limpopo Province for the above 5-year period, 2010 was recorded as the wettest year with 248.12mm rainfall. The driest year was 2013 when only 661.07mm rainfall was recorded (www.worldweatheronline.com) [Date accessed: 12 June 2017].

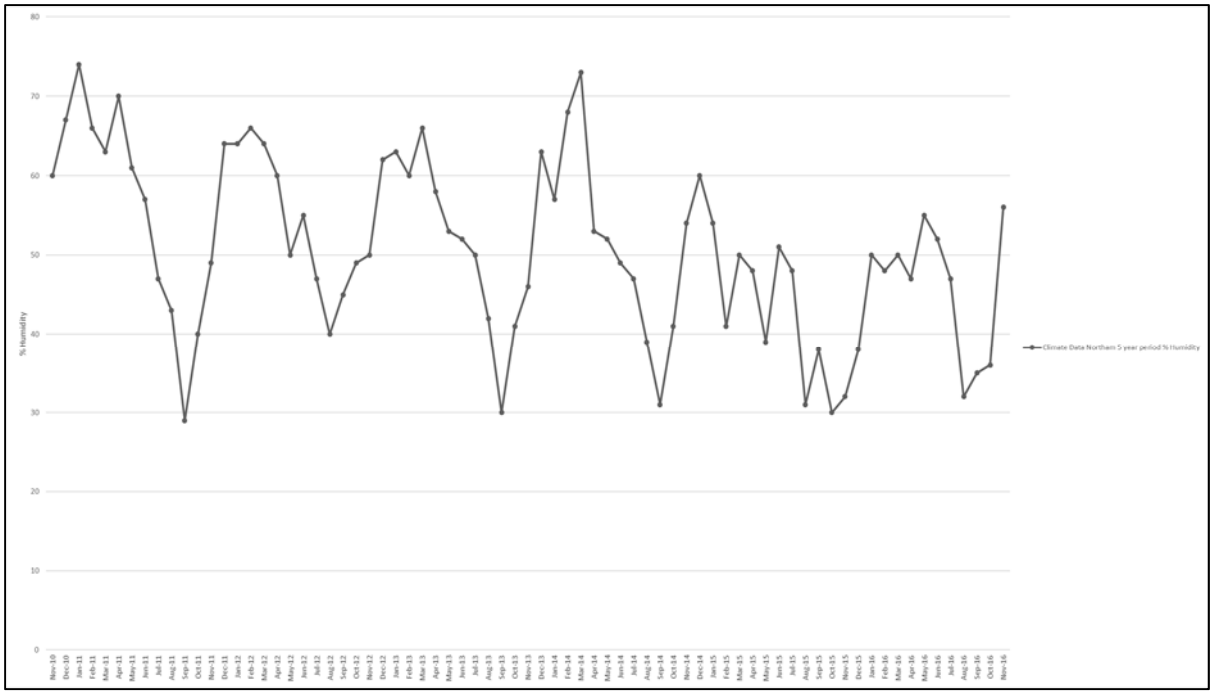

Figure 6: Percentage humidity for Limpopo Province for a 5-year period (reproduced from www.worldweatheronline.com).

Evaporation: Evaporation data for the area is recorded at Thabazimbi, which is located approximately 35km north of Zondereinde Mine. Gross annual 'A' pan evaporation is 2 479.1mm/a. If this is compared with the average annual rainfall, it is obvious that Zondereinde Mine is located in an extreme water deficit area, with average evaporation exceeding rainfall 4.4 times. A summary of the climate data for the Zondereinde Mine and surrounding areas is presented in Table 8. This information is sourced from the 1998 EMP and the Northam Weather Station data (up until 2012).

Table 8: Temperature, rainfall and evaporation data summary.

MONTH	AVERAGE RAINFALL (mm)	MAX RAINFALL IN 24HRS mm (date)	MEAN MONTHLY TEMP °C	AVERAGE DAILY TEMPERATURES °C		MEAN MONTHLY EVAPORATION (mm)
				MAX	MIN	
Jan	110.0	69	25.0	31.3	18.8	247.3
Feb	95.5	75	24.3	31.0	17.7	213.1
Mar	80.5	73	22.8	29.3	16.4	195.7
Apr	36.4	46	19.6	27.6	11.6	182.6
May	9.39	32	15.6	25.0	6.2	152.6
Jun	6.45	31	12.6	22.6	2.6	152.6
Jul	2.59	14	12.8	23.1	2.6	146.1
Aug	4.14	21	16.5	27.3	5.8	220.9
Sep	10.6	38	20.4	29.1	11.7	219.4
Oct	51.9	62	23.4	31.2	15.7	276.5
Nov	86.3	185	24.0	31.2	16.9	217.5
Dec	109.8	133	24.4	31.1	17.8	254.8

Humidity: The humidity in Limpopo Province for a 5-year period from November 2011 to November 2016 is illustrated in Figure 6. The humidity peaked every year during December/January, with lowest humidity percentages during the September months of each year (www.worldweatheronline.com) [Date accessed: 12 June 2017].

Geology:
Regional Geology: The information gathered from the previous EMPs, as well as the Geotechnical Report (A Geotechnical Report for the Northam Platinum Project, 1986: Dr Pavlakis and Associates) indicates that this region of the Bushveld Igneous Complex is underlain by gabbronorite, ferrogabbro and granites with red syenite of the Pilanesberg Complex in some places (ENPAT, 2001[3]). The information further indicates that in predominately granite areas, a thin layer of Quaternary ferricrete overlies the Bushveld Complex rocks. Outcrops of the Transvaal Sequence and the Crocodile fragment occur in the north (near Thabazimbi) and the south of the region respectively. Dykes and plugs of various ages and compositions also occur in the region. The Gabbronite layer is illustrated in Figure 7.

[3] ENPAT, 2001. Environmental Potential Atlas of South Africa. South African Department of Environmental Affairs and Tourism. University of Pretoria. 3rd Edition. 2001.

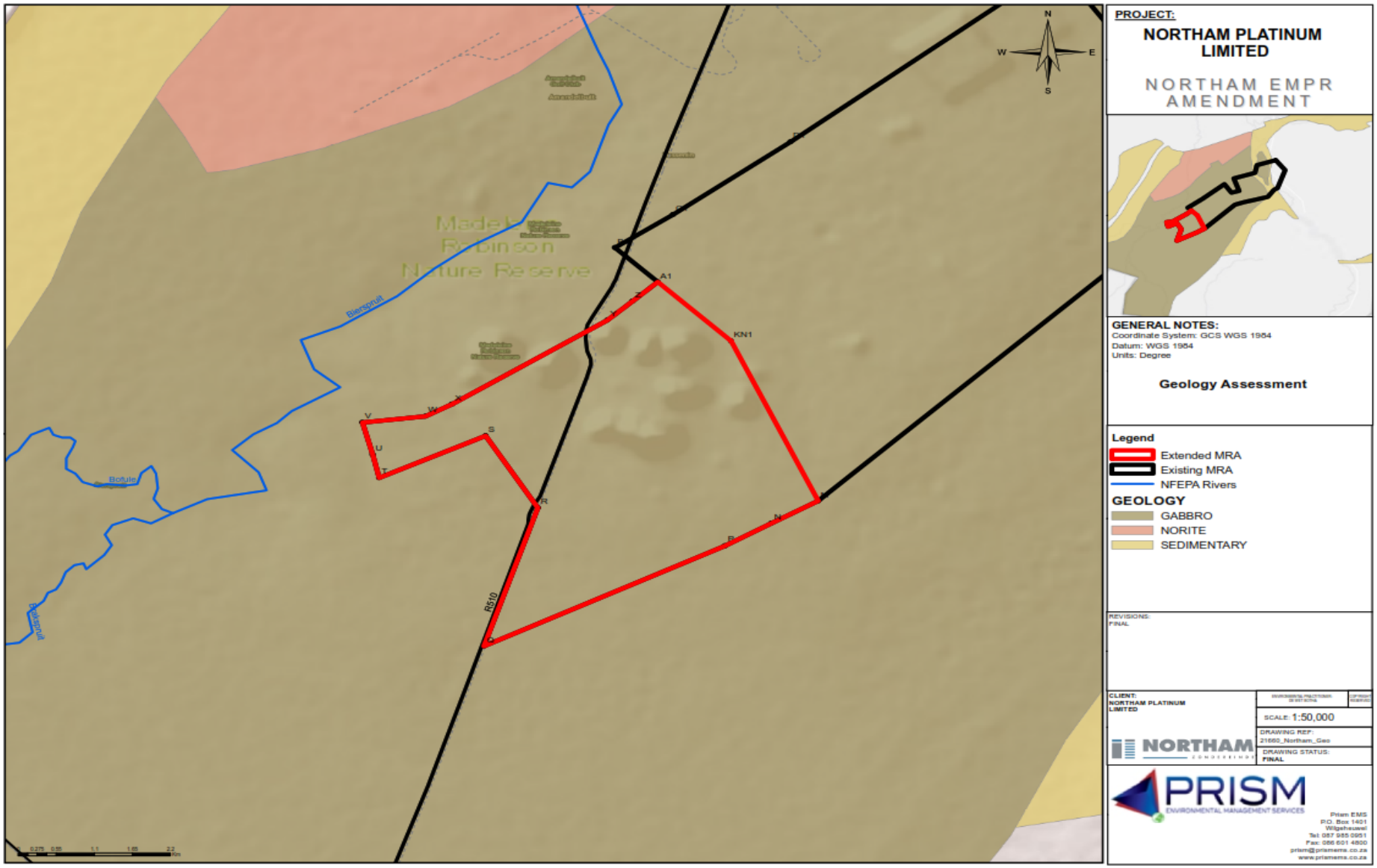

Figure 7: Geology description of surrounding area (ENPAT, 2001).

Site specific Geology: The site is underlain by sub-zone B and C of the Pyramid Gabbronite succession. The mafic rocks are covered by a deep black turf soil while ferruginous soil overlies the magnetite and ferrogabbro in the south-western section of the Existing MRA. The rocks along the Crocodile River are overlain by alluvium. Outcropping is mainly restricted to the north-eastern sector of the Existing MRA, in the form of the Bierkraal Magnetite Gabbro and Nebo Granite.

Geochemistry and Mine Reefs: The reef consists of layered mafic/ultramafic suite typically hosting PGMs, gold, silver and chrome in association with base metal sulphides, such as chalcopyrite, pyrrhotite and pentlandite. The UG2 reef occurs approximately 28m below the Merensky Reef. The Reef composition is indicated in Figure 8.

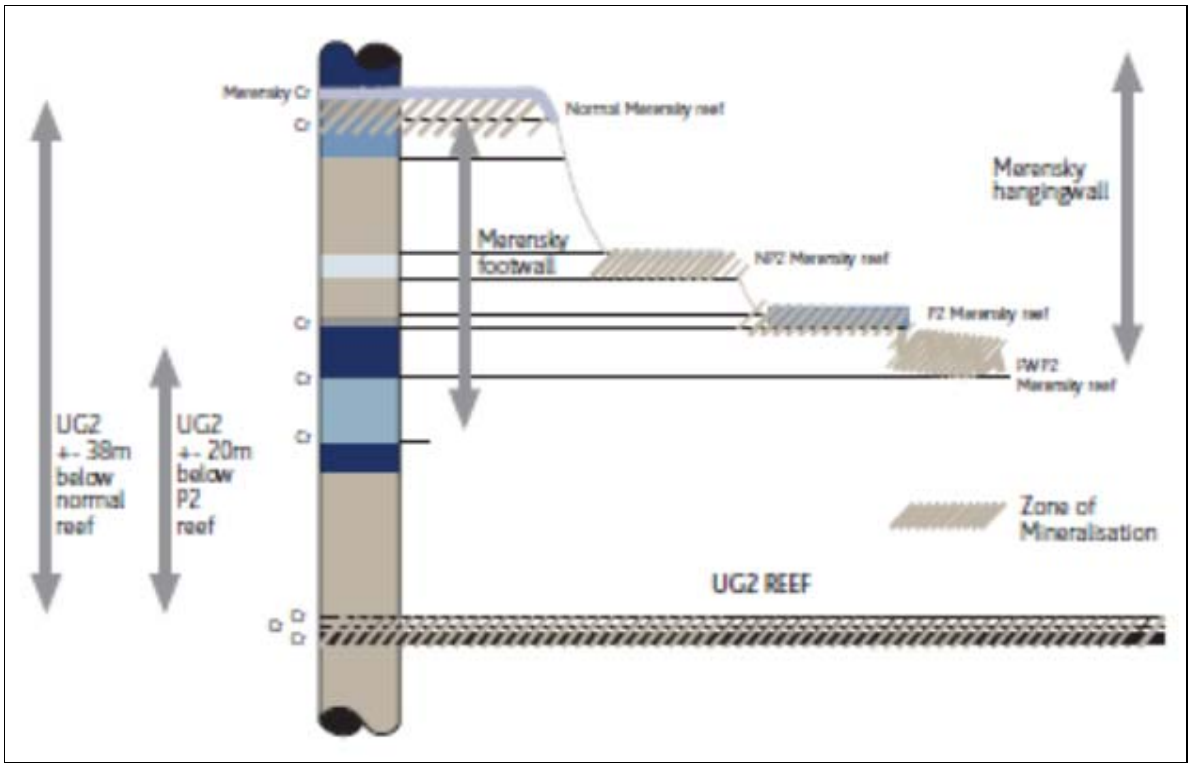

Figure 8: Merensky and UG2 Reefs (Source: Northam Technical Report, 2010).

Topography:
The Proposed Extended MRA lies within the Bushveld Igneous Complex that is characterised by a relative flat landscape, with intermittent typical hills and torso. The regional topographical description included in the 1998 EMP further indicated that the majority of the region is relatively flat, with an elevation of between 950m and 1, 050m above mean sea level (mamsl). ENPAT data-layers indicate a 0–9% slope for the study area.

From Thabazimbi to the north a line of low hills and a ridge extend to the south-west for approximately 65km. The plain slopes down from this ridge's base towards the Limpopo River valley in the west and the Crocodile River in the north and east. From the Crocodile River the land rises to the Bosmanberg's base to the east, with its highest peak at 639mamsl. The highest mountains in the region are the Kransberge, to the north-east of Thabazimbi, which reaches a height of 2,088mamsl. The site-specific topography is indicated in Figure 9, which illustrates a relief of between 0 and 130m.

The highest point of the watershed of the Crocodile River on the western side of the Existing MRA is approximately 996mamsl; from here the landscape gradually slopes towards the Crocodile River to a lowest elevation on the Existing MRA at 913mamsl. From

the Crocodile River the land rises again to the east to an approximate elevation of 934mamsl on the boundary of the Existing MRA. As with the Crocodile River, the highest point of the western watershed (Bierspruit catchment) is also at 996mamsl before descending again to an elevation of 960mamsl on the Existing MRA boundary.

