mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment
And
Environmental Management Plan

for a Waste Management Licence and Listed Activities Associated with the Lanxess Chrome Mine, Rustenburg

DMR Reference Number:

NW30/5/1/2/2/336MR

NW30/5/1/2/3/2/1/336EM

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 2008) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008) (NEM:WA) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 of 2008) AS AMENDED (MPRDA).

Name of Applicant:	**Lanxess Chrome Mining (Pty) Ltd**
Tel no:	**014 536 0600**
Fax no:	**011 536 3997**
Postal Address:	**P.O. Box 8, Kroondal, 0350**
Physical Address:	**Farm Rietfontein 338 JQ, Bleskop, Rustenburg, 0292**
File Reference Number SAMRAD:	**NW30/5/1/2/2/336MR** **NW30/5/1/2/3/2/1/336EM**

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This document has been prepared by Digby Wells Environmental.

Report Type:	**Final EIA and EMP Report**
Project Name:	**Waste Licence and Environmental Authorisation for Lanxess Chrome Mine, Rustenburg**
Project Code:	**LAN3865**

Name	Responsibility	Signature	Date
Xanthe Taylor	Document Compilation		February 2017
Stephanie Aken	First Review		March 2017
Grant Beringer	Exco Review		March 2017

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: -

- 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;
- describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- 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;
- determine the: -
    - nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
    - degree to which these impacts: -
    - can be reversed;
    - may cause irreplaceable loss of resources, and
    - can be avoided, managed or mitigated.
- identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- identify suitable measures to manage, avoid or mitigate identified impacts; and
- identify residual risks that need to be managed and monitored.

EXECUTIVE SUMMARY

Introduction

Lanxess Chrome Mining (Pty) Ltd (Lanxess) wishes to apply for a Waste Management Licence as well as Environmental Authorisation for the Listed Activities pertaining to its proposed open pit mining operations. These listed activities will be located on the farm Rietfontein 338 JQ near Rustenburg in the North West Province.

The previous Environmental Management Programme (EMPr) was approved in 2008 and subsequently Lanxess Chrome Mining (Pty) Ltd (Lanxess) was granted a new order Mining Right in April 2013 for the Lanxess Chrome Mine (LCM) operations (Mining Right reference number *34/2013 MR*).

In 2015 the mine submitted an amendment to its existing Mining Right and Environmental Authorisation to the Department of Mineral Resources. The update included the proposed open pit operation within the mining right area as well as the extension of the underground operations as part of a transfer of rights with neighbouring mines.

A summary of the Lanxess Licences and Approvals is contained in the table below.

Licence / Authorisation / Amendment	**Date**
Beyer Rustenburg Chrome Mine	2006
EMP to convert Mining Right	2008
EMP Amendment (Section 102)	2015

This amendment was made in accordance with the provisions of Section 102 of the Mineral and Petroleum Resources Development Act, 2002 Act No 28 of 2002), and did not include listed and waste management activities. It was understood that the applications were made prior to the promulgation of new legislation and in particular, the Environmental Impact Assessment (EIA) Regulations, 2014[1], under the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA). Lanxess is required to submit an integrated Environmental Authorisation (EA) application in terms of the NEMA, and a Waste Management Licence (WML) application, in terms National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) for the listed and waste management activities. An Integrated Water Use Licence Application (IWULA) was also submitted to the Department of Water and Sanitation in terms of the National Water Act, 1998 (Act No. 36 of 1998) and included all activities (proposed and existing).

The Scoping Phase commenced in 2016 and the Final Scoping Report was submitted to the DMR on 26 September 2016. The Scoping Report was approved on 21 October 2016.

[1] Government Notice Regulation 982 published in Government Gazette 38282 of 4 December 2014

Lanxess has appointed Digby Wells Environmental (Pty) Ltd as the independent environmental consultants to undertake this process and the associated specialist studies. The (DMR) is the competent authority for this environmental regulatory process.

Project applicant

The details of the Project Applicant are tabulated below.

Name of Applicant:	Lanxess Chrome Mining (Pty) Ltd		
Registration number (if any):	-		
Responsible person: *(E.g. CEO, Director, etc.)*	Mr Sarel Ferreira (CEO)		
Contact person:	Kefentse Molefe		
Physical address:	Farm Rietfontein 338 JQ, Bleskop, Rustenburg, 0292		
Postal address:	PO Box 8, Kroondal		
Postal code:	0350	**Cellphone:**	+27(0)71 302 9353
Telephone:	014 536 0604	**Fax:**	-
Email:	kefentse.molefe@lanxess.com		

Project overview

Lanxess currently has an approved Environmental Impact Assessment and Environmental Management Plan (EIA/EMP) in line with the MPRDA that covers various portions of the farms Kroondal 304 JQ, Rietfontein 338 JQ and Klipfontein 300 JQ and has submitted an amendment to the existing EIA/EMP to include the details of the proposed open pit mining operations on the farm Rietfontein 338 JQ (owned by the mine).

The proposed additional infrastructure required on site includes the following:

- Decline ramp and conveyor – A decline ramp will be constructed on the western side of the open pit to access the existing underground areas through the highwall. An additional section of conveyor will be needed to transport ore from the underground and up to the surface.
- Haul roads and service road – Approximately 5 km of haul roads, 25 m wide to accommodate two lanes of traffic. The haul roads connect the existing road network with the open pit as well as the stockpile areas. A service or access road will be constructed to provide access to open pit operation from the southern boundary of the site. These roads will most likely be gravel and 8m wide. ***Listed Activity in this application.***
- Waste Rock Dump – An additional waste rock or overburden dump will be required to the south of the open pit for overburden removed during mining. This proposed dump

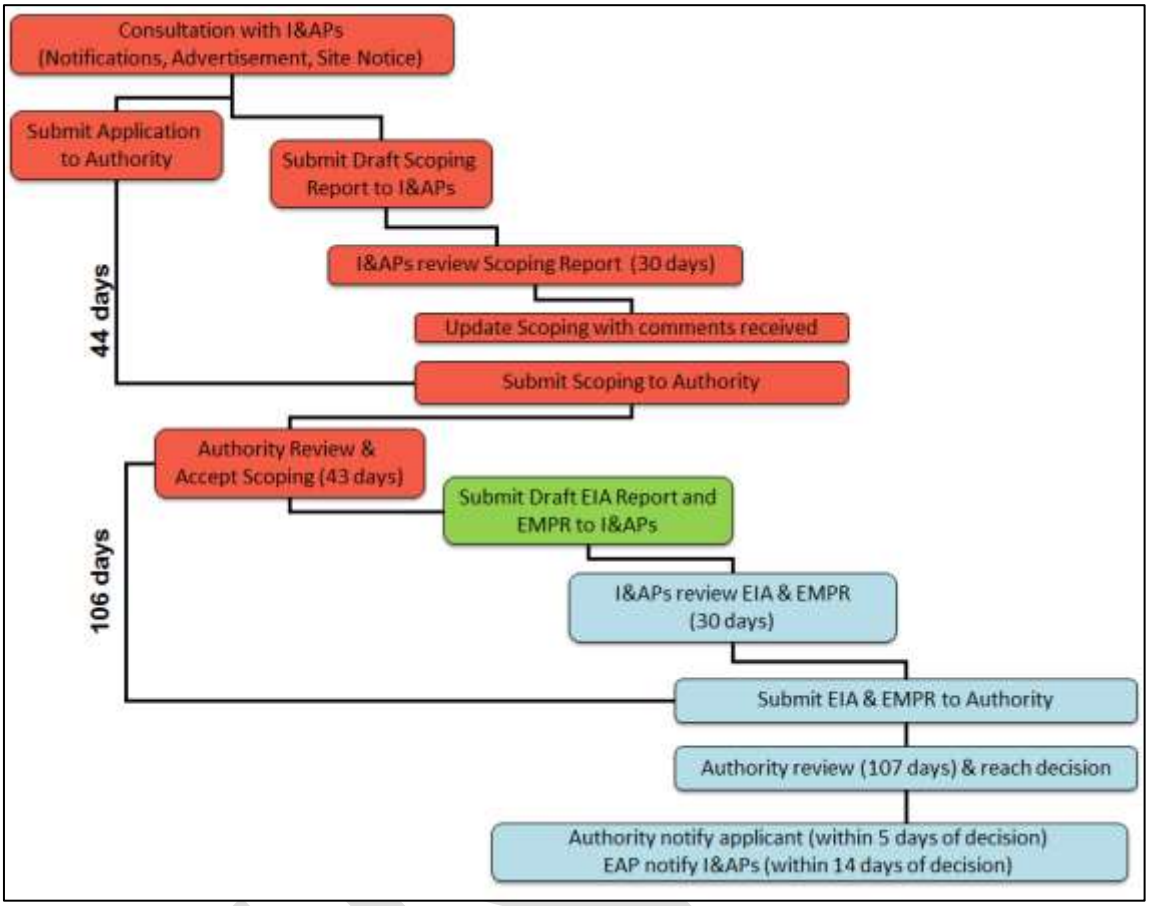
will have a footprint of approximately 100 ha and a height of 30 m. ***Listed Activity in this application.***

- Stockpile – An additional topsoil stockpile will be located between the waste rock dump and the N4 highway. This will be screened off by trees. This proposed stockpile will measure have a footprint of approximately 11 ha and a height of 25 m but does not involve the clearance of natural vegetation. This topsoil will be kept for rehabilitation purposes.
- A small workshop, office block and parking area will be built in the area of the open pit (less than 1ha).

Purpose of this report

The EIA process is considered a tool to identify and manage potential impacts to the environment as a result of particular project activities. Environmental risks associated with such a project are also identified and mitigation measures proposed. The completion of an EIA is a regulatory requirement in terms of the provisions of the NEMA and the EIA process which is regulated in accordance with the EIA Regulations, 2014. The overarching purpose of the EIA process is to determine, assess and evaluate the consequences (positive and negative) of a proposed development, activity or project.

This Final EIA/EMP Report forms part of the EIA process and aims to identify those biophysical and socio-economic issues or concerns that require investigation as well as determine feasible alternatives. During the scoping phase, people interested or affected by the project were informed of the project as well as provided the opportunity to raise issues and concerns. The process diagram for the Scoping and EIA Phases is provided in the diagram below.



The objectives of the report are, therefore, to:

- Describe the Project and the associated activities;
- Provide a summary of the Baseline Environment;
- Identify the potential positive and negative impacts as a result of the Project and its activities;
- Provide mitigation measures for the identified impacts;
- Asses the alternatives proposed for each activity; and
- Share the Project information with Interested and Affected Parties (I&APs) and to record the issues and comments raised by all stakeholders.

Environmental consultants

Digby Wells Environmental (Pty) Ltd. has been appointed by Lanxess to undertake this application process. The details of the Environmental Assessment Practitioner are contained in the table below:

Company name:	Digby Wells Environmental (Pty) Ltd
Contact person:	Stephanie Aken

Physical address:	48 Grosvenor Road, Bryanston,
Telephone:	+27 11 789 9495
Email:	Stephanie.Aken@digbywells.com

Approach and methodology for the Public Participation Process

A thorough stakeholder engagement process was undertaken as part of the amendment application submitted in 2015 informing the public of the proposed underground and open pit mining activities with infrastructure. These I&APs have been notified and informed of this additional process being undertaken for the NEM:WA and NEMA listed activities. The project description and the identified impacts have remained unchanged with regards to the open pit activities proposed. Public comments provided during the Section 102 Amendment Process have been referenced in this document and all comments received during the Scoping and EIA Public Participation phases are also included.

The aforementioned stakeholders have been informed by means of a formal Background Information Document (BID) containing a Registration and Comment Form as well as by an Announcement Letter which was sent by email and SMS.

An advertisement was placed in the Rustenburg Herald newspaper (01 September 2016) and site notices were put up around site and in the following public places:

- Rustenburg Local Municipal Public Library;
- Bojanala District Municipality Public Library; and
- Marikana Community Library.

The BID, newspaper advertisement and site notices provided details of the proposed project, location of the expansion site, the legislative requirements, the competent authority, details of the EAP and the relevant information enabling stakeholders to become involved in the Public Participation Process (PPP).

The Draft Scoping Report was out for a 30-day public review period from the 26 August 2016 to 24 September 2016. The report was made available as hard copies in public places as well as on the company website for download. Electronic copies were distributed to authorities. No additional comments were received from the public. It is presumed that the issues raised during the Section 102 Amendment in 2015 are still relevant. The final Scoping Report was submitted to the DMR on 26 September 2016 and was approved on 21 October 2016. The approval of the Scoping Report enables the process to proceed to the EIA Phase (refer to the process diagram above).

A 50 day extension on the final submission date was granted on the 21 January 2017 to allow for geochemical analyses to be completed as part of the waste classification process. The final EIA report will be submitted to the DMR on or before the 20th April 2017, after the

public consultation process for this Draft EIA Report is complete and the document has been updated to include these comments.

Project alternatives

The Project alternatives considered for the NEM:WA and NEMA activities for the purposes of this environmental authorisation include the following:

- The location, size and design of the waste rock dump;
- The size and route of the proposed haul roads;
- The "No-go" alternative: this alternative refers to the status quo remaining and the activities not taking place.

The mining alternatives were considered in the EIA for the Mining Right application and accepted therefore are not considered again in this environmental authorisation. The mining area and footprint were revised to avoid sensitive areas.

Conclusions and recommendations

The approval of the activities related to the open pit mining will influence whether the mining activities will be able to continue on the site. The most significant impacts are expected to be from the waste rock dump which is not only a source of dust but also a source of potential surface and groundwater contamination. A geochemical and waste classification assessment has been undertaken to determine the hazard rating of the materials to be stored on the dump which will assist in the mitigation measures (e.g. designs, linings, drainage facilities) recommended.

The proposed activities are required for the operation of the open pit mining on the site. Currently there is insufficient infrastructure on site to handle the increase capacities anticipated with the extended Life of Mine (LOM). Additional haul roads as well as waste rock storage is required on site for the mining activities to continue for the mine to operate effectively and legally.

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Part A: Scope of Assessment and Environmental Impact Assessment Report

1 Introduction

Lanxess Chrome Mining (Pty) Ltd (Lanxess) wishes to apply for a Waste Management Licence in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008 (NEM:WA). This process also includes the Environmental Authorisation of the Listed Activities pertaining to its proposed open pit mining operations as identified in the Environmental Impact Assessment (EIA) Regulations, 2014[2], in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA). These listed activities will be located on the farm Rietfontein 338 JQ (owned by the mine) near Rustenburg in the North West Province.

The previous Environmental Management Programme (EMPr) was approved in 2008 and subsequently Lanxess Chrome Mining (Pty) Ltd (Lanxess) was granted a new order Mining Right in April 2013 for the Lanxess Chrome Mine (LCM) operations (Mining Right Number *34/2013 MR*).

In 2015 the mine submitted an amendment to its existing Mining Right and Environmental Authorisation to the Department of Mineral Resources. The update included the proposed open pit operation within the mining right area as well as the extension of the underground operations as part of a transfer of rights with neighbouring mines. This amendment was made in accordance with the provisions of Section 102 of the Mineral and Petroleum Resources Development Act, 2002 Act No 28 of 2002), and did not include listed and waste management activities. It was understood that the applications were made prior to the promulgation of new legislation and in particular, the EIA Regulations, 2014, under the NEMA. Lanxess is required to submit an integrated Environmental Authorisation (EA) application in terms of the NEMA, and a Waste Management Licence (WML) application, in terms of the NEM:WA for the listed and waste management activities. An Integrated Water Use Licence Application (IWULA) was also submitted to the Department of Water and Sanitation in terms of the National Water Act, 1998 (Act No. 36 of 1998).

Lanxess has appointed Digby Wells Environmental (Pty) Ltd. as the independent environmental consultants to undertake this process and the associated specialist studies. The Department of Mineral Resources is the competent authority for this environmental regulatory process.

2 Item 3: Project applicant

The details of the Application, Lanxess Chrome Mining (Pty) Ltd, are contained in Table 2-1 below.

[2] Government Notice Regulation 982 published in Government Gazette 38282 of 4 December 2014

Table 2-1: Applicant Details

Name of Applicant:	Lanxess Chrome Mining (Pty) Ltd		
Registration number (if any):	-		
Responsible person: *(E.g. CEO, Director, etc.)*	Mr Sarel Ferreira (CEO)		
Contact person:	Mr Kefentse Molefe		
Physical address:	Farm Rietfontein 338 JQ, Bleskop, Rustenburg, 0292		
Postal address:	PO Box 8, Kroondal		
Postal code:	0350	**Cellphone:**	+27(0)71 302 9353
Telephone:	014 536 0604	**Fax:**	-
Email:	kefentse.molefe@lanxess.com		

2.1 Item 3(a)(i): Details of the EAP

Digby Wells Environmental was appointed by Lanxess Chrome Mining to facilitate and complete the environmental and legal applications.

Table 2-2: Contact details of the EAP

Name of Practitioner:	Stephanie Aken
Telephone:	+27 11 789 9495
Fax:	+27 11 789 9498
Email:	Stephanie.Aken@digbywells.com

2.2 Item 3(a)(ii): Expertise of the EAP

2.2.1 The qualifications of the EAP

Ms Aken holds the following degrees/diplomas:

- BSc Zoology and Entomology, Rhodes University, 2003;
- BSc Hons, Rhodes University, 2004; and
- Post-grad diploma in Environmental Science, Wits University, 2014.

The EAP's Certificates and CV are attached as Appendix 1 respectively.

2.2.2 Summary of the EAP's past experience

Ms Aken has eight years' experience as an Environmental Consultant and has participated in various projects for different commodities. Her involvement has ranged from project manager to undertaking various specialist studies, including public consultation, from initiation to the final authorisation of projects. She has gained experience on IFC and World

Bank projects as well as dealing with local legislation in South Africa and other African countries.

Currently she is in the Environmental and Legal Services Department at Digby Wells, which handles various environmental licencing and permitting processes in the Mining and Energy sector, which are undertaken concurrently for the life of the projects. These processes include Mining Rights, Waste and Water licences as well as Environmental and Social Impact Assessment (ESIA) authorisations.

3 Item 3(b): Description of the property

The process will involve the authorisation of the listed activities associated with the proposed open pit mining operation on the farm Rietfontein 338 JQ (owned by the Mine). Refer to Table 3-1 below,

Table 3-1: Description of the Property

Farm Name:	Portion 1 of Rietfontein 338 JQ Portion 10 of Rietfontein 338 JQ Portion 11 of Rietfontein 338 JQ Portion 14 of Rietfontein 338 JQ Portion 32 of Rietfontein 338 JQ Portion 34 of Rietfontein 338 JQ Remainder Portion 1 of Rietfontein 338 JQ
Magisterial District:	Rustenburg Local Municipality (RLM)
Distance and direction from nearest town:	7 km East of Kroondal and 11 km south-east of Rustenburg.
21 digit Surveyor General Code for each farm portion:	T0JQ00000000033800001 T0JQ00000000033800010 T0JQ00000000033800011 T0JQ00000000033800014 T0JQ00000000033800032 T0JQ00000000033800034 T0JQ00000000033800001

4 Item 3(c) of Appendix 3: Locality map

A Locality Map indicating the open pit mining area, where the activities will take place, is depicted in Figure 5-1 below and is also attached as Appendix 2.

5 Item 3(d) of Appendix 3: Description of the scope of the proposed overall activity

A preliminary Infrastructure Layout Plan indicating the proposed activities (NEM:WA and NEMA) is depicted as Figure 5-2 below and is attached as Appendix 3.

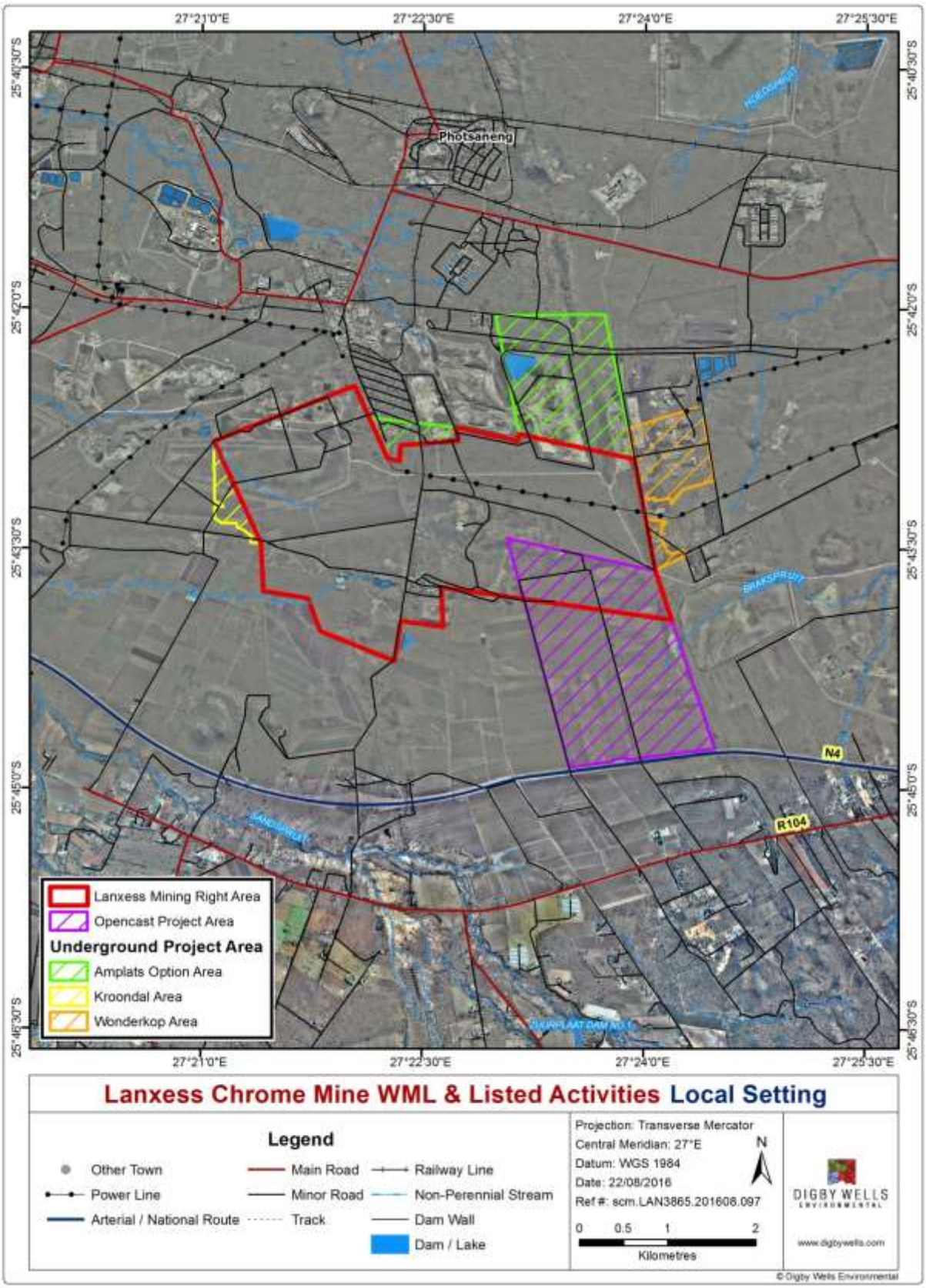


Figure 5-1: Locality Map

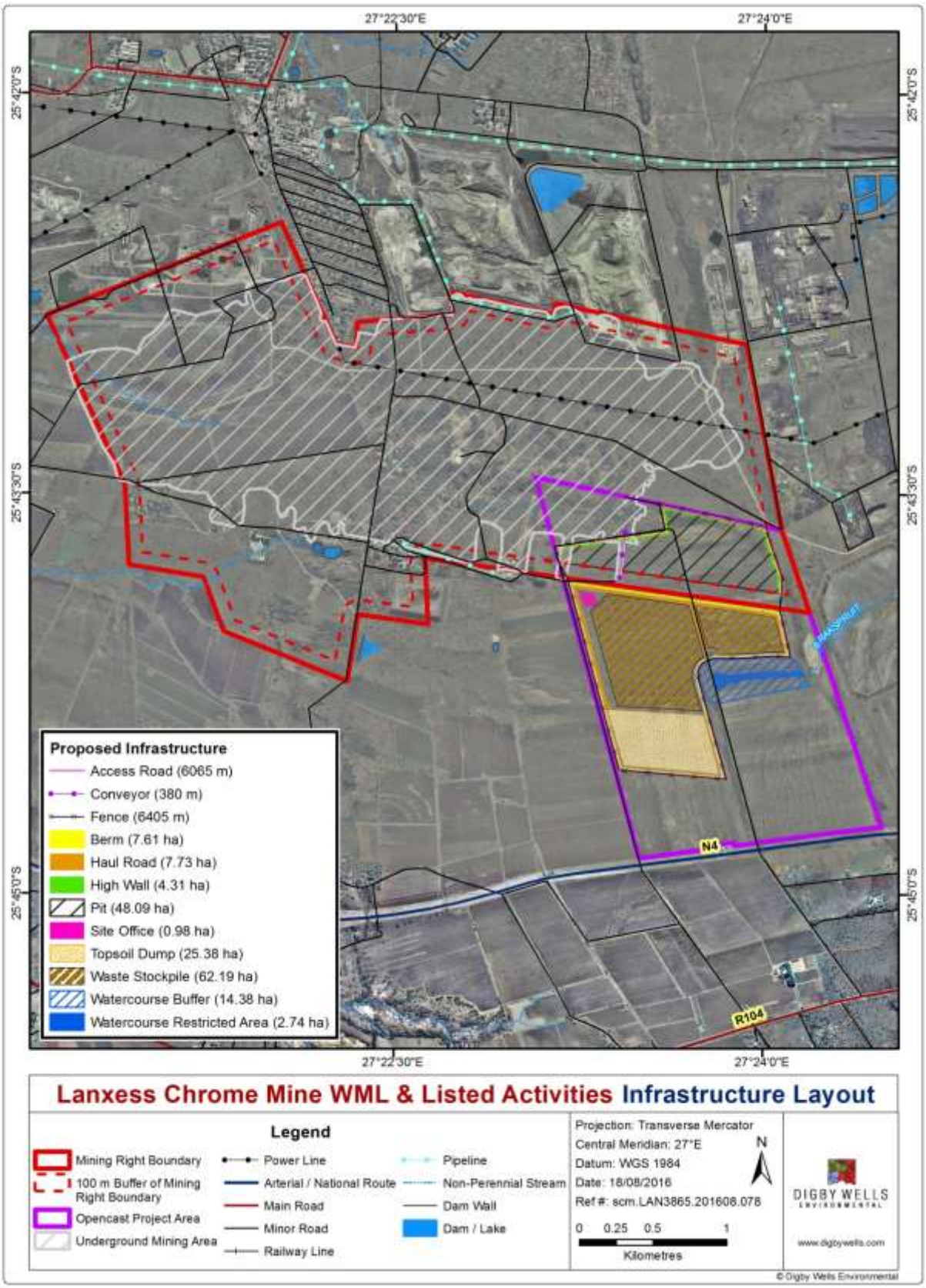


Figure 5-2: Proposed Infrastructure Layout Plan

5.1 Item 3(d)(i): Listed and specified activities

Table 5-1 sets out the Listed Activities in terms of NEMA and the NEM:WA which are applicable to this application. The application is for the listed activities associated with the construction and operation of the infrastructure required for open pit mining.

5.2 Description of the activities to be undertaken

Table 5-1 sets out the activities that will take place as part of the open pit mining operation and the associated waste and listed activities.

Table 5-1: Activities Associated with the Open Pit Mining area

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
The transportation of construction material to the Project site via national, provincial and local roads.	Undefined – Temporary activity	-	NOT LISTED	
Storage of fuel, lubricant and explosives in temporary facilities for the duration of the construction phase.	500 m^2 – Temporary activity	-	NOT LISTED	
Site clearance and topsoil removal prior to the commencement of physical construction activities across the project area.	167.19 ha (Open pit Area only) – includes all open pit infrastructure (pit, waste rock dump, topsoil dump, offices, workshop, parking and roads). **Not indigenous vegetation.**	-	NOT LISTED	
The construction of waste rock dumps.	**100.17 ha**	**Activity 6** ***A process of activity that requires a licence in terms of national legislation***	**GNR 984**	**Activity 9, Category A** **Activity 7, Category B** **Activity 10, Category B** **Activity 11, Category B**

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
The construction of topsoil stockpiles.	10.87 ha	-	NOT LISTED	
The establishment of the initial boxcut and access ramps, mining of the open-pit mining areas.	**>3 ha**	**Activity 17**	**GNR 984**	
The transportation of construction material to the Project site via national, provincial and local roads.	Undefined – Temporary activity	-	NOT LISTED	
The development of a road with a reserve wider than 13,5 metres, or where no reserve exists where the road is wider than 8 metres (haul roads)	**13 ha**	**X Activity 24**	**GN R. 983**	
The construction of the hard park area (this is made up of the workshop, office block and parking lot).	0.98 ha	-	NOT LISTED	
Drilling and blasting of the overburden rock for easy removal by excavators and dump trucks.	N/A	-	NOT LISTED	
Dumping of waste rock and maintenance of waste rock dump.	N/A	-	NOT LISTED	
Removal and loading of ore onto trucks to the plant.	N/A	-	NOT LISTED	
Continuing operation of existing processing plant (Crusher, settler, gravity plant and	2 500 m^2	Already authorised	NOT LISTED	

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
reclamation plant).				
Vehicular activity on the proposed roads and maintenance activities.	N/A	-	NOT LISTED	
The operation of the current Tailings Storage Facility (TSF) (dirty water from stormwater and dewatering mining activities) and the connected return water dam.	17.9 ha	Already authorised	NOT LISTED	
Continuing operation and maintenance of the stockpiles, including topsoil and Run of Mine (ROM) stockpiles.	N/A	-	NOT LISTED	
Continuing Waste and sewage generation and disposal.	N/A	-	NOT LISTED	
Maintenance of secondary infrastructure (offices, parking).	N/A	-	NOT LISTED	
Removal of surface infrastructure (Plant machinery, decline ramp, conveyors).	N/A	-	NOT LISTED	
Decommissioning of services (if necessary, depending on post land use) including waste treatment and removal, power and water facilities).	N/A	-	NOT LISTED	
Rehabilitation of roads and cleared areas (offices and workshop area).	N/A	-	NOT LISTED	

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Removal of fuel, lubricant and explosives.	N/A	-	NOT LISTED	
Safe closure of mine access ramps.	N/A	-	NOT LISTED	
Final replacement of overburden and topsoil and the establishment of vegetation on the final void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will placed and the area vegetated.	N/A	-	NOT LISTED	
Waste handling of scrap metal and used oil as a result of the Decommissioning Phase will be undertaken.	N/A	-	NOT LISTED	
Post-closure monitoring and rehabilitation will determine the level of success of the rehabilitation, as well as to identify any additional measures that have to be undertaken to ensure that the mining area is restored to an adequate state. Monitoring will include surface water, groundwater, soil fertility and erosion, natural vegetation and alien invasive species, and dust generation from the discard dumps.	N/A	-	NOT LISTED	

6 Item 3(e): Policy and legislative context

This section aims to outline the policy and legislative requirements of the proposed activities, contained in Table 6-1 below.

Table 6-1: Policy and Legislative Context

Applicable legislation and guidelines used to compile the report	Reference where applied
The Constitution of the Republic of South Africa, 1996 Under Section 24 of the Constitution of the Republic of South Africa, 1996 (the Constitution) it is clearly stated that: *Everyone has the right to* *(a) an environment that is not harmful to their health or well-being; and* *(b) to 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.*	Lanxess has undertaken an EIA process to identify and determine the potential impacts associated with mining activities. Mitigation measures recommended aim to ensure that the identified impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.
National Environmental Management Act, 1998 (Act No 107 of 1998) and EIA Regulations (December 2014) The Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA), as amended was set in place in accordance with Section 24 of the Constitution. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the*	This EIA/EMP Report is informed by the requirements of the NEMA and Regulations thereunder.