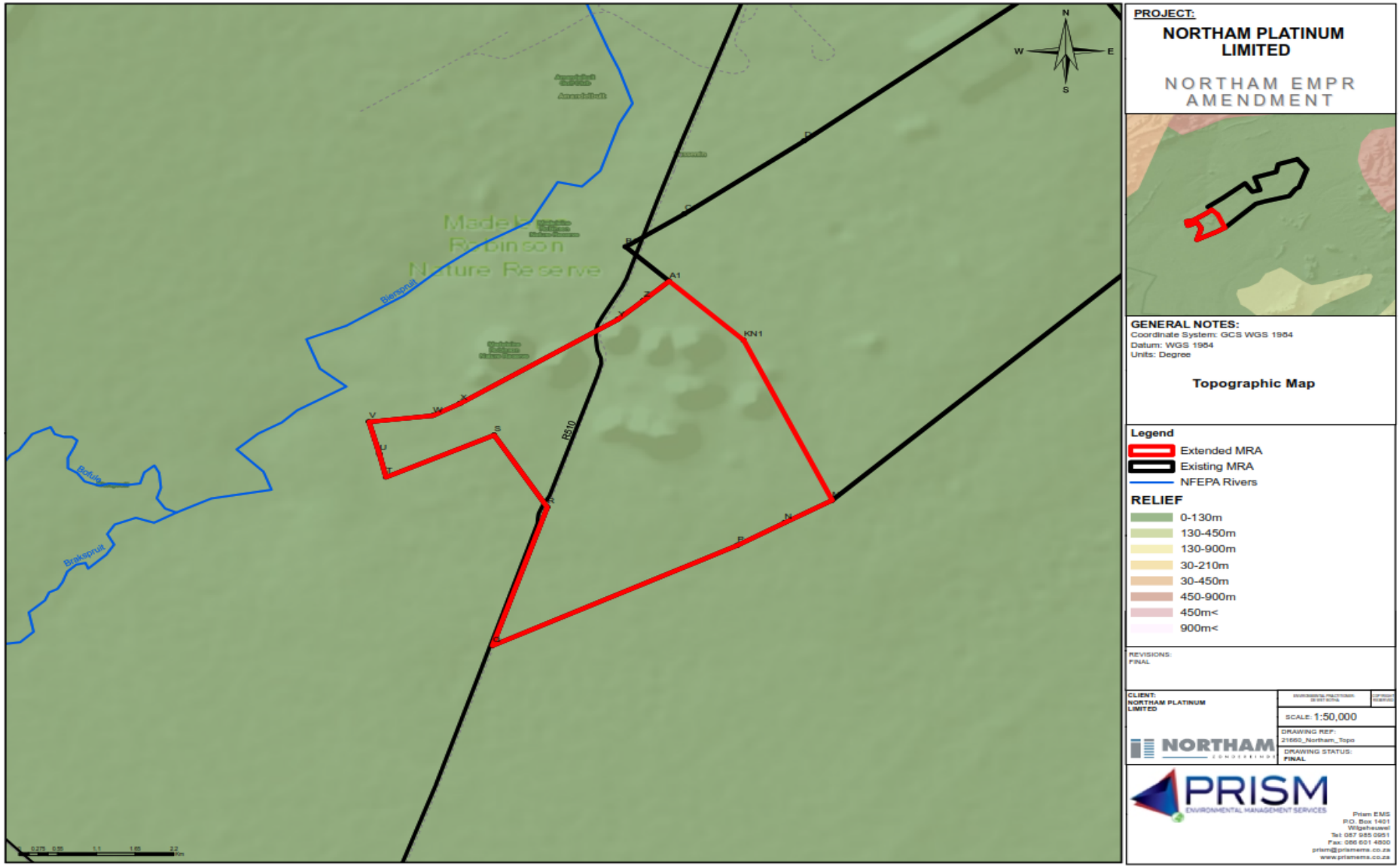

Figure 9: Topographic map with associated Relief of the Proposed Extended MRA.

Soil, Land use and Soil Potential:

Soil: A desktop study was conducted to identify the soil description of the surrounding area using ENPAT data-layer. The majority of the Proposed Extended MRA is situated on one or more of a vertic, melanic and red structured diagnostic horizons, which are undifferentiated. The northern section of the Proposed Extended MRA is situated on Glenora and Mispah forms Figure 10.

Lime is generally present within low-lying soils but rare or absent within the upland soils. The desktop study reveals that the soil depth in and around the Proposed Extended MRA is relatively even and ranges between 450 mm and 750 mm (ENPAT, 2001).

Most of the soil in and around the Proposed Extended MRA is classified as intermediately suitable for arable agriculture, where climate permits. The north-eastern section of the site contains soils which are not suitable for arable agriculture but are suitable for forestry or grazing, where the climate permits. This is mainly due to the topography of the northern section of the Proposed Extended MRA, refer to Figure 11.

Land Use: A desktop assessment of the land use within and around the Proposed Extended MRA illustrates a conservation area on the northern side and cultivated land on the far southern side of the Proposed Extended MRA. The remaining extent of the Proposed Extended MRA is situated within unspecified land, refer to Figure 12. The land cover of the Proposed Extended MRA is dominated by thicket and bushland vegetation with a portion of the land covered by cultivated land (ENPAT, 2001).

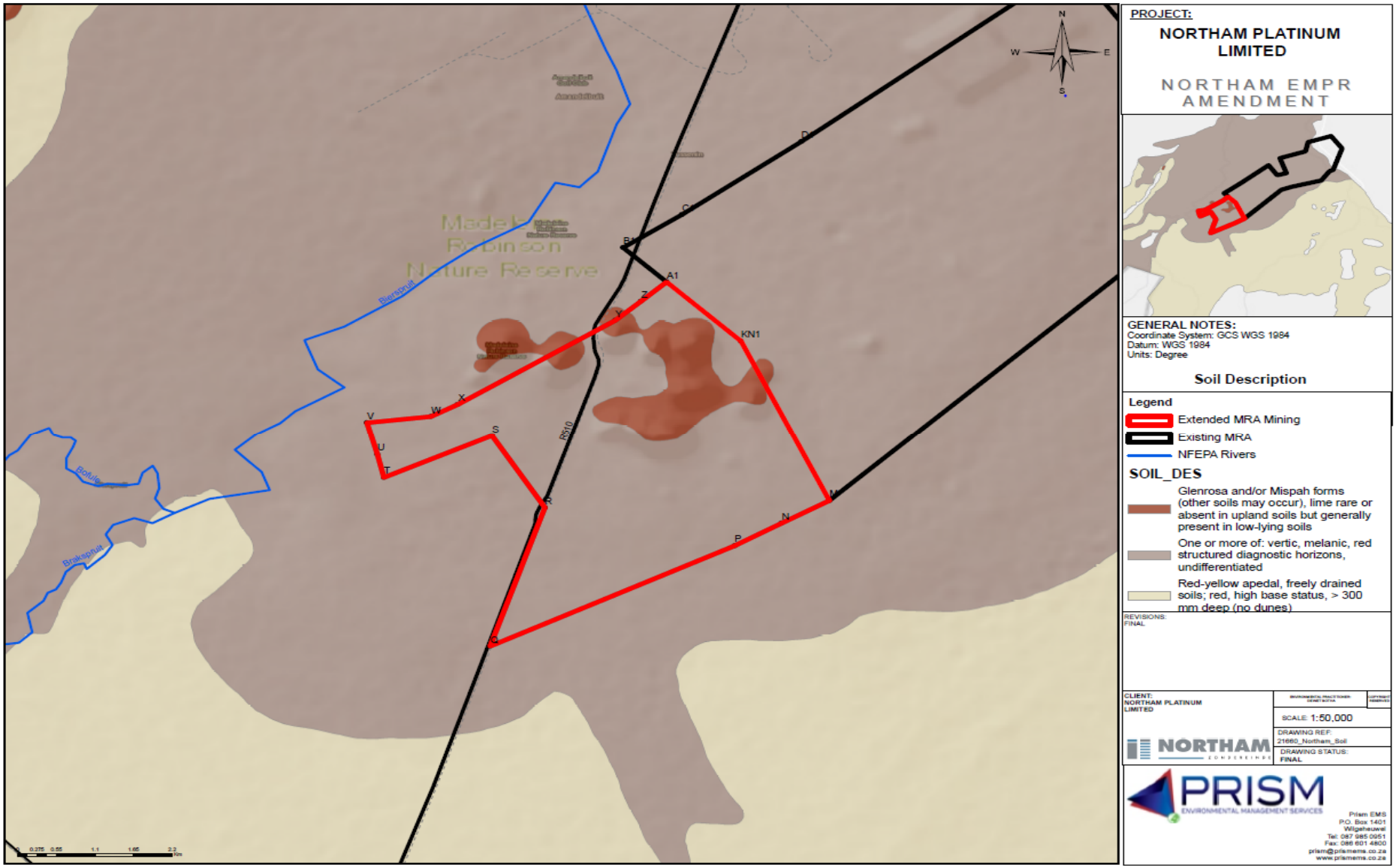

Figure 10: Soil description of the Proposed Extended MRA.

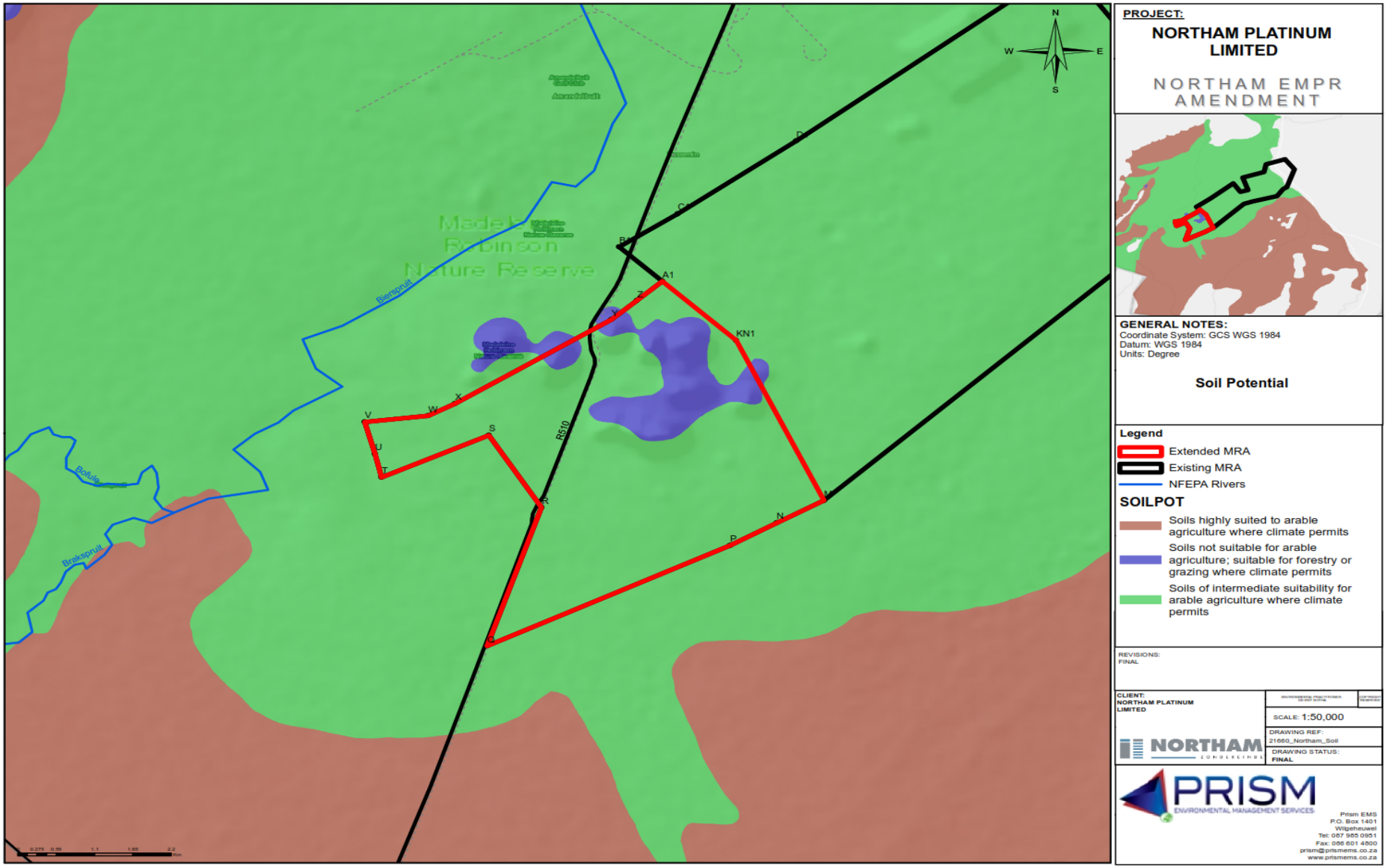

Figure 11: Soil potential of Proposed Extended MRA (ENPAT, 2001).

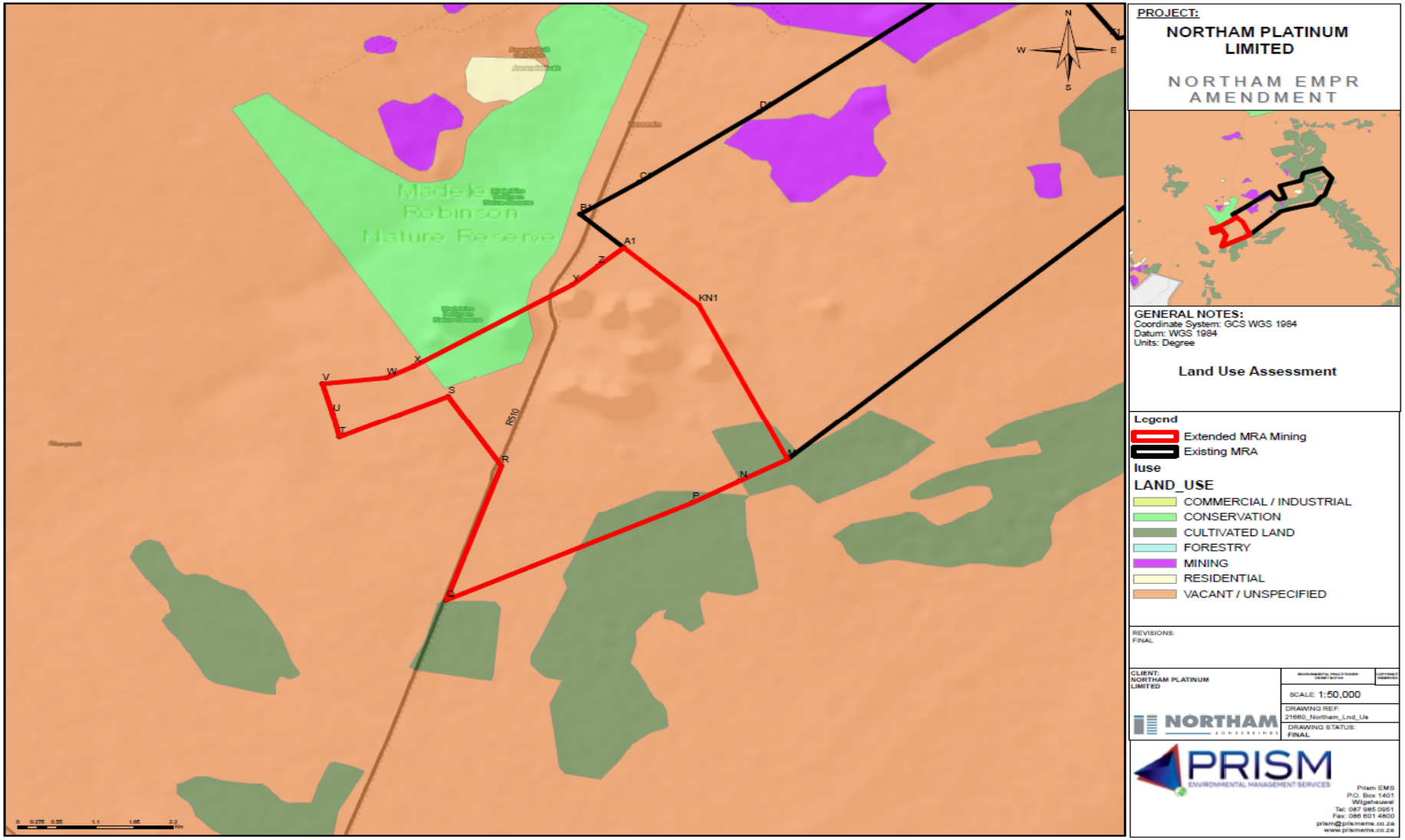

Figure 12: Land use of the surrounding area (NPAT, 2001).

Ecological:

Vegetation: The Proposed Extended MRA is located within the Savanna Biome. This biome represents 32.8% of South Africa and occupies most of the far-northern part of the Northern Cape, North-West, western parts of Free State, northern Gauteng and almost the entire Limpopo Provinces. Savannas are largely tropical and occupy the greater area of the southern continents.

Further, the Proposed Extended MRA site is situated within the **Central Bushveld Bioregion**. According to Mucina and Rutherford (2006)[4] the Proposed Extended MRA is situated within the *Dwaalboom Thornveld* vegetation type. This vegetation type is found throughout the Limpopo and North-West Provinces. It's most commonly found on the flats north of the Dwarsberge and associated ridges mainly west of the Crocodile River in the Dwaalboom area, north of the Pilanesberg to the Northam area (study site) between 900 – 1200 meters above sea-level.

This vegetation group is not regarded as threatened, with about 14% of the land area transformed mainly by cultivation and other agricultural activities. The vegetation group is subject to little or very low levels of erosion due to the topography of the site. The conservation status for this vegetation unit is considered less threatened, with a target of 19%. Approximately 6% of this vegetation type is conserved, mostly within the Madikwe Game Reserve. The main use of the unit is cattle grazing. Key indicator species of this vegetation type include those shown in Table 9.

Table 9: Dwaalthorn Vegetation Type Key Indicator Species.