Applicable legislation and guidelines used to compile the report	Reference where applied
implementation of an activity. The EIA Regulation, 2014 was published under GN R 982 on 4 December 2014 (EIA Regulations) and came into operation on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R 983 (Listing Notice No. 1), GN 984 (Listing Notice No. 2) and GN R 985 (Listing Notice No. 3) in terms of Sections 24(2) and 24D of the NEMA, as amended. The EIA Regulations have been made applicable to prospecting and mining activities.	
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through exploration and mining related activities. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts.	The EIA process is undertaken to meet the requirements of the MPRDA read with the EIA Regulations, 2014.
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) On 29 November 2013, the list of waste management activities published under GN R718 of 3 July 2009 (GN R718) was repealed and replaced with a new list of waste management activities under GN R921 of 29 November 2013. Included in the new list are activities listed under Category A, B and C. These activities include inter alia the following: Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA Regulations supporting an application for a waste management licence;	A WML has been applied for due to the nature of mining activities. The associated waste activities are recorded in Table 5-1.

Applicable legislation and guidelines used to compile the report	Reference where applied
Category B describes waste management activities requiring an Environmental Impact Assessment process to be conducted in accordance with the EIA Regulations supporting a waste management licence application; and Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store in excess of 100 m^3 and storage of hazardous waste in excess of 80 m^3. The Waste Classification and Management Regulations published under GN R 634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification.	
National Water Act, 1998 (Act No. 36 of 1998) (NWA) The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. GN R 704 was published in June 1999 and aims to regulate the use of water for mining and related activities for the protection of water resources and states the following: ▪ Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution; ▪ Regulation 5: No person(s) may use substances for the construction of a dam or	An IWULA and an associated IWWMP has been submitted in terms of Section 21 of the NWA for the Project. The IWULA and IWWMP was compiled and submitted to the DWS as the decision-making authority.

Applicable legislation and guidelines used to compile the report	Reference where applied
impoundment if that substance will cause water pollution; ▪ Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, and ▪ Regulation 7 details the requirements necessary for the protection of water resources.	
DWS[3] Best Practice Guideline – G1: Storm Water Management Plan (SWMP) These are guidelines provided by the DWS for the development of a SWMP. The following will be undertaken to develop the conceptual SWMP: ▪ Delineate the clean and dirty area contributing to runoff (based on the final layout plans) and site specific hydrological assessments to determine volumes that require to be handled. The SWMP should ensure that temporary drainage installations should be designed, constructed, and maintained for recurrence periods of at least a 25-year, 24-hour event, while permanent drainage installations should be designed for a 50-year, 24-hour recurrence period; and ▪ Site specific assessments to establish the appropriate mitigation measures and surface water monitoring programme.	All water management infrastructures will be designed for a 1:100 year, 24 hour rainfall event. Refer to Appendix 7 for the Surface Water Report.
National Dust Control Regulation 2013 The Minister of Water and Environmental Affairs, released on the 01 November 2013 the National Dust Control Regulation, in terms of Section 53, read with Section 32 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)(NEM:AQA). In the published National Dust Control Regulations, terms like target, action and alert thresholds were omitted. Another notable observation was the reduction of the permissible frequency of exceedance from three to two incidences within a	The Project's activities will set out to abide by the NEM:AQA and standards set out in the National Ambient Air Quality Standards (NAAQS). The required mitigation is included in the EMP. Refer to Appendix 5 for the Air Quality Report.

[3] Previously the Department of Water Affairs (DWA)

Applicable legislation and guidelines used to compile the report	Reference where applied
year. The standard actually adopted a more stringent approach than previously, and would require dedicated mitigation plans now that it is in force.	
The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agency's in this case the South African Heritage Resources Agency (SAHRA) and Provincial Heritage Resources Authority of Gauteng (PHRA-G), be notified as early as possible of any developments that may exceed certain minimum thresholds. This act is enforced through the National Heritage Regulations GN R 548 (2000).	Refer to Appendix 12 for the Heritage Impact Assessment Report.
GN R 1147 (Financial Provisioning Regulations), 2015 The Financial Provisioning Regulations prescribe methods for determining the quantum of financial provision for rehabilitation and mechanisms for providing for it. Section 41 (1) of the MPRDA has been repealed and Section 24P of the NEMA, as amended, which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision must guarantee the availability of sufficient funds.	The Financial Provisioning Regulations are applicable to rehabilitation and closure plans as they prescribe the minimum content of an annual rehabilitation plan and the minimum content of a final rehabilitation, decommissioning and mine closure plan. These were included as part of the Section 102 Amendment process and have been updated and included EIA. Also refer to Appendix 13 for the Closure and Rehabilitation Report
GN R 527 (MPRDA Regulations), 2004 Regulation 527 (GN R. 527) specifies that the EMP must include environmental objectives and specific goals for mine closure. The applicant for a mining right must make prescribed financial provision for the rehabilitation or management of negative environmental impacts, which must be reviewed annually. R527 provides specific principles for mine closure including safety and health, residual and latent environmental impacts etc.	Refer to Section 4 of this document.

7 Item 3(f): Need and desirability of the proposed activities

The proposed activities are required for the operation of the open pit on the site. Currently there is insufficient infrastructure on site to handle the increased capacities anticipated with the extended Life of Mine (LOM) due to the additional underground mining areas and proposed open pit. Additional haul roads as well as waste rock storage is required on site for the mining activities to continue and for the mine to operate effectively and legally.

The mine has a reputation for being a supplier of high quality chrome ore to various businesses. Lumpy (metallurgical ore) is sold to the ferrochrome industry where it is processed with coal in an electric furnace to form ferrochrome, which in turn is the master alloy used in the production of a wide range of corrosion and heat resistant stainless steel. Foundry grade chrome ore is used for the manufacture of casting moulds in foundries. The same material is also used the production of refractory materials. Finally, chemical grade chrome ore is the raw material for the production of sodium dichromate processed by Lanxess in their other operations (chemical plants), which is the main constituent of all chrome chemicals. Chrome chemicals are used, for example, as leather tanning agents.

The continuation of the mine to produce and supply the various grades of chrome ore to a wide spectrum of industrial and commercial establishments will benefit the Gross Domestic Product (GDP) of not only the municipality but also the province as a whole.

As stated in the MPRDA, the Government's objective is to maximise the benefits of the nation's mineral resources for the benefit of South Africans. By continuing production of chrome ore by way of extending Lanxess' LOM, this objective can be accomplished through, *inter alia*, the continuation of employment at the mine.

8 Item 3(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

Lanxess has an approved EIA/EMP for its current operations and the proposed additional infrastructure falls within the existing Mining Right area on properties owned by Lanxess. Therefore, the site layout in terms of the position of the haul and service roads, waste rock dump and stockpiles was determined by considering both spatial and practical mining operational aspects.

8.1 Item 3(g)(i): Details of the development footprint alternatives considered

8.1.1 Design and layout of the waste rock dump

The alternative of utilising the existing dump for the deposition of the waste rock generated from the open pit development was considered. This is not the preferred option as the

current waste rock dump is reaching capacity, in conjunction with the fact that the existing mining area cannot spatially accommodate the waste rock dump.

A second alternative to the placement of the waste rock dump was also considered. This entailed depositing the waste rock in an area north of the pit. The fauna and flora studies noted that the area to the north of the pit is in a more natural state than the area to the south, the preferred option as the vast majority of this area is already impacted by agriculture. Therefore, this alternative will not be pursued.

The preferred option involves the new waste rock dump being developed on a portion of the farm Rietfontein 338 JQ, south of the pit area, which Lanxess owns. This is the preferred alternative as the site is seen to be heavily disturbed by past agricultural practices.

The results of the Waste Classification results show the waste rock is classified as Type 3 waste and therefore requires a Class C liner, however; due to the results of leachate potential and no chemicals of concern being detected, Digby Wells has recommended the waste be considered Type 4, requiring a Class D barrier system. Refer to Section 9.1.5.

8.1.2 Route and designs for the haul road

Due to the limited space (and short distance to cover) on the site there are no alternative routes for the haul road which has been proposed to link the pit area with the stockpiles and waste rock dump. The option to reduce the width of the road was investigated however the road needs to be wide enough to allow for larger trucks to utilise the road.

8.1.3 The “No-Go” Alternative

The “no-go” option for implementing the activity has been considered, but due to the fact that the mining of the remaining resources will lead to job creation and continued contribution to the GDP of not only the municipality, but also the Province as a whole, this option will not be pursued.

8.2 Item 3(g)(ii): Details of the public participation process followed

A public participation process is being undertaken, this includes notifying stakeholders of the additional activities included in the application since the Section 102 Amendment project in 2015.

8.2.1 Scoping Phase Stakeholder Engagement

During this Scoping Phase, the following activities occurred:

- Stakeholders (including Government Departments, landowners, land occupiers, communities, Non-Governmental Organisations, agricultural organisations, Parastatals and businesses) have and will continue to be identified and captured in a stakeholder database;

- A BID and letter was distributed via post, email and SMS to the identified I&APs together with the placement of one advertisement and site notices around the Project area;
- The Scoping Report and associated documentation was made available for public comment for a period of 30 days; and
- I&APs have been provided the opportunity to comment via email, post or telephonically.

8.2.2 EIA Phase Stakeholder Engagement

Table 8-1 provides the detail of the Stakeholder Engagement activities already undertaken during the Scoping Phase; as well as the EIA Phase activities.

Table 8-1: Public Participation EIA Phase Activities

Activity	Details
Project Announcement (Scoping Phase)	
Identification of stakeholders	A stakeholder database was developed in the previous Section 102 Amendment project which included I&APs from various sectors of society, including directly affected and adjacent landowners, in and around the mining area.
Distribution of announcement letter and Background Information Document (BID)	A BID, announcement letter with Registration and Comment Form was distributed to stakeholders on **26 August 2016**.
Placing of newspaper advertisement	An English advert was placed in the Rustenburg Herald on **01 September 2016**
Placing site notices	English site notices were put up at the proposed project site, local libraries and municipal offices on **26 August 2016** at four different locations around the Project site.

Activity	Details
EIA Phase Stakeholder Engagement Activities	
Announcement of Scoping Report	A notification announcing the availability of the Draft EIA Report was emailed and posted to stakeholders. Copies of the EIA Report were made available at: ■ Rustenburg Local Municipal Public Library; ■ Bojanala District Municipality Public Library; and ■ Marikana Community Library. A SMS was sent to stakeholders announcing availability of the Draft EIA Report. The Draft EIA Report was also made available on www.digbywells.com (Public Documents). Copies of the draft report were also sent to the following authorities: ■ North West Department of Agricultural and Rural Development; ■ Department of Mineral Resources; ■ National Department of Environmental Affairs; ■ North West Department of Rural Development and Land Reform - Land Claims Commission; and ■ Rustenburg Local Municipality. ***(30-day comment period for the Draft EIA Report: 15/03 to 13/04.***
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders will be captured in the CRR.

8.3 Item 3(g)(iii): Summary of issues raised by I&APs

No comments were received from I&APs during the Scoping Phase for this application process. It is presumed that all the issues pertaining to the open pit mining activities were raised by I&APs when the same information was presented during the Section 102 Amendment process in 2015 and are still considered relevant. Any comments received during the EIA Phase public comment period will be captured in the Final EIA Report. Comments received relating to environmental impacts during the Section 102 process are included in Table 8-2 below:

Table 8-2: Interested and Affected Parties

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant
Name of Individual	**Consulted**			
Landowners				
No comments were received from landowners				
Lawful occupier/s of the land				
No comments were received from lawful occupiers of land				
Landowners or lawful occupiers on adjacent properties				
No comments were received from landowners or lawful occupiers on adjacent properties				
Municipal councillor				
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Local companies are to be appointed to sweep the road and stockpile chrome, particles are to be swept into bins and given back to Lanxess	All the SMMEs and Enterprise development are channelled through procurement and currently the Procurement is doing the good job to ensure that preference is given to local companies when tender procedures are followed.

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant
Name of Individual	**Consulted**			
Municipality				
No comments were received from the Municipality				
Organisations of state (Responsible for Infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc.				
No comments were received from organs of state				
Communities				
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Agriculture activities to produce food and employment, we have to feed ourselves for us to be self-sustained therefore our role is to create an enabling environment which will allow our farmers to maximize their potential	Lanxess currently has the Fertiliser Project on the SLP and Lanxess will assist in any agricultural projects should it be identified by the community as one of the needs, in consideration will all the resources available.
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Open House Meeting	1 July 2015	Concerned that a legal process has been followed in terms of the Section 102 Amendment but not a moral process as we are only informed once the report has already been drafted. Which phase of consultation is the project in?	The Section 102 Amendment process is a shorter process compared to what is required as part of a comprehensive EIA process. Unlike the EIA process that goes through an announcement, application, Scoping and EIA Phase, this process essentially only has an announcement phase after which the

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant
Name of Individual	Consulted			
				Draft document for submission is made available for public comment (which is presented at a public meeting or Open House Meeting). However, it is important to emphasize that the engagement process is not complete and is a continuous process.
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Chrome falls off during transportation to Bleskop railway siding. Trucks damage our roads therefore this needs to be managed.	Comment noted. Mitigation measures set in place to manage impacts associated with the mining operation has been detailed in the EMP. It will be the responsibility of the Mine to ensure these measures are implemented. Comment noted. Mitigation measures set in place to manage impacts associated with the mining operation has been detailed in the EMP. It will be the responsibility of the Mine to ensure these measures are implemented.
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Healthy environmental leads to healthy living so it is imperative to secure our environmental and avoid all kinds of pollution where pollution is already taking	Comment noted. Mitigation measures set in place to manage impacts associated with the mining operation has been detailed in the EMP. It will be the

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant
Name of Individual	Consulted			
			place steps have to be taken to maintain, regulate and reduce it. Dust is a serious hazard causing (pheumocanions)	responsibility of the Mine to ensure these measures are implemented.
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Explosives vibrate the land which affects our Houses.	All blasting will take place on the mine property and the surrounding properties are also mines blasting will not affect community houses.
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Water for dust allaying and large group of disease on the respiratory organs caused by the inhalation of noxious dust so animals eat grass, plant having dust, During your Meta Murgical process Lanxess Mine use Chemical reaction to leaching and use Sodium, Calcium etc.	Comment noted. Mitigation measures set in place to manage impacts associated with the mining operation has been detailed in the EMP. It will be the responsibility of the Mine to ensure these measures are implemented.
Mr Simon Malesela Lesame Clan Mmakhunou (Treasure)	Registration Form	28 July 2015	Land usage is residing at Photsaneng Village where all activities' of farming, soil erosion, loss of natural vegetation is taking place.	Comment noted. Mitigation measures set in place to manage impacts associated with the mining operation has been detailed in the EMP. It will be the responsibility of the Mine to ensure these measures are implemented.
Mr Mogotsi Huma Entrepreneur	Open House Meeting	1 July 2015	Will the additional 80 000 tons result in additional trucks on the roads.	There will be additional trucks on the internal mine roads but not on the outside

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant
Name of Individual	**Consulted**			
				roads.
Headman Victor Khunou	Open House Meeting	1 July 2015	The pervious SLP manager made commitments which were not met and therefore they want to meet with the CEO.	The SLP coordinator will arrange a meeting with the CEO.
Department of Land Affairs				
No comments were received from the Department of Land Affairs				
Department of Environmental Affairs				
No comments were received from the Department of Enviornmental Affairs				
Other Competent Authorities Affected				
No comments were received from other competent authorities				

9 Item 3(g)(iv): The environmental attributes associated with the development footprint alternatives

9.1 The baseline environmental aspects and the type of environment affected by the proposed activities

A baseline of the open pit mining area was undertaken as part of the previous application (Section 102 Amendment). This area is where the proposed listed activities will take place.

9.1.1 Air Quality

The Air Quality Report is attached hereto as Appendix 5.

The Mine falls in the Waterberg Bojanala Priority Area (WBPA), which encompasses the Waterberg District in Limpopo Province and the Bojanala Platinum District in the North West. This district has several sources of pollution such as heavy industry, refinery, power station, motor vehicles, small industries and households that rely on coal for cooking and space heating).

The current air pollution sources of concern in the Waterberg District are:

- Dust from mines, quarries, brickworks, spoil/overburden heaps and heavy vehicles using gravel roads;
- Burning of solid waste at waste disposal sites, informal waste dumps;
- Tailpipe emissions especially heavy vehicles that drive through towns; and
- Use of biomass for cooking and space heating.

To determine the baseline conditions for the project area, site specific (meso-scale model) MM5 modelled meteorological was utilised to determine local prevailing weather conditions. Predominant winds come from the east and east-north-east respectively. Over the three year period (January 2011 to December 2013), frequency of occurrence was 11.8% from the east, 10.5% east northeast, and 9.9% from north-east. Calm conditions (wind speeds < 0.5 m/s) occurred for 4.7% of the time. The average monthly maximum temperatures range from 13.3°C in July to 25.7°C in February, with monthly minima ranging from 12°C in July to 25.1°C in January. The maximum relative humidity of 76.4% in July and the lowest of 55.9% was achieved in November.

The surrounding residential sensitive receptor areas include:

- Wigwam – approximately 9 km to the south west;
- Kroondal – approximately 5 km to the west;
- Marikana – approximately 8 km to the north east;

- Buffelspoort – approximately 9 km to the south east;
- Lapologang – approximately 6 km to the east;
- Waterkloof – approximately 5 km to the north west; and
- Nkaneng – approximately 2 km to the north of the project boundary.

9.1.1.1 Dust Deposition Monitoring

Lanxess has been monitoring dust deposition rates at 10 monitoring points in the vicinity of its current operations. According to the margin of tolerance within the Air Quality standards for a non-residential area, the limit may be exceeded twice in one year however this should not be in sequential months. The most recent data available from February 2017, three monitoring sites all recorded deposition rates in exceedance of the limit more than twice in the previous 12-month preiod.

9.1.1.2 Dispersion Modelling

An emissions inventory was established comprising emissions for the different activities associated with the Lanxess operations. These included material handling operations from both the proposed opencast and underground (for example, tipping, storage and conveyors coming from below ground to the surface), vehicle activity on haul roads and access routes as well as wind erosion of stockpiles.

The following pollutants were assessed:

- Total Suspended Particulates (TSP);
- Particulates with aerodynamic diameter of ≤10 µm (PM_{10}); and
- Particulates with aerodynamic diameter of ≤2.5 µm ($PM_{2.5}$)

These were assessed within the mines boundary or property.

Results were similar for both PM_{10} and $PM_{2.5}$ as standard levels were exceeded within the mine property for both a 24 period and as the annual levels. However all of the sensitive receptors located outside the mine did not exceed these standard levels. This indicates that the potential health risks are more significant for the exposed workers on site.

The main sources of dust generation from the proposed activities will be the dump, opencast operations and haul roads.

9.1.2 Fauna and Flora

The Fauna and Flora Report is attached hereto as Appendix 6.

The mine is located in the Savanna Biome of South Africa. The dominant vegetation type, according to literature for the proposed development area is Marikana Thornveld, formally classified as an endangered vegetation type nationally with none conserved and 55% altered, primarily by cultivation.

A total of 71 plant species were recorded on the open pit area. Of these, one is regarded as a Species of Special Concern (SSC), *Boophone distcha*, with no plants on the national list of Protected Trees. Nine invasive species were recorded from Schedules 1 and 3 of Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA). Mammal species were recorded on site on previous visits. Twenty-one bird species were recorded, none of which are protected, and one reptile species. No amphibian species were recorded on site.

9.1.2.1 Sensitivity

Information that was assessed for this report showed that the overall project area does occur within the Magaliesberg and Witwatersberg Important Bird Area. The study area occurs within Marikana thornveld which is a threatened ecosystem, however through site investigation it was found that much of the project area has been transformed due to agricultural and mining activities. The study area does not form part of the National Protected Areas Expansion Strategy. As far as protected species are concerned, broad scale data was available for the mammal determination and there are protected species that can occur on the Lanxess site, as listed in this report. No protected reptile species are expected, and none were encountered, no protected amphibian species are expected.

The open pit operation area can be divided into two main sections; Transformed and Natural land. Certain areas of the study site are currently being used for commercial farming, more specifically Sorghum (*Sorghum bicolor*), whereas other areas of the site on hill slopes remain largely natural and some disturbance from grazing was evident. Some parts of the study site are difficult to access and as a result, are in an unaltered condition. These relatively pristine areas tend to be on hill slopes and crests of the *koppie* areas that are very rocky.

There is a potential to encounter additional protected species in the remaining natural areas on site despite them being isolated. These areas therefore need to be seen as potentially sensitive and mitigation measures have been provided accordingly in the EMP.

9.1.3 Surface Water

The Surface Water Report is attached hereto as Appendix 7.

9.1.3.1 Catchments

The Project area is located in the Crocodile West and Marico Water Management Area (WMA 3) within the A22H quaternary catchment. The eastern boundary of this project area lies on the catchment divide between quaternary catchments A22H and A21K as seen below.

The A22H quaternary catchment area is 579 km^2, and has an MAR of 14.07 million cubic meters (mcm). Runoff emanating from this quaternary catchment drains in a north-easterly direction via the Hex River. Elevations in the A22H quaternary range from 1 220 meters

above mean sea level (mamsl) at the highest point within the catchment, and drop to 1 112 mamsl at the outlet of the catchment. The A21K quaternary catchment area is 865 km^2, and has an MAR of 9.11 mcm. Runoff emanating from this quaternary catchment also drains in a north easterly direction via the Sterkstroom River.

The project area is located in the south-eastern side of the A22H quaternary catchment on the watershed of the A22H and A21K quaternary catchments. Average slopes for the western Project boundary range from 0.7 % to 1.0 % for the majority of the area, whilst the steeper slopes are located on the western and eastern boundary of the project area and range from 0.3 % to 2.1%.

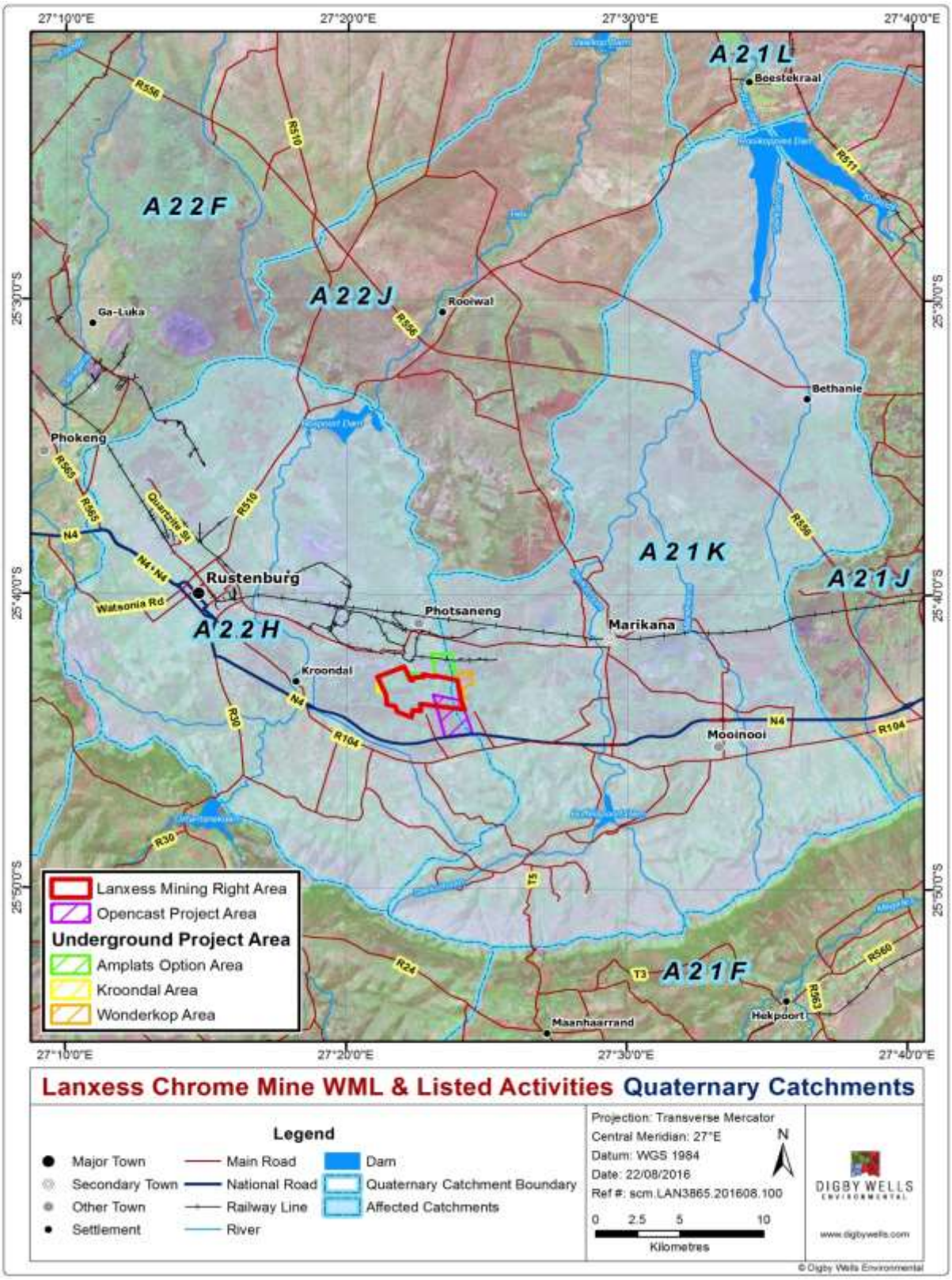


Figure 9-1: Regional Hydrological Setting

The main water course in the A22H quaternary catchment is the Hex River found on the western side of the Project area, this river joins the Elands River which is a tributary to Crocodile River. There are two major tributaries to the Hex River namely the Sandspruit and Waterkloofspruit. The Sandspruit flows from the south of the Project area in a north-westerly direction joining the Hex River. The Waterkloofspruit is located on the western side of the Project area and it flows in a north-easterly direction to also join the Hex River in the north.

On the eastern side of the Project area is the A21K quaternary catchment which consists of four rivers/streams namely; the Sterkstroom, Kleinwater, Tshukutswe and the Maretlwana River. The Sterkstroom River is the main river in the mentioned quaternary catchment and it drains in a north-easterly direction into the Crocodile River which is a tributary to the Limpopo River.

A buffer of 100 m has been applied to the mine plan and layout to accommodate the close proximity to the waste rock dump and this buffer area is approximately 15 ha. Where this has not been possible (around the pit area) the relevant Section 21 c and i water uses have been applied for in the IWULA.

9.1.3.2 Water Users

The mine does not utilise water from any local surface water resources for its activities, with Rand Water being the primary supplier of water to the mine.

Due to the non-perennial nature of the unnamed streams around the Project area, there are limited surface water users that are registered on the Department of Water and Sanitation (DWS) Water Users Registration Management Systems (WARMS) database. The farmers downstream (west of the Project area) utilise water from small farm dams together with the Holthausen Dam, which is 4 km away from the site, for agricultural purposes such as irrigation, stock feed and livestock watering. Other surface water uses identified for A22H quaternary catchment include urban industry and mining.

9.1.3.3 Water Quality

The monitoring is conducted at the slimes dam, Heavy Medium Separator (HMS) Plant Circular dam, Gravity Plant dam and Return Water dam (RWD). Elevated levels of Nitrates (NO_3) have been observed in all the dams on the 2014 monitoring results. The elevated levels of Nitrates (NO_3) could possibly be as a result of contamination of water from the explosives waste material underground. Ammonia (NH_4) and Aluminium (Al) in the Gravity Plant Dam (referred to as GRA) and HMS dams were also above the limits in November to December 2014. Other water quality parameters were found to be within the limits. Elevated levels of NO_3 have again been observed in all the dams on the 2014 monitoring results. This has not shown any improvement as these levels were also exceeding the limits in 2010 except for the Rand Water supply used for drinking. The elevated levels of NO_3 could possibly be as a result of contamination of water from the explosives waste material.

NH_4 and Al in the GRA and HMS dams were also above the limits in November to December 2014 monitoring period. Other water quality parameters were found to be within the limits.

Although Sulphate (SO_4), Magnesium (Mg) and Manganese (Mn) were above the recommended aesthetic quality limits, they were still within the maximum allowable water quality limits. In general, water in the three dams is regarded as waste water and cannot be used for drinking.

9.1.4 Geohydrology

The Geohydrological Report is attached hereto as Appendix 8.

9.1.4.1 Aquifers and Yields

The weathered aquifer in the Lanxess Chrome Mine area stores the bulk of the groundwater and also forms the main recharge zone. This aquifer occurs across the entire surface area of the proposed pit. With a saturated thickness of up to 26 m, this aquifer dips towards the south-eastern portion of the proposed pit.

Rainfall recharge to the groundwater system is expressed as a percentage of the Mean Annual Precipitation (MAP). The MAP used for the site is 645 mm per annum. The mean annual recharge (MAR) to the groundwater systems for the study area is estimated to be between 3% and 7% of the MAP, putting it in the recharge range of 20 mm per annum to 45 mm per annum (JMA Consulting, 2009).

9.1.4.2 Groundwater Levels

The depth to groundwater within the open pit operations ranges between 10 and 24 m, with an average of 16 metres below ground level (mbgl). Based on the depth of weathering recorded during drilling, the deeper groundwater levels indicate that the weathered aquifer is unsaturated, most likely due to mine dewatering impacts. The water level also indicates that seepage from the adjacent waste rock dump is not towards the proposed pit as infiltration from the waste rock dump would have elevated the groundwater level in other boreholes.

The shallow groundwater level in boreholes around the proposed pit area indicate the thick weathered aquifer south-east of the proposed pit is saturated and mine dewatering is less significant in this area. The groundwater elevation data indicates that groundwater flows from the south eastern perimeter of the pit in north-westerly direction. Historical boreholes, with water levels less than 11 mbgl, were plotted against surface elevations. It can be concluded that the regional shallow groundwater levels are less influenced by underground mining and correlate with topography. Therefore, the groundwater levels below 11 mbgl can be used for steady model calibration purposes.

9.1.4.3 Groundwater Quality

The groundwater quality results have been compared to the South African National Standards (SANS) 241:2005 for Drinking Water and have been grouped into classes in accordance with the above stated standard.

All the samples have the same water type; dominated by magnesium and bicarbonates. It has also been demonstrated that boreholes LANBH6 and LANBH7 are being influenced by

water from old or current underground workings. It can be said that the current impacts on groundwater around the proposed pit lies in the vicinity of the old or current underground workings.

9.1.4.4 Modelling results

The catchment boundary between quaternary catchments A21K and A22H transects the proposed pit some 450 m west of the eastern pit boundary. Excavation of the proposed pit will change the topography and as a result groundwater from both catchments will flow towards the pit centre in response to hydraulic gradient. Groundwater inflow into the proposed pit will not only depend on the aquifer properties. The mine plan, mined area, depth and mining rate will also affect the groundwater inflow rates. Two scenarios were simulated analytically, based on the minimum and maximum groundwater level expected above the final pit floor level (50 mbgl), to predict the steady state groundwater inflow rate during mining.

The predicted inflow rates range between 1 027 and 1 684 m^3/d. When groundwater flows towards the pit (during mining) it inevitably dewaters and lowers the groundwater levels in the surrounding area. As the pits develop, the zone of influence of the groundwater level drawdown migrates and expands as the groundwater system attempts to maintain a state of equilibrium.

The zone of influence due an inflow rate of 1 027 m^3/d is predicted to extend some 2.1 km from the pit centre. The worst-case zone of influence is predicted to extend 2.5 km from the pit centre. The syenite dyke east of the pit is reportedly impermeable; hence the aquifers on the other side of the dyke are not expected to be influenced by mining of the proposed pit.

The properties and boreholes within the zone of influence belong to Lanxess Chrome Mine, therefore the dewatering is unlikely to affect external private groundwater users. As there are no external receptors within the zone of influence, the decrease in the volume of groundwater in natural storage due to mine dewatering is not foreseen to be significant.

9.1.5 Geochemistry

For the purpose of characterising the residue stockpiles according to geochemical and waste classification criteria, samples were taken from drilled boreholes. Samples were taken as follows:

- GSBH301;
- GSBH302;
- GSBH303;
- GSBH304; and
- GSBH305.

All the samples representing the residue stockpile material have a positive Nett Neutralising Potential (NNP), which illustrates the major buffering capacity of the material, and all the residue stockpile samples are non- acid generating.

According to the NEM: WA the residue stockpile samples are classified as a Type 3 waste. Type 3 wastes are required to be disposed of in a Class C landfill (NEM:WA Regulations, 2013) or a GLB+ landfill (DWS, 1998). These require a liner type designed according to Class C disposal area specification.

It is our recommendation that the residue stockpiles be classed as a Type 4 waste that needs to be deposited on a Class D disposal area based on the risk approach method. The main aim of the amendment is to allow for the pollution control barrier system required for residue stockpiles and residue deposits to be determined on a case by case basis, based on a risk analysis approach.

Lanxess Chrome mine is currently monitoring boreholes around the current tailings facility and waste rock dump. About three boreholes are located in proximity to location of the proposed Open Cast: LANBH1, LANBH2 and LANBH3.

LANBH1 and LANBH2 baseline data illustrate that no chemical of concern was picked up from the boreholes. Based on the results from the leachate, no elements were detected to leach from the five samples representing the residue material to be stockpiled. Elements detected in the total concentration were not detected on the leachate. The current numerical model (Digby Wells, 2016) illustrate that the current waste rock dumps onsite do not appear to leach sulphate and nitrates to the groundwater system and therefore do not require lining.

Based on the risk based approach model, the current mitigation (separation of dirty and clean water, containing of all runoff from storage facilities and installation of stockpile berms), Digby Wells proposes that the residue stockpiles be classed as Type 4 waste that needs to be deposited on Class D disposal area.

9.1.6 Soils, Land Capability and Land Use

The Soil, Land Capability and Land Use Report is attached hereto as Appendix 9.

This baseline study focused on the open pit operations and the associated infrastructure such as the dumps and the haul roads. The area of the open pit operations is dominated by dark well-structured clayey soils (Arcadia and Valsrivier). These soils account for 373.77 ha (97.3%) of the study area. The north-western portion of the open pit site contains shallow rocky soils (Mispah and Glenrosa type), which accounts for 10.32 ha (2.7%) of the study area. The dominant land capability for the area is the Class III capability (373.77 ha), with the Class VIII capability (10.32 ha) in the north-western portion of the Project area.

The dominant land use in the Lanxess open pit Project area is that of cultivation (320.83 ha) as shown in the Land Use map (Figure 9-2). Sorghum is being grown in these heavy clay soils.

The land use summary is as follows:

- Cultivated (320.77 ha);
- Grazing (13.04 ha);
- Natural (47.21 ha);
- Infrastructure (1.74 ha); and
- Disturbed (1.27 ha).

The dominant land capability for the open pit area is the Class III capability (373.77 ha), with the Class VIII capability (10.32 ha) in the north-western portion of the project area.

9.1.7 Visual

The Visual Impact Assessment Report is attached hereto as Appendix 10.

The baseline study focused on the surface infrastructure and changes in topography as a result of the open pit operations. The expected visual impact of the proposed Lanxess activities was categorised based on the type of receiving environment and the type of development.

The proposed activities will have a high visibility and moderate visual exposure as it will be visible from a large area and will be recognisable to the viewer. The proposed project has a moderate visual intrusion as it partially fits into the surroundings, but will be clearly noticeable. Although the proposed project is an extension of an existing mine, its open pit, waste rock dump and topsoil stockpile cover a larger area than the surface infrastructure of the existing Lanxess Chrome Mine and will therefore have an impact on the receiving environment. The receiving environment has a moderate visual absorption capacity because there is partial screening by the topography.

9.1.8 Noise

The Noise Impact Assessment Report is attached hereto as Appendix 11.

The existing operations form part of the current ambient noise levels for the area. However the impact and mitigation measures include the existing and current operations.

The surrounding receptors are rural and suburban to the south, with numerous mines in the surrounding area as well.

The site criteria used for to determine the current ambient noise level at the nearest noise sensitive receptor to the proposed project were as follows:

- The location of the nearest rural receptors to the proposed project and subsequently the most likely to be impacted on by the proposed mining activities; and
- Locations that served as a suitable reference point for the measurement of ambient sound levels surrounding the proposed project area.

Predictive modelling was performed for the proposed open pit mining activities through the use of modelling software. Estimates of the cumulative mining noise levels from the study were derived from the noise emissions from all the major noise-generating components and activities of the proposed Project.

The noise dispersion modelling software was used to assess whether the noise from the proposed open pit mining activities will impact on the relevant noise sensitive receptors, by comparing the predicted propagating noise levels with the current ambient baseline noise levels.

According to the National Noise Control Regulations (PN 627 of 1998), "disturbing noise" means a noise level which exceeds the zone sound level or, if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 A-weighted (dBA) or more.

Based on the daytime results the existing ambient noise levels are above the SANS rating levels for the maximum allowable outdoor daytime limit (45 dBA) for ambient noise in rural districts. The average daytime noise level measured 58 dBA. The noise sources contributing to the ambient daytime levels are due mainly to the frequent vehicular activity on the N4 National Road.

Based on the night time results the existing ambient noise levels are above the SANS rating levels for the maximum allowable outdoor night time limit (35 dBA) for ambient noise in rural districts. The average night time noise level measured 54dBA. The noise sources contributing to the ambient night time levels are mainly the vehicle activity on the N4 National Road as well as insect noise from the cricket family, *Gryllidae*.

9.1.9 Heritage

The Heritage Impact Assessment Report is attached hereto as Appendix 12.

Due to the surface disturbance, the baseline study focused on the open pit operations and the associated infrastructure such as the dumps and the haul roads. If Lanxess proposes any additional surface infrastructure above these areas, further heritage studies are recommended.

A total of 22 heritage resources including Stone Age surface scatters, Iron Age stone-walled settlements, historical farmsteads and graves have been identified within 10 km from the mining area. These sites are discussed in the sections below.

9.1.9.1 Stone Age

A total of four Middle Stone Age (MSA) surface scatters were identified through a review of existing relevant heritage reports, within 10 km of the LCM project area.

Weathered MSA tools were identified on the farm Kroondal 304JQ approximately 2 km from the Project area, during a survey conducted by van Schalkwyk and Pelser (2001); however no exact co-ordinates were supplied for this site.

9.1.9.2 Iron Age

Ceramic facies that can be found in the project area include Ntsuanatsatsi, Uitkomst and Rooiberg. The most visible indicator of Late Iron Age settlements is that of the stone walls. Stone-walled settlements in South Africa have been characterised and defined into two clusters and several types. Stone walled settlement types found within the Project area are that of the Molokwane type settlement. Additional ground-truthing and auger excavations are currently been done in order to map these findings at the request of SAHRA.

9.2 Description of the current land uses

The dominant land use in the Lanxess open pit project area is that of cultivation (320.83 ha), with sorghum being grown in these heavy clay soils.

The land use summary for that area is as follows:

- Cultivated (320.77 ha);
- Grazing (13.04 ha);
- Natural (47.21 ha);
- Infrastructure (1.74 ha); and
- Disturbed (1.27 ha).

9.3 Description of specific environmental features and infrastructure on the site

9.3.1 Environmental features

Certain areas of the study site are currently being used for commercial farming, more specifically Sorghum (*Sorghum bicolor*), whereas other areas of the site on hill slopes remain largely natural with some disturbance from grazing evident. Some parts of the study site are difficult to access and from a farming perspective are in an unaltered condition as a result. These relatively pristine areas tend to be on hill slopes and crests of the *Koppie* areas that are very rocky.

There is a potential chance to encounter additional protected species in the remaining natural areas on site despite them being isolated. These areas therefore need to be seen as potentially sensitive and mitigation measures have been provided accordingly in the EMP.

9.3.2 Cultural Heritage

During the screening study a total of 22 heritage resources including Stone Age surface scatters, Iron Age stone-walled settlements, historical farmsteads and graves have been identified within 10 km from the proposed activities. These are detailed above in Section 9.1.9.

9.3.3 Infrastructure

As the underground mine is currently operational, there is existing infrastructure on site being utilised. Existing infrastructure on the mine is set out in Table 9-1.

Table 9-1: Existing infrastructure on site

Infrastructure	Associated Activities
Incline and Shafts (vertical and ventilation)	Provide access to the underground workings.
Underground workings	▪ Drilling and blasting. ▪ Loading and transfer of ore to conveyors. Conveyor belt transport ore to plant.
Processing facilities ▪ Crusher ▪ Settlers ▪ HMS plant ▪ Gravity plant ▪ New reclamation plant	▪ Beneficiation. ▪ Crushing and screening. ▪ HMS Plant: The coarse fraction >19mm is fed into a heavy media separation plant in order to separate the remaining waste from lumpy ore which is then sold as lumpy ore into the ferrochrome industry. ▪ Gravity Plant: The fine fraction of ROM (<19mm) is upgraded to foundry sand (CO4) and chemical grade (CO1) by milling, screening spiralling and hydro-classification. Regrinding of the waste material leaving from the foundry sands and chemical grade circuits and subsequently re-classification, results in the metallurgical grade products (CO6) ▪ Plant for the reclamation of 12 year old tailings dam.
Waste rock dumps	Dumping of waste rock.

Infrastructure	Associated Activities
Stockpiles: ▪ ROM ▪ Lumpy Ore ▪ Crusher Fines ▪ HMS Fines ▪ CO1 ▪ CO4 ▪ CO6	Stockpiling of material before use or transport (Bunded).
Tailings dams	Tailings material from processing is pumped by pipeline to the tailings dam. Tailings deposition. Waste management facility.
Transport infrastructure ▪ Conveyor belt ▪ Roads	▪ Load-Haul-Dump vehicles transport broken ore to the nearest conveyor belt loading point. ▪ Ore is then transported to a central point on surface by a network of conveyor systems, with a total length of more than 18 km, where it is dumped on the run of mine stockpile. ▪ Earthworks. ▪ Transport of material (road to siding for further transport via rail).
Water management facilities ▪ Sewage treatment ▪ Settling ponds ▪ Return water dams ▪ Boreholes	▪ Treatment of sewage generated on the site (hostels, villages, change rooms etc.). Chemicals are used at sewage treatment plant. ▪ Spillages (solids) are picked up and suspended with water to be transferred to the settling ponds. A flocculant is used to produce sludge to be transferred to the tailings dam. A cyclone is used to remove ultra- fine chrome. ▪ Return water dams to manage water from tailings dam and recycle.

Infrastructure	Associated Activities
Support infrastructure ▪ Stores (including magazines) ▪ Workshops ▪ Offices ▪ Power lines ▪ Access roads	▪ Storage of materials, equipment and explosives. ▪ Maintenance. ▪ Administration and management.
Housing	The majority of the mine's employees do not live on the mine property. Lower skilled employees live in a small village.

9.4 Environmental and current land use map

The land use map is shown in Figure 9-2 below.

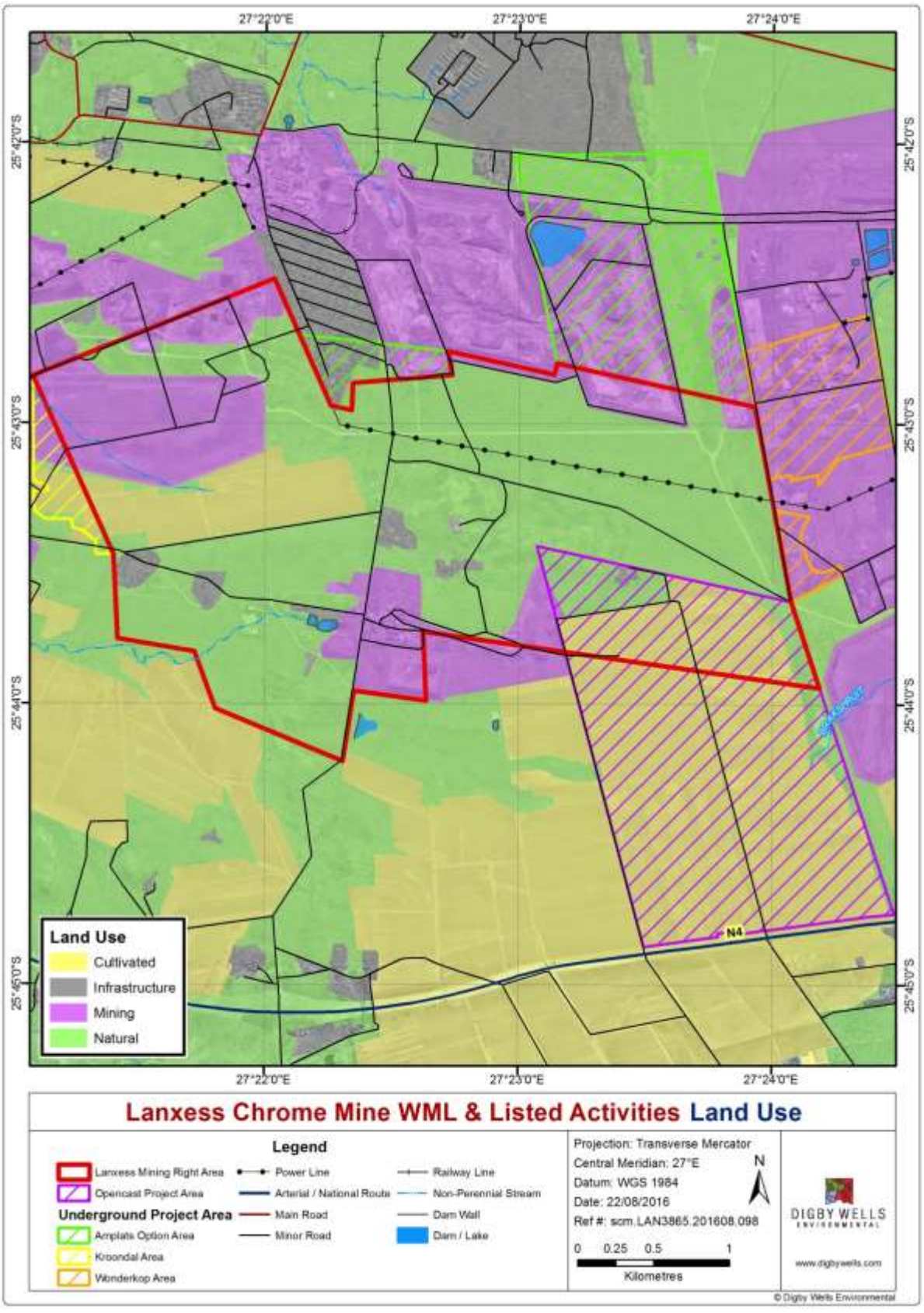


Figure 9-2: Land Use Map

9.5 Item 3(g)(v): Impacts and risks identified including the nature, significance, consequence, extent, duration and probability

To interpret the impact ratings below, the methodology used to assess impacts is described below.

9.5.1 Impact Assessment Methodology

To clarify the purpose and limitations of the impact assessment methodology, it is necessary to address the issue of subjectivity in the assessment of the significance of environmental impacts. Even though Digby Wells, and the majority of environmental impact assessment practitioners, propose a numerical methodology for impact assessments, one has to accept that the process of environmental significance determination is inherently subjective.

The weight assigned to each factor of a potential impact, and also the design of the rating process itself, is based on the values and perception of risk of members of the assessment team, as well as that of the I&AP's and authorities who provide input into the process. Whereas the determination of the spatial scale and the duration of impacts are to some extent amenable to scientific enquiry, the severity value assigned to impacts is highly dependent on the perceptions and values of all involved.

Therefore it is crucial that all EIAs make reference to the environmental and socio-economic context of the proposed activity to reach an acceptable rating of the significance of impacts. Similarly, the perception of the probability of an impact occurring is dependent on perceptions, aversion to risk and availability of information.

It has to be stressed that the purpose of the EIA process is not to provide an incontrovertible rating of the significance of various aspects, but rather to provide a structured, traceable and defendable methodology of rating the relative significance of impacts in a specific context. The methodology employed for the environmental impact assessment is divided into two distinct phases, namely, impact identification and impact rating.

9.5.2 Impact Rating

The impact assessment methodology utilised during the EIA Phase for the Project consists of two phases namely impact identification and impact significance rating.

Impacts and risks have been identified based on a description of the activities to be undertaken. Once impacts were identified, a numerical environmental significance rating process was undertaken that utilises the probability of an event occurring and the severity of the impact as factors to determine the significance of a particular environmental risk.

The severity of an impact is determined by taking the spatial extent, the duration and the severity of the impacts into consideration. The probability of an impact is then determined by the frequency at which the activity takes place or is likely to take place and by how often the type of impact in question has taken place in similar circumstances.

Following the identification and significance ratings of potential impacts, mitigation and management measures were incorporated into the EMP.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 9-4. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this EIA/EMP Report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 9-3, which is extracted from Table 9-2. The description of the significance ratings is discussed in Table 9-4.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 9-2: Impact Assessment Parameter Ratings

Rating	Intensity/Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	Province/ Region Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures / items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	Municipal Area Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.

Rating	Intensity/Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare / improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely / None: Expected never to happen. <1% probability.

Table 9-3: Probability/Consequence Matrix

Probability	Significance																																						
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Consequence																																						

Table 9-4: Significance Rating Description[4]

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

[4] It is generally sufficient to only monitor impacts that are rated as negligible or minor

9.5.3 Potential Impacts on Air Quality (Please refer to detailed report in Appendix 5)

9.5.3.1 Operational Phase

Activity/Impact	Crushing and screening				
Criteria	**Details / Discussion**				
Description of impact	During this stage, the ore from the proposed open pit (as well as the current underground operations) will be crushed to reduce the size. The dust generated encompasses TSP, PM_{10} and $PM_{2.5}$ (which may impact the human respiratory system due to the depth of penetration and the resultant interaction with human tissues).				
Mitigation required	To mitigate the impacts, the crusher should be enclosed to control the dust that is generated in the process. The application of water sprayers also helps to suppress generated dust thus reducing the impact.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	4	6	72
Post-Mitigation	2	5	3	5	50

Activity/Impact	Dumping of waste rock
Criteria	**Details / Discussion**
Description of impact	During this stage, waste rock brought to the surface and those from the open pit process is loaded onto 30 tonne tipper trucks and offloaded at the waste rock dumps. The loading and offloading process results in dust generated comprises TSP, PM_{10} and $PM_{2.5}$ (this fraction is causing health problem in the human respiratory system due to the depth of penetration and the resultant interaction with human tissues).

Activity/Impact	Dumping of waste rock				
Criteria	**Details / Discussion**				
Mitigation required	To mitigate the impacts of the loading and dumping process, the drop height when offloading must be lowered.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	4	6	66
Post-Mitigation	2	5	3	5	50

Activity/Impact	Stockpiling material				
Criteria	**Details / Discussion**				
Description of impact	Materials i.e. ROM, lumpy ore, crusher fines, HMS fines and stockpiles CO1, CO4 and CO6 are stored at their respective stockpiles. The various stockpiles thus represent sources of dust, with the subsequent erosion of dust that comprises TSP, PM_{10} and $PM_{2.5}$.				
Mitigation required	To mitigate the impacts of the stockpiling, water sprays on the stockpiles need to be utilised, use of wind breaks can be implemented near the respective stockpiles as these reduce anticipated dust impacts by 30%.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	3	5	55
Post-Mitigation	2	5	3	4	40

Activity/Impact	Transporting material				
Criteria	**Details / Discussion**				
Description of impact	This focuses on the use haul roads and the conveyance of chrome using conveyor belts. During this stage, materials are transported to the various stockpile using 3 tonne tipper trucks, which leads to the generation of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$.				
Mitigation required	To mitigate the impacts, vehicle speeds must be reduced that will, in turn, reduce emissions into the atmosphere. Water sprays on the road should be used frequently, keeping the road moist. Dust suppressants such as Dust-a-side can be applied on the haul roads. The construction of speed humps and enforcement of speed limits will also reduce the generation of dust.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	5	6	78
Post-Mitigation	2	5	3	6	60

9.5.3.2 Decommissioning Phase

Activity/Impact	Decommissioning
Criteria	**Details / Discussion**
Description of impact	This activity entails the removal of buildings and foundations and rehabilitation of the voids and spreading of sub soil and topsoil. The reshaping and restructuring of the landscape though spreading of subsoil and topsoil will generate dust as soil is being transferred from one location to another. There is movement and transfer of soil to rehabilitate the void.
Mitigation required	Spreading of soil must be performed on less windy days. The bare soil will be prone to erosion there is need to introduce surface vegetation cover to check erosion. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces

Activity/Impact	Decommissioning				
Criteria	**Details / Discussion**				
	the dust levels. Additional mitigation measures include keeping the soil moist using sprays or water tanks, using wind breaks. The best time to re-vegetate the area must be linked to the distribution and reliability of the rainfall.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	2	4	6	54
Post-Mitigation	3	2	3	5	40

9.5.4 Potential Impacts on Fauna and Flora (Please refer to detailed report in Appendix 6)

9.5.4.1 Construction Phase

Activity/Impact	Site clearance and topsoil removal prior to the commencement of physical construction activities across the open pit area
Criteria	**Details / Discussion**
Description of impact	The almost complete degradation of natural vegetation and habitat for animal life has already taken place within the general environment due to current land use practices specifically agricultural. No natural vegetation remains within the project area, therefore none will be impacted on, except for the eastern edge of the open pit that will impact on medium high sensitivity Bushveld. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.
Mitigation required	The following mitigation measures are recommended: ■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the disturbed area to the minimum and within designated areas only. Re-vegetate open areas to limit erosion.

Activity/Impact	Site clearance and topsoil removal prior to the commencement of physical construction activities across the open pit area				
Criteria	**Details / Discussion**				
	■ Avoid sensitive landscapes such as the *Koppies* that were encountered on site and have been excluded from the mining footprint ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	3	4	40
Post-Mitigation	1	5	3	4	36

Activity/Impact	The construction of waste rock dumps
Criteria	**Details / Discussion**
Description of impact	No natural vegetation remains within the waste rock dump area, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.
Mitigation required	The following mitigation measures are recommended:

Activity/Impact	The construction of waste rock dumps				
Criteria	**Details / Discussion**				
	■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the rock dump within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	2	4	36
Post-Mitigation	1	5	2	4	32

Activity/Impact	The construction of topsoil stockpiles
Criteria	**Details / Discussion**
Description of impact	No natural vegetation remains within the topsoil stockpiles area, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.
Mitigation required	The following mitigation measures are recommended:

Activity/Impact	The construction of topsoil stockpiles				
Criteria	**Details / Discussion**				
	■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	2	6	54
Post-Mitigation	1	5	1	6	42

Activity/Impact	The establishment of the initial boxcut and access ramps to the open pit mining areas
Criteria	**Details / Discussion**
Description of impact	No natural vegetation remains within the initial boxcut area, therefore none will be impacted on. The agricultural fields have a low sensitivity rating. The impact will be site specific in extent. The severity of the impact was determined to be low.
Mitigation required	The following mitigation measures are recommended: ■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the initial

Activity/Impact	The establishment of the initial boxcut and access ramps to the open pit mining areas				
Criteria	**Details / Discussion**				
	boxcut within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	2	4	36
Post-Mitigation	1	5	2	4	32

Activity/Impact	The construction of haul roads on site
Criteria	**Details / Discussion**
Description of impact	No natural vegetation remains within the haul roads locations, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.
Mitigation required	The following mitigation measures are recommended:

Activity/Impact	The construction of haul roads on site				
Criteria	**Details / Discussion**				
	■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the haul roads within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	2	4	36
Post-Mitigation	1	5	2	4	32

Activity/Impact	The construction of the access or service road
Criteria	**Details / Discussion**
Description of impact	No natural vegetation remains within the access or service road locations, therefore none will be impacted on. The agricultural fields have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.

Activity/Impact	The construction of the access or service road				
Criteria	**Details / Discussion**				
Mitigation required	The following mitigation measures are recommended: ■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the access and service roads within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	2	6	54
Post-Mitigation	1	5	1	6	42

Activity/Impact	The construction of the hard park area
Criteria	**Details / Discussion**
Description of impact	No natural vegetation remains within the hard park area location, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.

Activity/Impact	The construction of the hard park area				
Criteria	**Details / Discussion**				
Mitigation required	The following mitigation measures are recommended: ■ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the hard park area within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ■ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ■ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	2	6	54
Post-Mitigation	1	5	1	6	42

9.5.4.2 Operational Phase

Activity/Impact	Vehicular activity on haul roads, use of hall roads
Criteria	**Details / Discussion**
Description of impact	Vehicular activity could impact on fauna species in terms of road deaths; signs of road deaths were evident during field work.

Activity/Impact	Vehicular activity on haul roads, use of hall roads				
Criteria	**Details / Discussion**				
	Furthermore, the vehicular activity will result in the creation of soil based dust which will increase the deposits these materials on plant leaves, blocking stomata and inhibiting evapotranspiration. Natural dust will be created from use of the haul road and ash dust will be created during transport by haul trucks. This will impact on the vegetation health and availability as food items as well as inhibit the ability of the plants units to provide ecological services.				
Mitigation required	The following mitigation measures are recommended: ■ Prevent excess dust creation that could inhibit plant growth by wetting of the haul roads to suppress dust creation as well as cover haul trucks to prevent dust emissions during transport. ■ To avoid animal deaths specific speed limits must be adhered to by all mining vehicles.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	3	5	50
Post-Mitigation	1	5	2	5	40

Activity/Impact	Concurrent replacement of overburden and topsoil and the re-vegetation of mined out strips
Criteria	**Details / Discussion**
Description of impact	This may be considered to be a positive impact if implemented properly over time. The replacement of overburden and topsoil throughout the concurrent rehabilitation during the operational phase may result in the reduction of available space for alien invasive species, soil erosion and soil compaction, associated with topsoil storage areas. This activity will create favourable habitat for

Activity/Impact	Concurrent replacement of overburden and topsoil and the re-vegetation of mined out strips				
Criteria	**Details / Discussion**				
	indigenous plant species, and promote rehabilitation efforts, if completed correctly.				
Mitigation required	The following mitigation measures are recommended: ■ Reduce areas available for alien infestation by restoring disturbed areas to natural habitat. ■ Implementation of an alien invasive management program is imperative to reduce the risk of these plant species infesting the mine area.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Enhancement	1	2	2	2	10
Post-Enhancement	4	5	4	4	39

9.5.4.3 Decommissioning Phase

Activity/Impact	Removal of infrastructure
Criteria	**Details / Discussion**
Description of impact	Of concern here is the creation of favourable habitat for fast growing invasive species and ground compaction. Also of concern are the possible spillages from infrastructure holding hazardous material. The demolition of infrastructure may require vehicles making use of non-designated areas, special care must be taken not to destroy rehabilitated areas.
Mitigation required	The following mitigation measures are recommended:

Activity/Impact	Removal of infrastructure				
Criteria	**Details / Discussion**				
	■ Avoid spillage of hazardous materials, thereby protecting vegetation and soil. The correct and careful handling of the infrastructure housing pollutants and toxicants to prevent spillages and leaks. ■ Avoid destruction of vegetation, the creation of favourable habitat for fast growing invasive plants and ground compaction, by forcing vehicles to make use of existing roads and designated areas. Avoid rehabilitated and natural habitat areas as far as possible. ■ The implemented alien invasive control program must be adhered to carefully.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	2	4	4	32
Post-Mitigation	2	2	3	4	28

Activity/Impact	Final replacement of overburden and topsoil and the establishment of vegetation on the final open cast void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will placed and the area vegetated
Criteria	**Details / Discussion**
Description of impact	This may be considered to be a positive impact if implemented properly, and managed over time. The replacement of overburden and topsoil throughout the life of mine as well as the final replacement during the decommissioning phase may result in the restoration of the natural vegetation.