DESCRIPTION	SPECIES
Tall Trees	Vachellia erioloba
Small trees	Vachellia erubescens V. nilotica V. tortilis subsp. heteracantha, V fleckii V. melllifera subsp. Detinens Combretum imberbe Searsia lancea
Shrubs	Vachellia hebeclada Combretum hereroense Diospyros lycioides Euclea undulate
Grasses	Aristida bipartite Bothriochloa insculpta Digitaria eriantha Ischaemum afrum
Forbs	Kalanchoe rotundifolia Talinum caffrum Rhychosia minima

[4] Mucina, L. & Rutherford, M.C. (Eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. *Strelizia 19.* South African National Biodiversity Institute, Pretoria.

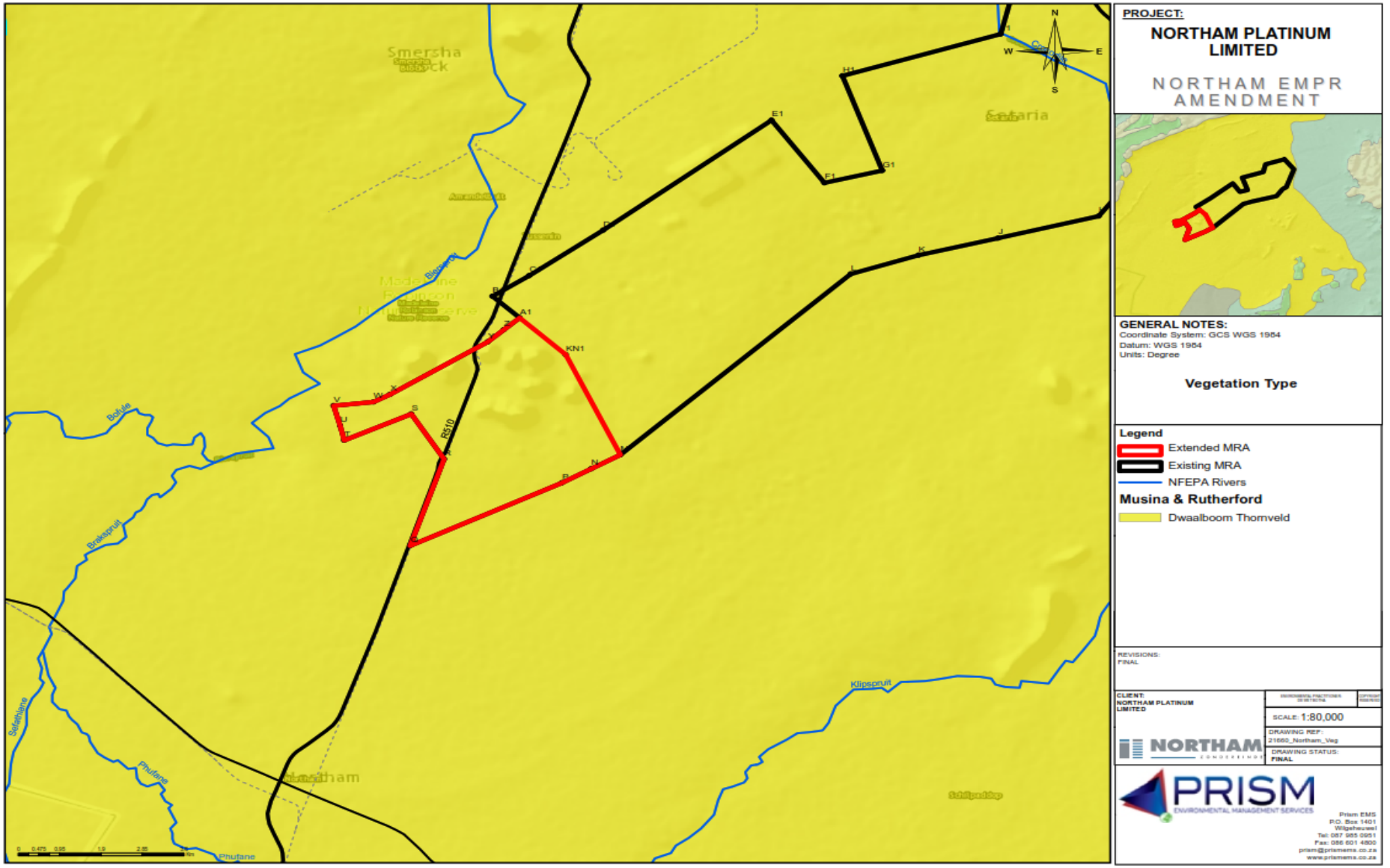

Figure 13: Vegetation group of the Proposed Extended MRA (Mucina & Rutherford, 2006).

Current Ecological Condition: The ecological condition of the Proposed Extended MRA is regarded as being moderate, as ecological functioning has been retained in spite of impacts of mining and agriculture.

Limpopo Critical Biodiversity Area: 40% of the Province has been identified as Critical Biodiversity Areas and 22% as Ecological Support Areas.

Fauna:
Mammals: A number of game species are managed in the fenced game areas of Northam in the area. These are managed by Anglo Platinum's adjacent Amandelbult Mine. Mammal species present in the game area include impala, kudu, reedbuck, zebra, blue wildebeest, giraffe, steenbok, waterbuck, duiker, ostrich, warthog and Nyla.

Birds: A number of bird species databases exist for South Africa, most notably the Roberts list. The Roberts list for the quarter degree square was collated with the Ecofin database of birds. The Extended MRA is within the habitat range of the Yellow Throated Sandgrouse and the South African population is likely to number less than 300 breeding pairs. The secretary bird is also listed as near threatened but with a much wider distribution in South Africa.

Herpetofauna: The reptile species that have been recorded in the area and immediate surrounds (for the quarter degree 2427CD) identified by ADU (2017) for the period 1990 to 2017, is indicated in Table 10.

Table 10: Reptile species recorded for the area.

COMMON NAME	SCIENTIFIC NAME	RED LIST CATEGORY	NO RECORDS
Boaedon capensis	Brown House Snake	Least Concern (SARCA 2014)	1
Naja annulifera	Snouted Cobra	Least Concern (SARCA 2014)	3
Varanus Albigularis subsp. albigularis	Rock Monitor	Least Concern (SARCA 2014)	1
Bitis Arietans subsp. arietnas	Puff Adder	Least Concern (SARCA 2014)	6
Matobosaurus validus	Common Giant Plated Lizard	Least Concern (SARCA 2014)	1

Amphibians: The eleven (11) species known to occur in the area are presented in Table 11. None of these species are indicated as having any conservation threat status. The conservation status is as determined by the LEDET database (Bates et al. In prep.).

Table 11: Amphibian species known to occur within the area.

SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY	ATLAS REGIONAL ENDEMIC	LIMPOPO STATUS
Breviceps adspersus	Bushveld rain frog	Least Concern	0	Least Concern
Amietophrynus garmani	Eastern olive toad	Least Concern	0	Least Concern
Schismaderma carens	Red toad	Least Concern	0	Least Concern
Kassina senegalensis	Bubbling kassina	Least Concern	0	Least Concern

SCIENTIFIC NAME	COMMON NAME	RED LIST CATEGORY	ATLAS REGIONAL ENDEMIC	LIMPOPO STATUS
Phrynomantis bifasciatus	Banded rubber frog	Least Concern	0	Least Concern
Ptychadena anchietae	Plain grass frog	Least Concern	0	Least Concern
Ptychadena mossambica	Broad-banded grass frog	Least Concern	0	Least Concern
Cacosternum boettgeri	Boettger's caco	Least Concern	0	Least Concern
Pyxicephalus edulis	African bullfrog	Least Concern	0	Least Concern
Tomopterna cryptotis	Tremelo sand frog	Least Concern	0	Least Concern
Chiromantis xerampelina	Southern foam nest frog	Least Concern	0	Least Concern

Invertebrates:

Records indicate that a two (2) Red Data Lepidopteran species of conservation concern are known to occur in the vicinity of the Proposed Extended MRA, namely *Dingana jerinae* and *Erikssonia edgei*. Two (2) scorpion species listed as protected under the List of Critically Endangered, Vulnerable and Protected Species, published under the National Environmental Management: Biodiversity Act 10 of 2004 ("**TOPS List**") are known to occur in the vicinity of the Proposed Extended MRA, namely *Hadogenes troglodytes* and *Opistothalmus glabrifrons*.

Hadogenes troglodytes (flat rock scorpion): A species known to occur in drier bushveld areas that receive less than 600mm of mean annual rainfall. This genus is restricted to areas with a type of rock that will split to form cracks for them to live in. This includes sandstone and granite that is largely absent from the area. They seem to prefer living at the bottoms of hills rather than higher up. Adults usually occupy cracks about 1.5cm in width, with juveniles occupying smaller cracks so as to decrease competition with adults. They can be quite dense in some areas, getting to the point where almost every available crack will have a scorpion in it. This species can reach up to 20cm in length and is commonly sold on the pet market. All members of this genus are listed as protected under the TOPS List.

Opistophthalmus glabrifrons (yellow legged burrowing scorpion): Known to dry areas with different temperature regimes. This species is relatively widespread and, like all members of its genus, it is sought after by the pet trade. It is known to stridulate and burrows vary from 10mm to 1m deep, depending on how hard the soil is. Burrows in softer soil are usually shorter than burrows in harder soil. Sandy soils are often completely avoided. All members of this genus are listed as protected under the TOPS List.

Dingana jerinae (Jerine's Widow): Only known from one population on the upper southern scree slopes of the Kransberg in Marakele National Park. This specimen only flies early in the morning and is usually off the wing by 11 am. The species is single brooded and only flies in November. It is highly unlikely that this species will be present on the Proposed Extended MRA.

Erikssonia edgei: A recently described species of butterfly. It was formerly considered to be *Erikssonia craeina*, a species that has been recorded in the southern parts of the Democratic Republic of the Congo, southern and south-eastern Angola and western and north-western Zambia (*Mongu Kataba and Mundwiji Plain*). The South African population on the Waterberg is now treated as *Erikssonia edgei*. Adults are on the wing through most of the summer months, having been recorded from October to April, with a peak in activity

from January to March. The only breeding population of this rare ant-associated butterfly is known to occur in Marakele National Park. This species was recently listed as being critically endangered by the IUCN.

Surface water:
The Proposed Extended MRA is located within the A24F Quaternary Catchment, situated in the Limpopo Water Management Area (WMA1). The Bierspruit River is regarded as a large tributary within WMA1. The Bierspruit River flows in a north-easterly direction, approximately 800 meters west of the Proposed Extended MRA. The confluence of the Bierspruit and Crocodile Rivers is just north of Thabazimbi. Runoff within the A24F Quaternary Catchment is in the direction of the Bierspruit River, to the west of the Proposed Extended MRA. The desktop study revealed a single drainage line flowing through the southern corner of the Proposed Extended MRA. The drainage line flows in a north-north west direction towards the Bierspruit River, underneath the R510. It originates from a small wetland catchment area (indicated as an aquatic resource) within the Proposed Extended MRA. No data was found on the status of the wetland, however, the land area around the Proposed Extended MRA has been severely altered and modified through cultivation and other agricultural activities.

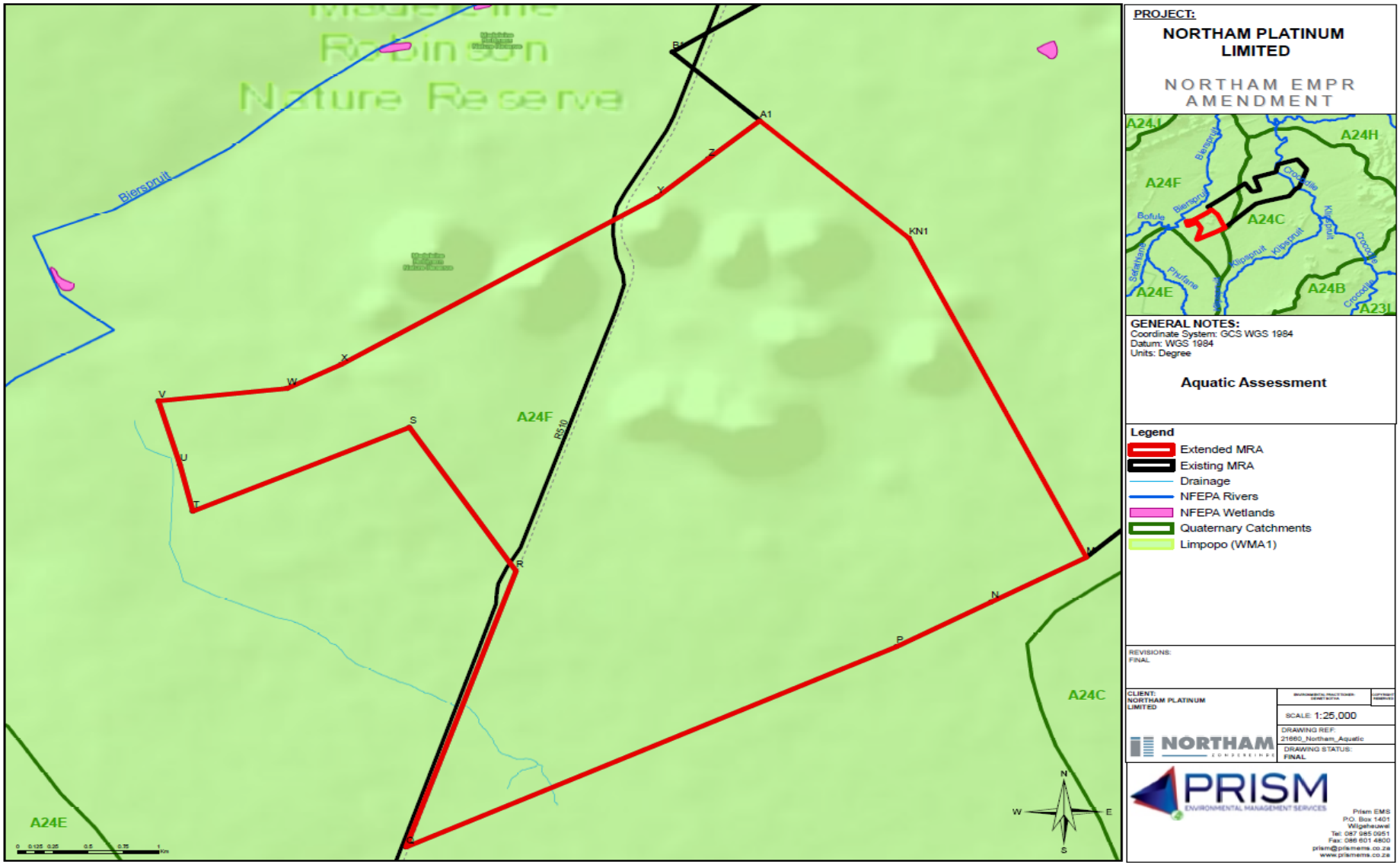

Figure 14: Aquatic properties of the Proposed Extended MRA.

Mean Annual Runoff: The mean annual runoff for catchment A24F, as obtained from the Reserve Determination (RD), is 14.723Mm³/a.

Resource Class and River Health: The resource class and river health, presented Table 12 ,was obtained from the DWS Reserve Office for the A24F Quaternary Catchment.

Table 12: Resource Class and River Health.

QUATERNARY CATCHMENT	RESOURCE CLASS	PES	EISC	REC
A21F	B – largely natural	B – largely natural	Low/Marginal	B

PES = Present Ecological Status/Ecostatus
EISC = Ecological Importance and Sensitivity Category
REC = Recommended Ecological Category

Receiving Water Quality Objectives: The basic human needs ("**BHN**") and reserve requirements for A24F quaternary catchments is summarised in Table 13.

Table 13: Reserve Requirements for Quaternary Catchment A24C and A24F.

CATCHMENT	NATURAL MAR (Mm^3/a)	EWR (Mm^3/a)	BHN (Mm^3/a)	RESERVE REQUIREMENT (Mm^3/a)
A24C	463.4	42.351	0.001	42.355
A24F	14.7	6.711	0.1	6.82

Surface Water User Survey: Surface water is used for irrigation purposes, according to DWS allocations along the Bierspruit and Crocodile River. There are no settlements in the vicinity of the Proposed Extended MRA which are dependent on surface water for household use.

Sensitive Areas Survey: The surface water systems of both the Crocodile and Bierspruit Rivers are robust systems.

Groundwater: The following information has been provided from a desktop Groundwater Assessment undertaken by **Future Flow Groundwater Management Solutions**.

Hydrogeology:
Three aquifers occur in the area:

- alluvial aquifer material;
- shallow weathered fractured material; and
- underlying competent and fractured rock material.

Alluvial Aquifer: The alluvial aquifer is composed of unconsolidated layers of sand and silt deposits. It is unconfined and laterally discontinuous, localised within the immediate vicinity of the river banks and the floodplains, and therefore does not extend regionally throughout the total study area. These aquifers are usually fairly high yielding due to their interaction with the surface water bodies, coupled with the relatively high storage capacity of the unconsolidated sediments. The interaction between the alluvial aquifer and the river depends on the differences between the surface water and groundwater levels and the presence or absence of an impervious streambed which would affect the hydraulic connection.

Shallow weathered fractured material: The upper aquifer forms due to the vertical infiltration of recharging rainfall through the weathered material being retarded by the lower permeability of the underlying competent rock material. Groundwater collecting

above the weathered / unweathered material contact migrates down gradient along the contact to lower lying areas.

Based on data collected from previous drilling programs performed in the area, it is estimated that the upper 2m of the soil consists of the semi-confining black turf layer. The Bushveld Igneous Complex norite weathers to form a dark brown to black, very clayey vertisol soil horizon. During dry weather the soil forms deep open fissures or shrinkage cracks, while the soil becomes sticky and slow draining during wet weather. This results in varying hydraulic conductivities in the expansive clay layer. When saturated the clays are highly impermeable, but allows for infiltration and recharge through the surface cracks during dry conditions.

The upper weathered aquifer is below the turf layer and has an average depth of approximately 9 to 12m. These average values are not absolute values for the entire study area. Deeper weathering can also occur. However, the mentioned values are considered to provide a good general indication of the Proposed Extended MRA's conditions.

The borehole yields in this aquifer are seasonally variable due to the strong dependence on rainfall recharge. The groundwater quality in undisturbed areas is good due to the dynamic recharge from rainfall. This aquifer is, however, more likely to be affected by contaminant sources situated on surface.

Fractured Rock Aquifer: Although the lower permeability of the unweathered rock material will retard vertical infiltration of groundwater, a percentage of the water in the shallow aquifer will recharge the fractured rock aquifer.

The ultramafic / mafic Rustenburg Layered Suite consists of relatively low permeability sediments that have been subjected to extensive faulting associated with the intrusion of the Bushveld sediments.

Groundwater flows in the fractured rock aquifer are associated with the secondary fracturing in the competent rock and, as such, will be along discrete pathways associated with the fractures. Faults and fractures in the competent rock can be a significant source of groundwater, depending on whether the fractures have been filled with secondary mineralisation.

Groundwater Levels:
A groundwater monitoring program is undertaken, where the depth to groundwater level in the boreholes is monitored in the Existing MRA. The monitoring is being conducted on a monthly basis. A total of 38 monitoring borehole points were found from the latest Aquatico Monitoring Report for July 2016. The results of the 25 monitoring runs between January 2014 and July 2016, the latest (July 2016) groundwater level and details of the boreholes included in the monitoring program were analysed. Details of the groundwater levels are contained in the Groundwater Assessment (refer to

APPENDIX E). The groundwater levels vary throughout the general area. The deepest groundwater levels are observed in borehole NPG13, which is located east of the Smelter area at the Existing MRA. There is no certainty around the reason for the low groundwater level in borehole NPG13. The depth to groundwater levels in the other monitoring boreholes are shallower, ranging between 0.9 and 24.1 m below ground level (mbgl).

The changes in groundwater levels over time between January 2014 and July 2016. From Figure 15 it can be seen that the groundwater levels within individual boreholes remained within a similar range during the time January 2014 to July 2016.

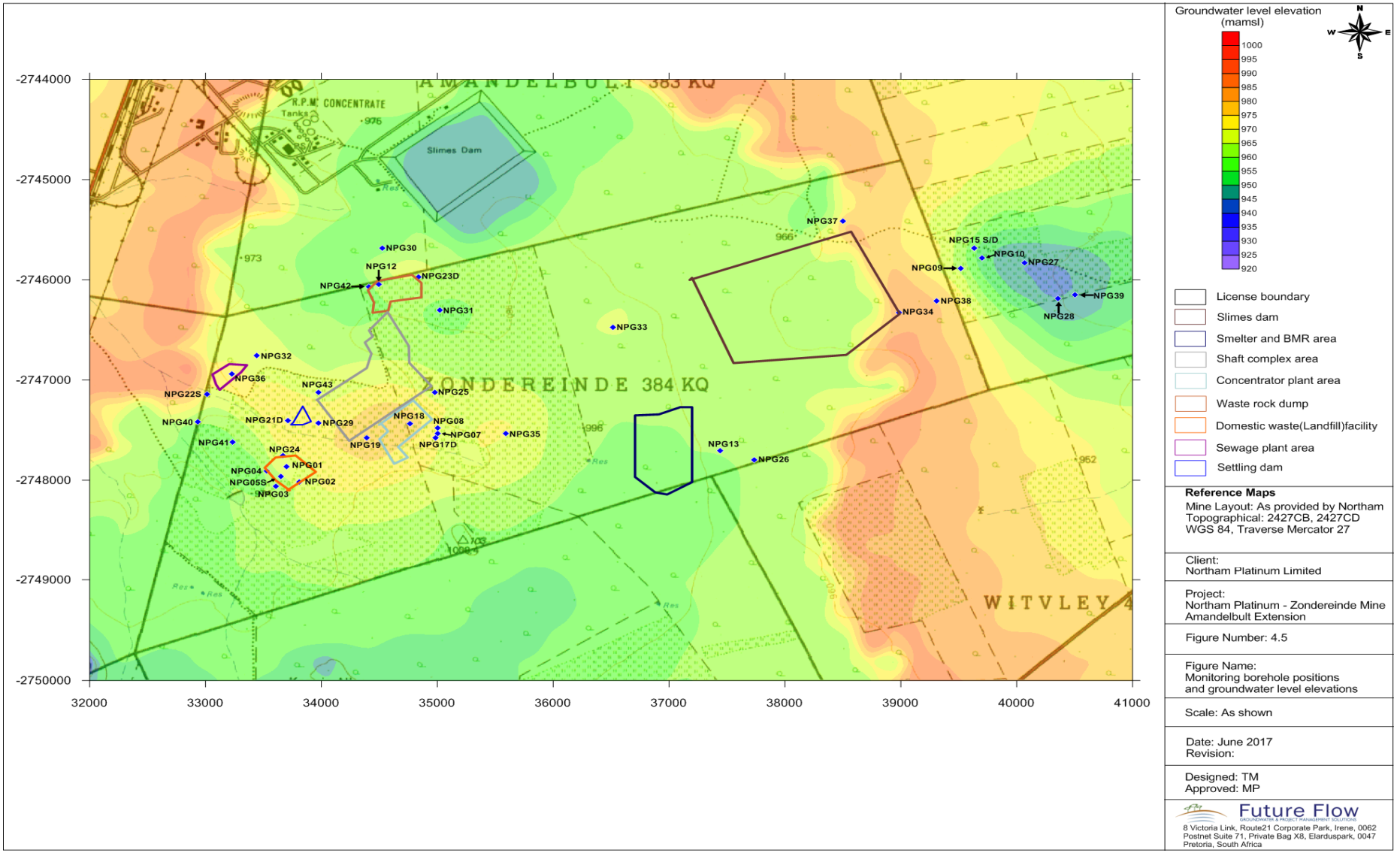

Figure 15: Monitoring borehole positions and groundwater level elevation contours.

In areas where there are no large scale external impacts on the groundwater environment, such as the lowering of groundwater level through dewatering, it is expected that the groundwater level contours will reflect topographical contours. Plotting groundwater level elevation versus topographical elevation yields an 86.7% correlation. From this, it is concluded that the groundwater levels generally mimic topography in the areas where the boreholes are located and there is no indication of the aquifers being dewatered. Groundwater level elevation contours for the upper weathered material aquifer are shown in Figure 15.

Underground Mining Area:
The existing underground mine area is located at depths of 1,294 to 2,300 mbgl. The Proposed Extended MRA will be at similar and greater depths. It is not expected that there will an active aquifer at those depths. The Shaft is lined and it is not expected that after closure, when the underground mine area is eventually submerged, there will be significant seepage from the Shaft area into the surrounding aquifers. Additionally, there are no groundwater users accessing water from that depth.

Based on this, it is considered that the Additional Mining Activities are not a major risk to the active aquifers at depths shallower than 100 to 150 mbgl.

Surface Infrastructure:
Refer to the Groundwater Assessment (

APPENDIX E) for how the surface infrastructure at the Existing MRA impacts the groundwater quality (contaminated and un-contaminated groundwater) within the Existing MRA. The Additional Mining Activities will not contribute to the groundwater impacts being caused by the surface infrastructure within the Extended MRA.

Groundwater Quality:
The groundwater quality at the Existing MRA is monitored by boreholes in close proximity to potential pollution sources. The monitoring data indicates that there is no widespread contamination in the Existing MRA but limited to within less than 400 m from sources. During 2014 six additional monitoring boreholes (NPG37 to NPG43) were drilled near the identified pollution sources in order to confirm the contamination sources in the Existing MRA and better monitor contaminant plume development.

Aquifer Characterisation:
- Groundwater Vulnerability: For aquifer vulnerability reference is made to the aquifer vulnerability map of South Africa, which shows a low aquifer vulnerability for the project area.
- Aquifer Classification: The aquifers present in the area are classified as minor aquifer but of high importance to the local landowners as it is their sole source of water for domestic and agricultural (stock watering and irrigation) purposes.

Air Quality:
The definite source of air quality pollution at the Existing MRA is the sulfur dioxide (SO_2) and dust released from the Smelter Plant through a 200m high Stack. Zondereinde Mine has an Air Emissions Licence under the National Environmental Management: Air Quality Act 39 of 2004 to release 4 900mg/nm^3 maximum emission rates under normal conditions of a 24-hour period. The Stack was built to release the emissions above the inversion layer, thereby ensuring that emissions will be set free in the higher atmosphere and not trapped in the lower atmosphere. However, the Additional Mining Activities are located below the surface within the Proposed Extended MRA; therefore, there are no anticipated impacts on the air quality within the Proposed Extended MRA.

The only current land uses on the Proposed Extended MRA that contribute to the air quality include dust generated from agricultural activities.

Noise:
The Proposed Extended MRA is mostly undisturbed with natural vegetation, undisturbed areas, with ridges and koppies and the Madeleine Robinson Nature Reserve to the north of the Proposed Extended MRA.

The existing noise levels within the Proposed Extended MRA are generally quiet. Even though there are many intruding noise sources (use of the main road and agricultural practises to the southwest), these are not perceived to be particularly disturbing.

There are no interfering noise levels, except within certain buildings and working areas, within the Existing MRA. The noise levels are monitored and the relevant provisions of the Mine Health and Safety Act No. 29 of 1996 ("**MHSA**") must be adhered to. Perimeter noise levels are well below 80 dB (A) (refer to Table 14) for the Existing MRA.

Table 14: Perimeter noise levels for Existing MRA.

NOISE LEVEL (Max 85.0) dB(A)	MONITORING POINT	CO-ORDINATES	
		S	E
63.7	Zondereinde Entrance	24° 50′ 39.7″	27° 18′ 19.7″
63.1	South of entrance road	24° 51′ 08.8″	27° 19′ 13.7″

63.6	Smelter Plant	24° 50′ 10.2″	27° 21′ 54.5″
63.2	South-west of Smelter Plant	24° 51′ 06.8″	27° 22′ 40.3″
63.1	South-west of Zondereinde	24° 51′ 39.5″	27° 22′ 38.8″
63.4	South of Concentrator	24° 50′ 37.8″	27° 20′ 47.5″
63.1	TSF Complex (north-west)	24° 49′ 06.3″	27° 22′ 01.0″
63.1	North-west of Setaria Village	24° 47′ 19.1″	27° 25′ 01.5″
63.1	North of Hostels	24° 49′ 25.4″	27° 20′ 06.7″

Visual:
Due to the fact that no infrastructure or any activities are to be constructed and there will be no additional visual impacts, the need for an updated visual impact assessment is deemed unnecessary.

In relation to the Existing MRA:

- a visual assessment was undertaken as part of the 1998 EMP. Since then no other intrusive infrastructure has been constructed and, as such, the visual intrusion (with the exception of the tailings storage facility ("**TSF**")) has not changed. Zondereinde Mine's location (Figure 1) between the R510 and R511 makes it visible for road users. From the south, the view of Zondereinde Mine is mainly obscured by the Tors Hills' low range. Once past the hills the view is Amandelbult Mine and TSF with the addition of Zondereinde Mine mining infrastructure.
- due to the distance to the R510, the view is limited. From the R511 and D56 side, it is mainly the smoke Stack of the Smelter Plant which is visible, together with Setaria Village from a closer distance. Emissions from the Stack are visible in the form of a white smoke. Setaria Village is visually less intrusive, as it mainly consists of one story housing and commercial development. The trees and gardens associated with the Village serve as a visual mitigation. Even though the water tower is relatively high, the natural topography ensures that it is not intrusive in the skyline from the access roads. The TSF is mainly obscured as a result of the Amandelbult TSF from the R510.

Socio-Economic Baseline:
The information in this section has been obtained from the StatsSa website. The information provided is divided for Northam A and B local regions.

Population and Demographics: Northam A has a total population of 4259 people, while Northam B contains 27 611 people. The majority of the population in both areas is Black African, 86% (Northam A) and 95% (Northam B). Setswana is more prevalent in Northam A (25%) followed by Xhosa (21%). In Northam B, Xhosa is more prevalent (32%) proceeded by Setswana (26%).

Table 15: Comparison of the population and demographics between Northam A and B.

	Northam A	Northam B
Population Groups		
Black African	86.1	95.6
Coloured	0.9	0.6
Indian/Asian	0.4	0.3
White	12.0	2.8
Other	0.7	0.7
Languages		
Afrikaans	17.5	3.6
English	4.3	2.6

IsiNdebele	0.4	0.9
IsiXhosa	21.1	32.1
IsiZulu	2.5	2.9
Sepedi	5.3	5.9
Sesotho	8.5	6.8
Setswana	25.2	26.3
Sign Language	0.5	0.5
SiSwati	1.7	1.6
Venda	0.6	1
Xitsonga	11.6	13.3
Other	0.8	2.7
Higher Education		
No Schooling	8.6	7.4
Some Primary	8.7	14.4
Completed Primary	3.5	7.1
Some Secondary	29.6	41.5
Matric	36	26.1
Higher Education	13.5	3.4

Source: Statistics South Africa (Stats SA) 2011

Living Conditions: are explained in terms of the type of energy used/accessible to use for cooking, heating and lighting, refer to Table 16.

Table 16: Comparison of general living conditions between Northam A and B.

	Northam A	Northam B
Energy for Fuel for Cooking		
Electricity	76.2	51.9
Gas	0.5	1.3
Paraffin	20.5	44.2
Solar	0.2	0.1
Candles	0	0
Wood	2.4	2.2
Coal	0	0.2
Animal Dung	0.1	0
None	0.2	0.1
Energy for Fuel for Heating		
Electricity	74.3	50
Gas	0.7	1
Paraffin	17.6	21.4
Solar	0.5	0.2
Candles	0	0
Wood	5.4	22.4
Coal	0.1	0.2
Animal Dung	0.1	0.1
None	1.2	4.7
Energy for Fuel for Lighting		
Electricity	74.3	50
Gas	0.7	1
Paraffin	17.6	21.4
Solar	0.1	0.2
Candles	5.4	22.4
Wood	0	0
Coal	0	0
Animal Dung	0	0
None	0.1	0.1

	Northam A	Northam B
Access to Internet		
Home	11.5	3.2
Cellphone	18.7	18.3
Work	13.6	2.9
Elsewhere	1.1	3.5
No Access	55.1	72.1
Settlement Type		
Rented	54.5	41.7
Owned (not yet paid off)	0	8.3
Occupied (rent free)	18.2	16.7
Owned (paid off)	9.1	8.3
Other	9.1	0
Owned (fully paid off/paying off)	9.1	25
Source of Water		
Regional	71.2	52.2
Borehole	3.5	4.4
Spring	0.1	0.2
Rain Water Tank	0.1	0.2
Dam Pool Stagnant Water	0.3	0.1
River / Stream	0	0.1
Water Vendor	10.7	1.1
Water Tanker	9.9	39.7
Other	4.1	1.9
Toilet Facilities		
None	4.8	1.8
Flush Toilet (sewerage)	75.3	47.9
Flush Toilet (septic)	0.7	1.1
Chemical	0	1
Pit Toilet (ventilation)	0.3	2
Pit Toilet (no ventilation)	18.4	38.2
Bucket	0.2	1.2
Other	0.2	6.8
Refuse Disposal		
Removal (at least once/week)	74.6	48.3
Removal (less often)	0.8	1.7
Communal Refuse Dump	0.2	1.3
Own Refuse Dump	13.9	40.2
No Rubbish Disposal	9	6.8
Other	1.4	1.6

Source: Statistics South Africa (Stats SA) 2011

Economy: the economic contribution is described by the average household income (Table 17).