Activity/Impact	Final replacement of overburden and topsoil and the establishment of vegetation on the final open cast void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will placed and the area vegetated				
Criteria	**Details / Discussion**				
Mitigation required	The following mitigation measures are recommended: ■ The footprint of the area disturbed by the mining operation will have topsoil and overburden replaced to restore the vegetation cover, through proper rehabilitation. ■ Limit the erosion potential of exposed areas by re-vegetation. ■ Re-vegetated areas will form seepage areas which will help aid infiltration.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Enhancement	1	1	2	2	8
Post-Enhancement	4	5	4	5	65

9.5.4.4 Closure/Post Closure Phase

Activity/Impact	Post-closure monitoring and rehabilitation
Criteria	**Details / Discussion**
Description of impact	This activity will commence only after closure has taken place, furthermore this activity will be on-going after operations in the area has stopped.
Mitigation required	The following mitigation measures are recommended:

Activity/Impact	Post-closure monitoring and rehabilitation				
Criteria	**Details / Discussion**				
	■ Direct rehabilitation efforts by ensuring correct measures are employed for a variety of rehabilitation projects. ■ Avoid erosion, alien invasive species establishment, by monitoring rehab outcome to ensure open areas are eliminated.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Enhancement	1	1	2	2	8
Post-Enhancement	4	5	4	5	65

9.5.5 Potential Impacts on Surface Water (Please refer to detailed report in Appendix 7)

9.5.5.1 Construction Phase

Activity/Impact	Impacts on surface water during construction phase
Criteria	**Details / Discussion**
Description of impact	The following impacts are anticipated: ■ Increase in turbidity of surface water runoff during construction caused by an increase in runoff from the cleared and stripped areas or from topsoil stockpiles; and ■ Impacts on surface water quality as a result of accidental spillages of hazardous substances (hydrocarbons) from construction vehicles used during site clearing and grubbing.
Mitigation required	The following mitigation measures are recommended:

Activity/Impact	Impacts on surface water during construction phase				
Criteria	**Details / Discussion**				
	■ Clearing of vegetation should be limited to the project site, and the use of existing access roads should be prioritized so as to limit the construction of new access roads in these areas; ■ The construction phase should be limited to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing and grubbing; ■ The removed topsoil should be covered or vegetated as soon as possible to prevent sediment erosion; ■ Haul roads need to be well compacted to avoid erosion of the soil into the stream.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	2	4	9	54
Post-Mitigation	2	2	3	7	28

9.5.5.2 Operational Phase

Activity/Impact	Impacts on surface water during operational phase
Criteria	**Details / Discussion**
Description of impact	The following impacts are anticipated: ■ Unconfined stormwater runoff from dirty water areas in the mine have the potential to contaminate the natural water resources; ■ Divert clean water runoff upstream of the mine and associated water area. Water upstream of the mine area is considered

Activity/Impact	Impacts on surface water during operational phase
Criteria	**Details / Discussion**
	clean and will have to be separated from the dirty water area. ■ Blasting during the operational phase will release ammonium nitrates from the explosive residues. This chemical will contaminate the water in the pit and may potentially contaminate the streams if water is discharged into the natural environment. Nitrates and ammonia from blasting residues, can lead to eutrophication (nutrient enrichment) of water bodies. They may also be converted into toxic nitrites. Ammonia (NH_3 as opposed to NH_4^+) is highly toxic to fish and many aquatic organisms at even low (µg/l) concentrations; ■ Impacts on surface water quality as a result of mobilized hazardous substances (hydrocarbons) from trucks and machinery during operation of mine; and ■ Inadequate storm water management and soil stabilisation measures in cleared areas could lead to erosion that may result in siltation of nearby watercourses.
Mitigation required	The following mitigation measures are recommended: ■ Dust suppression measures should be implemented to prevent the spread of dust and erosion of loose materials; ■ The topsoil stockpiles should be vegetated as soon as possible to prevent dust, erosion and siltation of the water bodies; ■ The storage facilities for fuel, lubricant and explosives must comprise a hard standing area (paved or concrete surface) and be roofed and bunded. This will prevent mobilisation of leaked hazardous substances. Emergency spillage response plan should in place and accessible to the responsible monitoring team; ■ All the water being pumped from the pit should be stored in the existing pollution control dams (PCD's) for re-use on the mine so as to prevent unnecessary discharge into the environment; ■ Based on Reg 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. Therefore clean water emanating from upstream of the mine must be diverted away and

Activity/Impact	Impacts on surface water during operational phase				
Criteria	**Details / Discussion**				
	discharged to the nearby watercourse or environment; The clean water diversion must be sized to accommodate the 1:50 year storm event. ■ Should the contained water be more than the water use requirement, the BPGs advises that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water; and ■ As the open pit mining progresses, continuous rehabilitation should be implemented by backfilling the voids. This will ensure that the dirty water footprint area is decreased so that the volume of dirty water runoff required to be pumped out of the pit is significantly reduced.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	4	5	60
Post-Mitigation	1	4	3	4	32

9.5.5.3 Decommissioning Phase

Activity/Impact	Impacts on surface water during decommissioning phase
Criteria	**Details / Discussion**
Description of impact	The following impacts are anticipated: ■ Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from trucks and machinery during decommissioning phase could have an impact on the quality of water in the nearby streams; and

Activity/Impact	Impacts on surface water during decommissioning phase				
Criteria	**Details / Discussion**				
	■ Backfilling of open cast voids and re-vegetation of the rehabilitated area will have a positive impact on the quantity of water reporting to the rivers as the natural drainage pattern i.e. runoff, will be restored.				
Mitigation required	The following mitigation measures are recommended: ■ Use of accredited contractors for removal or demolition of infrastructures should be ensured; ■ The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies; ■ Inspection of the rehabilitated areas need to be undertaken to ensure that the surface profile encourages natural drainage, such that no ponding or standing water occurs after a rainfall event. ■ Where rehabilitation (grass seeding of topsoil cover) is not effective, sedimentation should be mitigated by installing silt traps at areas where the surface runoff enters the surface water resources; and ■ Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	4	4	48
Post-Mitigation	2	2	3	3	21

9.5.5.4 Closure/Post Closure Phase

Activity/Impact	Impacts on surface water during closure/post closure phase

Criteria	Details / Discussion				
Description of impact	Decant of poor quality groundwater from the mining areas may have a negative impact on the surrounding surface water resources.				
Mitigation required	Surface water quality monitoring should continue to ensure that there is no impact on the surrounding water resources emanating from the mine area.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	2	4	6	54
Post-Mitigation	2	2	3	4	28

9.5.6 Potential Impacts on the Geohydrology (Please refer to detailed report in Appendix 8)

Based on the results and interpretations for the geochemistry and waste classification, Digby Wells Environmental recommends the following:

- The residue stockpiles be classed as Type 4 waste that needs to be deposited on Class D disposal area and designed according to Class D liner specification;
- Borehole LANBH1, LANBH2, LANBH4 located in close proximity to the proposed location of the Open Cast Mine be incorporated in the current monitoring programme;
- Drilling of additional two boreholes downstream and upstream of the proposed location of the Open cast Mine and the WRD; and
- The current monitoring programme established by Lanxess for the groundwater and surface water monitoring in the vicinity (downstream and upstream) of the proposed stockpile are should carry-on to monitor the chemical (s) of concern.

9.5.6.1 Construction Phase

Activity/Impact	The establishment of the boxcut				
Criteria	**Details / Discussion**				
Description of impact	The establishment of the boxcut requires blasting which may negatively affect the groundwater quality if significant amounts of explosive are spilled or incompletely detonated.				
Mitigation required	Impacts from mine dewatering during the construction phase are unlikely. The following mitigation and management measures are proposed to keep the impact to a minimum if it occurs: ■ Undertake groundwater intrusive investigation around the access ramp to optimise the position of the ramp and associated infrastructure to avoid major water bearing features; ■ Handle and store blasting material according to manufacturing requirements; ■ Establish the depth to groundwater table prior to construction; ■ Grout or pump out any significant inflow of groundwater during ramp construction to ensure a dry and safe working environment; ■ Depending on the quality of the groundwater, discharge, store or recycle as appropriate; and ■ Monitor quality of mine water.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	3	3	3	24
Post-Mitigation	1	2	2	2	18

9.5.6.2 Construction Phase – Open Pit Mining

Activity/Impact	Mine dewatering				
Criteria	**Details / Discussion**				
Description of impact	Excavation of the proposed pit will change the topography. As a result groundwater from both catchments will flow towards the pit centre in response to hydraulic gradient.				
Mitigation required	Although the impacts due to mine dewatering during construction phase are unlikely, the following mitigation and management measures are proposed to keep the impact to a minimum if it occurs; ■ Establish the depth to groundwater table prior to construction; ■ Minimise penetration into the groundwater table; ■ If groundwater table is to be penetrated to significant depth, dewater aquifer prior to excavations; ■ Depending on the quality of the groundwater, discharge, store or recycle as appropriate; and ■ Obtain permission from regulating authority.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	3	3	3	24
Post-Mitigation	1	3	2	2	18

Activity/Impact	Mine water contamination
Criteria	**Details / Discussion**

Activity/Impact	Mine water contamination				
Criteria	**Details / Discussion**				
Description of impact	Site clearing and removal of topsoil may lead to puddles of surface water in the cleared areas during the wet season and potentially lead to increased infiltration to the weathered aquifers. Oil or fuel spillages from site machinery may collect in the soils. During rainfall events, hydrocarbon compounds from oil and fuel in the soils may migrate to the aquifers with water infiltrating through these polluted areas.				
Mitigation required	The following mitigation measures are recommended: ■ Implement and train drivers to adhere to traffic rules; ■ Implement a vehicle maintenance schedule; ■ Install oil collection pans under vehicles; ■ Handle and store blasting material according to manufacturing requirements; ■ Minimise external contamination sources in the pit (diesel, oils, chemicals) as far as possible to ensure that groundwater flowing into the mine is contaminated; and ■ Monitor quality of mine water.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	3	3	3	24
Post-Mitigation	1	3	2	2	20

9.5.6.3 Operational Phase – Open Pit Mining

Activity/Impact	Mine dewatering				
Criteria	**Details / Discussion**				
Description of impact	The predicted inflow rates range between 1 027 and 1 684 m^3/d. When groundwater flows towards the pit (during mining) it inevitably dewaters and lowers the groundwater levels in the surrounding area. As the pits develop, the zone of influence of the groundwater level drawdown migrates and expands as the groundwater system attempts to retain a state of equilibrium.				
Mitigation required	The following mitigation measures are recommended: ■ Minimise groundwater influx into pit through optimisation of mining layout to minimise structural disturbance; ■ Dewater aquifer prior to further excavations. Dewatering is more effective when operated very closely to the active mining face; ■ Manage groundwater abstraction rates and volumes in accordance with borehole sustainable yields; ■ Perform monitored groundwater abstractions to ensure that the aquifer from which water is abstracted is not over-exploited; ■ Pump excess pit water to appropriate surface storage facility according to water quality. When required by the process plant the abstracted water can be discharged into the return water dam; ■ Reuse water as far as possible. An off-take can be installed from the reservoir to the vehicle maintenance bay for use in dust suppression activities and general usage at the bay. However, for dust suppression it is good practice to first use “marginal” mine water before using pristine groundwater; and ■ Monitor water influx, water stored, water removed; water level in the pit and groundwater levels in the perimeter of the pit.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	2	5	3	3	30

Activity/Impact	Mine dewatering				
Criteria	**Details / Discussion**				
Post-Mitigation	1	5	2	2	22

Activity/Impact	Mine water contamination				
Criteria	**Details / Discussion**				
Description of impact	Any seepage emanating from the adjacent waste rock dump will eventually join the underlying saturated zone and migrate towards the pit due to hydraulic gradient.				
Mitigation required	The following mitigation measures are recommended: ■ At least Class D liner / barrier is recommended for the waste rock dump as well as sufficient surface water management infrastructure; ■ The mine water management measures recommended during construction phase should continue during the operational phase; ■ It is recommended that abstraction from boreholes that are close to the mine workings should be avoided so that contaminants will not migrate away from the mine, towards the abstraction boreholes; ■ Divert surface flows from the waste rock dump to a PCD to prevent seepage; ■ Monitoring of groundwater quality and water levels is recommended (particularly down gradient of the mine site) with continuous refining and updating of the monitoring network based on the results obtained; ■ Annual audits of monitoring and management systems should be conducted by independent environmental consultants; and ■ With the application of the above-stated mitigation plans, the impact of the contaminant migration during construction of the waste rock dump can be lowered to Negligible.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	5	4	40

Activity/Impact	Mine water contamination				
Criteria	**Details / Discussion**				
Post-Mitigation	2	5	3	3	30

9.5.6.4 Closure/Post Closure Phase – Open Pit Mining

Activity/Impact	Mine decant				
Criteria	**Details / Discussion**				
Description of impact	After the operational phase the pit will be left open. The groundwater table will rise again to its pre-mining position and water will accumulate in the pits due to cessation of dewatering. A pit lake will develop. Groundwater flow will be directed to towards the pit lake as evaporation from the pit water causes it to act as a groundwater sink. In addition to precipitation, surface water runoff from the surrounding area will flow to the pit and add to the rise of the pit lakes.				
Mitigation required	The following mitigation measures are recommended: ■ Monitor pit water level rise and apply stage curves to assess the rate of flooding; ■ Seal mine shafts to prevent surface water from flowing into the defunct underground voids; ■ Monitor groundwater level elevation in boreholes in the surrounding aquifer to assess groundwater table responses; and ■ Groundwater monitoring should continue up to 5 years after closure.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	6	5	2	30

Activity/Impact	Mine decant				
Criteria	**Details / Discussion**				
Post-Mitigation	2	6	4	1	24

Activity/Impact	Mine water contamination				
Criteria	**Details / Discussion**				
Description of impact	The final open pit, the waste dumps and old underground workings will be the major contamination sources in the post closure environment. The quality of groundwater in the post-closure environment will depend on background groundwater quality, the quality and quantity of surface water flowing into the pit and the geochemical processes that occur on the walls of the pit, above and below the pit lake.				
Mitigation required	The following mitigation measures are recommended: ■ No abstraction boreholes should be drilled in 2.5 km radius from the pit in the post closure environment; ■ Perform effective rehabilitation and closure of redundant facilities through material placing and shaping, capping with appropriate capping liners and revegetation to prevent post closure infiltration through sources; and ■ Consider groundwater plume remediation only if post closure monitoring indicates a persistent pollution plume at unacceptable concentrations.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	6	5	4	56

Activity/Impact	Mine water contamination				
Criteria	**Details / Discussion**				
Post-Mitigation	2	6	3	3	33

9.5.7 Potential Impacts on Soils, Land Capability and Land Use (Please refer to detailed report in Appendix 9)

9.5.7.1 Construction Phase

Activity/Impact	Loss of topsoil as a resource – open pit
Criteria	**Details / Discussion**
Description of impact	When vegetation is cleared and the topsoil is stripped, the soils natural structure is disturbed and as a result the natural cycle is broken exposing the bare soil to erosion. Construction vehicles driving on these soils cause compaction reduces the soils ability to be penetrated by root growth. Compaction also increases erosion potential. When soils are not stripped and stockpiled according to the soil stripping guidelines these soils would have lost their natural physical and chemical properties, reducing the topsoil's ability to be a plant growth medium. The above factors all contribute to a loss of the topsoil's ability to be a resource through alterations and removal.
Mitigation required	■ The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; ■ Stockpiles are to be kept to a maximum height of 4m (the practical tipping height of dump trucks); ■ Topsoil is to be stripped when the soil is dry, as to reduce compaction; ■ The topsoil 0.3 m of the soil profile should be stripped first and stockpiled separately;

Activity/Impact	Loss of topsoil as a resource – open pit				
Criteria	**Details / Discussion**				
	■ The subsoil approximately 0.7 – 0.9 m thick will then be stripped and stockpiled separately; ■ Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly; ■ Foundation excavated soil should also be stockpiled; ■ Stockpiles are to be maintained in a fertile and erosion free state by sampling and analysing annually for macro nutrients and pH; ■ The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; ■ Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; ■ Prevent unauthorised borrowing of stockpiled soil; ■ The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ■ Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.3 m) then subsoil separately; and ■ Access should be limited to prevent any unnecessary compaction from occurring.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	5	7	91
Post-Mitigation	2	5	3	3	30

Activity/Impact	Loss of land capability				
Criteria	**Details / Discussion**				
Description of impact	Removal of soil layers will impact on the land capability because vegetation can no longer be supported.				
Mitigation required	■ No land capability mitigation is possible during the construction and operational phases because the land use is changed from agriculture to open pit; and ■ Mitigation of land capability post mining is required through legislation through land rehabilitation.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significant rating*
Pre-Mitigation	1	5	6	7	84
Post-Mitigation	1	5	5	6	66

9.5.7.2 Operational Phase

Activity/Impact	Loss of stockpiled topsoil as a resource
Criteria	**Details / Discussion**
Description of impact	Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles where steep slopes are present.
Mitigation required	■ Stockpiles are to be maintained in a fertile, vegetated, and erosion free state; ■ Stockpiles are to be clearly demarcated; ■ Ensure proper storm water management designs are in place; ■ Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring;

Activity/Impact	Loss of stockpiled topsoil as a resource				
Criteria	**Details / Discussion**				
	■ If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; and ■ Unauthorised borrowing of stockpiled soil materials should be prevented.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	3	5	5	7	91
Post-Mitigation	2	5	3	3	30

Activity/Impact	Hydrocarbon pollution				
Criteria	**Details / Discussion**				
Description of impact	Hydrocarbon spills can impact soil quality.				
Mitigation required	■ Prevent any spills from occurring; ■ If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; ■ All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and ■ Leaking vehicles will have drip trays place under them where the leak is occurring.				
Parameters	*Spatial*	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	1	7	7	6	90
Post-Mitigation	1	1	7	5	45

Activity/Impact	Loss of land use and land capability
Criteria	**Details / Discussion**
Description of impact	Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent because vegetation will be supported and therefore returned to the planned post mining land capability such as arable and or grazing.
Mitigation required	■ Mitigation is possible because the land use is changed from mining back to agriculture as follows: ■ The spoil should be shaped taking the pre-mining landscape into consideration; ■ The designed post mining landforms should be modelled to establish the post mining landscape stability by using a combination of GIS and erosion modelling techniques by a suitably qualified expert using site specific soil quality data; ■ The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; ■ The yellow and red soils should be replaced in upland landscape positions; ■ Wetland soils should be put back in the reverse order of stripping; ■ Wetland soils should be placed in lower landscape positions; ■ The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; ■ The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; ■ Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan; and ■ From a national food security viewpoint, ways need to be found of rendering land rehabilitated to arable standards suitable for the economic production of cash crops.

Parameters	Spatial	*Duration*	*Intensity*	*Probability*	*Significance rating*
Pre-Mitigation	1	5	6	7	84
Post-Mitigation	1	5	4	6	60

9.5.8 Potential Visual Impacts (Please refer to detailed report in Appendix 10)

9.5.8.1 Construction Phase

Activity/Impact	The transportation of construction material to the project site via national, provincial and local roads				
Criteria	**Details / Discussion**				
Description of Impact	The transportation of construction material will have a negative visual impact on the receiving environment. Vehicular activity and the resulting dust will draw attention to the project area. These visual impacts are temporary and will only occur during the construction phase.				
Mitigation Required	The following mitigation measures are recommended: ■ Roads should be wetted frequently by means of a water bowser to suppress dust; and ■ Vehicles must be roadworthy and obey the recommended speed limits at all times.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	2	2	4	28
Post-Mitigation	3	2	1	4	24

Activity/Impact	Site clearance and topsoil removal prior to the commencement of physical construction activities across the project area
Criteria	**Details / Discussion**

Description of Impact	The removal of vegetation and topsoil for site clearing will have a negative visual impact on the receiving environment. The project area will become noticeable to the nearby receptors as it will contrast the surrounding areas.				
Mitigation Required	The following mitigation measures are recommended: ■ Vegetation and topsoil should only be removed when and where necessary; and ■ Topsoil stockpiles should be vegetated.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	3	6	66
Post-Mitigation	3	5	3	5	55
Activity/Impact	The construction of waste rock dumps				
Criteria	**Details / Discussion**				
Description of Impact	Stockpiling waste rock will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.				

Mitigation Required	The following mitigation measures are recommended: ■ Overburden should only be removed when and where necessary; ■ Reduce the height of overburden stockpiles where possible; ■ Limit the height and footprint area of overburden stockpiles where possible; ■ Apply dust suppression techniques to limit the dust from stockpiles; and ■ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	3	6	66
Post-Mitigation	3	5	3	5	55

Activity/Impact	The construction of topsoil stockpiles
Criteria	**Details / Discussion**
Description of Impact	Stockpiling topsoil will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.

Mitigation Required	The following mitigation measures are recommended: ■ Topsoil should only be removed when and where necessary; ■ Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; ■ Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; ■ Limit the height and footprint area of topsoil stockpiles where possible; ■ Apply dust suppression techniques to limit the dust from stockpiles; and ■ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles.

Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	3	6	66
Post-Mitigation	3	5	3	5	55

Activity/Impact	The establishment of the initial boxcut and access ramps to the open-pit mining areas
Criteria	**Details / Discussion**
Description of Impact	The establishment of the initial boxcut and access ramps to the open pit mining areas will have a negative visual impact on the receiving environment. Drilling and blasting to develop the initial boxcut for mining will result in noise and dust thereby attracting attention to the project area. The boxcut will dramatically contrast the surrounding agricultural area. This will leave a scar on the landscape. Dust from the blasting will also have a negative visual impact. This visual impact will occur for the life of the project.

Mitigation Required	The following mitigation measures are recommended: ■ Only remove overburden when and where necessary; and ■ Apply dust suppression techniques to limit the dust created by blasting.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	4	7	84
Post-Mitigation	3	5	4	6	72

Activity/Impact	The construction of haul roads on site				
Criteria	**Details / Discussion**				
Description of Impact	The construction of haul roads will have a negative visual impact on the receiving environment.				
Mitigation Required	Do not create numerous haul roads alongside each other.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	2	3	2	4	28
Post-Mitigation	2	3	1	4	24

Activity/Impact	The construction of the access or service road				
Criteria	**Details / Discussion**				
Description of Impact	The construction of the access or service road will have a negative visual impact on the receiving environment.				
Mitigation Required	Do not create numerous roads alongside each other.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	1	3	1	4	20
Post-Mitigation	1	3	1	3	15

Activity/Impact	The construction of the hard park area (this is made up of the workshop, office block and parking lot)
Criteria	**Details / Discussion**
Description of Impact	The construction of hard park area will have a negative visual impact on the receiving environment. This hard park area includes the workshop, office block and parking lot. These visual impacts will occur for the life of the project. Construction area lighting at night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place. The visual impacts from the construction area lighting will occur during the construction phase.

Mitigation Required	The following mitigation measures are recommended: ■ Limit the height and footprint area of surface infrastructure where possible; ■ If the surface infrastructure is to be painted, it should be painted natural hues so as to blend into the surrounding landscape where possible; ■ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ■ Avoid construction activities at night if possible, thereby avoiding the use of construction area lighting. If construction activities take place at night, down lighting should be implemented to minimise light pollution.

Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	2	3	2	6	42
Post-Mitigation	2	3	2	5	35

9.5.8.2 Operational Phase

Activity/Impact	Drilling and blasting of the overburden rock for removal by excavators and dump trucks
Criteria	**Details / Discussion**
Description of Impact	The removal of overburden by drilling and blasting will have a continual negative visual impact on the receiving environment. Overburden stockpiling will have a negative visual impact on the receiving environment. Dust from the blasting and from stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.

Mitigation Required	The following mitigation measures are recommended: ■ Only remove overburden when and where necessary; ■ Plant fast-growing endemic vegetation in areas where it can conceal stockpiles; ■ Limit the height and footprint area of overburden stockpiles where possible; and ■ Apply dust suppression techniques to limit the dust created by blasting and from the stockpiles.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	4	7	84
Post-Mitigation	3	5	4	6	72

Activity/Impact	Dumping of waste rock and maintenance of waste rock dump
Criteria	**Details / Discussion**
Description of Impact	Operation and maintenance of the waste rock dump will have a negative visual impact on the receiving environment. Dust from the dump will also have a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.

Mitigation Required	The following mitigation measures are recommended: ■ Overburden should only be removed when and where necessary; ■ Limit the height and footprint area of stockpiles where possible; ■ Apply dust suppression techniques to limit the dust from stockpiles; ■ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; and ■ Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	3	6	66
Post-Mitigation	3	5	3	5	55

Activity/Impact	Removal and loading of ore onto trucks (O/C) or conveyor (U/G) to the plant
Criteria	**Details / Discussion**
Description of Impact	The removal of ore will have a continual negative visual impact on the receiving environment. Infrastructure and mine area lighting will be visible at night resulting in a negative visual impact on the receiving environment. This visual impact will occur for the life of the project.

Mitigation Required	The following mitigation measures are recommended: ■ Limit the quantity and time of ROM stored on site; and ■ Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	4	7	84
Post-Mitigation	3	5	4	6	72

Activity/Impact	Vehicle movement on haul roads				
Criteria	**Details / Discussion**				
Description of Impact	Vehicular activity on the haul roads and access or service road will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact. These visual impacts will occur for the life of the project.				
Mitigation Required	The following mitigation measures are recommended: ■ Do not create numerous haul roads alongside each other; ■ Roads should be wetted frequently by means of a water bowser to suppress dust; and ■ Vehicles must be roadworthy and obey the recommended speed limits at all times.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*

Pre-Mitigation	2	5	2	4	36
Post-Mitigation	2	5	1	4	32

Activity/Impact	Continuing operation and maintenance of the stockpiles, including topsoil and ROM stockpiles
Criteria	**Details / Discussion**
Description of Impact	Operation and maintenance of the topsoil and ROM stockpiles will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.

Mitigation Required	The following mitigation measures are recommended: ■ Topsoil should only be removed when and where necessary; ■ Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; ■ Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; ■ Limit the height and footprint area of stockpiles where possible; ■ Apply dust suppression techniques to limit the dust from stockpiles; ■ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; ■ Limit the quantity and time of ROM stored on site; and ■ Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.

Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	3	6	66
Post-Mitigation	3	5	3	5	55

Activity/Impact	Concurrent replacement of overburden and topsoil and the re-vegetation of mined out strips. The mined strip will be backfilled with overburden and compacted. Subsequently, the topsoil will be placed on top of the overburden and the area will be vegetated
Criteria	**Details / Discussion**
Description of Impact	Concurrent rehabilitation by replacement of overburden and topsoil as well as re-vegetation as mining progresses will have a

	neutral visual impact on the receiving environment. The aim of rehabilitation is to return the project area to a state similar to the pre-mining state. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment. Backfilling of the open pit with overburden will use rock removed from the void of the current mining strip to partly fill the mined out void in the previously mined strip. Once backfilling commences, overburden should no longer be added to the overburden stockpiles. This will have a neutral visual impact on the receiving environment. Spreading of topsoil and re-vegetation of the backfilled areas will have neutral visual impacts on the receiving environment.
Mitigation Required	The following mitigation measures are recommended: ■ Backfill as much of the open pit area as possible; ■ Spread topsoil over the backfilled area; and ■ Re-vegetate the backfilled area.

Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	4	7	84
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

9.5.8.3 Decommissioning Phase

Activity/Impact	Removal of surface infrastructure (plant machinery and conveyors)
Criteria	**Details / Discussion**
Description of Impact	Demolition and removal of infrastructure will have a neutral visual impact on the receiving environment. This will help to reverse some of the changes that occurred when the infrastructure was constructed.

Mitigation Required	Ensure that all unnecessary infrastructure is demolished and removed from the site.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	2	3	2	6	42
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

Activity/Impact	Rehabilitation of roads and cleared areas (offices and workshop area)				
Criteria	**Details / Discussion**				
Description of Impact	Rehabilitation of the roads and cleared areas by replacement of topsoil will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state. Spreading of topsoil, and profiling and contouring to create a free-draining topography will have a neutral visual impact. Re-vegetation of the rehabilitated areas will have a neutral visual impact. These visual impacts will be permanent. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.				
Mitigation Required	The following mitigation measures are recommended: ■ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ■ Spread topsoil over the rehabilitated area; ■ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; and ■ Re-vegetate the rehabilitated areas.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	2	3	2	4	28
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

Activity/Impact	Final placement of overburden and topsoil and the establishment of vegetation on the final opencast void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will be placed and the area vegetated

Criteria	Details / Discussion				
Description of Impact	Rehabilitation of the final open void (where possible) by replacement of overburden and topsoil will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state. Once ore has been removed from the open pit, there will be insufficient overburden to fill the void completely. Due to this material imbalance, a permanent void will remain. Spreading of topsoil, and profiling and contouring to create a free-draining topography will have a neutral visual impact. Re-vegetation of the rehabilitated areas will have a neutral visual impact. These visual impacts will be permanent. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.				
Mitigation Required	The following mitigation measures are recommended: ■ Backfill as much of the final void as possible; ■ Ensure that the final void is as small as practically possible; ■ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ■ Spread topsoil over the rehabilitated area; ■ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; and ■ Re-vegetate the rehabilitated areas.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	4	7	84
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

9.5.8.4 Closure/Post Closure Phase

Activity/Impact	Post-closure monitoring and rehabilitation will determine the level of success of the rehabilitation, as well as to identify any additional measures that have to be undertaken to ensure that the mining area is restored to an adequate state. Monitoring will include surface water, groundwater, soil fertility and erosion, natural vegetation and alien invasive species and dust generation from the discard dumps				
Criteria	**Details / Discussion**				
Description of Impact	Post-closure monitoring and rehabilitation is essential to limit the impact of the proposed Lanxess Chrome Mine Expansion Project on the receiving environment. This is a neutral impact that will help to reverse some of the negative impacts.				
Mitigation Required	The following mitigation measures are recommended: ■ Ensure that all disturbed areas are rehabilitated to a state as close as possible to the pre-mining state; and ■ Carefully monitor the rehabilitated areas to ensure that rehabilitation is successful.				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	3	5	4	7	84
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

9.5.9 Potential Impacts on Ambient Noise Levels (Please refer to detailed report in Appendix 11)

9.5.9.1 Construction Phase

Activity/Impact	Site clearance and construction activities
Criteria	**Details / Discussion**
Description of impact	Mining machinery and vehicles is expected to increase ambient noise levels on site, but according to the dispersion models the

Activity/Impact	Site clearance and construction activities				
Criteria	**Details / Discussion**				
	noise levels are expected to be restricted to site. The negligible impacts are due to the noise not impacting on the surrounding sensitive receptors.				
Mitigation required	The following mitigation measures are recommended: ■ Restricting construction activities to daylight hours where viable; ■ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ■ Switching off equipment when not in use.				
Parameters	*Spatial*	*Duration*	*Severity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	2	3	18
Post-Mitigation	1	2	1	2	8

9.5.9.2 Operational Phase

Activity/Impact	Drilling, blasting and operational activities
Criteria	**Details / Discussion**
Description of impact	Mining machinery and vehicles is expected to increase ambient noise levels on site, but according to the dispersion models the noise levels are expected to be restricted to site. The negligible impacts are due to the noise not impacting on the surrounding sensitive receptors.

Activity/Impact	Drilling, blasting and operational activities				
Criteria	**Details / Discussion**				
Mitigation required	The following mitigation measures are recommended: ■ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ■ Switching off equipment when not in use.				
Parameters	*Spatial*	*Duration*	*Severity*	*Probability*	*Significant rating*
Pre-Mitigation	2	5	2	3	27
Post-Mitigation	1	5	1	2	14

9.5.9.3 Decommissioning Phase

Activity/Impact	Demolition and removal of surface infrastructures and rehabilitation works
Criteria	**Details / Discussion**
Description of impact	Mining machinery and vehicles is expected to increase ambient noise levels on site, but due to the limited activities the noise levels are expected to be restricted to site. The negligible impacts are due to the noise not impacting on the surrounding sensitive receptors.
Mitigation required	The following mitigation measures are recommended: ■ Restricting construction activities to daylight hours where viable; ■ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are

Activity/Impact	Demolition and removal of surface infrastructures and rehabilitation works				
Criteria	**Details / Discussion**				
	effective e.g. installed exhaust mufflers; and ■ Switching off equipment when not in use.				
Parameters	*Spatial*	*Duration*	*Severity*	*Probability*	*Significant rating*
Pre-Mitigation	2	2	2	3	18
Post-Mitigation	1	2	1	2	8

9.5.9.4 Closure/Post Closure Phase

Activity/Impact	All noise causing activities have ceased during this phase				
Criteria	**Details / Discussion**				
Description of Impact	The noise impact during this phase will be neutral due to the expected ambient noise level returning to pre-mining baseline.				
Mitigation Required	None required				
Parameters	*Spatial Scale*	*Duration*	*Intensity*	*Probability*	*Significance Rating*
Pre-Mitigation	1	7	1	7	63
Post-Mitigation	*This is a positive impact with a neutral net benefit.*				

9.6 Item 3(g)(vi): Methodology used in determining and ranking the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks

9.7 Item 3(g)(vii): The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected

No alternatives other than the preferred alternative have been assessed. Therefore this section will outline the positive and negative impacts of the preferred option. The placement of the waste rock dump was determined based on avoiding the sensitive area to the north of the pit. The preferred option for the placement of the waste rock dump is to the south of the pit due to that area being extensively disturbed through agricultural practices.

9.7.1 Positive Impacts

Positive impacts that the proposed activity will have on the receiving environment include:

- Continued employment;
- Continued skills development;
- Continued contribution to GDP;
- Eradication of alien species present in the area where the open pit area is envisaged;
- During rehabilitation, soil monitoring, associated treatment of soil, and re-vegetation of disturbed areas will have a positive impact on soil;
- Increased groundwater quantity will be positive due to groundwater ingress into the workings until the final decant elevations and hydraulic gradients are reached;
- The replacement of overburden and topsoil throughout the life of mine as well as the final replacement during the decommissioning phase may result in the restoration of the natural vegetation; and
- Backfilling of open cast voids and re-vegetation of the rehabilitated area will have a positive impact on the quantity of water reporting to the rivers as natural drainage pattern will be restored.