Table 17: Average household income for Northam A and B.

	Northam A	Northam B
No Income	9.2	20.1
R1 – R4 800	0.6	2.7
R4 800 – R 9 600	1.3	3.9
R 9 601 – R 19 600	7.1	5.6
R 19 601 – R 38 200	6.7	14.3
R 38 201 - R 76 400	17.6	29.5

R 76 401 – R 153 800	20.2	16.5
R 153 801 – R 307 600	22.8	5.3
R 307 601 – R 614 000	11.1	1.5
R 614 001 – R 1 228 800	2.8	0.4
R 1 228 801 – R 2 457 600	0.4	0.2
R 2 457 601 +	0.1	0.1

Source: Statistics South Africa (Stats SA) 2011

Cultural Heritage Resources:
On the 1.50 000 map sheet 2427 CD several sites are on record for the larger study area at the Wits Archaeological database. Several previous Cultural Resources Management Surveys are on record for the larger study area e.g. van Schalkwyk (2004) Huffman (2006) and vd Walt (2010). These sites consist of MSA open air sites, LIA stone walled settlements and graves.

*Genealogical Society and Google Earth Monument*s: Neither the Genealogical Society nor the monuments database at Google Earth (Google Earth also include some archaeological sites and historical battlefields) have any recorded sites in the Proposed Extended MRA.

Background Information for Proposed Extended MRA: South Africa has one of the longest archaeological sequences in the world because humanity evolved in the area stretching from the Cape to Ethiopia. Most of this sequence covers the times when our ancestors used stone tools. It is worthwhile, thus, to review the archaeological records for southern Africa and to place in context the known occurrences. The archaeology of the area can be divided into the Stone Age, Iron Age and Historical timeframe. These can be divided as follows:

Stone Age: The Stone Age is divided in Early; Middle and Late Stone Age and refers to the earliest people of South Africa who mainly relied on stone for their tools.

Earlier Stone Age: The period from ± 2.5 million yrs - ± 250 000 yrs ago. Acheulean stone tools are dominant: The Early Stone Age in southern Africa is defined by the Oldowan complex, primarily found at the sites Sterkfontein, Swartkrans and Kroomdraai, situated within the Cradle of Humankind, just outside Johannesburg (Kuman, 1998). Within this complex, tools are more casual and expediently made and tools consist of rough cobble cores and simple flakes. The flakes were used for such activities as skinning and cutting meat from scavenged animals. This industry is unlikely to occur in the study area. The second complex is that of the more common Acheulean, defined by large handaxes and cleavers produced by hominids at about 1.4 million years ago (Deacon & Deacon, 1999). Among other things these Acheulian tools were probably used to butcher large animals such as elephants, rhinoceros and hippopotamus that had died from natural causes. Acheulian artefacts are usually found near the raw material from where they were quarried, at butchering sites, or as isolated finds. No Acheulian sites are on record near the Proposed Extended MRA, but isolated finds are possible. However, isolated finds have little value. Therefore, the project is unlikely to disturb a significant site.

Middle Stone Age ("MSA"): Various lithic industries in SA dating from ± 250 000 yrs – 22000 yrs before present: During the MSA, significant changes start to occur in the evolution of the human species. These changes manifest themselves in the complexity of the stone tools created, as seen in the diversity of tools; the standardisation of these tools over a wide spread area; the introduction of blade technology; and the development of ornaments and art. What these concepts ultimately attest to is an increase or development of abstract thinking. By the beginning of the MSA, tool kits included prepared cores, parallel-sided blades and triangular points hafted to make spears (Volman, 1984). MSA people had become accomplished hunters by this time, especially of large grazing animals such as wildebeest, hartebeest and eland. These hunters are classified as early humans but by 100,000 years ago, they were anatomically fully modern. The oldest

evidence for this change has been found in South Africa and it is an important point in debates about the origins of modern humanity. The repeated use of caves indicates that MSA people had developed the concept of a home base and that they could make fire. These were two important steps in cultural evolution (Deacon & Deacon, 1999). Accordingly, if there are caves in the study area, they may be sites of archaeological significance. MSA artefacts are common throughout southern Africa, but unless they occur in undisturbed deposits, they have little significance. Some MSA sites are on record close to the Proposed Extended MRA.

Later Stone Age ("LSA"): The period from ± 22 000-yrs before present to the period of contact with either Iron Age farmers or European colonists: By the LSA, human beings are anatomically and culturally modern. Tools associated with this time period are specialised and commonly associated with hunter-gatherer groups. It is also within this period that contacts with migrating groups occur throughout southern Africa. Initial contact was between hunter-gatherer groups and expanding Bantu farming societies, and secondly with the arrival of colonist along the coast. San rock art has a well-earned reputation for aesthetic appeal and symbolic complexity (Lewis-Williams, 1981). Several rock art sites are on record to the north and east of the general project area. In addition to art, LSA sites contain diagnostic artefacts, including microlithic scrapers and segments made from very fine-grained rock (Wadley, 1987). Spear hunting probably continued but LSA people also hunted small game with bows and poisoned arrows. Sites in the open are usually poorly preserved and therefore have less value than sites in caves or rock shelters. If there are rock shelters or caves in the Proposed Extended MRA, they may contain LSA sites of significance.

Iron Age (general): The Iron Age as a whole represents the spread of Bantu speaking people and includes both the pre-Historic and Historic periods. It can be divided into three distinct periods:

- Early Iron Age: Most of the first millennium AD;
- Middle Iron Age: 10th to 13th centuries AD; and
- Late Iron Age: 14th century to colonial period.

The Iron Age is characterised by the ability of these early people to manipulate and work Iron ore into implements that assisted them in creating a favourable environment to make a better living.

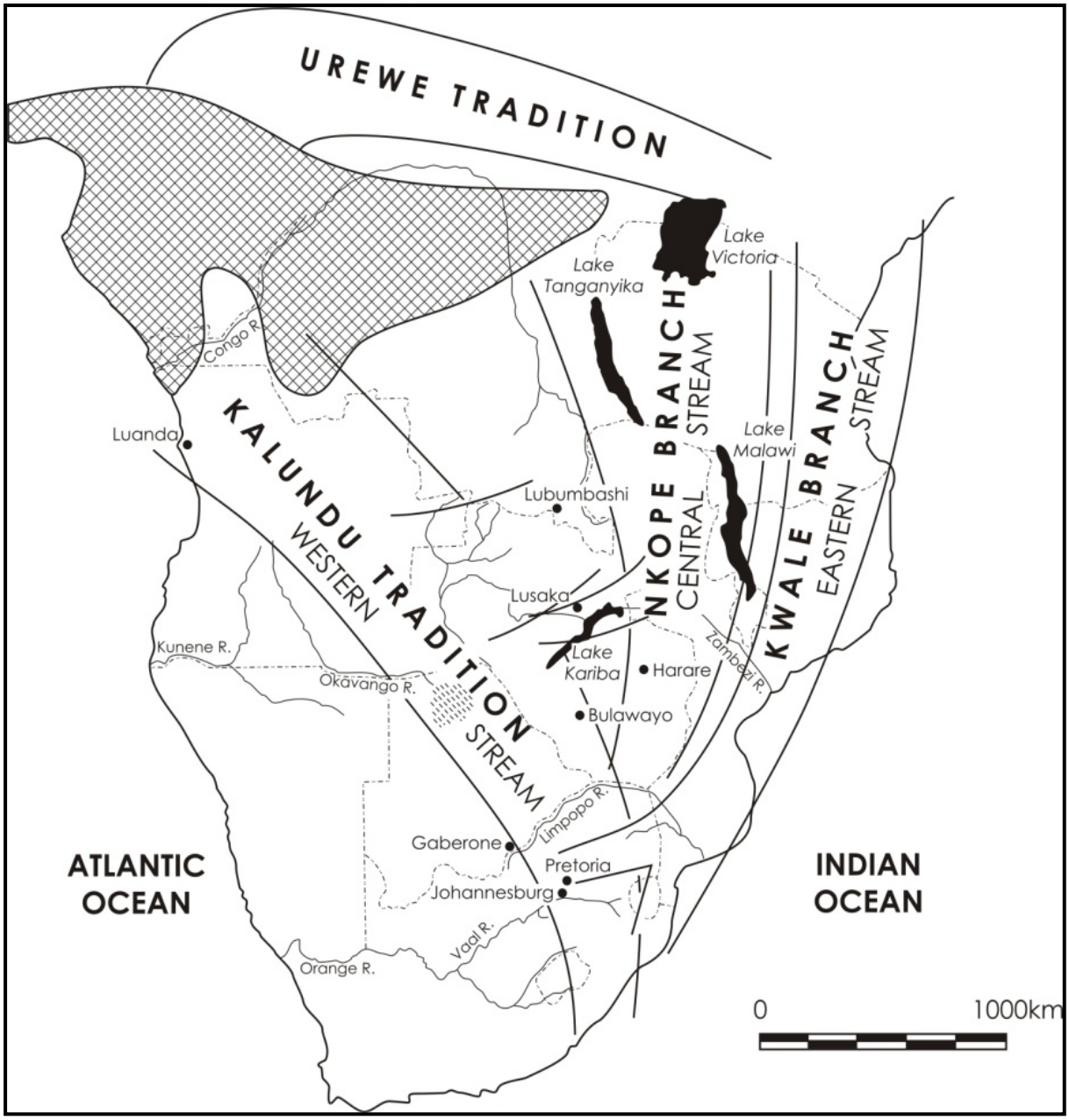

Figure 16: Movement of Bantu speaking farmers (Huffman 2007).

Early Iron Age: Early in the first millennium AD, there seem to be a significant change in the archaeological record of the greater part of eastern and southern Africa lying between the equator and Natal. This change is marked by the appearance of a characteristic ceramic style that belongs to a single stylistic tradition. These Early Iron Age people practised a mixed farming economy and had the technology to work metals like iron and copper. A meaningful interpretation of the Early Iron Age has been hampered by the uneven distribution of research conducted so far; this can be partly attributed to the poor preservation of these early sites. Sites belonging to the EIA consisting of *Happy Rest and Mzonjanifacies*have been recorded close to the Proposed Extended MRA. Happy Rest and Mzonjani pottery form part of two traditions (Kalundu and Urewe) that represent the spread of mixed farmers into southern Africa during the Early Iron Age (See Figure 1). This find is important as it provides evidence for early interaction between these groups. Later, by the 8th and 9th centuries, the two merged to form a new facies, *Doornkop*.

Middle Iron Age: No sites dating to this period are on record close to the Proposed Extended MRA.

Late Iron Age ("LIA"): For the area in question the history and archaeology of the Sotho Tswana are of interest. The ceramic sequence for the Sotho Tswana is referred to as Moloko and consists of different facies with origins in either the Icon facies or a different branch associated with Nguni speakers. Several sites belonging to the Madikwe and Olifantspoortfacies (from Icon) have been recorded close to the project area. These sites date to between AD 1500 and 1700 and predate stone walling ascribed to Sotho-Tswana speakers. Sotho Tswana stonewalled sites with Uitkomst pottery have been found close to the Proposed Extended MRA and date to the seventeenth to nineteenth centuries. Stone walled sites belonging to the LIA have also been identified next to the Proposed Extended MRA but so far have not been linked to a cultural group. LIA peoples were attracted to the area because of the relatively fertile soils around the hills and valleys, and because of the iron ore and red ochre. Mining techniques associated with the ancient mine workings are the same as those found in the Rooiberg area some 30km from Thabazimbi (Huffman 2006). Three groups are found in the Rooiberg area, specifically Madikwe, Melora and Rooiberg groups. Strategraphically, the relationship between Madikwe and Rooiberg is evident where the Madikwe site 20/85 lies underneath the Rooiberg site 11/85, suggesting that Rooiberg is the more recent (Mason 1986). Ceramic evidence suggests then that at one time Sotho-Tswana people were mining at Rooiberg. The ceramic evidence from the Rhino Andalusite Mine shows that the Sotho-Tswana people living there were directly related to the miners at Rooiberg: both belonged to the Western Sotho-Tswana cluster. Therefore, the relationship between the ochre mine and Madikwe settlements is great. Associated with the Madikwe settlements, in addition to the ochre mine is the several maize grindstones found.

Trade connections for ochre and tin have a bearing on the presence of maize. Trade networks spanned a wide area, up to the Zimbabwe culture area in the north, and as far as Maputo in the east before the arrival of the Dutch (Friede & Steel 1976). Maize came to Maputo sometime after the early 16th Century, through Portuguese trade with the New World. The grindstones found at the site CB14 in the Rhino Andalusite Mine indicate that maize was grown in the Thabazimbi area during the 17th Century (Huffman 2006). If one accepts the grindstone as diagnostic, then maize was cultivated some 150 years earlier than in Kwazulu-Natal.

Mitigation in the area by the National Cultural History Museum was conducted in 2004 on the Farm Elandsfontein 386 KQ, Amandelbult Mine. This included the survey and mapping of Sites in and around the Madeleine Robinson Nature Reserve of the Amandelbult Mine as part of the proposed extension of the mines operations into the area. From the survey, several stone walled sites conforming to the Central Cattle Pattern (CCP) were identified along the base and between the saddle of the hills. Sites contained central kraals, smaller livestock enclosures, lower grindstones and ceramic scatters. These Sites form part of a

larger settlement complex dating to the LIA. Unfortunately, at the time of the mitigation, insufficient data resulted in the absence of identifying the cultural facies of the people who occupied the settlements. Evidence for Iron Age activity will most likely be concentrated along water courses and rocky outcrops marked by ceramic clusters or dry stone walling.

(b) Description of the current land uses

A desktop assessment of the land use within and around the Proposed Extended MRA illustrates a conservation area and cultivated land on the northern and far southern side of the Proposed Extended MRA respectively. The remainder of the Proposed Extended MRA is situated within unspecified land, refer to Figure 17. The land cover of the Proposed Extended MRA is dominated by thicket and bushland vegetation, with a portion of the land covered by cultivated land (ENPAT, 2001). The aerial imagery indicates that the cultivated boundary has expanded along the R510 since the data survey. The remainder of the Proposed Extended MRA is currently used for grazing purposes.