9.7.2 Negative Impacts

Negative impacts that the proposed activity will have on the receiving environment include:

- The waste rock dump will require a Class D liner / barrier to prevent seepage however it must be noted that the waste classification shows that the waste rock does not present acid generating potential;

- Dust generated by various operational aspects such as crushing and screening, dumping of waste rock and the transport of material encompasses TSP, PM_{10} and $PM_{2.5}$, which may cause respiratory issues;
- The existing vegetation within the proposed area of development will be impacted on as the existing vegetation (mostly agricultural fields) will be removed to facilitate the construction of mine and related infrastructure;
- Vehicular activity could impact on faunal species in terms of road deaths;
- Groundwater contamination and loss of raw water through pit ingress;
- Increase in turbidity of surface water runoff during construction caused by an increase in runoff from the cleared and stripped areas or from topsoil stockpiles which is high in suspended solids;
- Blasting material during operational phases releases ammonium nitrates from the explosive residues. This chemical contaminates the water in the pit and can potentially contaminate the streams if water is discharge into the natural environment;
- Potential loss of topsoil during the removal and stockpiling of soil;
- Potential loss of land capability due to the removal of soil layers; and
- Increased ambient noise levels at surrounding noise sensitive receptors.

9.8 Item 3(g)(viii): The possible mitigation measures that could be applied and the level of risk

9.8.1 Mitigation Measures Relating to Potential Impacts on Air Quality

The fugitive dust from haul roads increases the particulate loading of the atmosphere and at the same time reduces visibility. Effective dust management measures reduce fugitive dust from haul roads. The efficacy of dust suppressant is proven on haul roads. Dust suppressants work by forming a layer over the top of the roads i.e. dust-a-aside. Road construction should have the following properties: resistance to wear, soundness, maximum size, particle shape and gradation.

Reducing speed on haul roads is also an effective way to manage fugitive dust. However, reducing speed may lower the production of mines. Reducing speed reduces the generation of particles less than 10 micro meters by about 58% when speed controls are reduced from 25 mph (40 km/h) to 15 mph (24 km/h). Reducing the volume of traffic on the haul roads reduces the impacts of dust entrainment.

Lastly, when loads are covered by tarps, the loaded material is prevented from being airborne. Entrainment may occur when air flow comes into contact with materials exceeding 21 km/h for small material (0.1 mm), while larger materials require high velocities. Wetting of

the loaded materials can be done to keep the material moist and further reduce the dust generated.

9.8.2 Mitigation Measures Relating to Potential Impacts on Fauna and Flora

9.8.2.1 Avoid Sensitive Habitats

Avoidance of the rocky bushveld areas and *koppies* are strongly recommended. If possible, low sensitivity areas must be favoured for infrastructure placement such as the fallow fields.

9.8.2.2 Rescue and Relocation of Flora

It is recommended that rehabilitation efforts for small areas cleared during construction which will not be utilised for operation commence as soon as the project is initiated both prior and during construction activities.

Collection of indigenous grass, herb and shrub seeds is recommended prior to construction activities.

It is recommended that the rocky bushveld, bushveld areas and *koppies* are set aside as biodiversity corridors and conservation areas (throughout the life of the operation and beyond)

Cattle should be excluded from these areas (or managed correctly within them) and the invasive and problem plant species controlled. Restoration should also occur to restore natural habitat for naturally occurring Species of Special Concern (SCC).

9.8.2.3 Rescue and Relocation of Fauna

Mammal SSC is expected to be capable of moving away from habitat impacted by operational activities to a habitat which is not impacted by current activities. Fences within the Project Area should be taken down to allow for easier movement by species.

Bird SSC are capable of flying away from a habitat impacted by mining activity to a habitat which is not impacted by open pit activities. It is recommended that before and during the construction phase an ecological audit is undertaken to ensure that the breeding sited for birds of special concern are not located within the construction areas. SSC should be avoided where possible. If avoidance is not probable then relocation is obligatory.

The ECO should undertake an inspection prior to construction to ensure that all burrowing animals have moved away from the disturbance and fauna that might be harmed and are unable to move away are relocated.

9.8.3 Mitigation Measures Relating to Potential Impacts on Surface Water Bodies

All the water being pumped from the pit should be diverted into the existing PCD's for re-use on the mine so as to prevent unnecessary discharge into the environment.

Based on Regulation 704 requirements (as per the NWA) regarding storm water management for mining activities, it is noted that all clean and dirty water must be separated. Therefore clean water emanating upstream of the mine must be diverted away and discharged to the nearby watercourse or environment. The clean water diversion must be sized to accommodate the 1:50 year storm event.

Should the contained water be more than the water use requirement, the Best Practice Guidelines advise that water be recycled or, as a last resort, be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as lower-grade water.

9.8.4 Mitigation Measures Relating to Potential Impacts on the Geohydrological Environment

9.8.4.1 Mitigation and Management during Construction Phase

- Handle and store blasting material according to manufacturing requirements;
- Confirm the depth to groundwater table prior to construction;
- Depending on the quality, groundwater should be discharged, stored or recycled as appropriate; and
- Monitor quality of mine water.

9.8.4.2 Mitigation of and Management of Mine Dewatering during Operation Phase

- Dewater very closely to the active mining face;
- Manage groundwater abstraction rates and volumes in accordance with borehole sustainable yields;
- Monitor groundwater abstractions to ensure that the aquifer from which water is abstracted is not over-exploited;
- Pump excess underground water to an appropriate surface storage facility to manage and minimise the water quality impacts;
- Reuse water as far as possible. An off-take can be installed from the reservoir to the vehicle maintenance bay for use in dust suppression activities and general usage at the bay. However, it is good practice to first use marginal mine water or grey water before using pristine groundwater for dust suppression.

9.8.4.3 Mitigation and Management of Mine Water Contamination during Operation Phase

- The mine water management measures recommended during the construction phase should continue during the operational phase;

- It is recommended that abstraction from boreholes that are close to the mine workings should be avoided so that contaminants will not migrate away from the mine, towards the abstraction boreholes;
- Monthly or quarterly monitoring of groundwater qualities and water levels is recommended (particularly down gradient of the mine site) with continuous refining and updating of the monitoring network based on the results obtained;
- Annual audits of monitoring and management systems should be conducted by independent environmental consultants; and
- With the application of the above-stated mitigation plans, the impact of the contaminant migration during construction phase can be lowered to negligible.

9.8.4.4 *Mitigation and Management of Mine Decant during Closure and Post-closure Phase*

- Monitor water level rise and apply stage curves to assess the rate of flooding;
- Seal all boreholes that connects the mine void to surface;
- Monitor groundwater levels in boreholes in the surrounding aquifers to assess groundwater table responses; and
- Groundwater monitoring should continue up to five years after closure.

9.8.4.5 *Mitigation and Management of Mine Water Contamination during Closure and Post-closure Phase*

- No abstraction boreholes should be drilled in a 3 km radius from the open pit and underground workings in the post closure environment;
- Perform effective rehabilitation and closure of redundant facilities through material placing and shaping, capping with appropriate capping liners and re-vegetation to prevent post closure infiltration through sources; and
- Consider groundwater plume remediation only if post closure monitoring indicates a persistent pollution plume at unacceptable concentrations.

9.8.5 Mitigation Measures Relating to Potential Impacts on Soils, Land Capability and Land Use

The following measures are to be put in place to mitigate impacts on soils, land capability and land use:

- Stockpiles are to be kept to a maximum height of 4 m (the practical tipping height of dump trucks);
- Topsoil is to be stripped when the soil is dry, so as to reduce compaction;
- The top 0.3 m of the soil profile should be stripped first and stockpiled separately;

- The subsoil; approximately 0.7 to 0.9 m thick, will then be stripped and stockpiled separately;
- Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly;
- Foundation excavated soil should also be stockpiled;
- Stockpiles are to be maintained in a fertile and erosion-free state by sampling and analysing annually for macro nutrients and pH;
- The handling of the stripped topsoil will be minimized to ensure the soil structure does not deteriorate;
- Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles;
- The stockpiles will be vegetated (details contained in rehabilitation plan) to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil;
- Soils will be stripped using the delineated soil types as a guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.3 m) then subsoil separately;
- The designed post mining landforms should be modelled to establish the post mining landscape stability by using a combination of GIS and erosion modelling techniques by a suitably qualified expert using site specific soil quality data;
- The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil;
- The yellow and red soils should be replaced in upland landscape positions;
- The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; and
- Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan.

9.8.6 Mitigation Measures Relating to Potential Impacts on Ambient Noise Levels

The following mitigation measures can be put in place to abate increased noise levels:

- Mining-related machine and vehicles must be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers and switching off equipment when not in use;
- As for the blasting operations, it is generally intermittent and should be limited to daylight hours when ambient noise levels are highest;

- The following with regards to blasting operations is recommended:
  - The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant is recommended;
  - Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; Restriction of blasting to daylight hours are mitigation measures that should be followed; and
  - Maintaining good public relations with the surrounding communities i.e. warning the local communities in advance before blasts.

9.9 Item 3(g)(ix): Motivation where no alternatives sites were considered

Lanxess already has an approved EIA/EMP in line with the MPRDA for its current operations on various portions of the farms Rietfontein 338 JQ, Kroondal 304 JQ and Klipfontein 300 JQ. No property alternatives have therefore been considered as the envisaged mining operations will occur on properties already utilised for the mining operations or on properties that the Mine currently own. Furthermore, the chrome reserve is limited to the preferred site.

No alternative sites were considered for the location of the haul roads as space is limited on the site and no area of suitable size is available.

The waste rock shape and design has been modified so as to avoid the wetland areas to the east of the project area. As a result there is less space and therefore there are no options for additional layout alternatives.

9.10 Item 3(g)(x): Statement motivating the alternative development location within the overall site

No property alternatives have been considered as the envisaged mining operations will occur on properties already utilised for the mining operations (for which Lanxess holds the mining rights) or on properties that the Mine currently own. Furthermore, the chrome reserve is limited to the preferred site.

The preferred overall site is based on the location of the identified pit, and the placement of infrastructure has already been assessed in the previous application for the Section 102 Amendment to the Mining Right.

10 Item 3(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

Please refer to Section 0 above for a description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site.

Please refer to Section 11 below for a description of all environmental issues and risks that were identified during the environmental impact assessment process.

11 Item 3(i): Assessment of each identified potentially significant impact and risk

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

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
Crushing and screening	Air quality	During this stage, the ore from the underground operations and the open pit will be crushed to reduce the size. The dust generated encompasses TSP, PM_{10} and $PM_{2.5}$ (which may impact the human respiratory system due to the depth of penetration and the resultant interaction with human tissues).	Operational	72	To mitigate the impacts, the crusher should be enclosed to control the dust that is generated in the process. The application of water sprayers also helps to suppress generated dust thus reducing the impact.	50
Dumping of waste rock	Air quality	During this stage, waste rock brought to the surface and those from the open pit process is loaded onto 30 tonne tipper trucks and offloaded at the waste rock dumps. The loading and offloading process results in dust generated comprises TSP, PM_{10} and $PM_{2.5}$ (this fraction is causing health problem in the human respiratory system due to the depth of penetration and the resultant interaction with human tissues).	Operational	66	To mitigate the impacts of the loading and dumping process, the drop height when offloading must be lowered.	50
Stockpiling material	Air quality	Materials i.e. ROM, lumpy ore, crusher fines, HMS fines and stockpiles CO1, CO4 and CO6 are stored at their respective stockpiles. The various stockpiles thus represent sources of dust, with the subsequent erosion of dust that comprises TSP, PM_{10} and $PM_{2.5}$.	Operational	55	To mitigate the impacts of the stockpiling, water sprays on the stockpiles need to be utilised, use of wind breaks can be implemented near the respective stockpiles as these reduce anticipated dust impacts by 30%.	40
Transporting material	Air quality	This focuses on the use haul roads and the conveyance of chrome using conveyor belts. During this stage, materials are transported to the various stockpile using 3 tonne tipper trucks, which leads to the generation of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$.	Operational	78	To mitigate the impacts, vehicle speeds must be reduced that will, in turn, reduce emissions into the atmosphere. Water sprays on the road should be used frequently, keeping the road moist. Dust suppressants such as Dust-a-side can be applied on the haul roads. The construction of speed humps and enforcement of speed limits will also reduce the generation of dust.	60
Decommissioning	Air quality	This activity entails the removal of buildings and foundations and rehabilitation of the voids and spreading of sub soil and topsoil. The reshaping and restructuring of the landscape though spreading of subsoil and topsoil will generate dust as soil is being transferred from one location to another. There is movement and transfer of soil to rehabilitate the void.	Decommissioning	54	Spreading of soil must be performed on less windy days. The bare soil will be prone to erosion there is need to introduce surface vegetation cover to check erosion. Leaving the surface of the soil in a coarse condition reduces wind erosion and ultimately reduces the dust levels. Additional mitigation measures include keeping the soil moist using sprays or water tanks, using wind breaks. The best time to re-vegetate the area must be linked to the distribution and reliability of the rainfall.	40

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
Site clearance and topsoil removal prior to the commencement of physical construction activities across the open pit area	Fauna and Flora	The almost complete degradation of natural vegetation and habitat for animal life has already taken place within the general environment due to current land use practices specifically agricultural. No natural vegetation remains within the project area, therefore none will be impacted on, except for the eastern edge of the open pit that will impact on medium high sensitivity Bushveld. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.	Construction	40	1. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the disturbed area to the minimum and within designated areas only. Re-vegetate open areas to limit erosion. 2. Avoid sensitive landscapes such as the Koppies that were encountered on site. 3. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 4. Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.	36
The construction of waste rock dumps	Fauna and Flora	No natural vegetation remains within the waste rock dump area, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.	Construction	36	5. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the rock dump within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. 6. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 7. Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.	32
The construction of topsoil stockpiles	Fauna and Flora	No natural vegetation remains within the topsoil stockpiles area, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.	Construction	54	8. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. 9. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 10. Maintain top soil biological activity by soils	42

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
					stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.	
The establishment of the initial boxcut and access ramps to the open pit mining areas	Fauna and Flora	No natural vegetation remains within the initial boxcut area, therefore none will be impacted on. The agricultural fields have a low sensitivity rating. The impact will be site specific in extent. The severity of the impact was determined to be low.	Construction	36	11. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the initial boxcut within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. 12. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 13. Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used. 14.	32
The construction of haul roads on site	Fauna and Flora	No natural vegetation remains within the haul roads locations, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.	Construction	36	15. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the haul roads within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. 16. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 17. Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.	32
The construction of the access or service road	Fauna and Flora	No natural vegetation remains within the access or service road locations, therefore none will be impacted on. The agricultural fields have a	Construction	54	18. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the access and service roads within	42

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.			the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. 19. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 20. Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.	
The construction of the hard park area	Fauna and Flora	No natural vegetation remains within the hard park area location, therefore none will be impacted on. The agricultural field have a sensitivity rating of low. The impact will be site specific in extent with impacts likely to occur on site. The severity of the impact was determined to be low.	Construction	54	21. Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the hard park area within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. 22. Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. 23. Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used.	42
Vehicular activity on haul roads, use of hall roads	Fauna and Flora	Vehicular activity could impact on fauna species in terms of road deaths; signs of road deaths were evident during field work. Furthermore, the vehicular activity will result in the creation of soil based dust which will increase the deposits these materials on plant leaves, blocking stomata and inhibiting evapotranspiration. Natural dust will be created from use of the haul road and ash dust will be created during transport by haul trucks. This will impact on the vegetation health and availability as food items as well as inhibit the ability of the plants units to provide ecological services.	Operational	50	24. Prevent excess dust creation that could inhibit plant growth by wetting of the haul roads to suppress dust creation as well as cover haul trucks to prevent dust emissions during transport. 25. To avoid animal deaths specific speed limits must be adhered to by all mining vehicles.	40
Concurrent replacement of overburden and topsoil and the re-vegetation of mined out strips	Fauna and Flora	This may be considered to be a positive impact if implemented properly over time. The replacement of overburden and topsoil throughout the concurrent rehabilitation during the operational	Operational	10	26. Reduce areas available for alien infestation by restoring disturbed areas to natural habitat. 27. Implementation of an alien invasive management	39

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		phase may result in the reduction of available space for alien invasive species, soil erosion and soil compaction, associated with top soil storage areas. This activity will create favourable habitat for indigenous plant species, and promote rehabilitation efforts, if completed correctly.			program is imperative to reduce the risk of these plant species infesting the mine area.	
Removal of infrastructure	Fauna and Flora	Of concern here is the creation of favourable habitat for fast growing invasive species and ground compaction. Also of concern are the possible spillages from infrastructure holding hazardous material. The demolition of infrastructure may require vehicles making use of non-designated areas, special care must be taken not to destroy rehabilitated areas.	Decommissioning	32	28. Avoid spillage of hazardous materials, thereby protecting vegetation and soil. The correct and careful handling of the infrastructure housing pollutants and toxicants to prevent spillages and leaks. 29. Avoid destruction of vegetation, the creation of favourable habitat for fast growing invasive plants and ground compaction, by forcing vehicles to make use of existing roads and designated areas. Avoid rehabilitated and natural habitat areas as far as possible. 30. The implemented alien invasive control program must be adhered to carefully.	28
Final replacement of overburden and topsoil and the establishment of vegetation on the final open cast void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will placed and the area vegetated	Fauna and Flora	This may be considered to be a positive impact if implemented properly, and managed over time. The replacement of overburden and topsoil throughout the life of mine as well as the final replacement during the decommissioning phase may result in the restoration of the natural vegetation.	Decommissioning	8	31. The footprint of the area disturbed by the mining operation will have topsoil and overburden replaced to restore the vegetation cover, through proper rehabilitation. 32. Limit the erosion potential of exposed areas by re-vegetation. 33. Re-vegetated areas will form seepage areas which will help aid infiltration.	65
Post-closure monitoring and rehabilitation	Fauna and Flora	This activity will commence only after closure has taken place, furthermore this activity will be on-going after operations in the area has stopped.	Closure/Post closure	8	34. Direct rehabilitation efforts by ensuring correct measures are employed for a variety of rehabilitation projects. 35. Avoid erosion, alien invasive species establishment, by monitoring rehab outcome to ensure open areas are eliminated.	65

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
Impacts on surface water during construction phase	Surface Water	36. Increase in turbidity of surface water runoff during construction caused by an increase in runoff from the cleared and stripped areas or from topsoil stockpiles; and 37. Impacts on surface water quality as a result of accidental spillages of hazardous substances (hydrocarbons) from construction vehicles used during site clearing and grubbing.	Construction	54	38. Clearing of vegetation should be limited to the project site, and the use of existing access roads should be prioritized so as to limit the construction of new access roads in these areas; 39. The construction phase should be limited to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing and grubbing; 40. The removed topsoil should be covered or vegetated as soon as possible to prevent sediment erosion; Haul roads need to be well compacted to avoid erosion of the soil into the stream.	28
Impacts on surface water during operational phase	Surface Water	41. Unconfined stormwater runoff from dirty water areas in the mine have the potential to contaminate the natural water resources; 42. Diversion of clean water runoff upstream of the mine dirty water area Water upstream of the mine area is considered clean and will have to be separated from the dirty water area. 43. Blasting during the operational phase will release ammonium nitrates from the explosive residues. This chemical will contaminate the water in the pit and may potentially contaminate the streams if water is discharged into the natural environment. Nitrates and ammonia from blasting residues, can lead to eutrophication (nutrient enrichment) of water bodies. They may also be converted into toxic nitrites. Ammonia (NH3 as opposed to NH4+) is highly toxic to fish and many aquatic organisms at even low (µg/l) concentrations; 44. Impacts on surface water quality as a result of mobilized hazardous substances (hydrocarbons) from trucks and machinery during operation of mine; and 45. Inadequate storm water management and soil stabilisation measures in cleared areas could lead to erosion that may result in siltation of nearby watercourses.	Operational	60	46. Dust suppression measures should be implemented to prevent the spread of dust and erosion of loose materials; 47. The topsoil stockpiles should be vegetated as soon as possible to prevent dust, erosion and siltation of the water bodies; 48. The storage facilities for fuel, lubricant and explosives must comprise a hard standing area (paved or concrete surface) and be roofed and bunded. This will prevent mobilisation of leaked hazardous substances. Emergency spillage response plan should in place and accessible to the responsible monitoring team; 49. All the water being pumped from the pit should be stored in the existing pollution control dams (PCD's) for re-use on the mine so as to prevent unnecessary discharge into the environment; 50. Based on Reg 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. Therefore clean water emanating from upstream of the mine must be diverted away and discharged to the nearby watercourse or environment; The clean water diversion must be sized to accommodate the 1:50 year storm event. 51. Should the contained water be more than the water use requirement, the BPGs advises that the water be recycled or as the last resort be treated to	32

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
					acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water; and 52. As the open pit mining progresses, continuous rehabilitation should be implemented by backfilling the voids. This will ensure that the dirty water footprint area is decreased so that the volume of dirty water runoff required to be pumped out of the pit is significantly reduced.	
Impacts on surface water during decommissioning phase	Surface Water	53. Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from trucks and machinery during decommissioning phase could have an impact on the quality of water in the nearby streams; and 54. Backfilling of open cast voids and re-vegetation of the rehabilitated area will have a positive impact on the quantity of water reporting to the rivers as the natural drainage pattern i.e. runoff, will be restored.	Decommissioning	48	55. Use of accredited contractors for removal or demolition of infrastructures should be ensured; 56. The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies; 57. Inspection of the rehabilitated areas need to be undertaken to ensure that the surface profile encourages natural drainage, such that no ponding or standing water occurs after a rainfall event. 58. Where rehabilitation (grass seeding of topsoil cover) is not effective, sedimentation should be mitigated by installing silt traps at areas where the surface runoff enters the surface water resources; and 59. Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented.	21
Impacts on surface water during closure/post closure phase	Surface Water	Decant of poor quality groundwater from the mining areas may have a negative impact on the surrounding surface water resources.	Closure/Post closure	54	60. Surface water quality monitoring should continue to ensure that there is no impact on the surrounding water resources emanating from the mine area.	28
The establishment of the underground decline ramp	Geohydrology	During the construction phase, the establishment of the underground access ramp could have an impact on the groundwater system. The establishment of the ramp requires blasting which may negatively affect the groundwater quality if significant amounts of explosive are spilled or incompletely detonated.	Construction	24	61. Undertake groundwater intrusive investigation around the ramp to optimise the position of the ramp and associated infrastructure to avoid major water bearing features; 62. Handle and store blasting material according to manufacturing requirements; 63. Establish the depth to groundwater table prior to construction; 64. Grout or pump out any significant inflow of groundwater during ramp construction to ensure a	18

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
					dry and safe working environment; 65. Depending on the quality of the groundwater, discharge, store or recycle as appropriate; and 66. Monitor quality of mine water.	
Mine dewatering	Geohydrology	Excavation of the proposed pit will change the topography. As a result groundwater from both catchments will flow towards the pit centre in response to hydraulic gradient.	Construction	24	67. Establish the depth to groundwater table prior to construction; 68. Minimise penetration into the groundwater table; 69. If groundwater table is to be penetrated to significant depth, dewater aquifer prior to excavations; 70. Depending on the quality of the groundwater, discharge, store or recycle as appropriate; and Obtain permission from regulating authority.	18
Mine water contamination	Geohydrology	Site clearing and removal of topsoil may lead to puddles of surface water in the cleared areas during the wet season and potentially lead to increased infiltration to the weathered aquifers. Oil or fuel spillages from site machinery may collect in the soils. During rainfall events, hydrocarbon compounds from oil and fuel in the soils may migrate to the aquifers with water infiltrating through these polluted areas.	Construction	24	71. Implement and train drivers to adhere to traffic rules; 72. Implement a vehicle maintenance schedule; 73. Install oil collection pans under vehicles; 74. Handle and store blasting material according to manufacturing requirements; 75. Minimise external contamination sources in the pit (diesel, oils, chemicals) as far as possible to ensure that groundwater flowing into the mine is contaminated; and 76. Monitor quality of mine water.	20
Mine dewatering – underground mining (new segments)	Geohydrology	In general, significant influxes of groundwater can occur during underground mining. This influx inevitably dewaters and lowers groundwater levels in the surrounding mining area. As more areas are mined, the zone of influence of the groundwater level drawdown migrates and expands as the groundwater system attempts to retain a state of equilibrium.	Operational	48	77. Dewater very closely to the active mining face; 78. Manage groundwater abstraction rates and volumes in accordance with borehole sustainable yields; 79. Monitor groundwater abstractions to ensure that the aquifer from which water is abstracted is not over-exploited; 80. Pump excess underground water to appropriate	30

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
					surface storage facility accordingly to manage and minimise the water quality impacts. When required by the process plant, the abstracted water can be discharged into the return water dam; 81. Reuse water as far as possible. An off-take can be installed from the reservoir to the vehicle maintenance bay for use in dust suppression activities and general usage at the bay. However, for dust suppression it is good practice to first use marginal mine water or grey water before using pristine groundwater; and 82. Monitor water influx, water stored, water removed; and water levels in the underground mine and groundwater levels in the perimeter of the underground mine.	
Mine water contamination	Geohydrology	The current impact on groundwater quality lies in the vicinity of the old underground workings. Mining at the new segments is therefore predicted to increase the TDS levels of groundwater pumped from underground.	Operational	60	83. The mine water management measures recommended during construction phase should continue during the operational phase; 84. It is recommended that abstraction from boreholes that are close to the mine workings should be avoided so that contaminants will not migrate away from the mine, towards the abstraction boreholes; 85. Monthly or quarterly monitoring of groundwater qualities and water levels are recommended (particularly down gradient of the mine site) with continuous refining and updating of the monitoring network based on the results obtained; 86. Annual audits of monitoring and management systems should be conducted by independent environmental consultants; and 87. With the application of the above-stated mitigation plans, the impact of the contaminant migration during construction phase can be lowered to negligible.	30
Mine dewatering	Geohydrology	The predicted inflow rates range between 1 027 and 1 684 m^3/d. When groundwater flows towards the pit (during mining) it inevitably dewaters and lowers the groundwater levels in the surrounding area. As the pits develop, the zone of influence of the groundwater level drawdown migrates and expands as the groundwater system attempts to	Operational	30	88. Minimise groundwater influx into pit through optimisation of mining layout to minimise structural disturbance; 89. Dewater aquifer prior to further excavations. Dewatering is more effective when operated very closely to the active mining face; 90. Manage groundwater abstraction rates and volumes	22

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		retain a state of equilibrium.			in accordance with borehole sustainable yields; 91. Perform monitored groundwater abstractions to ensure that the aquifer from which water is abstracted is not over-exploited; 92. Pump excess pit water to appropriate surface storage facility according to water quality. When required by the process plant the abstracted water can be discharged into the return water dam; 93. Reuse water as far as possible. An off-take can be installed from the reservoir to the vehicle maintenance bay for use in dust suppression activities and general usage at the bay. However, for dust suppression it is good practice to first use "marginal" mine water before using pristine groundwater; and 94. Monitor water influx, water stored, water removed; water level in the pit and groundwater levels in the perimeter of the pit.	
Mine water contamination	Geohydrology	Any seepage emanating from the adjacent waste rock dump will eventually join the underlying saturated zone and migrate towards the pit due to hydraulic gradient.	Operational	40	95. The mine water management measures recommended during construction phase should continue during the operational phase; 96. It is recommended that abstraction from boreholes that are close to the mine workings should be avoided so that contaminants will not migrate away from the mine, towards the abstraction boreholes; 97. Divert surface flows away from the open pit areas through channels, drains and culverts; 98. Monitoring of groundwater quality and water levels is recommended (particularly down gradient of the mine site) with continuous refining and updating of the monitoring network based on the results obtained; 99. Annual audits of monitoring and management systems should be conducted by independent environmental consultants; and	30

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
					With the application of the above-stated mitigation plans, the impact of the contaminant migration during construction phase can be lowered to Negligible.	
Mine decant	Geohydrology	100. After the operational phase, the underground mine will be left to flood. Water level rise and inflows during the rebound period in any one compartment will be a function of only two features: 101. The total recharge to the compartment (i.e. the sum of rain-fed recharge and any head-dependent inflows from adjoining aquifers, and/or other compartment); and 102. The distribution of storage capacity within the compartment.	Closure/Post closure	68	103. Monitor water level rise and apply stage curves to assess the rate of flooding; 104. Seal all boreholes that connects the mine void to surface; 105. Monitor groundwater levels in boreholes in the surrounding aquifers to assess groundwater table responses; and 106. Groundwater monitoring should continue up to 5 years after closure.	33
Mine water contamination	Geohydrology	Contaminant migration away from the mine voids can only be induced by groundwater abstractions within the capture zone of the mine workings, and if decant occurs.	Closure/Post closure	56	107. No abstraction boreholes should be drilled in a 3 km radius from the underground workings in the post closure environment; 108. Perform effective rehabilitation and closure of redundant facilities through material placing and shaping, capping with appropriate capping liners and re-vegetation to prevent post closure infiltration through sources; and 109. Consider groundwater plume remediation only if post closure monitoring indicates a persistent pollution plume at unacceptable concentrations.	33
Mine decant	Geohydrology	After the operational phase all the pit will be left open. The groundwater table will rise again to its pre-mining position and water will accumulate in the pits due to cessation of dewatering. A pit lake will develop. Groundwater flow will be directed to towards the pit lake as evaporation from the pit water causes it to act as a groundwater sink. In addition to precipitation, surface water runoff from the surrounding area will flow to the pit and add to the rise of the pit lakes.	Closure/Post closure	30	110. Monitor pit water level rise and apply stage curves to assess the rate of flooding; 111. Monitor groundwater level elevation in boreholes in the surrounding aquifer to assess groundwater table responses; and 112. Groundwater monitoring should continue up to 5 years after closure.	24
Mine water contamination	Geohydrology	The final open pit, the waste dumps and old underground workings will be the major contamination sources in the post closure environment. The quality of groundwater in the post-closure environment will depend on background groundwater quality, the quality and	Closure/Post closure	56	113. No abstraction boreholes should be drilled in 2.5 km radius from the pit in the post closure environment; 114. Perform effective rehabilitation and closure of redundant facilities through material placing and shaping, capping with appropriate capping liners and	33

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		quantity of surface water flowing into the pit and the geochemical processes that occur on the walls of the pit, above and below the pit lake.			revegetation to prevent post closure infiltration through sources; and 115. Consider groundwater plume remediation only if post closure monitoring indicates a persistent pollution plume at unacceptable concentrations.	
Loss of topsoil as a resource – open pit	Soils, Land Capability and Land Use	When vegetation is cleared and the topsoil is stripped, the soils natural structure is disturbed and as a result the natural cycle is broken exposing the bare soil to erosion. Construction vehicles driving on these soils cause compaction reduces the soils ability to be penetrated by root growth. Compaction also increases erosion potential. When soils are not stripped and stockpiled according to the soil stripping guidelines these soils would have lost their natural physical and chemical properties, reducing the topsoil's ability to be a plant growth medium. The above factors all contribute to a loss of the topsoil's ability to be a resource through alterations and removal.	Construction	91	116. The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; 117. Stockpiles are to be kept to a maximum height of 4m (the practical tipping height of dump trucks); 118. Topsoil is to be stripped when the soil is dry, as to reduce compaction; 119. The topsoil 0.3 m of the soil profile should be stripped first and stockpiled separately; 120. The subsoil approximately 0.7 – 0.9 m thick will then be stripped and stockpiled separately; 121. Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly; 122. Foundation excavated soil should also be stockpiled; 123. Stockpiles are to be maintained in a fertile and erosion free state by sampling and analysing annually for macro nutrients and pH; 124. The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; 125. Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; 126. Prevent unauthorised borrowing of stockpiled soil; 127. The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; 128. Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.3 m) then subsoil separately; and 129. Access should be limited to prevent any unnecessary compaction from occurring.	30