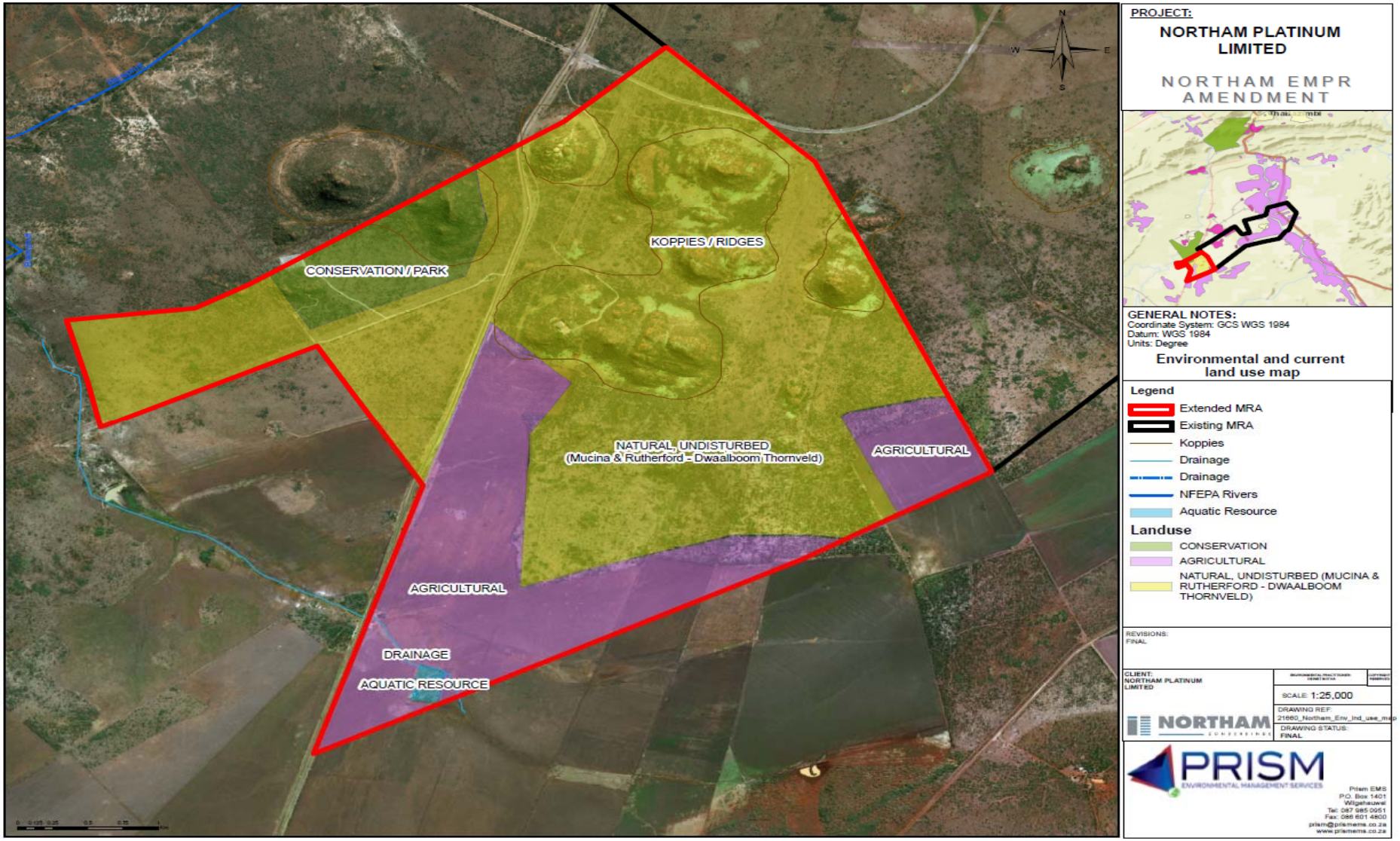

Figure 17: Land use of the Proposed Extended MRA (NPAT, 2001).

Land Capability and Land Use: The soil and land types identified in the Proposed Extended MRA can be classified into four (4) different land capability classes as summarised in Table 18 and presented in Figure 17. The majority of the Proposed Extended MRA has arable land capability (82.6%) and only 1.3% has grazing land capability. The areas where mining has already taken place and housing constructed has industrial land capability (13.9% of the Proposed Extended MRA). Land with wetland land capability is associated with the Rensburg soil form and is situated around the river (2.1% of the Proposed Extended MRA).

Table 18: Summary of Land Capability Classes within the Proposed Extended MRA.

SUMMARY OF LAND CAPABILITY CLASSES IDENTIFIED FOR THE PROPOSED EXTENDED MRA			
LAND CAPABILITY CLASS	MAP COLOUR	AREA (ha)	% OF STUDY AREA (%)
Grazing land capability		106.4	1.3
Industrial land capability		1102.7	13.9
Wetland land capability		169.3	2.1
Arable land capability		6534.8	82.6
TOTALS		7913.2	100.0

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

No infrastructure will be located on site. All mining activities are underground and access will be obtained from the Existing MRA. The specific environmental features noted within the Proposed Extended MRA are indicated in Figure 18.

(d) Environmental and current land use map

(Show all environmental, and current land use features)

Refer to Figure 18 below for an illustration of the current land use map showing environmental features of the Proposed Extended MRA

i) 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).

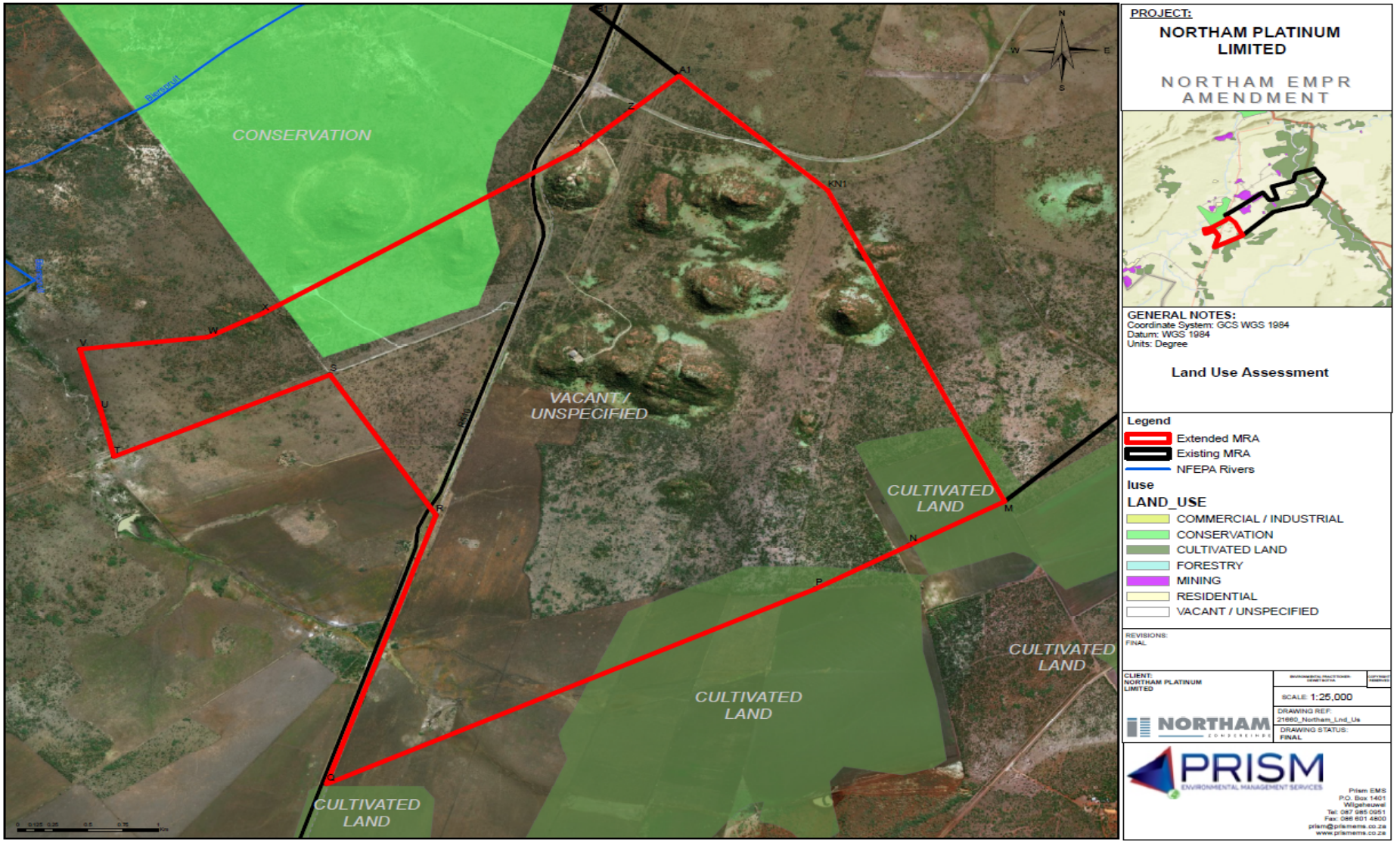

Figure 18: Land use map of Proposed Extended MRA adjacent to Existing MRA.

Table 19: Summary list of potential impacts.

ACTIVITY	ASPECTS	IMPACTS	SIGNIFICANCE	PROBABILITY	DURATION
CONSTRUCTION PHASE					
Not Applicable	Atmospheric Emissions	Dust Emissions Noise	None	None	None
Not Applicable	Discharge to Water	Sewage Silt Run-off Contamination Drainage Lines Groundwater Pollution Aquatic Systems	None	None	None
Underground Mining Activities	Alteration of Geology	Alteration of Geology	Medium-High	Definite	Long-term
Not Applicable	Soil Alteration	Loss of topsoil Loss of land capability Alteration of topography Soil Pollution	None	None	None
Not Applicable	Resource Consumption	Electricity Water Fuel Raw materials	None	None	None
Not Applicable	Effects on Biodiversity	Loss of Habitat Loss of Fauna Loss of Flora Ecological Degradation Natural Corridors	None	None	None

ACTIVITY	ASPECTS	IMPACTS	SIGNIFICANCE	PROBABILITY	DURATION
Health & Safety Activities	Incidents, Accidents and Potential Emergencies	Spillages from storage and handling of dangerous goods Health and Safety incidents Fire	Low	Possible	Short-term
Not Applicable	Waste Generation	Construction Domestic Hazardous Sewage	None	None	None
Contractors, Project Management	Safety & Security	Cultural Heritage	Low	Possible	Short-term
		Visual Traffic Sense of Place Land use Change Crime	None	None	None
Economics and Employment	Economic	Economy Property Value	None	None	None
		Employment	Low-Medium (Positive)	Highly-Likely	Incidental
OPERATIONAL PHASE					
Underground Mining Activities	Atmospheric Emissions	Dust	None	None	None
		Noise	Low	Improbable	Incidental
Underground Mining Activities	Discharge to Water	Sewage Silt Run-off Contamination Drainage Lines Groundwater Pollution Aquatic Systems	None	None	None
Underground Mining Activities	Alteration of Geology	Alteration of Geology	Medium-High	Definite	Permanent

ACTIVITY	ASPECTS	IMPACTS	SIGNIFICANCE	PROBABILITY	DURATION
Not Applicable	Soil Alteration	Loss of topsoil Loss of land capability Alteration of topography Soil Pollution	None	None	None
Not Applicable	Resource Consumption	Electricity Water Fuel Raw materials	None	None	None
Not Applicable	Effects on Biodiversity	Loss of Habitat Loss of Flora Loss of Fauna Ecological Degradation Natural Corridors	None	None	None
Health & Safety Activities	Incidents, Accidents and Potential Emergencies	Pollution Health and Safety	Low	Possible	Medium-term
		Storage of HC Fire	None	None	None
Not Applicable	Waste Generation	Construction Domestic Hazardous	None	None	None
Contractors, Project Management	Safety & Security	Safety & Security	Low-Medium	Possible	Long-term
		Visual Safety & Security Traffic Cultural Heritage Sense of Place Land use Change	None	None	None
Economics and Employment	Economic	Economy Employment	Medium (Positive)	Highly-Likely	Incidental
		Property Value	None	None	None

ii) 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).

The standard methodology used in the EIA to determine the significance rating of the potential impacts are outlined in this section.

Significance: the significance is defined as the combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative, refer to Table 20 below for the specific definitions.

Table 20: Nature and type of impact.

IMPACT	Nature and Type of Impact:		
	Direct	Impacts that are caused directly by the activity and generally occur at the same time and place as the activity	✓/×
	Indirect	Indirect or induced changes that may occur as a result of the activity. These include all impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity	✓/×
	Cumulative	Those impacts associated with the activity which add to, or interact synergistically with existing impacts of past or existing activities, and include direct or indirect impacts which accumulate over time and space	✓/×
	Positive	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will benefit significantly, and includes neutral impacts (those that are not considered to be negative)	☐
	Negative	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will be comprised	☐

Table 21 presents the defined criteria used to determine the **consequence** of the impact occurring which incorporates the extent, duration and intensity (severity) of the impact.

Table 21: Consequence of the impact occurring.

CONSEQUENCE	Extent of Impact:	
	Site	Impact is limited to the site and immediate surroundings, within the study site boundary or property (immobile impacts)
	Neighbouring	Impact extends across the site boundary to adjacent properties (mobile impacts)
	Local	Impact occurs within a 5km radius of the site
	Regional	Impact occurs within a provincial boundary
	National	Impact occurs across one or more provincial boundaries
	Duration of Impact:	
	Incidental	The impact will cease almost immediately (within weeks) if the activity is stopped, or may occur during isolated or sporadic incidences

	Short-term	The impact is limited to the construction phase, or the impact will cease within 1 - 2 years if the activity is stopped
	Medium-term	The impact will cease within 5 years if the activity is stopped
	Long-term	The impact will cease after the operational life of the activity, either by natural processes or by human intervention
	Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient
	Intensity or Severity of Impact:	
	Low	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are not affected
	Low-Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are modified insignificantly
	Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are altered
	Medium-High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes are severely altered
	High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will permanently cease

The **probability** of the impact occurring is the likelihood of the impacts actually occurring, and is determined based on the classification provided in Table 22.

Table 22: Probability and confidence of impact prediction.

PROBABILITY	Probability of Potential Impact Occurrence:	
	Improbable	The possibility of the impact materialising is very low either because of design or historic experience
	Possible	The possibility of the impact materialising is low either because of design or historic experience
	Likely	There is a possibility that the impact will occur
	Highly Likely	There is a distinct possibility that the impact will occur
	Definite	The impact will occur regardless of any prevention measures

The **significance** of the impact is determined by considering the consequence and probability without taking into account any mitigation or management measures and is then ranked according to the ratings listed in Table 23. The level of confidence associated with the impact prediction is also considered as low, medium or high (Table 24).

Table 23: Significance rating of the impact.

SIGNIFICANCE	Significance Ratings:	
	Low	Neither environmental nor social and cultural receptors will be adversely affected by the impact. Management measures are usually not provided for low impacts
	Low-Medium	Management measures are usually encouraged to ensure that the impacts remain of low-medium significance. Management measures may be proposed to ensure that the significance ranking remains low-medium

	Medium	Natural, cultural and/or social functions and processes are altered by the activities, and management measures must be provided to reduce the significance rating
	Medium-High	Natural, cultural and/or social functions and processes are altered significantly by the activities, although management measures may still be feasible
	High	Natural, cultural, and/or social functions and processes are adversely affected by the activities. The precautionary approach will be adopted for all high significant impacts and all possible measures must be taken to reduce the impact

Table 24: Level of confidence of the impact prediction.

CONFIDENCE	Level of Confidence in the Impact Prediction:	
	Low	Less than 40% sure of impact prediction due to gaps in specialist knowledge and/or availability of information
	Medium	Between 40 and 70% sure of impact prediction due to limited specialist knowledge and/or availability of information
	High	Greater than 70% sure of impact prediction due to outcome of specialist knowledge and/or availability of information

Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher in order to attempt to reduce the level of significance that the impact may reflect.

The EIA Regulations (2014) specifically require a description is provided of the degree to which these impacts:

- can be reversed;
- may cause irreplaceable loss of resources; and
- can be avoided, managed or mitigated.

Based on the proposed mitigation measures the EAP will determined a mitigation efficiency (Table 25), whereby the initial significance is re-evaluated and ranked again to effect a significance that incorporates the mitigation based on its effectiveness. The overall significance is then re-ranked and a final significance rating is determined.

Table 25: Mitigation efficiency.

MITIGATION EFFICIENCY	Mitigation Efficiency	
	None	Not applicable
	Very Low	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. Positive impacts will remain the same
	Low	Where the significance rating reduces by one level, after mitigation
	Medium	Where the significance rating reduces by two levels, after mitigation
	High	Where the significance rating reduces by three levels, after mitigation
	Very High	Where the significance rating reduces by more than three levels, after mitigation

The reversibility is directly proportional the "Loss of Resource" where no loss of resource is experienced, the impact is completely reversible; where a substantial "Loss of resource" is experienced there is a medium degree of reversibility; and an irreversible impact relates to a complete loss of resources, i.e. irreplaceable (Table 26).

Table 26: Degree of reversibility and loss of resources.

DEGREE REVERSABILITY & LOSS OF RESOURCES	Loss of Resources:	
	No Loss	No loss of social, cultural and/or ecological resource(s) are experienced. Positive impacts will not experience resource loss
	Partial	The activity results in an insignificant or partial loss of social, cultural and/or ecological resource(s)
	Substantial	The activity results in a significant loss of social, cultural and/or ecological resource(s)
	Irreplaceable	The activity results in the complete and irreplaceable social, cultural and/or ecological loss of resource(s)
	Reversibility:	
	Irreversible	Impacts on natural, cultural and/or social functions and processes are irreversible to the pre-impacted state, in such a way that the application of resources will not cause any degree of reversibility
	Medium Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if less than 50% resources are applied
	High Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if more than 50% resources are applied
	Reversible	Impacts on natural, cultural and/or social functions and processes are fully reversible to the pre-impacted state if adequate resources are applied

Cumulative impacts: It is important to assess the natural environment using a systems approach that considers the cumulative impact of various actions. Cumulative impact refers to the environmental impacts, which result from the incremental impact of the actions when added to other past, present and reasonably foreseeable future actions regardless of what agencies or persons undertake such actions. Cumulative impacts can result from individually minor but collectively significant actions or activities taking place over a period of time. Cumulative effects can take place frequently and over a period of time that the effects cannot be assimilated by the environment.

iii) 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)

As noted, Northam plans to conduct the Additional Mining Activities on the Proposed Extended MRA by accessing the Proposed Extended MRA through Zondereinde Mine's existing underground infrastructure. The existing conveyor system will be utilised to transfer the ore and waste from the Proposed Extended MRA to the existing Concentrator Plant and waste facilities. There will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or Existing MRA, therefore no layout alternatives are applicable.

The **negative impacts** associated with the underground workings include:

- *Alteration of geology:* This will commence during the Construction Phase and increase during the Operational Phase, whereby mining of the resource will deplete and alter the specific geological substrate;
- *Noise:* Noise from blasting and vibrations from the underground workings during the Construction Phase and Operational Phase of Proposed Extended MRA could occur, although this is highly unlikely;
- *Health and safety risks:* Associated with the operation of equipment, explosives and machinery, storage and use of oil underground; and risk of working underground during both the Construction and Operational Phases;
- *Safety and Security*: During both the Construction and Operational Phases, the hiring of contractors and presence of valuables may pose the risk of theft or other crimes.

The **positive impacts** associated with the underground workings include:

- *Employment*: Ensuring the continuation of work opportunities associated with the Construction Phase (setting up of mining) and Operational Phases during actual underground workings;
- *Economy:* Maintenance in the contribution to the economy will be experienced, as the Additional Mining Activities will ensure that the existing 30 years LoM can be maintained at current production rates.

iv) 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).

There will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or Existing MRA, therefore no site layout alternatives are applicable. To date, no issues or concerns have been raised by I&APs. However, for all identified impacts, the possible mitigation measures have been provided in the EMPr, to ensure the potential impacts are mitigated to acceptable levels.

v) Motivation where no alternative sites were considered

Site layout alternatives are not applicable, as there will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or Existing MRA.

vi) Statement motivating the alternative development location within the overall site

(Provide a statement motivating the final site layout that is proposed)

No alternatives were considered because the Proposed Extended MRA is located where the mineral resources are present and is an extension of the existing / current underground workings. The Proposed Extended MRA is the preferred option due to the presence of mineral resources (reserves).

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 are 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)

The following was undertaken in order to identify the potential impacts associated with the underground workings:

- Consultation with potentially I&APs:
  Potential I&APs were notified of the Project and provided with an opportunity to register and participate in the Project. This included being provided with opportunity to review and provide comments and/or feedback on the draft reports containing information about the potential environmental, cultural, economic and social impacts.

- Desktop & Specialist Investigations:
  Research of baseline environmental information has been undertaken by the EAP via desktop analysis of data resources of geographical, physical, biological and socio-economic character of the environment.

  The following baseline environmental investigations were undertaken:
  - Geology
  - Ecological and environmental sensitive features
  - Noise
  - Surface water
  - Air quality
  - Visual
  - Socio-economic

  The following specialist studies were undertaken:
  - A ***Groundwater Assessment*** was undertaken by a groundwater specialist. Details of the specialist and methodology is contained in his report (refer to APPENDIX E.1:).
  - A ***Heritage Impact Assessment*** was undertaken by a Cultural Resources Management Archaeologist. Details of the expertise of the specialist and methodology is contained in his report (refer to APPENDIX E.2:).

- Environmental Impact Assessment:

The impact assessment has been completed by the EAP, using the method described in the Scoping Report and in Section vi) 1) d) ii) of this report. Refer to APPENDIX D for the detailed impact assessment.

- Knowledge and Experience by the EAP relative to Mining Projects:
  The EAP has more than 10 years' experience assisting mines with compliance with the environmental legislation and has compiled several mining applications, EMPrs, Environmental Management Plans and conducted several performance assessment audits for numerous mining operations.

- Knowledge and Experience in the implementation of the EIA Regulations and other applicable legislation:
  The EAP has more than 10 years' experience as an environmental consultant and is a registered Environmental Scientist with SACNASP (*Pr.Sci.Nat. 11683*), with specific reference to undertaking EIAs.

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)

Table 27: Assessment of significant impacts.

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
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.).	*(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc. etc…)*		*In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)*	*If not mitigated*	*(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.*	*If mitigated*
Underground mine works	Alteration of geology	Geology	Construction Operation	Medium-High	Mining must occur according to a mine work programme ("**MWP**") approved by the DMR and any amendments to the MWP must be approved by the DMR.	Medium-High

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
	Health and Safety incidents	Incidents, accidents and potential emergency situations	Construction Operation	Low	- Environmental Awareness - Induction and General Training - Clean-up procedures - Toolbox Talks - Supervisory appointment and reporting procedure - Emergency numbers to be displayed in a communal area - Implement appropriate warning signage of potential risks - Undertake risk assessment - Demarcate an emergency assemblage point - Ensure compliance with the MHSA, including the required health and safety processes.	Low
						Low
	Safety and security	Social	Construction Operation	Low	- 24-hour security must be employed - Implement security procedures - Ensure that shift changes are supervised	Low
	Employment	Social	Construction Operation	Low-Medium	- This is a positive impact; no mitigation is necessary - Appropriate procurement procedures must be followed according to the approved Social and Labour Plan for the Zondereinde Mine ("**SLP**")	Low-Medium

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	SIGNIFICANCE	MITIGATION TYPE	SIGNIFICANCE
	Increase in economy	Economic	Construction Operation	Low-Medium	- This is a positive impact; no mitigation is necessary	Low-Medium
	Noise	Emissions	Operation	Low	- Save for potential unlikely vibration, little to noise is expected as mining is underground - Restrict any identified noisy activity to daylight business hours	Low

The supporting detailed impact assessment conducted by the EAP is attached as APPENDIX D.

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)

Table 28: Summary of specialist reports.

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT	REFERENCE TO APPLICABLE SECTION OF REPORT
		Mark with an X where applicable	*Where specialist recommendations have been included*
Groundwater Assessment	It is recommended that the Project be authorised. This recommendation is based on: • the impact assessment shows that it not expected that there will be any measurable impact on the groundwater levels in the area; • any groundwater that will enter the Zondereinde Mine's Shafts will be dewatered and pumped to the surface, where it will be treated in existing water management dams. Thus any groundwater flows that occur at the depth of mining on the Proposed Extended MRA will be towards the Proposed Extended MRA. This will prevent any groundwater contamination within the Extended MRA from migrating away from the Extended MRA; • no privately owned boreholes around the Proposed Extended MRA will be impacted by the drawdown in the fractured rock aquifer; • in terms of surface water contamination, the impact	N/A	N/A

	assessment results indicate that none of the non-perennial streams fall within the zone of influence of contaminant plumes on the Existing MRA and the plume will not migrate onto the Extended MRA;		
	• there are existing impacts on the groundwater qualities in the area. The increase in the severity, and the zone of influence, of the impacts on the groundwater qualities associated with the Proposed Extended MRA is not expected to be significant compared to if no Additional Mining Activities are conducted on the Proposed Extended MRA. No privately owned and used boreholes on neighbouring properties will be impacted;	N/A	N/A
	• numerical model simulation and analytical impact assessment results show that there will be no impact on the Crocodile and Bierspruit Rivers. There can be a limited impact on the stream water quality on one non-perennial stream that occurs in the Existing MRA in the long term post-closure	N/A	N/A
	• overall, it can be concluded that that there are few sensitive receptors in the area and the impacts on those sensitive receptors will be minimal	N/A	N/A
	• there are no conditions for authorisation, except commitment to optimal management and monitoring of the expected impacts as described	N/A – Mitigation and management refers potential sources of contamination within the Existing MRA	N/A

	in Sections 8 and 9 of the Groundwater Assessment		
Heritage Resources & Archaeological Impact Assessment	• The Proposed Extended MRA is known to contain several stone walled Sites conforming to the CCP along the hills' base and between the saddles. These Sites consist of central kraals, smaller livestock enclosures, lower grindstones and ceramic scatters. These Sites form part of a larger settlement complex dating to the LIA. MSA artefacts are found scattered over the Proposed Extended MRA, with higher frequencies of artefacts found around small hills and rocky outcrops. As this is an underground mine, no impact is foreseen on surface indicators of heritage sites. • The SAHRIS Paleontological Sensitivity Map indicates that the Proposed Extended MRA is of insignificant paleontological significance. Therefore, no further mitigation prior to construction is recommended in terms of section 35 of the NHRA for the Project to proceed	N/A - No further mitigation prior to construction is required in terms of section 35 of the NHRA for the Project to proceed.	N/A
	• No impact is foreseen on the built environment or on burial sites, as the Project consists of an underground mine with no surface infrastructure and impacts. No public monuments are located within or close to the Proposed Extended MRA. The Proposed Extended MRA is	N/A – No negative impacts on cultural landscapes or viewscapes	N/A

	surrounded by mining developments and road infrastructure developments and the Additional Mining Activities will not impact negatively on significant cultural landscapes or viewscapes.		
	• As this is an underground mine with no surface impacts the impact of the Proposed Extended MRA on heritage resources is considered low and it is recommended that the Project can commence on the condition that the following recommendations are implemented as part of the EMPr and based on approval from the South African Heritage Resources Agency: o If any surface infrastructure is constructed it will have to be subjected to a Heritage Impact Assessment	If any surface infrastructure is constructed, it will have to be subjected to a Heritage Impact Assessment. This is N/A as no surface infrastructure is planned.	N/A

Specialist Reports are attached as

APPENDIX E.

k) Environmental impact statement

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

The following significant environmental impacts (ranked as medium and high) have been identified:

The **main negative impacts** associated with the underground mine workings at the Proposed Extended MRA include:

- *Alteration of Geology:* This will commence during the Construction Phase and increase during the Operational Phase, whereby mining of the resource will deplete and alter the specific geological substrate;
- *Health and Safety Risks:* During both the Construction and Operational Phases associated with the operation of equipment and machinery and risk of working underground; and
- *Safety and Security:* During both construction and operational phases the hiring of contractors and presence of valuables (such as equipment, diesel and/or hydrocarbons or personal items) may pose as a risk of theft or other crimes.

The **main positive impacts** associated with the underground workings at the Proposed Extended MRA include:

- *Employment:* Ensuring the continuation of the employment of current employees that will be utilised during the Construction Phase (setting up of mining) and Operational Phases during actual underground workings; and
- *Economy:* Maintenance in the contribution to the economy will be experienced by maintaining the LoM.

(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.

Refer to APPENDIX B for the final site map indicating the Proposed Extended MRA, the Existing MRA and the environmental sensitivities.

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

No other properties have been considered as an alternative for the undertaking of the Additional Mining Activities because the location is dependent on the relative position of the mineral resource.

Since there will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or Existing MRA, no site layout alternatives are applicable and positive / negative implications or risks in relation to alternatives have therefore not been identified. For the Proposed Extended MRA, a summary of the positive and negative implications and risks of the are listed below.

The **main negative impacts** associated with the underground mine workings include:

- *Alteration of Geology:* This will commence during the Construction Phase and increase during the Operational Phase, whereby mining of the resource will deplete and alter the specific geological substrate;

- *Health and Safety Risks:* During both Construction and Operational Phases associated with the operation of equipment and machinery, dangerous goods and explosives and risk of working underground;
- *Safety and Security:* During both Construction and Operational Phases the hiring of contractors and presence of valuables (such as equipment, diesel and/or hydrocarbons or personal items) may pose as a risk of theft or other crimes.

The **main positive impacts** associated with the underground workings include:

- *Employment:* Ensuring the continuation of the employment of current employees that will be utilised during the Construction Phase (setting up of mining) and Operational Phase during actual underground workings;
- *Economy:* Maintenance in the contribution to the economy will be experienced by maintaining the LoM.

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.

Based on the outcome of the EIA and associated Significance ranking, the main aspects identified for consideration during the **Construction and/or Operational phases** include:

- *Noise:* Potential noise and vibrational impacts from underground mining activities, although very unlikely;
- *Geology:* Alteration of the geology;
- *Health and Safety:* Associated with the operation of equipment and machinery, dangerous goods and explosives and risk of working underground;
- Social: crime;
- *Economic Aspects (positive):* Maintenance of existing employment opportunities associated with mining activities.

Therefore, the following **objectives** must be implemented:

- *Noise:* To undertake environmental noise monitoring every 2 years;
- *Geology:* Compliance with the MWP;
- *Social Incidents:* Induce training for all employees on the clean-up procedures and to reduce the number of reported incidents related to safety and security;
- *Economic Aspects (positive):* To maintain compliance with the targets set out within the SLP.

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)

There will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or Existing MRA and no site layout alternatives are therefore applicable.

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

The aspects that must be included as a condition of the authorisation are:

- A risk assessment must be undertaken, to determine the safety requirements and stability of the underground mining area at the Proposed Extended MRA, in accordance with the requirements of the MHSA.
- Groundwater monitoring, optimal management and monitoring of the expected impacts, as described in the Groundwater Assessment, by continuing the Zondereinde Mine's existing groundwater level and quality monitoring program as is.

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

(Which relate to the assessment and mitigation measures proposed)

There are no known uncertainties or gaps in knowledge that may contribute to the assessment of impacts and proposed mitigation measures.

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.

There are no significant environmental aspects that will be compromised should the Project be authorised. The largest concern relates to the risks associated with health and safety associated with underground mining, however this can be mitigated extensively with the implementation of occupational, health and safety legal requirements under the MHSA.

ii) Conditions that must be included in the authorisation

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

All management measures identified for the impacts identified for the Proposed Extended MRA have been included in the EMPr.

The aspects that must be included as specific conditions of the EMPr include:

- A risk assessment must be undertaken to determine the safety requirements and stability of the underground mining area, in accordance with the MHSA.
    - Groundwater monitoring: optimal management and monitoring of the expected impacts, as described in the Groundwater Assessment through continuing the Zondereinde Mine's existing groundwater level and groundwater quality monitoring program as is.

In terms of monitoring, it is recommended that an independent Environmental Auditor is appointed to undertake an audit in the frequency included in the EIA Regulations or the conditions of the environmental authorisation. This as a continuation of the current monitoring and auditing conducted in terms of the Zondereinde EMPr.

(2) Rehabilitation requirements

The Proposed Extended MRA is in the process of being incorporated under the Existing MRA in terms of Section 102, therefore the rehabilitation requirements of the Proposed Extended MRA must be considered with the requirements of the Existing MRA, as rehabilitation costs are calculated per Mining Right.

No rehabilitation is anticipated for the Proposed Extended MRA, as the underground workings cannot be rehabilitated and there will be no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or the Existing MRA. Furthermore, no remediation of groundwater contamination is anticipated, based on the findings of the Groundwater Assessment.

Northam will conduct groundwater monitoring as part of the existing programme at Zondereinde Mine and compile rehabilitation and cost closure assessments, as required by law. Should any water remediation be required, this will be addressed in accordance with the legislative requirements. As noted above, this is however unlikely.

q) Period for which the Environmental Authorisation is required

The Proposed Extended MRA will be incorporated in the Zondereinde Mining Rights and linked to the authorised LoM in terms of the duration of these Rights, being 30 years, ending on the 12th July 2041. As noted above, Northam holds the Zondereinde Mining Rights, being two converted mining rights with DMR reference numbers LP30/5/1/2/2/36MR and LP30/5/1/2/2/37MR, both of which were executed on behalf of the Minister and Northam on 13 July 2011 and registered at the MPTRO on 8 and 14 October 2014 under registration numbers 73/2014 and 75/2014 respectively, consisting of the sole and exclusive right to mine certain minerals in, on and under the properties listed in the mining rights and Annexure A thereto, situated in the Magisterial District of Thabazimbi and measuring 7627.5 hectares in combined extent.

Period for which authorisation is required: From date of commencement of authorisation until 12 July 2041.

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.

The EAP confirms that the information contained in Part A is correct. The undertaking applicable to the EIA and EMPr is contained in Part B of this report.

s) Financial Provision

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

Since there are no surface activities or infrastructure for the Additional Mining Activities on the Proposed Extended MRA or the approved Existing MRA, no additional ongoing management is required. Furthermore, no rehabilitation or remediation of groundwater contamination is required for the Proposed Extended MRA for the reasons set about above.