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
Hydrocarbon pollution	Soils, Land Capability and Land Use	When Hydrocarbons are spilled on a soil surface the soil becomes contaminated and therefor becomes toxic for plant growth.	Construction	90	130. Prevent any spills from occurring; 131. If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; 132. All vehicles are to be serviced in a correctly bunded area or at an off-site location; and 133. Leaking vehicles will have drip trays place under them where the leak is occurring.	45
Loss of land capability	Soils, Land Capability and Land Use	Removal of soil layers will impact on the land capability because vegetation can no longer be supported.	Construction	84	134. No land capability mitigation is possible during the construction and operational phases because the land use is changed from agriculture to open pit; and 135. Mitigation of land capability post mining is required through legislation through land rehabilitation.	66
Loss of stockpiled topsoil as a resource	Soils, Land Capability and Land Use	Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles where steep slopes are present.	Operational	91	136. Stockpiles are to be maintained in a fertile, vegetated, and erosion free state; 137. Stockpiles are to be clearly demarcated; 138. Ensure proper storm water management designs are in place; 139. Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring; 140. If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; and 141. Unauthorised borrowing of stockpiled soil materials should be prevented.	30
Hydrocarbon pollution	Soils, Land Capability and Land Use	Hydrocarbon spills can impact soil quality.	Operational	90	142. Prevent any spills from occurring; 143. If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; 144. All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and Leaking vehicles will have drip trays place under them where the leak is occurring.	45
Loss of land use and land capability	Soils, Land Capability and Land Use	Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent because vegetation will be supported and therefore returned to the planned post mining land capability such as arable	Decommissioning	84	145. Mitigation is possible because the land use is changed from mining back to agriculture as follows: 146. The spoil should be shaped taking the pre-mining landscape into consideration; 147. The designed post mining landforms should be modelled to establish the post mining landscape	60

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		and or grazing.			stability by using a combination of GIS and erosion modelling techniques by a suitably qualified expert using site specific soil quality data; 148. The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; 149. The yellow and red soils should be replaced in upland landscape positions; 150. Wetland soils should be put back in the reverse order of stripping; 151. Wetland soils should be placed in lower landscape positions; 152. The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; 153. The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; 154. Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan; and 155. From a national food security viewpoint, ways need to be found of rendering land rehabilitated to arable standards suitable for the economic production of cash crops.	
The transportation of construction material to the project site via national, provincial and local roads	Visual	The transportation of construction material will have a negative visual impact on the receiving environment. Vehicular activity and the resulting dust will draw attention to the project area. These visual impacts are temporary and will only occur during the construction phase.	Construction	28	156. Roads should be wetted frequently by means of a water bowser to suppress dust; and 157. Vehicles must be roadworthy and obey the recommended speed limits at all times.	24
Site clearance and topsoil removal prior to the commencement of physical construction activities across the project area	Visual	The removal of vegetation and topsoil for site clearing will have a negative visual impact on the receiving environment. The project area will become noticeable to the nearby receptors as it will contrast the surrounding areas.	Construction	66	158. Vegetation and topsoil should only be removed when and where necessary; and 159. Topsoil stockpiles should be vegetated.	55
The construction of waste rock dumps	Visual	Stockpiling waste rock will have a negative visual impact on the receiving environment. Dust from	Construction	66	160. Overburden should only be removed when and	55

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.			where necessary; 161. Reduce the height of overburden stockpiles where possible; 162. Limit the height and footprint area of overburden stockpiles where possible; 163. Apply dust suppression techniques to limit the dust from stockpiles; and 164. Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles.	
The construction of topsoil stockpiles	Visual	Stockpiling topsoil will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.	Construction	66	165. Topsoil should only be removed when and where necessary; 166. Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; 167. Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; 168. Limit the height and footprint area of topsoil stockpiles where possible; 169. Apply dust suppression techniques to limit the dust from stockpiles; and 170. Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles.	55
The establishment of the initial boxcut and access ramps to the open-pit mining areas	Visual	The establishment of the initial boxcut and access ramps to the open pit mining areas will have a negative visual impact on the receiving environment. Drilling and blasting to develop the initial boxcut for mining will result in noise and dust thereby attracting attention to the project area. The boxcut will dramatically contrast the surrounding agricultural area. This will leave a scar on the landscape. Dust from the blasting will also have a negative visual impact. This visual impact will occur for the life of the project.	Construction	84	171. Only remove overburden when and where necessary; and 172. Apply dust suppression techniques to limit the dust created by blasting.	72
The construction of haul roads on site	Visual	The construction of haul roads will have a negative visual impact on the receiving environment.	Construction	28	173. Do not create numerous haul roads alongside each other.	24
The construction of the access or service road	Visual	The construction of the access or service road will have a negative visual impact on the receiving	Construction	20	174. Do not create numerous roads alongside each other.	15

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		environment.				
The construction of the hard park area (this is made up of the workshop, office block and parking lot)	Visual	The construction of hard park area will have a negative visual impact on the receiving environment. This hard park area includes the workshop, office block and parking lot. These visual impacts will occur for the life of the project. Construction area lighting at night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place. The visual impacts from the construction area lighting will occur during the construction phase.	Construction	42	175. Limit the height and footprint area of surface infrastructure where possible; 176. If the surface infrastructure is to be painted, it should be painted natural hues so as to blend into the surrounding landscape where possible; 177. Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and 178. Avoid construction activities at night if possible, thereby avoiding the use of construction area lighting. If construction activities take place at night, down lighting should be implemented to minimise light pollution.	35
Drilling and blasting of the overburden rock for easy removal by excavators and dump trucks	Visual	The removal of overburden by drilling and blasting will have a continual negative visual impact on the receiving environment. Overburden stockpiling will have a negative visual impact on the receiving environment. Dust from the blasting and from stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.	Operational	84	179. Only remove overburden when and where necessary; 180. Plant fast-growing endemic vegetation in areas where it can conceal stockpiles; 181. Limit the height and footprint area of overburden stockpiles where possible; and 182. Apply dust suppression techniques to limit the dust created by blasting and from the stockpiles.	72
Dumping of waste rock and maintenance of waste rock dump	Visual	Operation and maintenance of the waste rock dump will have a negative visual impact on the receiving environment. Dust from the dump will also have a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.	Operational	66	183. Overburden should only be removed when and where necessary; 184. Limit the height and footprint area of stockpiles where possible; 185. Apply dust suppression techniques to limit the dust from stockpiles; 186. Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; and 187. Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.	55

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
Removal and loading of ore onto trucks (O/C) or conveyor (U/G) to the plant	Visual	The removal of ore will have a continual negative visual impact on the receiving environment. Infrastructure and mine area lighting will be visible at night resulting in a negative visual impact on the receiving environment. This visual impact will occur for the life of the project.	Operational	84	188. Limit the quantity and time of ROM stored on site; and 189. Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.	72
Vehicle movement on haul roads	Visual	Vehicular activity on the haul roads and access or service road will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact. These visual impacts will occur for the life of the project.	Operational	36	190. Do not create numerous haul roads alongside each other; 191. Roads should be wetted frequently by means of a water bowser to suppress dust; and 192. Vehicles must be roadworthy and obey the recommended speed limits at all times.	32
Continuing operation and maintenance of the stockpiles, including topsoil and ROM stockpiles	Visual	Operation and maintenance of the topsoil and ROM stockpiles will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.	Operational	66	193. Topsoil should only be removed when and where necessary; 194. Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; 195. Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; 196. Limit the height and footprint area of stockpiles where possible; 197. Apply dust suppression techniques to limit the dust from stockpiles; 198. Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; 199. Limit the quantity and time of ROM stored on site; and 200. Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.	55
Concurrent replacement of overburden and topsoil and the re-vegetation of mined out strips. The mined strip will be backfilled with overburden and	Visual	Concurrent rehabilitation by replacement of overburden and topsoil as well as re-vegetation as mining progresses will have a neutral visual impact on the receiving environment. The aim of rehabilitation is to return the project area to a state	Operational	84	201. Backfill as much of the open pit area as possible; 202. Spread topsoil over the backfilled area; and 203. Re-vegetate the backfilled area.	

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
compacted. Subsequently, the topsoil will be placed on top of the overburden and the area will be vegetated		similar to the pre-mining state. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment. Backfilling of the open pit with overburden will use rock removed from the void of the current mining strip to partly fill the mined out void in the previously mined strip. Once backfilling commences, overburden should no longer be added to the overburden stockpiles. This will have a neutral visual impact on the receiving environment. Spreading of topsoil and re-vegetation of the backfilled areas will have neutral visual impacts on the receiving environment.				
Removal of surface infrastructure (plant machinery, conveyors)	Visual	Demolition and removal of infrastructure will have a neutral visual impact on the receiving environment. This will help to reverse some of the changes that occurred when the infrastructure was constructed.	Decommissioning	42	204. Ensure that all unnecessary infrastructure is demolished and removed from the site.	
Rehabilitation of roads and cleared areas (offices and workshop area)	Visual	Rehabilitation of the roads and cleared areas by replacement of topsoil will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state. Spreading of topsoil, and profiling and contouring to create a free-draining topography will have a neutral visual impact. Re-vegetation of the rehabilitated areas will have a neutral visual impact. These visual impacts will be permanent. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.	Decommissioning	28	205. Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; 206. Spread topsoil over the rehabilitated area; 207. Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; and 208. Re-vegetate the rehabilitated areas.	
Final placement of overburden and topsoil and the establishment of vegetation on the final opencast void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will be placed and the area vegetated	Visual	Rehabilitation of the final open void (where possible) by replacement of overburden and topsoil will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state. Once ore has been removed from the open pit, there will be insufficient overburden to fill the void completely. Due to this material imbalance, a	Decommissioning	84	209. Backfill as much of the final void as possible; 210. Ensure that the final void is as small as practically possible; 211. Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; 212. Spread topsoil over the rehabilitated area;	

Activity	Potential Impact	Aspects Affected	Phase	Significance (Pre-Mitigation)	Mitigation Type	Significance (Post-Mitigation)
		permanent void will remain. Spreading of topsoil, and profiling and contouring to create a free-draining topography will have a neutral visual impact. Re-vegetation of the rehabilitated areas will have a neutral visual impact. These visual impacts will be permanent. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.			213. Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; and 214. Re-vegetate the rehabilitated areas.	
Site clearance and construction activities	Noise	Mining machinery and vehicles is expected to increase ambient noise levels on site, but according to the dispersion models the noise levels are expected to be restricted to site. The negligible impacts are due to the noise not impacting on the surrounding sensitive receptors.	Construction	18	215. Restricting construction activities to daylight hours where viable; 216. Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and 217. Switching off equipment when not in use.	8
Drilling, blasting and operational activities	Noise	Mining machinery and vehicles is expected to increase ambient noise levels on site, but according to the dispersion models the noise levels are expected to be restricted to site. The negligible impacts are due to the noise not impacting on the surrounding sensitive receptors.	Operational	27	218. Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and 219. Switching off equipment when not in use.	14
Demolition and removal of surface infrastructures and rehabilitation works	Noise	Mining machinery and vehicles is expected to increase ambient noise levels on site, but due to the limited activities the noise levels are expected to be restricted to site. The negligible impacts are due to the noise not impacting on the surrounding sensitive receptors.	Decommissioning	18	220. Restricting construction activities to daylight hours where viable; 221. Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and 222. Switching off equipment when not in use.	8
All noise causing activities have ceased during this phase	Noise	The noise impact during this phase will be neutral due to the expected ambient noise level returning to pre-mining baseline.	Closure/Post closure	63		

12 Item 3(j): Summary of specialist reports

List of studies undertaken	*Prioritised* Recommendations of specialist reports (detailed mitigation measures are included in Part B)	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Air Quality Assessment	■ Ensure that air quality levels during the construction and operational		Appendix 5

List of studies undertaken	*Prioritised* Recommendations of specialist reports (detailed mitigation measures are included in Part B)	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	phase comply with all relevant statutory standards, and that air quality impacts on surrounding sensitive receptors are minimised. ■ Adherence to the suggested mitigation measures outlined in this report is recommended in order to reduce anticipated impacts. ■ Start ambient air monitoring programmes i.e. PM_{10}. ■ The air quality impacts on the mine boundary are to be minimised to ensure compliance.	**X (detailed mitigation measures are included in Part B)**	
Fauna and Flora Assessment	■ Avoiding of sensitive habitats. ■ Rescue and relocation of sensitive fauna species. ■ Rescue and relocation of sensitive flora species.	**X (detailed mitigation measures are included in Part B)**	Appendix 6.
Surface Water Assessment	■ Divert surface flows away from the open pit areas through channels, drains and culverts. ■ No mining or any operation should take place within a horizontal distance of 100 metres from any watercourse (GN, 704).	**X (detailed mitigation measures are included in Part B)**	Appendix 7
Geohydrological Assessment	■ It is recommended that abstraction from boreholes that are close to the mine workings should be avoided so that contaminants will not migrate away from the mine, towards the abstraction boreholes; ■ Minimise groundwater influx into pit through optimisation of mining layout to minimise structural disturbance. ■ Dewater aquifer prior to further excavations. Dewatering is more effective when operated very closely to the active mining face. ■ Implementation of water management system and groundwater monitoring system.	**X (detailed mitigation measures are included in Part B)**	Appendix 8
Soils, Land Use and Land Capability Assessment	■ The general best practice for soil stripping and stockpiling is to strip the top 0.3 m separately from the rest of the soil profile. ■ The soil should be stripped and stockpiled together to a maximum of 4 m (practical tipping height for dump trucks without the risk of compaction).	**X (detailed mitigation measures are included in Part B)**	Appendix 9.
Visual Impact Assessment	■ It is recommended that the mitigation measures detailed in the Visual Impact Report are implemented to reduce the impact that the proposed open pit project will have on the topography and visual	**X (detailed mitigation measures are included in Part B)**	Appendix 10.

List of studies undertaken	*Prioritised* Recommendations of specialist reports (detailed mitigation measures are included in Part B)	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	character of the receiving environment. Vegetation and topsoil should only be removed when and where necessary to avoid exposing larger areas for longer periods of time which could result in soil erosion and increase the visual disturbance. ■ The most important mitigation aspect is the rehabilitation of the site. The success of this rehabilitation will influence the overall long term impacts of the project. The open pit should be filled with overburden. It is of utmost importance that the topography of the site be re-contoured and profiled to create a free-draining topography that resembles the pre-mining topography as closely as possible. It is also essential to reconstruct all pre-development surface water and drainage lines to ensure that a free-draining surface is created and that the surface water flow returns to its original state. After re-contouring and profiling the site, it should be covered with topsoil and re-vegetated to complete the rehabilitation process. ■ The stockpiles will stand out in the surrounding area and will have a long term visual impact. If the stockpiles could be spread to reduce the height, the visual impact could be reduced. In addition, rehabilitation (vegetating) of these large features can significantly reduce the visual impacts.		
Noise Impact Assessment	The following with regards to blasting operations is recommended: ■ The use of millisecond delays between rows of blast holes in a given blasting pattern in order to reduce the amount of explosive charge detonated at any given instant; ■ Reduction of the powder factor, that is, use of less explosive per cubic yard of overburden; Restriction of blasting to daylight hours are mitigation measures that should be followed; and ■ Maintaining good public relations with the surrounding communities i.e. warning the local communities in advance before blasts.	**X (detailed mitigation measures are included in Part B)**	Appendix 11
Heritage Assessment	■ Exemption from further palaeontological assessments for the proposed infrastructure footprint is to be applied for as the palaeo-sensitivity is insignificant; ■ An HIA be undertaken that includes the following heritage components: ▪ An Archaeological Impact Assessment including reconnaissance to identify and record archaeological resources within the impact footprint; and ▪ An assessment of burial grounds and graves including	**X (detailed mitigation measures are included in Part B)**	Appendix 12.

List of studies undertaken	*Prioritised* Recommendations of specialist reports (detailed mitigation measures are included in Part B)	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
	reconnaissance to identify, record and document all burials that may exist in the impact footprint.		
Rehabilitation Plan	The following recommendations form part of the rehabilitation plan: ■ Should there is a change in the mining method, the hydrogeological impacts associated with the post closure environment should be remodelled; ■ A specific seed mix is recommended for revegetation of rehabilitated areas (refer to Rehabilitation Plan in Appendix H); ■ The Waste Rock dump should be shaped to an 18° slope; ■ The subsoil clay layers which can be found under certain hydromorphic soils need to be stripped and stockpiled separately; ■ There must be no planting of alien plants anywhere within the mining area; ■ Annual surveys, aimed at updating the alien plant list and establishing and updating the invasive status of each of the alien species, should be carried; and ■ The transportation of soils or other substrates infested with alien species should be strictly controlled.	**X**	Appendix 13.

13 Item 3(k): Environmental impact statement

13.1 Item 3(k)(i): Summary if the key findings of the environmental impact assessment

13.1.1 Air Quality Assessment

The pollutants TSP, PM_{10}, and $PM_{2.5}$ were assessed within the project boundary and on the eight sensitive receptors. These were modelled using emissions from both the opencast and underground activities. The predicted PM_{10} annual level of 43 µg/m³ within the mine boundary will be in exceedance of the current standard. This can have adverse implications on the health of exposed mine workers if mitigation measure are not applied to bring this within compliance. The concentration predicted at all the selected sensitive receptors were all below the limit.

For $PM_{2.5}$, the annual level of 28 µg/m³ was experienced in the project boundary but the sensitive receptors were all below the limit. The levels $PM_{2.5}$ daily and annual are in exceedance within the mine boundary. Thus, the exposed workers are at risk due to daily exposure of this pollutant higher than the recommended limit.

In terms of dust deposition, deposition rates predicted for the different sensitive receptors were all below the 600 mg/m²/day. When the mitigation measures were implemented, the modelled dust fallout level in the project boundary reduced to 1 604 mg/m²/day and the anticipated fallout dust at the sensitive receptors reduced further.

13.1.2 Fauna and Flora Assessment

From the findings presented in the report, one can draw the conclusion that the Project may go ahead on the portion earmarked for the open pit area as it is an impacted agricultural area. Therefore the open pit will have minimal impact on the natural vegetation and habitat types present. Small isolated pockets of sensitive areas (small *koppie* area) are found along the edges of the farm portion where the opencast operation will be based (seen in Figure 8–4 of the Fauna and Flora Report attached as Appendix 6) however the infrastructure layout has been amended to avoid these areas. Mitigation measures have been provided to reduce the impact on these areas.

13.1.3 Surface Water Assessment

Although the study found no streams or any other water resources within the project area, the IWWMP compiled in 2010 indicated that excess water may only be discharged to the surrounding environment if it meets statutory requirements. It is important to note that blasting material during operational phases releases ammonium nitrates from the explosive residues. Furthermore, the lining associated with the waste rock dump and associated surface water management infrastructure should sufficiently divert contaminated water to the

PCD. If run-off is not diverted, the chemicals present in the blast material may contaminate nearby watercourses.

Mining activities have a variety of impacts on the natural water resources in terms of quality and quantity. The extent and nature of impacts can range from minimal to significant depending on a range of factors associated with on-going mining processes as well as post mining management of the affected environment. Therefore, certain recommendations for the proposed Lanxess opencast mine and associated infrastructure have been made as mitigation measures for the identified potential surface water impacts.

13.1.4 Geohydrology Assessment

The worst case zone of influence is predicted to extend 2.5 km from the pit centre. The syenite dyke east of the pit is reportedly impermeable; hence the aquifers on the opposite site of the dyke are not expected to be influenced by mining of the proposed pit and private users will not be impacted.

In terms of groundwater quality, chromium levels in groundwater are below detection limits. The general groundwater body has elevated and non-compliant magnesium levels. Specifically, the current impacts on groundwater quality around the proposed pit lies in the vicinity of the old underground workings at Makuku informal settlement.

The geochemical assessment found the waste rock material does not present acid generating chemicals and although it is classed as Type 3 waste, Digby Wells recommends this be considered Type 4 based on the lack of acid generating potential.

13.1.5 Soils, Land Capability and Land Use Assessment

The dominant land capability for the area is the Class III (Moderate cultivation/ Intensive grazing) capability (373.77 ha), with the Class VIII (Wilderness) capability (10.32 ha) in the north-western portion, corresponding with the ecological sensitivity for the opencast area. The Class VIII capability was found on the steeper sloped soils with shallow soil depth. The development of this cultivated area will result in the irreplaceable loss of agricultural land.

13.1.6 Noise Assessment

Based on the national noise control regulations, whereby disturbing noise means a noise level that causes the ambient noise level to rise above the designated zone level, or if no zone level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more, it is concluded that the proposed mining activities will not impact on the surrounding areas.

13.1.7 Visual Assessment

The proposed Lanxess Chrome Mine Expansion Project will have a negative visual impact on the receiving environment. The greatest visual impact will be from the open pit, overburden and topsoil stockpiles as these cover a large area. The height of the overburden

and topsoil stockpiles will also increase the visual impact. The construction of surface infrastructure will have a lesser visual impact as it only covers a small part of the project area.

13.1.8 Heritage Assessment

Stone Age material has been identified throughout the local study area and reported on in other relevant heritage studies. A few weathered examples were found to the north of the proposed open pit. These lithics are often identified in isolation and outside of discernible context, therefore providing limited scientific information beyond form, function and technique of manufacture.

The local study area contains a large number of LIA stone-walled settlements. A large LIA stone-walled settlement was identified just to the north of the proposed open pit and additional associated stone-walling to the east within the pit. Additional work is being done (March/April 2017) to excavate and map these stonewalls and remove where necessary to a registered repository.

13.2 Item 3(k)(ii): Final Site Map

Refer to Appendix 4 for the infrastructure layout plan 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.

As a result of sensitive areas found on the eastern boundary of the site it was previously recommended by Digby Wells that the layout of the proposed stockpile be amended. By reshaping the stockpile the footprint size and capacity will remain the same however a 100m buffer zone will be included around the water course. The implementation of this buffer zone as a mitigation measure will reduce the impact of construction and operation on the fauna and flora in this sensitive area Item 3(k)(iii): Summary of the positive and negative implications and risks of the proposed activity and identified alternatives.

14 Item 3(l): Proposed impact management objectives and the impact management outcomes for inclusion in the EMPR

The environmental and social objectives are set to allow the mining of the chrome resource in an environmental and socially responsible fashion while ensuring that sustainable closure can be achieved. To achieve closure the correct decisions need to be taken during the planning phase of the project.

14.1 Environmental Objectives and Goals

The environmental objectives for the construction and operational phases are to:

- Protect the biophysical environment from any impacts that cannot be mitigated and that will negatively impact on biodiversity on a regional scale;

- Reserve the water resources in line with the objectives of the integrated catchment management and thereby ensure that the limited available resources are utilised to the maximum benefit of the country and its inhabitants;
- To ensure that activities are carried out so as to aid rehabilitation; and
- To ensure a safe environment for people to live in as is stipulated in the constitution.

14.2 Socio-economic Objectives and Goals

The following socio-economic objectives should be attained during the construction, operation, and decommissioning phases of the Lanxess mining operations.

- Adhere to an open and transparent communication procedure with stakeholders at all times;
- Ensure that accurate and regular information is communicated to IAPs;
- Ensure that information is communicated in a manner which is understandable and accessible to IAPs;
- Enhance project benefits and minimise negative impacts through intensive consultation with stakeholders;
- Assemble adequate, accurate, appropriate, and relevant socio-economic information relating to the context of the operation;
- Ensure that recruitment strategies for the mine, prioritise the sourcing of local labour, and share in gender equality;
- Ensure an atmosphere of equality and non-discrimination among the workforce;
- Contribute to the development of functional literacy and numeracy among employees;
- Empower the workforce to develop skills that will equip them to obtain employment in other sectors of the economy;
- Contribute to the development of a self-reliant (not dependent on the mine) community surrounding the area of operation;
- Ensure that decommissioning and retrenchments take place in a legally compliant and humane manner; and
- Adhere to principles of international best practice in all socio-economic activities.

14.3 Historical and Cultural Aspects

Sites of historical and cultural significance will have to be removed or relocated before the onset of mining operations. The objective is to encourage the preservation of cultural structures not affected by mining.

15 Item 3(m): Final proposed alternatives

As the chrome reserve is limited to the preferred site, no property alternatives have been considered as the envisaged mining operations will occur on properties already utilised for the mining operations (for which Lanxess holds the mining rights), or on properties that the Mine currently own or on mining areas that Lanxess has acquired through a Section 11 transfer process in accordance with the MPRDA.

No alternatives to the mining of chrome have been considered as this application deals with the expansion of the current operations which mine chrome.

The site layout in terms of the position of the haul and service roads, waste rock dump and topsoil stockpile was determined by considering both spatial and practical mining operation aspects. As such, various options would have been considered during the planning phase in order to derive an optimal layout (See Section 13.2 on site layout changes).

The site layout in terms of the position of the haul and service roads, waste rock dump and topsoil stockpile was determined by considering both spatial and practical mining operation aspects. As such, various options would have been considered during the planning phase in order to derive an optimal layout.

The “no-go” option for implementing the activity has been considered, but due to the fact that the mining of the remaining resources will lead to job creation and continued contribution to the Gross Domestic Product of not only the municipality, but also the Province as a whole, this option will not be pursued.

16 Item 3(n): Aspects for inclusion as conditions of authorisation

No additional aspects have been considered for inclusion into the conditions for the Environmental Authorisation.

17 Item 3(o): Description of any assumptions, uncertainties and gaps in knowledge

17.1.1 Assumptions, Uncertainties and Knowledge Gaps Relating to the Air Quality Study

Data limitations and assumptions associated with the air quality study include:

- The impact assessment was limited to particulates $PM_{2.5}$, PM_{10}, and dust fallout;
- This assessment did not include tail pipe emissions from vehicles; and
- US-EPA and NPi emission factors for mining were utilised in this assessment due to the unavailability of local emission factors.

17.1.2 Assumptions, Uncertainties and Knowledge Gaps Relating to the Fauna and Flora Study

As the sampling of the entire study area is not feasible, representative samples of the vegetation were assessed. The vegetation was classified according to available aerial imagery as well as through an initial site inspection. The number of sample sites visited was determined by the time available for the study as well as the accessibility of each of the sample sites. Then, areas of each vegetation type classified before going to site were randomly sampled. This methodology allowed for more efficient sampling other than overall random sampling.

There is a method for determining the number of plots required for a statistically accurate sample for each vegetation type. However, time limitations did not allow for such complete sampling. The result is the sampling of as many plots as possible in each predetermined vegetation type.

17.1.3 Assumptions, Uncertainties and Knowledge Gaps Relating to the Geohydrological Study

17.1.3.1 Numerical Model Limitations and Assumptions

Numerical models are commonly used to develop hydrogeological management solutions that include the prediction of contaminant plume migration and groundwater level changes over time. However, groundwater systems are often complex and the data input requirement is beyond our capability to evaluate in detail. A model, no matter how sophisticated, will never describe the investigated groundwater system without deviation of model simulations from the actual physical process (Spitz, 1996). Therefore, it is necessary to make several simplifying assumptions to simplify the complex, real world hydrogeological conditions into a simplified, manageable model. The following are the assumptions and limitations of the model:

- The model is a regional scale model and encompasses a wide area around Lanxess Chrome Mine to determine hydrogeological interaction between the mine site and surrounding regional groundwater systems;
- The current geological information is sufficient to describe the extent of the different aquifers;
- Site specific (intrusive) hydrogeological studies have not been carried out in the proposed segments, as such aquifer parameters that cover tested areas are assumed for areas with no site details;
- The regional dyke system separating the catchments is modelled as a no-flow boundary;
- Faults and fractures are not explicitly modelled. The assumption that a fractured aquifer will behave as a homogeneous porous medium can lead to error. However, on

a large enough scale (bigger than the REV, Representative Elemental Volume) this assumption should be acceptable;

- The model does not incorporate detailed historical mining. The underground mine voids at Wonderkop are represented, but the simulation does not include details on the timeline;
- The spatial distribution and amount of natural and artificial recharge is uncertain. So a uniform recharge is used to avoid over-complication of the model;
- A recharge rate of 50 mm/a is used for all slimes dumps adjacent to the existing and proposed Lanxess mining operations; and

The complexities of fractured rock aquifers imply that the model can only be used as a guide to determine the order of magnitude of dewatering and contaminant transport.

17.1.4 Assumptions, Uncertainties and Knowledge Gaps Relating to the Heritage Study

The following restrictions and limitations were encountered:

- The heritage report is primarily desktop based – field work was limited to a screening site visit undertaken over 1 day and focused on the proposed infrastructure footprint;
- The report is not intended to present an exhaustive list and description of heritage resources;
- The purpose of the screening site visit was to visually document the current conservation status of the cultural landscape, and to ground-truth certain tangible heritage resources identified in the literature review. The screening survey did not use systematic, controlled survey techniques, nor was it intended to be a comprehensive survey of the proposed project area; and
- Desktop findings are based on available research from credible sources. While every attempt to obtain the latest available information was made, reviewed literature does not represent an exhaustive list of information sources for the study area;

Many tangible heritage resources, specifically archaeological resources, commonly occur below the visible surface, and may not be adequately recorded, documented and assessed without intrusive and destructive methods. Such investigations are outside the scope of the specialist report and the consequent HIA, as well as beyond the requirements to conduct a HIA in terms of the NHRA.

18 Item 3(p): Reasoned opinion as to whether the proposed activity should or should not be authorised

18.1 Item 3(p)(i): Reasons why the activity should be authorised or not

The Mine has a reputation for being a supplier of high quality chrome ore to various businesses. Lumpy (metallurgical ore) is sold the ferrochrome industry where it is processed with coal in an electric furnace to form ferrochrome, which, in turn, is the master alloy used in the production of a wide range of corrosion and heat resistant stainless steel. Foundry grade chrome ore is used for the manufacture of casting moulds in foundries. The same material is also used in the production of refractory materials. And finally, chemical grade chrome ore is the raw material for the production of sodium dichromate processed by Lanxess in their other operations (chemical plants), which is the main constituent of all chrome chemicals. Chrome chemicals are used, for example, as leather tanning agents.

The continuation of the Mine to produce and supply the various grades of chrome ore to a wide spectrum of industrial and commercial establishments will benefit the GDP of not only the municipality, but also the Province as a whole.

Finally, as stated in the MPRDA, the Government's objective is to maximise the benefit of the nation's mineral resources for the benefit of all South Africans. By continuing producing chrome ore by way of expanding Lanxess's mining operations, this objective can be accomplished, particularly through job creation.

18.2 Item 3(p)(ii): Conditions that must be included in the authorisation

18.2.1 Specific conditions to be included into the compilation and approval of EMPR

No specific conditions, other than the mitigation measures as set out in the EMP, have been considered as part of the compilation and approval of the EMPR.

18.2.2 Rehabilitation requirements

The rehabilitation requirements, as set out in the rehabilitation plan attached under Appendix 13, must be adhered to.

19 Item 3(q): Period for which the environmental authorisation is required

Based in the LOM and considering various aspects that may delay mining operations, the period for which environmental authorisation is required is estimated at 70 years in total (for the LOM including the pit and current underground sections).

20 Item 3(r): Undertaking

I, Stephanie Aken, herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected parties has been correctly recorded in the report.

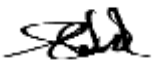
Signature of the EAP:

Date: February 2017

21 Undertaking regarding level of agreement

I, Stephanie Aken, herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP:



Date: February 2017

22 Item 3(s): Financial provision

The following associated surface infrastructure will be constructed in support of the additional mining activities proposed for the site:

- Haul roads;
- Waste dump;
- Open pit;
- Office and workshop; and
- Carport.

Closure liability costs were calculated by means of the DMR's standard method for assessment of mine closure. The closure liability only focused on the proposed opencast activities and the cost for rehabilitation and closure of the proposed site according to the DMR Guideline format is R 28,878,665.00.

22.1 Item 3(s)(i): Explain how the aforesaid amount was derived

Refer to Section B Table 7-1 for the Financial Provision quantum.

22.2 Item 3(s)(ii): Confirm that this amount can be provided for from operating expenditure

The amount provided, R 28,878,664.79, is believed to be sufficient for the requirements pertaining to closure.

23 Item 3(t): Deviations from the approved scoping report and plan of study

23.1 Item 3(t)(i): Deviations from the methodology used in determining the significance of potential environmental impacts and risks

The EIA Phase and Report does not deviate from the Plan of Study as contained in the approved Scoping Report.

23.2 Item 3(t)(ii): Motivation for the deviation

Refer to Section 23.1, above.

24 Item 3(u): Other Information required by the competent authority

24.1 Item 3(u)(i)(1): Impact on the socio-economic conditions of any directly affected person

No impacts on the socio-economic conditions of any directly affected person have been identified.

24.2 Item 3(u)(i)(2): Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

SAHRA provided comments to the Heritage Report submitted as part of the Section 102 process, on 18 November 2015 and again in February 2016. The Heritage Report identified five Late Iron Age stone walled sites (identified as Ft/003 to Ft/007), Later Stone Age surface scatter of stone stools (identified as Ft/011), and pottery surface scatter from the Later Iron Age (identified as Ft/002). The comments from SAHRA are as follows:

- Before construction can take place, the stone walled sites should be mapped and mitigated by a professional archaeologist who has applied for a permit to do so before construction begins;
- Test pit excavations below the *koppies* to ascertain the extent of the cultural material around the stone walled sites should also be conducted by an archaeologist before construction begins;
- If any further evidence of archaeological sites or remains (e.g., remnants of stone-made structures, indigenous ceramics, bones, stone artefacts, ostrich eggshell fragments and charcoal/ash concentrations), fossils or other categories of heritage resources are uncovered after mitigation takes place, a professional archaeologist or palaeontologist, depending on the nature of the finds, must be contacted as soon as possible to inspect the findings;
- If any newly discovered heritage resources prove to be of archaeological or palaeontological significance a Phase 2 rescue operation might be necessary, and a permit will be needed before mitigation. You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/Phillip Hine 021 202 8652); and
- If any unmarked human burials are uncovered then please contact the SAHRA BGG Unit (Mimi Seetelo 012 320 8490).

Additional field work is being conducted as per SAHRAs comments and subsequent correspondence with the agency.

25 Item 3(v): Other matters required in terms of sections 24(4)(a) and (b) of the Act

Refer to Section 8.1 for the discussion pertaining to the alternatives discussed and Section 9.9 for reasons provided for certain alternatives not being considered.

Part B: Environmental Management Programme Report

1 Item 1(a): Details of the EAP

Digby Wells Environmental was appointed by Lanxess Chrome Mining to facilitate and complete the environmental and legal applications. The EAP details are contained in Table 1-1 below.

Table 1-1: Contact details of the EAP

Name of Practitioner:	Stephanie Aken
Telephone:	+27 11 789 9495
Fax:	+27 11 789 9498
Email:	Stephanie.Aken@digbywells.com

2 Item 1(b): Description of the aspects of the activity

Refer to Section 0 in Part of this report for the environmental aspects pertaining to this Project.

3 Item 1(c): Composite Map

Refer to Appendix 14 for the composite map.

4 Item 1(d): Description of Impact management objectives including management statements

The current closure and rehabilitation plan has been updated to include the proposed open pit mining area. The following section therefore reflects the mine in its entirety (proposed and current activities).

4.1 Item 1(d)(i): Determination of closure objectives

The rehabilitation of Lanxess Chrome Mine will require significant levels of control and monitoring during implementation if the desired objectives are to be achieved. These closure objectives have been derived with the use of the baseline in Section A. In brief, these objectives are:

- Produce a free draining, and stable topography (landscape);
- Ensure erosion free, sustainable vegetation;
- Return rehabilitated land-use to the pre-mining environment where possible;
- Minimise negative impacts and maximise positive benefits on the local community;
- Follow a comprehensive consultation and communication process with all stakeholders.

- Prevent soil and surface/groundwater contamination by managing all water on site to acceptable and agreed standards; and

Maintain and monitor all rehabilitated areas following re-vegetation and, if this monitoring shows that the objectives have been met, make an application for closure.

Please refer to Section 7 for a breakdown of the closure objectives.

4.2 Item 1(d)(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

4.2.1 Sewage Plant

A sewage treatment facility is located on site to chemically treat the sewage produced from the living quarters and working sites.

4.2.2 Pollution Control Dams, Paddocks and Evaporation Dams

Return water dams are used to collect polluted water from the tailings dam facility and water is recycled from this facility and through the process again.

4.2.3 Polluted Water Treatment Facility

No additional polluted water treatment facility is currently necessary as existing dams will be utilised. Polluted water is kept separate from the clean water according to Regulation 704 of the Government Gazette 20118, 4 June 1999. At the tailings dam this separation is achieved through the construction of a clean water bypass berm that directs the clean water away from the tailings dam, while the polluted water is directed to one of the return water dams. All stockpiles are bunded. Water from the return water dams is recycled for use in the mining operations.

4.2.4 Potable Water Treatment Facility

No potable water treatment facility is required. Potable water is supplied by Rand Water.

4.2.5 Process Water Supply System

An additional process water dam with the capacity of 17 500 m^3 has been constructed downstream of the existing process water dam (which holds 6 300 m^3).

4.3 Item 1(d)(iii): Potential risk of Acid Mine Drainage

The potential for acid generation is based on an earlier review of the sulphur species concentrations, carbonate values, the AP, NP and Net NP values and the NP/AP ratios. When considering this summary it is important to keep in mind that the Modified ABA test method provides *an indication* of the potential for acid generation. Whether or not acidic drainage will result is largely a function of the mineralogy, the availability of each acid

generating and neutralising mineral present, the physical characteristics of the material and the environmental setting. All of the samples can be classified as having a Medium Neutralising Potential. The medium neutralising potential and absence of sulphur and therefore acid generation potential indicates that no AMD will be formed. Neutral pH, with a high TDS drainage will also not occur as no first step in the acidification occurs. Neutral Mine Drainage (NMD) is characterised by acidification followed by an adequate buffering capacity to result in a neutral pH, but high salinity from the release of sulphates, acidification and resultant neutralisation by carbonate minerals

4.4 Item 1(d)(iv): Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

A geochemical assessment of the waste rock material has been undertaken and found that the material does not present chemicals which would result in acid mine drainage. Based on this finding, Digby Wells recommend a Class D liner for the waste rock dump

4.5 Item i(d)(v): Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

The Lanxess Chrome Mine is not currently considered to have an impact on acid mine drainage in the area and therefore no additional engineering has been undertaken.

4.6 Item 1(d)(vi): Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Additional measures would include those included for the management of decant or the separation of dirty water from the current operations.

4.7 Item 1(d)(vii): Volumes and rate of water use required for the mining, trenching or bulk sampling operation

The mine does not utilise water from any local surface water resources for its activities, with Rand Water being the primary supplier of water to the mine. The water make up requirements are approximately 1 000 m^3/ day. Below is a summary of the water requirements for the mine.

- The water in circulation is estimated to be 175 000 m^3/month, of which most is recycled.
- The HMS plant uses 40% of the total water consumption (70 000 m^3/month).
- The gravity plant uses 60% of the water consumption (105 000 m^3/month).

The mine's domestic consumption averages 8 200 m^3/month (IWWMP, 2010)

4.8 Item 1(d)(viii): Has a water use licence has been applied for

An existing Water Use Authorisation was granted in 2005. An amendment to the current Water Use Licence (WUL) was submitted in 2011 and was again updated in 2016.

4.9 Item 1(d)(ix): Impacts to be mitigated in their respective phases

Please refer to Table 6-1 for a summary of impacts to be mitigated in their respective phases.

5 Item 1(e): Impact Management Outcomes

Please refer to Table 6-1 for a summary of impact management outcomes.

6 Item 1(f): Impact Management Actions

Please refer to Table 6-1 for a summary of impact management actions.

Table 6-1: Summary of impacts to be mitigated in their respective phases

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
1) The transportation of construction material to the Project site via national, provincial and local roads.	Construction for Underground and Opencast Operations	Mining machinery and vehicles may increase ambient noise levels at surrounding urban and rural noise sensitive receptors. The transportation of construction material will have a negative visual impact on the receiving environment. Vehicular activity and the resulting dust will draw attention to the project area. These visual impacts are temporary and will only occur during the	Increase in Noise levels. Negative visual impact.		▪ Restricting construction activities to daylight hours where viable; ▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use. ▪ Roads should be wetted frequently by means of a water bowser to suppress dust; and ▪ Vehicles must be roadworthy and obey the recommended speed limits at all times.	Recommended noise control measures (as recommended in previous column). Recommended visual mitigation measures (see previous column).	Noise levels will be kept to a minimum. There are no national standards for visual.	The expected noise levels from the proposed project will comply with the National Noise Control Regulations.	Construction Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		construction phase.							
2) Storage of fuel, lubricant and explosives in temporary facilities for the duration of the construction phase.		Impacts on surface water quality as a result of accidental spillages of hazardous substances from construction vehicles used during site clearing and grubbing. Impact on soil quality from hydrocarbon spills. Groundwater contamination. The temporary storage of fuel, lubricants and explosives will have a negative visual impact on the receiving environment. These visual impacts are temporary and will only occur during the construction phase.	Surface water contamination. Hydrocarbon spills. Potential decrease in groundwater quality. Negative visual impact.	>1ha	▪ Prevent any spills from occurring; ▪ If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; ▪ All vehicles are to be serviced in a correctly bunded area or at an off-site location; and ▪ Leaking vehicles will have drip trays place under them where the leak is occurring. ▪ Implement and train drivers to adhere to traffic rules; ▪ Implement a vehicle maintenance schedule; ▪ Install oil collection pans under vehicles; ▪ Handle and store blasting material according to manufacturing requirements; ▪ Minimise external contamination sources in the pit (diesel, oils, chemicals) as far as possible to ensure that groundwater flowing into the mine is contaminated; and ▪ Monitor quality of mine water. ▪ Limit the footprint area of temporary storage facilities where possible.	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life Construction Phase
3) Site clearance		Removal of soil layers will impact	Loss of land	100-200ha	▪ The construction phase should be limited to the dry months of the year	control through management	NWA, DWS BPG	Impact avoided/	Construction

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
and topsoil removal prior to the commencement of physical construction activities across the project area.		on the land capability because vegetation can no longer be supported. Increase in turbidity of surface water runoff during construction caused by an increase in runoff from the cleared and stripped areas or from topsoil stockpiles which is high in suspended solids. Removal of vegetation. Impact on unidentified heritage resources. The removal of vegetation and topsoil for site clearing will have a negative visual impact on the receiving environment. The project area will become noticeable to the	capability. Increase in turbidity in water affecting the water quality. Increase in levels of TSP, PM10 and PM2.5. Reduction in vegetation. Damage to unidentified heritage resource. Negative visual impact.		(May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing and grubbing; ▪ The removed topsoil should be covered or vegetated as soon as possible to prevent sediment erosion; ▪ No land capability mitigation is possible during the construction and operational phases because the land use is changed from agriculture to opencast; and ▪ Mitigation of land capability post mining is required through legislation through land rehabilitation. ▪ Clearing of vegetation should be limited to the project site, and the use of existing access roads should be prioritized so as to avoid construction of new access roads in these areas; ▪ Site clearing should be carried out in non-windy months ▪ Water should be used to dampen dust generating areas during the clearing process ▪ Avoid sensitive landscapes such as the *Koppies* that were encountered on site. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable	and monitoring. Recommended visual mitigation measures (see previous column).	Ambient air quality standard operating procedure including monitoring programme. There are no national standards for visual.	minimised.	Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		nearby receptors as it will contrast the surrounding areas.			seedbank will create an excellent basis for rehabilitated areas where these soils are used. ▪ A study to identify and record burial grounds and archaeological resources. ▪ A Heritage 'watch-out' during construction. ▪ Vegetation and topsoil should only be removed when and where necessary; and ▪ Topsoil stockpiles should be vegetated to reduce visual disturbance where possible.				
4) The construction of waste rock dumps.		Increase in turbidity of surface water runoff during construction caused by an increase in runoff from the cleared and stripped areas or from topsoil stockpiles which is high in suspended solids Removal of vegetation Unidentified heritage resources. Stockpiling waste rock will have a negative visual impact on the receiving	Decrease in water quality Decrease in vegetation cover Damage to heritage resources. Negative visual impact.	100-200ha	▪ The construction phase should be limited to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing and grubbing ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the rock dump within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	NWA, DWS BPG. There are no national standards for visual.	Impact avoided/ minimised.	Construction Phase Project Life

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.			seedbank will create an excellent basis for rehabilitated areas where these soils are used. ▪ A study to identify and record burial grounds and archaeological resources. ▪ A Heritage 'watch-out' during construction. ▪ Overburden should only be removed when and where necessary; ▪ Overburden stockpiles should be positioned to reduce visual disturbance where possible; ▪ Reduce the height of overburden stockpiles where possible; ▪ Limit the height and footprint area of overburden stockpiles where possible; ▪ Apply dust suppression techniques to limit the dust from stockpiles; ▪ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; and ▪ Ensure vegetation screens are built and maintained.				
5) The construction of topsoil stockpiles.		Increase in turbidity of surface water runoff during construction caused by an increase in runoff from the cleared and stripped areas or from topsoil stockpiles which is high in suspended	Loss of Topsoil as a resource Increase in run-off and turbidity. Impact on water quality from runoff Increase in levels of TSP, PM10 and PM2.5	50-100ha	▪ The topsoil should be stripped by means of an excavator bucket, and loaded onto dump trucks; ▪ Stockpiles are to be kept to a maximum height of 4m (the practical tipping height of dump trucks); ▪ Topsoil is to be stripped when the soil is dry, as to reduce compaction; ▪ The topsoil 0.3 m of the soil profile should be stripped first and stockpiled separately; ▪ The subsoil approximately 0.7 – 0.9 m thick will then be stripped and stockpiled separately;	control through management and monitoring. Recommended visual mitigation measures (see previous column).	NWA, DWS BPG NEMAQA. There are no national standards for visual.	Impact avoided/ minimised Within Air Quality Guidelines	Construction Phase Project Life

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		solids. Impact on soil through removal and stockpiling of soil. Impact on water quality from runoff Removal of vegetation cover. Stockpiling topsoil will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.	Loss of vegetation. Negative visual impact.		▪ Soils to be stripped according to the rehabilitation soil management plan and stockpiled accordingly; ▪ Foundation excavated soil should also be stockpiled; ▪ Stockpiles are to be maintained in a fertile and erosion free state by sampling and analysing annually for macro nutrients and pH; ▪ The handling of the stripped topsoil will be minimized to ensure the soil's structure does not deteriorate; ▪ Compaction of the removed topsoil should be avoided by prohibiting traffic on stockpiles; ▪ Prevent unauthorised borrowing of stockpiled soil; ▪ The stockpiles will be vegetated (details contained in rehabilitation plan) in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil; ▪ Soils will be stripped using the delineated soil types as guide. Yellow and red soils may be stripped together. Wetland soils (if allowed) should be stripped and stockpiled separately but also in the order topsoil (0.3 m) then subsoil separately; and ▪ Access should be limited to prevent any unnecessary compaction from occurring ▪ The removed topsoil should be covered or vegetated as soon as possible to prevent sediment erosion (details contained in rehabilitation plan)				

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
					▪ Water sprays can be utilised to reduce the levels of particulate matter. ▪ Drop heights should be reduced ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used. ▪ Topsoil should only be removed when and where necessary; ▪ Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; ▪ Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; ▪ Topsoil stockpiles should be positioned to reduce visual disturbance where possible; ▪ Limit the height and footprint area of topsoil stockpiles where possible; ▪ Apply dust suppression techniques to limit the dust from stockpiles;				

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
					▪ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; and ▪ Ensure vegetation screens are built and maintained.				
6) The establishment of the initial boxcut and access ramps to the open-pit mining areas.		Impacts on Air Quality during the development of the boxcut Removal of vegetation Potential dewatering. The establishment of the initial boxcut and access ramps to the open pit mining areas will have a negative visual impact on the receiving environment. Drilling and blasting to develop the initial boxcut for mining will result in noise and dust thereby attracting attention to the project area. The boxcut will dramatically contrast the surrounding	Increase in levels of TSP, PM10 and PM2.5 Loss of vegetation cover Decrease in water quantity. Negative visual impact.	>1ha	▪ Water should be used to dampen dust generating areas ▪ Avoid the establishment during windy months ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used. ▪ Establish the depth to groundwater table prior to construction; ▪ Minimise penetration into the groundwater table; ▪ If groundwater table is to be penetrated to significant depth, dewater aquifer prior to excavations; ▪ Depending on the quality of the	Recommended visual mitigation measures (see previous column).	There are no national standards for visual.		Project Life

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		agricultural area. This will leave a permanent scar on the landscape. The visual impact of the boxcut and access ramps will be permanent and irreversible. Dust from the blasting will also have a negative visual impact. This visual impact will occur for the life of the project.			groundwater, discharge, store or recycle as appropriate; and ▪ Obtain permission from regulating authority. ▪ Only remove overburden when and where necessary; and ▪ Apply dust suppression techniques to limit the dust created by blasting.				
8) The construction of haul roads on site		Impacts on surface water quality as a result of accidental spillages of hazardous substances from construction vehicles used during site clearing and grubbing Removal of vegetation cover Impact on unidentified heritage resources.	Decrease in water quality Loss in vegetation Damage to heritage resources. Negative visual impact.	30-40ha	▪ Haul roads need to be well compacted to avoid erosion of the soil into the stream ▪ Water sprays on the road should be used frequently during construction. ▪ The use of existing access roads should be prioritized so as to avoid construction of new access roads in these areas; ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Construction Phase Project Life

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		The construction of haul roads will have a negative visual impact on the receiving environment.			the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated A study to identify and record burial grounds and archaeological resources. ▪ A Heritage 'watch-out' during construction areas where these soils are used. ▪ Do not create numerous haul roads alongside each other.				
9) The construction of the access or service road.		Impacts on surface water quality as a result of accidental spillages of hazardous substances from construction vehicles used during site clearing and grubbing Loss in vegetation. The construction of the access or service road will have a negative visual impact on	Decrease in water quality Decrease in vegetation cover. Negative visual impact.	20-30ha	▪ Access roads need to be well compacted or surfaced correctly to avoid erosion of the soil into the stream ▪ the use of existing access roads should be prioritized so as to avoid construction of new access roads in these areas; ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Construction Phase Project Life

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		the receiving environment.			minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent basis for rehabilitated areas where these soils are used. ▪ Do not create numerous roads alongside each other.				
10) The construction of the hard park area (this is made up of the workshop, office block and parking lot).		Removal of soil layers will impact on the land capability because vegetation can no longer be supported. The construction of hard park area will have a negative visual impact on the receiving environment. This hard park area includes the workshop, office block and parking lot. These visual impacts will occur for the life of the project. Construction area lighting at	Loss of land capability Loss of vegetation cover. Negative visual impact.	1ha-2ha	▪ The construction phase should be limited to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing and grubbing; ▪ The removed topsoil should be covered or vegetated as soon as possible to prevent sediment erosion; ▪ Limit degradation and destruction of natural environment to designated project areas by keeping the footprint of the topsoil stockpiles within the low sensitivity agricultural fields. Re-vegetate open areas to limit erosion. ▪ Restrict nationally restricted alien invasive plant recruitment by ensuring the removal of vegetation during construction and operation will be minimised thereby reducing the risk of open areas occurring. ▪ Maintain top soil biological activity by soils stockpiling without compaction to keep the seed bank viable if topsoil is replaced within a year. This viable seedbank will create an excellent	Recommended visual mitigation measures (see previous column).	There are no national standards for visual.		Construction Phase Project Life

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place. The visual impacts from the construction area lighting will occur during the construction phase.			basis for rehabilitated areas where these soils are used. ▪ Limit the height and footprint area of surface infrastructure where possible; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; ▪ Construction of vegetation berms must be implemented close to infrastructure so that vegetation can be established; and ▪ Avoid construction activities at night if possible, thereby avoiding the use of construction area lighting. If construction activities take place at night, down lighting should be implemented to minimise light pollution.				
11) Drilling and blasting of the overburden rock for easy removal by excavators and dump trucks.	Operational Phase for Underground and Opencast Operations	Blasting material during operational phases releases ammonium nitrates from the explosive residues. This chemical contaminates the water in the pit and can	Decrease in water quality. Increase in Noise level. Negative visual impact.	N/A	▪ All the water being pumped from the pit should be stored in the pollution control dams (PCD's) for re-use on the mine so as to prevent unnecessary discharge into the environment; ▪ Based on Reg 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. Therefore clean water emanating from upstream of the mine will be diverted away and discharged	control through management and monitoring. Recommended noise control measures (as recommended in previous column). Recommended visual mitigation	Impact avoided/ minimised. Noise levels will be kept to a minimum. There are no national standards for visual.	The expected noise levels from the proposed project will comply with the National Noise Control Regulations	Project Life Operational Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		potentially contaminate the streams if water is discharge into the natural environment. Nitrates and ammonia from blasting residues, can lead to eutrophication (nutrient enrichment) of water bodies. They may also be converted into toxic nitrites. Ammonia (NH3 as opposed to NH4+) is highly toxic to fish and many aquatic organisms at even low (µg/l) concentrations; Mining machinery and vehicles may increase ambient noise levels at surrounding noise sensitive receptors. The removal of overburden by drilling and blasting will have a continual negative visual			to the nearby watercourse or environment. The clean water diversion will be sized to accommodate the 1:50 year storm event. ▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use. ▪ Only remove overburden when and where necessary; ▪ Overburden stockpiles should be positioned to reduce visual disturbance where possible; ▪ Plant fast-growing endemic vegetation in areas where it can conceal stockpiles; ▪ Ensure vegetation screens are built and maintained; ▪ Limit the height and footprint area of overburden stockpiles where possible; and ▪ Apply dust suppression techniques to limit the dust created by blasting and from the stockpiles.	measures (see previous column).			

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		impact on the receiving environment. This visual impact will be permanent and irreversible. Overburden stockpiling will have a negative visual impact on the receiving environment. Dust from the blasting and from stockpiles will also have a negative visual impact. These visual impacts will occur for the life of the project.							
12) Dumping of waste rock and maintenance of waste rock dump		Mining machinery and vehicles may increase ambient noise levels at surrounding noise sensitive receptors Unconfined stormwater runoff from other contaminated surfaces in the mine have the potential to contaminate the	Decrease in water quality. Increase Noise level. Negative visual impact.	100-200ha	• Based on Reg 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. Therefore clean water emanating from upstream of the mine will be diverted away and discharged to the nearby watercourse or environment. The clean water diversion will be sized to accommodate the 1:50 year storm event. • Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g.	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life Continuation (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		natural water resources. Operation and maintenance of the waste rock dump will have a negative visual impact on the receiving environment. Dust from the dump will also have a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.			installed exhaust mufflers; and • Switching off equipment when not in use. • Overburden should only be removed when and where necessary; • Stockpiles should be positioned to reduce visual disturbance where possible; • Limit the height and footprint area of stockpiles where possible; • Apply dust suppression techniques to limit the dust from stockpiles; • Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; • Ensure vegetation screens are built and maintained; and • Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.				
13) Removal and loading of ore onto trucks (O/C) or conveyor (U/G) to the plant.		During this stage, waste rock brought to the surface and those from the open cast process is loaded onto 30 tonne tipper trucks and offloaded at the waste rock dumps. The loading and	Increase in Dust. Decrease in water Quality. Increase in Noise level. Decrease in groundwater quantity and quality. Negative visual impact.	>1ha	• To mitigate the impacts of the loading and dumping process, the drop height when loading and offloading must be lowered. • All the water being pumped from the pit or underground should be stored in the pollution control dams (PCD's) for re-use on the mine so as to prevent unnecessary discharge into the environment • Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		offloading process results in dust generated comprises TSP, PM10 and PM2.5 (this fraction is causing health problem in the human respiratory system due to the depth of penetration and the resultant interaction with human tissues). Potential dewatering from underground and opencast mining. The removal of ore will have a continual negative visual impact on the receiving environment. This visual impact will be permanent and irreversible. Infrastructure and mine area lighting will be visible at night resulting in a negative visual			mechanisms are effective e.g. installed exhaust mufflers; and • Switching off equipment when not in use • Dewater aquifer prior to further excavations Dewater very closely to the active mining face; • Manage groundwater abstraction rates and volumes in accordance with borehole sustainable yields; • Monitor groundwater abstractions to ensure that the aquifer from which water is abstracted is not over-exploited; • Pump excess underground water to appropriate surface storage facility according to manage and minimise the water quality impacts. When required by the process plant, the abstracted water can be discharged into the return water dam; • Reuse water as far as possible. An off-take can be installed from the reservoir to the vehicle maintenance bay for use in dust suppression activities and general usage at the bay. However, for dust suppression it is good practice to first use marginal mine water or grey water before using pristine groundwater; and • Monitor water influx, water stored, water removed; and water levels in the underground mine and groundwater levels in the perimeter of the underground mine. • Divert surface flows away from the open pit areas through channels, drains and culverts.				

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		impact on the receiving environment. This visual impact will occur for the life of the project.			• ROM stockpiles should be positioned to reduce visual disturbance where possible; • Limit the quantity and time of ROM stored on site; and • Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.				
14) Continuing operation of existing processing plant (Crusher, settler, gravity plant and reclamation plant).		Impacts on surface water quality as a result of mobilized hazardous substances from trucks and machinery during operation of mine During this stage, the ore from the underground operations and the open pit will be crushed to reduce the size. The dust generated encompasses TSP, PM_{10} and $PM_{2.5}$ (this fraction is causing health problem in the human	Impact on water quality. Increase in dust. Increase in noise levels.	Project area	• To mitigate the impacts, the crusher should be enclosed to control the dust that is generated in the process. The application of water sprays also helps to suppress generated dust thus reducing the impact offsite. • Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Switching off equipment when not in use	Control through management and monitoring,	Impact avoided/minimised		Project Life (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		respiratory system due to the depth of penetration and the resultant interaction with human tissues).							
15) Storage of fuel in diesel tanks, as well as lubricant and explosives in facilities for the duration of the Project.		Impacts on surface water quality as a result of mobilized hazardous substances from trucks and machinery during operation of mine Hydrocarbon spills can impact soil quantity	Hydrocarbon spill Increase risk of soil contamination Impact on water quality	>1ha	▪ Prevent any spills from occurring; ▪ If a spill occurs it is to be cleaned up immediately and reported to the appropriate authorities; ▪ All vehicles are to be serviced in a correctly bunded areas or at an off-site location; and ▪ Leaking vehicles will have drip trays place under them where the leak is occurring. ▪ The storage facilities of fuel, lubricant and explosives must be a hard standing area (paved or concrete surface), roofed and bunded. This will prevent mobilization of leaked hazardous substances. Emergency spillage response plan should in place and accessible to the responsible monitoring team				Project Life (included in previously approved EMPr))
16) Vehicular activity on the proposed roads and maintenance activities		This focuses on the use haul roads and then the conveyance of chrome using conveyor belts. Loading and offloading will result in dust emissions. The chrome is loaded	Decrease in air quality/ increase in dust generation Increase in noise levels Decrease in vegetation health due to	25-50ha	▪ To mitigate the impacts, reduce vehicle speed will reduce emission to the atmospheric environment. ▪ Water sprays on the road should be used frequently, keeping the road moist. ▪ Dust suppressants such as Dust-a-side can be applied on the well-defined truck routes. ▪ Making speed humps and ensuring that the speed limits are adhered to or	Recommended visual mitigation measures (see previous column).	There are no national standards for visual.	N/A	Project Life (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		onto trucks and some onto conveyors. During this stage, materials are transported to the various stockpile using 3 tonne tipper trucks, which leads to the generation of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$. Health & growth of vegetation. Vehicular activity on the haul roads and access or service road will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact. These visual impacts will occur for the life of the project.	dust. Negative visual impact.		enforced to reduce potential generation of dust particles. ▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use ▪ Keeping the road moist. ▪ Dust suppressants such as Dust-a-side can be applied on the well-defined truck ▪ Prevent excess dust creation that could inhibit plant growth by wetting of the haul roads to suppress dust creation as well as cover haul trucks to prevent dust emissions during transport. ▪ To avoid animal deaths specific speed limits must be adhered to by all mining vehicles. ▪ Do not create numerous haul roads alongside each other; ▪ Roads should be wetted frequently by means of a water bowser to suppress dust; and ▪ Vehicles must be roadworthy and obey the recommended speed limits at all times.				
17) The operation of the TSF (dirty water from stormwater and dewatering		Impacts on surface water quality due to unconfined stormwater runoff	Decrease in water quality (surface water and groundwater)	50-100ha	▪ No mining or any operation should take place within a horizontal distance of 100 metres from any watercourse. ▪ Based on Reg 704 requirements regarding storm water management for	Control through management and monitoring,	Impact avoided/minimised		Project Life (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
mining activities) and the connected return water dam		from other contaminated surfaces in the mine have the potential to contaminate the natural water resources. Separation of clean water runoff upstream of the mine area. Water upstream of the mine area is considered clean and will have to be separated from the dirty water area. Dirty water Spillages from the mine area into the environment must be managed Groundwater contamination	Due to contamination		mining activities it is noted that all clean and dirty water must be separated. Therefore clean water emanating from upstream of the mine will be diverted away and discharged to the nearby watercourse or environment. The clean water diversion will be sized to accommodate the 1:50 year storm event. ▪ Should the contained water be more than the water use requirement, the BPGs advices that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water ▪ The mine water management measures recommended during construction phase should continue during the operational phase; ▪ It is recommended that abstraction from boreholes that are close to the mine workings should be avoided so that contaminants will not migrate away from the mine, towards the abstraction boreholes; ▪ Monthly or quarterly monitoring of groundwater qualities and water levels are recommended (particularly down gradient of the mine site) with continuous refining and updating of the monitoring network based on the results obtained; ▪ Annual audits of monitoring and management systems should be conducted by independent environmental consultants; and				

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
					▪ With the application of the above-stated mitigation plans, the impact of the contaminant migration during construction phase can be lowered to negligible.				
18) Continuing operation and maintenance of the stockpiles, including topsoil and ROM stockpiles.		Impacts on surface water quality due to unconfined stormwater runoff from other contaminated surfaces in the mine have the potential to contaminate the natural water resources. Topsoil losses can occur during the operational phases as a result of rain water runoff and wind erosion, especially from roads and soil stockpiles where steep slopes are present. Materials i.e. ROM, lumpy ore, crusher fines, HMS fines and stockpiles CO1, CO4 and CO6 are stored at their	Loss of stockpiled topsoil Increase in dust Decrease in water quality. Negative visual impact.	100-200ha	▪ Stockpiles are to be maintained in a fertile, vegetated, and erosion free state; ▪ Stockpiles are to be clearly demarcated; ▪ Ensure proper storm water management designs are in place; ▪ Access routes are to be kept to a minimum as to reduce any unnecessary compaction from occurring; ▪ If erosion occurs, corrective actions must be taken to minimize any further erosion from taking place; and ▪ Unauthorised borrowing of stockpiled soil materials should be prevented. ▪ To mitigate the impacts of the stockpiling, water sprays on the stockpiles need to be utilised, use of wind breaks can be implemented near the respective stockpiles as these reduce anticipated dust impacts by 30%.No mining or any operation should take place within a horizontal distance of 100 metres from any watercourse. ▪ Based on Reg 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. Therefore clean water	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		respective stockpiles. The various stockpiles thus represent sources of dust, with the subsequent erosion of dust that comprises TSP, PM_{10} and $PM_{2.5}$. Operation and maintenance of the topsoil and ROM stockpiles will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact on the receiving environment. These visual impacts will occur for the life of the project.			emanating from upstream of the mine will be diverted away and discharged to the nearby watercourse or environment. The clean water diversion will be sized to accommodate the 1:50 year storm event. ▪ Should the contained water be more than the water use requirement, the BPGs advices that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water. ▪ Topsoil should only be removed when and where necessary; ▪ Limit the height of soil stockpiles to 3 metres to prevent the soil from becoming compacted and to reduce the visual impact; ▪ Topsoil stockpiles should be vegetated so as to blend into the surrounding landscape; ▪ Stockpiles should be positioned to reduce visual disturbance where possible; ▪ Limit the height and footprint area of stockpiles where possible; ▪ Apply dust suppression techniques to limit the dust from stockpiles; ▪ Plant fast-growing endemic vegetation in areas where it can conceal the stockpiles; ▪ Ensure vegetation screens are built and maintained;				

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
					▪ Limit the quantity and time of ROM stored on site; and ▪ Avoid operational and mining activities at night if possible, thereby avoiding the use of infrastructure and mine area lighting. If operational and mining activities take place at night, down lighting should be implemented to minimise light pollution.				
19) Waste and sewage generation and disposal.		Impacts on surface water quality due to disposal of waste into the streams. Waste storage on site will have a negative visual impact on the receiving environment. This visual impact will occur	Negative visual impact.	10-50ha	▪ Based on Reg 704 requirements regarding storm water management for mining activities it is noted that all clean and dirty water must be separated. Therefore clean water emanating from upstream of the mine will be diverted away and discharged to the nearby watercourse or environment. The clean water diversion will be sized to accommodate the 1:50 year storm event. ▪ Should the contained water be more	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life (included in previously approved EMPr) Operational Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		until the waste is removed from the site.			than the water use requirement, the BPGs advices that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water. ▪ Limit the footprint area of the waste storage area where possible; and ▪ Limit the quantity and time of waste stored on site.				
20) Maintenance of secondary infrastructure (offices, parking)				1-2ha					
21) Concurrent replacement of overburden and topsoil and the re-vegetation of mined out strips. The mined strip will be backfilled with the overburden and compacted. Subsequently, the topsoil will be placed on top of the overburden and the area will be vegetated.		Impact on the rehabilitation of soil, soil quality and land capability. Backfilling of soil layers will impact on the land capability by restoring the land capability to some extent because vegetation will be supported and therefore returned to the planned post mining land capability such as arable and or	Loss of land use and capability Potential restoration in indigenous vegetation. Reduced negative visual impact.	Project area	• Mitigation is possible because the land use is changed from mining back to agriculture as follows: • The spoil should be shaped taking the pre-mining landscape into consideration; • The designed post mining landforms should be modelled to establish the post mining landscape stability by using a combination of GIS and erosion modelling techniques by a suitably qualified expert using site specific soil quality data; • The soil layers should be put back in the reverse order of stripping namely subsoil first then topsoil; • The yellow and red soils should be replaced in upland landscape positions; • Wetland soils should be put back in the reverse order of stripping;	Recommended visual mitigation measures (see previous column).	There are no national standards for visual.		Project Life (included in previously approved EMPr)

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		grazing. Impact on indigenous vegetation. Concurrent rehabilitation by replacement of overburden and topsoil as well as re-vegetation as mining progresses will have a neutral visual impact on the receiving environment. The aim of rehabilitation is to return the project area to a state similar to the pre-mining state. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment. Backfilling of the open pit with overburden will use rock removed from the void of the current mining strip to partly fill			• Wetland soils should be placed in lower landscape positions; • The soil quality should be investigated prior to establishing vegetation on the rehabilitated soil through representative sampling and laboratory analysis; • The analytical data should be evaluated by a suitably qualified expert and vegetation fertility and or soil acidity problems should be corrected prior to vegetation establishment; • Clear targets incorporating medium to long term post mining land capability influencing land use, should be part of a potentially successful closure plan; and • From a national food security viewpoint, ways need to be found of rendering land rehabilitated to arable standards suitable for the economic production of cash crops. Reduce areas available for alien infestation by restoring disturbed areas to natural habitat. • Implementation of an alien invasive management program is imperative to reduce the risk of these plant species infesting the mine area. • Backfill as much of the open pit area as possible; • Spread topsoil over the backfilled area; and • Re-vegetate the backfilled area.				