The recent rehabilitation and cost closure assessment calculated the financial provision required for the Existing MRA as **R160,422,799** (Assessment of the Closure Quantum for the Zondereinde Operations using the DMR Guideline, SRK Consulting, June 2016) ("**Rehabilitation Liability**"). Northam currently has financial provision for **R150,300,000.**

Northam will include the Proposed Expanded MRA in future rehabilitation and cost closure assessments. In the unlikely event that any rehabilitation or water remediation is required, Northam will increase its financial provision in accordance with the legislative requirements.

i) Explain how the aforesaid amount was derived

The aforesaid amount was calculated using the DMR Guideline for calculation of the quantum as well as adding a long-term inflation rate over the remaining LoM. The decommissioning and restoration costs are reviewed on an annual basis.

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).

Northam has procured the issue of insurance guarantees and has a trust fund, the Northam Platinum Restoration Fund, in place for the Rehabilitation Liability. It presently has financial provision in the amount of **R150, 300, 000** for the Rehabilitation Liability ("**Zondereinde Financial Provision**").

The future value of the Rehabilitation Liability can either be paid over to the Northam Platinum Restoration Fund over the remaining LoM, or through other financial products as approved by the DMR.

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)

No deviations have been made with reference to the methodology used in determining the significance of the potential environmental impacts and risks. The methodology detailed within the Scoping Report is the same as the methodology used herein to determine the significance of the potential environmental impacts and risks.

i) Motivation for the deviation

Not applicable, as no deviation from the methodology used in determining the significance of potential environmental impacts and risks occurred.

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

(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 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12 herein)

The socio-economic impacts of the Additional Mining Activities on the Proposed Extended MRA relate to ensuring the continuation of present employees' employment, as the LoM will be maintained.

This will also ensure the continued socio-economic benefits of Zondereinde Mine to the employee's dependants and the existing procurement benefits to the local and surrounding Communities.

APPENDIX is not applicable.

(2) Impact on any national estate referred to in section 3(2) of the National 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)

The Proposed Extended MRA is known to contain several stone walled sites conforming to the CCP along the hills' base and between the saddles. These Sites consist of central kraals, smaller livestock enclosures, lower grindstones and ceramic scatters. They form part of a larger settlement complex dating to the Later Iron Age and are expected around hills:

- **Built environment:** Based on aerial imagery and topographic maps of the area no standing structures older than 60 years occur within the Extended MRA.
- **Archaeological and palaeontological resources:** Stone Age artefacts are found scattered over the Proposed Extended MRA, with higher frequencies of artefacts found around small hills and rocky outcrops. Due to sheet erosion, the artefacts are weathered and badly preserved. Diagnostic features on the tools consist of facets on the striking platform indicating MSA occupation. Raw material consists of igneous rock, hornfels and possibly silcrete. All the Sites found in the area are associated with the Later Iron Age. Decorated ceramics found represent stamped ware and could possibly be related to the Rooiberg facies but a bigger ceramic sample is needed to confirm this. The Sites are important because of the alternative stone walled settlement layout. They consist of several kraals clustered together without an outer wall. These Sites have research potential that could clarify the new stone walled arrangement represented here that has not yet been identified and could hold clues to the interaction between the Uitkoms ceramic facies and Madikwe that formed Rooiberg. Based on the SAHRIS Paleontological Sensitivity Map the area is of insignificant paleontological significance.
- **Burial Grounds and Graves:** In terms of section 36 of the NHRA burial sites are expected anywhere on the landscape and they should ideally be preserved in-situ or alternatively relocated according to the NHRA.
- **Cultural Landscapes, Intangible and Living Heritage:** Long term impact on the cultural landscape is considered to be negligible as the surrounding area consists of an area extensively mined. As this is an underground mine, visual impacts to scenic routes and sense of place are also considered to be low (insignificant).
- **Battlefields and Concentration Camps:** There are no battlefields or related concentration camp sites located in the Proposed Extended MRA.

Potential Impacts: The chances of impacting unknown archaeological sites in the study area are considered to be negligible, as this an underground mine. Any direct impacts would be on the surface; Northam will not operate on the surface and thus there will be no mitigation measures required. Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. In the case of the underground mine it will not impact any heritage resources, so there will be no cumulative impacts.

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).

Information regarding the baseline and potential impacts for the Project are based on the information available, discussions with stakeholders, specialists, Northam and the authorities. The EAP has included all identified impacts based on the scope in this report and has assigned appropriate management measures to reduce the impacts associated with the identified impacts, and have been included in the EMPr.

PART B: ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

2) Draft Environmental Management Programme

a) Details of the EAP

(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)

The details and expertise of the EAP are detailed in Part A, Section 3(a)(i) and (ii).

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)

The details of the aspects of the activity are described in Part A, Section 3(b) and (d).

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 B for the site layout plan which indicates all the environmental features and sensitivities.

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 Proposed Extended MRA has no surface impact and represents replacement tonnage for the Existing MRA. No facilities will need to be decommissioned as a result of the Additional Mining Activities. No physical activities are therefore required for the closure of the Proposed Extended MRA.

Once the Section 102 is approved and the Proposed Extended MRA is included in the Zondereinde Mining Rights, any further closure objectives required for the Proposed Extended MRA will be updated in accordance with the relevant applicable legislative requirements.

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

According to the Groundwater Assessment, there will be no impacts on water resources as a result of the Additional Mining Activities. It is however recommended that Zondereinde Mine's existing groundwater monitoring programme be continued as is until at least 5 years after mine closure.

In relation to the current mining activities at the Existing MRA, the Groundwater Assessment notes that there are a number of surface areas at the Existing MRA where contamination of the groundwater resources occurs. Although no new surface infrastructure will be established for the Additional Mining Activities, it is expected that there will be a notable impact on the groundwater qualities in the area. This is however

not due to the Additional Mining Activities and should be managed in accordance with the Zondereinde EMP and WUL.

iii) Potential risk of Acid Mine Drainage

(Indicate whether or not the mining can result in acid mine drainage)

There is extremely limited risk to acid mine drainage ("**AMD**") due to the depth of mining and no water resources being impacted on.

iv) Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

Not applicable, as AMD is not an identified potential risk.

v) Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Not applicable, as AMD is not an identified potential risk.

vi) Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Not applicable, as AMD is not an identified potential risk.

vii) Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Not applicable, as AMD is not an identified potential risk.

viii) Has a water use licence has been applied for?

According to the groundwater investigation, no water resources will be impacted on.

No water will be abstracted from groundwater or surface water.

There is therefore no requirement for a WUL in terms of Sections 21 (a), (g), (c), (i) or (j) of the NWA.

ix) Impacts to be mitigated in their respective phases measures to rehabilitate the environment affected by the undertaking of any listed activity

Table 29: Impacts to be mitigated for rehabilitation.

ACTIVITIES	PHASE	SIZE AND SCALE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME 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.*	*Of disturbance (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.*
Underground mine works (no surface disturbance or infrastructure)	Construction Operation	1632,2827 hectares	Alteration of Geology: Mining must occur according to the MWP	Mining Works Programme (MWP)	Continuous during mining
	Construction	N/A	Spillage Incidents: - Environmental Awareness Training - Clean-up procedures	Clean-up procedures for spillages	Continuous during construction and operational activities
	Construction	N/A	Health and Safety: - Induction Training - Toolbox Talks - Supervisory appointment and reporting procedure	MHSA and Northam's Health and Safety Policies and Procedures	Commencement of Construction Phase
	Construction	N/A	Incidents, Accidents and Potential Emergency Situations: - Induction Training - Toolbox Talks - Supervisory appointment and reporting procedure	Induction training material	Commencement of Construction Phase

ACTIVITIES	PHASE	SIZE AND SCALE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME FOR IMPLEMENTATION
			- Emergency numbers to be displayed in a communal area - Implement appropriate warning signage of potential risks - Undertake risk assessment - Demarcate an emergency assemblage point		
	Construction	N/A	Safety and Security: - 24-hour security must be employed - Implement security procedures - Ensure that shift changes are supervised	MHSA, Northam's Security Policies and Procedures and Agreement with Security Company	Construction and Operational Phase
	Construction Operation	N/A	Employment: - This is a positive impact; no mitigation is necessary - Appropriate procurement procedures must be followed according to the approved SLP	SLP and MPRDA	Construction and Operational Phases
	Operation	N/A	Increase in Economy: - This is a positive impact; no mitigation is necessary - Appropriate procurement procedures must be followed according to the approved SLP	Not applicable	Not applicable
	Operation	N/A	Noise:	The relevant bylaws relating to noise control	Operational Phase of mining

ACTIVITIES	PHASE	SIZE AND SCALE	MITIGATION MEASURES	COMPLIANCE WITH STANDARDS	TIME FOR IMPLEMENTATION
			- Little to no noise is expected, as mining is underground - Restrict any potential noisy activity to daylight business hours		

e) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph)

Table 30: Impact management outcomes.

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
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.).	*(E.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc etc)*		*In which impact is anticipated (E.g. Construction, commissioning, operational. Decommissioning, closure, post-closure)*	*(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.*	*(Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives) etc.*
Underground mine works (no surface disturbance or infrastructure)	Alteration of geology	Geology	Construction Operation	Mining must occur according to the planned short, medium and long-term mining plans	Comply with MWP
	Pollution incidents	Incidents, accidents and potential emergency situations	Construction	- Environmental Awareness Training - Clean-up procedures	No contamination
	Health and safety	Incidents, accidents and potential emergency situations	Construction Operation	- Induction Training - Toolbox Talks - Supervisory appointment and reporting procedure - Emergency numbers to be displayed in a communal area	Incident targets

ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE	MITIGATION TYPE	STANDARD TO BE ACHIEVED
				- Implement appropriate warning signage of potential risks - Undertake risk assessment - Demarcate an emergency assemblage point	
	Safety & Security	Social	Construction Operation	- 24-hour security must be employed - Implement security procedures - Ensure that shift changes are supervised	Incident Reporting Targets
	Employment	Economic	Construction Operation	- This is a positive impact; no mitigation is necessary - Appropriate procurement procedures must be followed according to the approved SLP	Procurement targets
	Noise	Emissions	Operation	- Little to no noise is expected as mining is underground - Restrict any potential noisy activity to daylight business hours	Compliance with By-laws
	Increase in economy	Economic	Operation	Maintaining the current economic contribution	Maintain production rate

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).

Table 31: Impact management actions.

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
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.)	*(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.)*	*(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*	*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*	*(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)*
Underground mine works (no surface disturbance or infrastructure	Alteration of geology	Mining must occur according to the planned short, medium and long-term mining plans	Continuous during mining	
	Pollution incidents	- Environmental Awareness Training - Clean-up procedures	Continuous during construction and operational activities	
	Health and safety	'- Induction Training - Toolbox Talks - Supervisory appointment and reporting procedure - Emergency numbers to be displayed in a communal area - Implement appropriate warning signage of potential risks	Commencement of Construction Phase	

ACTIVITY	POTENTIAL IMPACT	MITIGATION TYPE	TIME PERIOD FOR IMPLEMENTATION	COMPLIANCE WITH STANDARDS
		- Undertake risk assessment - Demarcate an emergency assemblage point		
	Safety & Security	'- 24-hour security must be employed - Implement security procedures - Ensure that shift changes are supervised	Commencement of Construction Phase	
	Employment	'- This is a positive impact; no mitigation is necessary - Appropriate procurement procedures must be followed according to the approved SLP	Construction and Operational Phase	
	Noise	'- Little to no noise is expected as mining is underground - Restrict any potential noisy activity to daylight business hours	Operational Phase	
	Increase in economy	Maintain the current economic contribution	Operational Phase of mining	

i) 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 Proposed Extended MRA has no surface impact and represents replacement tonnage for the Existing MRA. No facilities will need to be decommissioned as a result of the Additional Mining Activities. No rehabilitation or treatment of extraneous water will be required. No physical activities are therefore required for the closure of the Proposed Extended MRA and no specific closure objectives are necessary.

Once the Section 102 is approved and the Proposed Extended MRA is included in the Zondereinde Mining Rights, any further closure objectives required for the Proposed Extended MRA will be updated in accordance with Northam's future assessments required under the Zondereinde Mining Rights and the relevant applicable legislative requirements.

(b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

As part of the public participation process, the Draft EIAR was made available to registered I&APs and the Existing MRA landowners and they will accordingly be consulted with about the fact that no physical activities are required for closure at the Proposed Extended MRA.

(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.

As no rehabilitation is required, a rehabilitation plan is not necessary for the Proposed Extended MRA.

(d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

As specific closure objectives are not required for the Proposed Extended MRA, this is not applicable.

(e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

As no rehabilitation or closure activities are required, the Zondereinde Financial Provision does not need to be increased at present for the Proposed Extended MRA.

Northam will continue to assess its rehabilitation or closure liabilities through rehabilitation and cost closure assessments required under the Zondereinde Mining Rights and the relevant legislation in place at the time. If any financial provision is required in future for the Proposed Extended MRA, the Zondereinde Financial Provision will be increased according to legislative requirements.

(f) Confirm that the financial provision will be provided as determined.

The Zondereinde Financial Provision is in place.

Once the Section 102 is approved, the Proposed Extended MRA will be included in future rehabilitation and cost closure assessments and Northam will increase the Financial Provision in accordance with the relevant applicable legislative requirements if it is necessary for the Proposed Extended MRA.

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
Underground Mining	Groundwater Monitoring[5]	Boreholes	Specialist	The current groundwater monitoring takes place on a quarterly basis.
Underground Mining	Environmental Impacts identified in the Impact Assessment	Management Measures contained in the EMP	Environmental Control Officer (Internal/External)	Performance Assessment to be conducted and submitted to the DMR, in accordance with the requirements of NEMA or the conditions of the environmental authorisation granted for the Project. Internal Performance Assessments to be conducted at least bi-annually.

[5] According the Groundwater Assessment, it is recommended that the Zondereinde Mine's existing groundwater level and quality monitoring program for the Existing MRA be continued as is. Water monitoring is currently undertaken for the Existing MRA. A number of boreholes are being monitored for groundwater quality and groundwater levels. The monitoring boreholes cover relevant potential pollution sources on the Existing MRA (water management dams etc.). The monitoring borehole details are contained in Table 4.1 of the Groundwater Assessment Report (

APPENDIX E).

l) Indicate the frequency of the submission of the performance assessment report

EMPr performance assessment audit must be undertaken at the frequency included in the EIA Regulations or the conditions of the environmental authorisation, for the duration of the Zondereinde Mining Rights. Internal operational inspections must be undertaken at least Bi-annually. All findings, recommendations and actions must be recorded and retained on site for inspection.

m) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

Environmental risks which may result from work relating to the triggered activity (underground mining) are identified in the Impact Assessment. These risks must be communicated to the employees in the following manner:

- contractual agreements that specify environmental requirements;
- induction and/or environmental awareness training;
- health and safety training; and
- toolbox talks prior to commencing work in new areas.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

The identified risks must be managed through the implementation of the management and mitigation measures contained in the EMPr. Compliance with the EMPr will be monitored through internal auditing to be undertaken at least bi-annually and external auditing at a frequency in accordance with the EIA Regulations or the conditions of the environmental authorisation, for the duration of the Zondereinde Mining Rights.

n) Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually)

The following information is required by the competent authority:

- Financial Provision to be reviewed annually; and
- EMPr auditing to be undertaken annually.

To date, no other specific information has been requested by the DMR.

p) UNDERTAKING

The EAP herewith confirms:

q) the correctness of the information provided in the reports	*
r) the correctness of the information provided in the	*
s) the inclusion of comments and inputs from stakeholders and I&APs	*
t) the inclusion of inputs and recommendations from the specialist reports where relevant	*
u) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed	*

-END-

APPENDIX A: COMPANY PROFILE AND CV OF EAP

APPENDIX B: FINAL SITE LAYOUT (COMPOSITE) MAP

APPENDIX C: PUBLIC PARTICIPATION PROCESS

APPENDIX D: IMPACT ASSESSMENT

APPENDIX E: SPECIALIST ASSESMENTS

APPENDIX E.1: ARCHAEOLOGICAL AND HERITAGE RESOURES IMPACT ASSESSMENT

APPENDIX E.2: GROUNDWATER ASSESMENT

APPENDIX F: SOCIO-ECONOMIC IMPACT ASSESSMENT (NOT APPLICABLE)

APPENDIX G: REHABILITATION PROVISION (NOT APPLICABLE)

APPENDIX H: A3 LOCALITY MAP