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		the mined out void in the previously mined strip. Once backfilling commences, overburden should no longer be added to the overburden stockpiles. This will have a neutral visual impact on the receiving environment. Spreading of topsoil and re-vegetation of the backfilled areas will have neutral visual impacts on the receiving environment.							
22) Removal of surface infrastructure (Plant machinery, conveyors)	Decommissioning of Opencast and Underground operations	Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from trucks and machinery during decommissioning phase could have an impact on the quality of water in	Decrease in water quality Increase in Noise levels. Reduced negative visual impact.		• Use of accredited contractors for removal or demolition of infrastructures should be ensured • Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented; • Restricting construction activities to daylight hours where viable; • Mining related machines and vehicles to be serviced on a regular basis to	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life Decommissioning Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		the nearby streams. Demolition and removal of infrastructure will have a neutral visual impact on the receiving environment. This will help to reverse some of the changes that occurred when the infrastructure was constructed.			ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Switching off equipment when not in use. • Ensure that all unnecessary infrastructure is demolished and removed from the site.				
23) Decommissioning of services (if necessary, depending on post landuse) incl. waste treatment and removal, power & water facilities)		Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from trucks and machinery during decommissioning phase could have an impact on the quality of water in the nearby streams as well as the vegetation	Decrease in water quality Impact on vegetation health and cover.		• Use of accredited contractors for removal or demolition of infrastructures should be ensured • Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented • Avoid spillage of hazardous materials, thereby protecting vegetation and soil. The correct and careful handling of the infrastructure housing pollutants and toxicants to prevent spillages and leaks. • Avoid destruction of vegetation, the creation of favourable habitat for fast growing invasive plants and ground compaction, by forcing vehicles to make use of existing roads and designated areas. Avoid rehabilitated and natural habitat areas as far as possible.	Control through management and monitoring,	Impact avoided/minimised		

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
					• The implemented alien invasive control program must be adhered to carefully.				
24) Rehabilitation of roads and cleared areas (offices and workshop area)		Construction vehicles will result in an increase in ambient noise. Rehabilitation of the roads and cleared areas by replacement of topsoil will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state. Spreading of topsoil, and profiling and contouring to create a free-draining topography will have a neutral visual impact. Re-vegetation of the rehabilitated areas will have a neutral visual impact.	Increase in noise level. Reduced negative visual impact.		• Restricting construction activities to daylight hours where viable; • Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and • Switching off equipment when not in use. • Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; • Spread topsoil over the rehabilitated area; • Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; and • Re-vegetate the rehabilitated areas.	Recommended visual mitigation measures (see previous column).	There are no national standards for visual.		Project Life Decommissioning Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		These visual impacts will be permanent. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.							
25) Removal of fuel, lubricant and explosives		Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from trucks and machinery during decommissioning phase could have an impact on the quality of water in the nearby streams	Decrease in water quality	N/A	• Use of accredited contractors for removal or demolition of infrastructures should be ensured • Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented	Control through management and monitoring,	Impact avoided/minimised		
26) Safe closure of shafts and mine access ramps		This will have a positive impact on the drainage pattern of the area, increased runoff will be reporting to the natural water resources.	Positive impact on Quantity		▪ Use of accredited contractors for removal or demolition of infrastructures should be ensured ▪ Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented	Control through management and monitoring,	Impact avoided/minimised		
27) Final replacement of overburden and		This will have a positive impact on the drainage	Positive impact on Quantity		▪ As the opencast mining progresses, continuous rehabilitation should be implemented by backfilling the voids	Recommended visual mitigation measures (see	There are no national standards for visual.		Project Life Decommissionin

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
topsoil and the establishment of vegetation on the final open cast void. Overburden will be backfilled into the final void and compacted. Subsequently, topsoil will placed and the area vegetated.		pattern of the area, increased runoff will be reporting to the natural water resources. Rehabilitation of the final open void (where possible) by replacement of overburden and topsoil will have a neutral visual impact on the receiving environment and will assist to return the project area to a state similar to the pre-mining state. Once ore has been removed from the open pit, there will be insufficient overburden to fill the void completely. Due to this material imbalance, a permanent void will remain. Spreading of topsoil, and profiling and	Potential to restore water quality Increase in noise levels Potential to restore indigenous vegetation. Reduced negative visual impact.		▪ The backfilled areas should be vegetated as soon as possible to prevent dust and siltation of the water bodies ▪ Where rehabilitation (grass seeding of topsoil cover) is not effective, sedimentation should be mitigated by installing silt traps at areas where the surface runoff enters the surface water resources ▪ Restricting construction activities to daylight hours where viable; ▪ Mining related machines and vehicles to be serviced on a regular basis to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use. ▪ The footprint of the area disturbed by the mining operation will have topsoil and overburden replaced to restore the vegetation cover, through proper rehabilitation. ▪ Limit the erosion potential of exposed areas by re-vegetation. ▪ Re-vegetated areas will form seepage areas which will help aid infiltration. ▪ Backfill as much of the final void as possible; ▪ Ensure that the final void is as small as practically possible; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated	previous column).			g Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		contouring to create a free-draining topography will have a neutral visual impact. Re-vegetation of the rehabilitated areas will have a neutral visual impact. These visual impacts will be permanent. Rehabilitation will assist to reduce the negative visual impact of mining on the receiving environment.			area; ▪ Ensure that surface water and drainage lines are rehabilitated to create a free-draining topography; and ▪ Re-vegetate the rehabilitated areas.				
28) Waste handling of scrap metal and used oil as a result of the Decommissioning Phase will be undertaken.		Mobilization of leaked/spilled contaminants (hazardous and hydrocarbon containing material) from trucks and machinery during decommissioning phase could have an impact on the quality of water in the nearby streams. Waste storage on	Decrease in water quality. Negative visual impact.	N/A	• Use of accredited contractors for removal or demolition of infrastructures should be ensured • Water quality monitoring should continue to enable the detection of decant when it occurs so immediate mitigation measures can be implemented. • Limit the footprint area of the waste storage area where possible; and • Limit the quantity and time of waste stored on site.	Control through management and monitoring. Recommended visual mitigation measures (see previous column).	Impact avoided/minimised. There are no national standards for visual.		Project Life Decommissioning Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
		site will have a negative visual impact on the receiving environment. This visual impact will occur until the waste is removed from the site.							
29) Post-closure monitoring and rehabilitation will determine the level of success of the rehabilitation, as well as to identify any additional measures that have to be undertaken to ensure that the mining area is restored to an adequate state. Monitoring will include surface water, groundwater, soil fertility and erosion, natural vegetation and alien invasive species and dust generation from the discard	Post-closure	Decant of poor quality groundwater from the mining areas may have a negative impact on the surrounding surface water resources. Post-closure monitoring and rehabilitation is essential to limit the impact of the proposed Lanxess Chrome Mine Expansion Project on the receiving environment. This is a neutral impact that will help to reverse some of the negative impacts.	Contamination of water Decant of poor quality water. Reduced negative visual impact.		• Surface water quality monitoring should continue to ensure that there is no impact on the surrounding water resources emanating from the mine area. • Direct rehabilitation efforts by ensuring correct measures are employed for a variety of rehabilitation projects • Avoid erosion, alien invasive species establishment, by monitoring rehab outcome to ensure open areas are eliminated. • Monitor water level rise and apply stage curves to assess the rate of flooding; • Seal mine shafts to prevent surface water from flowing into the defunct underground voids; • Seal all boreholes that connects the mine void to surface; • Monitor pit water level rise and apply stage curves to assess the rate of flooding • Monitor groundwater levels in	Recommended visual mitigation measures (see previous column).	There are no national standards for visual.		Project Life Post- Closure Phase

Activities	Phase	Aspect Affected	Potential impacts	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation type	Standard to be achieved	Compliance with standards	Time period for implementation
dumps.					boreholes in the surrounding aquifers to assess groundwater table responses; and • Groundwater monitoring should continue up to 5 years after closure • No abstraction boreholes should be drilled in a 3 km radius from the underground workings in the post closure environment; • No abstraction boreholes should be drilled in 2.5 km radius from the pit in the post closure environment • Perform effective rehabilitation and closure of redundant facilities through material placing and shaping, capping with appropriate capping liners and re-vegetation to prevent post closure infiltration through sources; and • Consider groundwater plume remediation only if post closure monitoring indicates a persistent pollution plume at unacceptable concentrations. • Ensure that all disturbed areas are rehabilitated to a state as close as possible to the pre-mining state; and • Carefully monitor the rehabilitated areas to ensure that rehabilitation is successful.				

7 Financial provision

7.1 Item (i)(1): Determination of the amount of Financial Provision

7.1.1 Item (i)(1)(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 rehabilitation of Lanxess Chrome Mine will require significant levels of control and monitoring during implementation if the desired objectives are to be achieved. In brief, these objectives are:

- Produce a free draining, and stable topography (landscape);
- Ensure erosion free, sustainable vegetation;
- Return rehabilitated land-use to the pre-mining environment where possible;
- Minimise negative impacts and maximise positive benefits on the local community;
- Follow a comprehensive consultation and communication process with all stakeholders.
- Prevent soil and surface/groundwater contamination by managing all water on site to acceptable and agreed standards; and
- Maintain and monitor all rehabilitated areas following re-vegetation and, if this monitoring shows that the objectives have been met, make an application for closure.

The Lanxess Chrome Mining operation aims to employ concurrent rehabilitation methods (direct replacement) of overburden materials from the current mining strip to the completed mining strips (open voids) with the ultimate goal to return the project area as far as possible back to the most sustainable landscape either the original landscape/topography or to a novel topography that is free draining and matches the surrounding topography.

Based on preliminary calculations done thus far it is assumed that there should be enough material to backfill the open pit that will be left once mining has ceased. In addition to this there should be enough material to rehabilitate and profile the area back to the pre-mining topography or close enough to the pre-mining topography as possible. In the event that the area cannot be rehabilitated back to the pre-mining topography, then the area must be rehabilitated to a state that matches the surrounding topography. Special attention must be given when placing material back into the pit and profiling to ensure that the landscape is free draining and that no ponding of water occurs. It is always important to ensure that there is a reserve of topsoil material for the touch up applications, to fill small depressions that may occur as a result of subsistence.

7.1.2 Item (i)(1)(b): Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

All the closure objectives based on the post mining land use will be consulted with I&APs during the public participation process as part of the closure application. All registered I&APs have the opportunity to review this document and all comments will be captured in the Comments and Responses Report.

7.1.3 Item (i)(1)(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

The approximate size of the mining lease area is 1 169 Ha and based on the mine layout plan approximately 130.79 ha of the total surface area is expected to be disturbed by the proposed mining activities. The pre-mining environment will be mapped against the post-mining environment to determine the appropriate portions of land that will need to be rehabilitated at closure. A site-specific rehabilitation plan is attached as Appendix 13.

7.1.4 Item (i)(1)(d): Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The closure objectives are regarded as guidelines for what the rehabilitation plan should entail. The rehabilitation plan describes how rehabilitation will need to be undertaken and will include management of soil resources and replacement of soil once mining has ceased. In addition to this, the rehabilitation plan contains information associated with re-shaping landforms (topographical plan), operational and post-closure water management, replacement of soils, re-vegetation of the landscape; and monitoring and maintenance. The successful rehabilitation of the site will ensure the rehabilitated area is free draining, erosion free and produce sustainable vegetation as per the closure objectives stated above.

7.1.5 Item (i)(1)(e): Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

Refer to Table 7-1 for the Financial Provision Quantum.

Table 7-1: Financial Provision Quantum

	CALCULATION OF THE QUANTUM						
Applicant:	Lanxess Mine				Location:	Rustenburg	
Evaluator:	Digby Wells Environmental				Date:		
			A	B	C	D	E=A*B*C*D
No.	Description	Unit	Quantity	Master Rate	Multiplication factor	Weighting factor 1	Amount (Rands)
1	Dismantling of processing plant and related structures (including overland conveyors and powerlines)	m3	304	12.83	1	1	3,900.55
2 (A)	Demolition of steel buildings and structures	m2	9800	178.77	1	1	1,751,990.69
2(B)	Demolition of reinforced concrete buildings and structures	m2	0	263.45	1	1	-
3	Rehabilitation of access roads	m2	161700	31.99	1	1	5,172,485.47
4 (A)	Demolition and rehabilitation of electrified railway lines	m	0	310.50	1	1	-
4 (B)	Demolition and rehabilitation of non-electrified railway lines	m	0	169.36	1	1	-
5	Demolition of housing and/or administration facilities	m2	0	357.54	1	1	-
6	Opencast rehabilitation including final voids and ramps	ha	9.6	187,427.98	0.52	1	935,640.49
7	Sealing of shafts adits and inclines	m3	0	95.97	1	1	-
8 (A)	Rehabilitation of overburden and spoils	ha	0	124,952.00	1	1	-
8 (B)	Rehabilitation of processing waste deposits and evaporation ponds (non-polluting potential)	ha	62.71	155,625.44	1	1	9,759,271.12

	CALCULATION OF THE QUANTUM						
8 (C)	Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	ha	0	452,010.05	0.66	1	-
9	Rehabilitation of subsided areas	ha	0	104,628.47	1	1	-
10 (A)	General surface rehabilitation (with undesirable objects)	ha	0	98,983.05	1	1	-
10 (B)	General surface rehabilitation (no undesirable objects)	ha	0	40,900.98	1	1	-
11	River diversions	ha	0	98,983.05	1	1	-
12	Fencing	m	5640	112.91	1	1	636,804.50
13	Water management	ha	9.6	37,636.14	0.25	1	90,326.73
14	2 to 3 years of maintenance and aftercare	ha	99.06	13,172.65	1	1	1,304,882.62
15 (A)	Hydrogeological Studies	Sum	1	120,000.00	1	1	120,000.00
15 (B)	Specialist study	Sum	0			1	-
					Sub Total 1		19,775,302.18
1	Preliminary and General		2,491,688.07		weighting factor 2 1.05		20,764,067.29
2	Contingencies		2,076,406.73				2,076,406.73
					Subtotal 2		25,332,162.09
					VAT (14%)		3,546,502.69
					Grand Total		**28,878,664.79**

7.1.6 Item (i)(1)(f): Confirm that the financial provision will be provided as determined

Lanxess Chrome Mining operation will update its financial provision annually and will contribute to a trust fund or other form of financial guarantee for rehabilitation provision, as required in terms of Section 24P of NEMA, as amended. Contributions to the fund will be made in accordance with the requirements of tax legislation and policy and this will be made up in a manner acceptable to the DMR.

8 Monitoring compliance with and performance assessment

A legal compliance and Environmental Management System (EMS) audit will be regularly conducted by professional consultants throughout the life of the mine, to monitor the EIA and EMP process and the rehabilitation process and to advise on any mitigation measures which need to be added to the existing programmes.

A report will be submitted to mine management annually covering all aspects investigated during the audit, and providing suggestions and recommendations as to how the rehabilitation programme is progressing, and any improvements which could be made.

The Audit will be conducted according to the following acts and regulations;

- National Water Act,1998 (Act No. 36 of 1998) (NWA);
- MPRDA;
- NEMA; and
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996) (MHSA).

The audit will take into consideration the management principles and strategies stated in the Environmental Management Programme, and assess whether this strategy is providing the required results. Any flaws found in the rehabilitation process will be included in the report along with the recommended mitigation measures.

A report will be compiled in accordance with the above listed government acts, on a biannual basis to mine management, who may then decide the appropriate actions to be taken, along with an updated financial provision

8.1 Item 1(g): Monitoring of impact management actions

8.1.1 Dust Monitoring Programme

It recommended that the management of Lanxess continue the current dust monitoring programme throughout the project life of the mine. This will ensure that historical dust deposition data is available to feed into management practices aimed at reducing impacts from the construction, operation and closure phases of the project.

As the area exposed is directly proportional to the amount of dust generated and transported, it is advised that construction activities be limited during the windy periods of August, September and October. If construction has to be done during this period, it is advised to disturb a small area at a time. As trucks are a major source of dust, reducing speed of trucks in haul roads will reduce dust immensely.

In order to determine the wind speed for each particular day, a wind anemometer installed on site should be utilised. Wind speeds are recorded daily and when it exceeds 5.4 m/s (this is the threshold for transporting particles) extra dust control measures need to be carried out. During dust generating periods, sprinkling until it is moist is ideal for haul roads and traffic routes. It must be noted however that excessive sprinkling to manage dust may result in runoff from the site.

8.1.1.1 Particulate Monitoring Programme

Lanxess should establish a fine particulate monitoring programme which should include at least one particulate instrument to monitor either PM_{10} or $PM_{2.5}$. Ideally, both set of pollutants should be monitored as required by regulatory authorities. In addition to pollutants, the ambient monitoring unit should include measurement of meteorological parameters representative of the mining area. Air dispersion modelling should always use site specific data if available. It is advised to install the unit at least one year prior to the construction phase to allow for the collection of ambient air quality baseline data set.

8.1.2 Ecological Monitoring Programme

A monitoring programme, which assesses the ecological state of the terrestrial ecological resources, is recommended. On site monitoring must take place to identify negative trends in the ecosystem, adaptive management will then be applied to correct these negative trends; bush encroachment and alien invasive plant species should be considered.

8.1.2.1 Flora

When removing alien invasive species and weeds, care must be taken to eradicate the plants fully. According to the Alien and Invasive Species Lists, 2014 (GN R599 in *GG* 37886 of 1 August 2014) of the NEMBA. Eradicate means to treat plants by any suitable method in order to prevent such plants from growing, multiplying and propagating. Therefore, when removing plants from the site it should be done at such a time when they are not producing seeds that could easily be spread by wind during cutting and transport. Plants that are known to grow back easily need to be uprooted in order to remove all possible avenues for re-growth and any juvenile plants spotted growing during the operation need to be removed before they become a problem.

8.1.2.2 Fauna

The animal survey revealed a very poor density and diversity of fauna on and around the Lanxess extension area. For this reason management of fauna during the operation will be

minimal, except on the *koppie*, bushveld area and rocky bushveld areas. It is likely that small mammals such as mongoose or hares are living on the extension area. Should any such animals be disturbed by the activities, the operators will be required to call in qualified people to handle and relocate the animals in question. It is however likely that they will move at their own free will. The same methodology must be applied to bird life when nests are found.

8.1.3 Surface Water Monitoring Programme

A monitoring programme is an essential management tool to detect negative impacts on water as they arise resulting from the existing mining activities as well as the newly proposed mine extension. This helps to ensure that the necessary mitigation measures are implemented.

A monitoring programme is already in existence. Both surface and groundwater is monitored on a monthly basis from local boreholes in the vicinity of the mining area and on the mine water dams. It is also necessary to monitor the surrounding water quality on the nearby streams in order to ensure no polluted water is reaching the local water resources.

8.1.4 Groundwater Monitoring Programme

Groundwater monitoring has to continue during all phases of the mine operation to identify the impact on the groundwater environment over time, and so that effective measures can be taken at an early stage before serious damage to the environment occurs.

8.1.4.1 Proposed Monitoring Boreholes

The main objectives in positioning the monitoring boreholes are to:

- Monitor the movement of polluted groundwater away from the mine area;
- Monitor the lowering of the water table and the radius of influence; and
- Monitor post closure groundwater recovery and pollution plume migration.

As obtained from the desktop study, a couple of monitoring boreholes exist in the project area. No additional drilling is proposed for the Wonderkop segment. The existing WKG boreholes would be sufficient for groundwater monitoring in the Wonderkop segment. Apart from the existing Lanxess monitoring boreholes and the Wonderkop monitoring boreholes, the existence of all other boreholes listed in the DWS database could not be verified. It is therefore proposed to drill monitoring boreholes for Kroondal, Overstep and Klipfontein segments.

The location of monitoring boreholes for the Kroondal and Klipfontein segments is limited by the presence of overlying tailings dam.

Eight new monitoring boreholes are recommended based on the impact assessment. Each borehole is recommended to be drilled to a maximum depth of 60 m below surface to monitor the water level and quality in the weathered and fractured aquifer in the Kroondal, Klipfontein, and Overstep segments. In total, 44 monitoring points are recommended for the proposed groundwater monitoring as given in Table 8-1. Furthermore, it is recommended

that LCM combines efforts with the surrounding mining operations in order to establish a more comprehensive monitoring program to assess the cumulative impacts on groundwater resources in the area.

Table 8-1: List of proposed monitoring boreholes

BHID	Coordinates (LO 27 WGS84)	
	Y-Coordinate	X-Coordinate
DWE1	35379	-2845928
DWE2	34591	-2845731
DWE3	35312	-2844525
DWE4	37205	-2843965
DWE5	37280	-2844940
DWE6	39571	-2843993
DWE7	38870	-2844006
DWE8	38722	-2843272
LANBH02	39742	-2846565
LANBH03	40281	-2847152
9A	36451	-2846496
13	38321	-2847399
15	35672	-2846745
17	37933	-2847475
18	37826	-2846954
12	38181	-2846357
20	38032	-2846478
19	37409	-2846200
22	38416	-2845183

8.1.4.2 Water Level

Groundwater levels must be recorded on a quarterly basis using an electrical contact tape or pressure transducer, to detect any changes or trends in groundwater flow direction or head.

8.1.4.3 Water Sampling and Preservation

When sampling the following procedures are proposed:

- One litre plastic bottles with a cap are required for the sampling exercises – provided by the water laboratory;
- Glass bottles are required if organic constituents are to be tested; and
- Sample bottles should be marked clearly with the borehole name, date of sampling, sampling depth and the sampler's name and submitted to a SANAS accredited laboratory.

8.1.4.4 Sampling Frequency

Groundwater is a slow-moving medium and drastic changes in the groundwater composition are not normally encountered within days. Monitoring should be conducted on a quarterly basis. Samples should be collected by an independent groundwater consultant, using best practice guidelines and should be analysed by an accredited laboratory.

It is suggested that the quarterly samples be collected, including up to 10 years post closure and based on the results it can be adjusted accordingly. Monitoring should continue until an acceptable water quality situation is reached.

8.1.4.5 Parameters to be Monitored

Analyses of the following constituents are recommended:

- EC, pH, TDS;
- Macro Analysis i.e. Ca, Mg, Na, K, SO_4, NO_3, F, Cl; and
- Heavy metals As, Al, Ba, Co, Cr, Zn, Cd, Cu, Fe, Ni, V, Mn, Se.

8.1.4.6 Data Storage

In any project, good hydrogeological decisions require good information developed from raw data. The production of good, relevant and timely information is the key to achieve qualified long-term and short-term plans. For the minimisation of groundwater contamination it is necessary to utilize all relevant groundwater data.

The generation and collection of this data is very expensive as it requires intensive hydrogeological investigations and therefore has to be managed in a centralised database if funds are to be used in the most efficient way. Digby Wells has compiled a WISH-based database during the course of this investigation and it is highly recommended that Lanxess utilise this database and continuously update and manage as new data becomes available.

8.2 Item 1(h): Monitoring and reporting frequency

Monitoring should be conducted on a quarterly basis at least, whilst a consolidated monitoring report should be compiled on an annual basis.

8.3 Item 1(i): Responsible persons

The Environmental Manager (or person in a similar capacity) must act as the responsible person in charge of undertaking the various monitoring programmes.

8.4 Item 1(j): Time period for implementing impact management actions

Once construction and/or mining activities have commenced, some of the mitigation measures are temporary and are proposed for different phase in the LOM. These are indicated in the management tables

8.5 Item 1(k): Mechanism for monitoring compliance

An annual performance audit (both internal and external) should be conducted by the Mine and an external consultant, respectively.

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
Potential increase in Dust generation	It is required to collect and record dust deposition data to create a historical baseline for the site.	It is the role and responsibility of an appointed environmental officer to collect dust samples and to record wind speed/direction	Monthly monitoring
Potential increase of fine particulates	It is recommended that either/or PM_{10} or $PM_{2.5}$ are monitored with an ambient monitoring unit to supplement the baseline data and to track increases based on mining activities on the site	It is the role and responsibility of an appointed environmental officer to download the relevant data and track patterns and trends as well as store historical data.	It is advised to install the unit at least one year prior to the construction phase to allow for the collection of ambient air quality baseline data set
Potential decrease in ecological state	On site monitoring must take place to identify negative trends in the ecosystem, adaptive management will then be applied to correct these negative trends; bush encroachment and alien invasive plant species should be considered	It is the role and responsibility of an appointed environmental officer to monitor the success of alien species eradication. It is recommended that a specialist be bought in annually to assist and assess success of rehab as well as alien species eradication	An on-site assessment can be done monthly to determine the spread of alien invasives or the success of a weed management program
Potential decrease in water quality (surface and groundwater)	The monitoring of water will assist in the early detection of issues on site and enable the site to remediate or mitigate where possible. It is also required to monitor the movement of polluted groundwater migrating away from the mine area. This is done with the use of boreholes and samples taken from surface water points around the infrastructure. Analyses of the following constituents are recommended: ■ Ec, pH, TDS; ■ Macro Analysis i.e. Ca, Mg, Na, K, SO4, NO_3, F, Cl; and ■ Heavy metals As, Al, Ba, Co, Cr, Zn, Cd, Cu, Fe, Ni, V, Mn, Se.	The continuation of Lanxess currently monitoring programme by the officers with some additional sites included (as discussed in Section 8)	Quarterly samples (should be increased to monthly for surface water points if a problem is detected). It is suggested that the quarterly samples be collected, including up to 10 years post closure and based on the results it can be adjusted accordingly. Monitoring should continue until an acceptable water quality situation is reached.
Potential decrease in water quantity	The monitoring of water levels in boreholes will detect the lowering of the water table and confirm the radius if influence.	The continuation of Lanxess currently monitoring programme with some additional sites included.	

9 Item 1(l): Indicate the frequency of the submission of the performance assessment report

It is recommended that a performance assessment is submitted to the Regional Manager every two years.

10 Item 1(m): Environmental Awareness Plan

The purpose of the Environmental Awareness Plan is to outline the methodology that will be used to inform Lanxess staff of environmental risks that may result from the working environment, and the manner in which these risks will be dealt with in order to reduce the potential degradation of the environment.

10.1.1 Communication Strategy

The communication of the environmental risks for each phase of the project will take place at local training centres with personnel from both the administrative and mine worker sectors of the mine.

10.1.2 Management Sector

The communication of the environmental risks to the administrative sector will occur through a one-day workshop. This workshop will seek to explain the following necessary actions:

Firstly each aspect will be described, as well as their significance. Risks associated with each aspect will be discussed to ensure that an understanding of how each action of the project may impact on the environment.

The mitigation of the environmental risk will be elaborated on. It is important that each person understands these management strategies as it ensures that the impact on the environment is kept to a minimum. Data collection regarding each aspect will also be explained to ensure that each aspect is monitored according to those protocols specified by the mine and DME. Along with data collection the reporting of findings will be discussed.

This workshop will take place before the construction phase begins thus ensuring a full understanding of the project and its associated environmental risks before any mining begins. The course will be repeated at the beginning of the operational phase and the material will be integrated in the induction for new personnel.

10.1.3 Mine Workers Sector

The mine workers sector will attend a full day induction coarse to ensure that each person is aware of the environmental risks associated with the project. This induction will form part of the health and safety induction if timing allows.

This induction course will explain and describe the relevant phases of the project as well as those environmental risks that may occur during these phases. The environmental risks of each aspect as well as the mitigation will be elaborated on.

As a method of gaining an understanding of the relevant risks, a play or industrial theatre will be performed to explain lay issues and the employees will be encouraged to rehearse and act out a play of their own. These workshops will be conducted in English as well as one of the local languages and translators will be provided where necessary. The course will take place prior to mining commencing, thus ensuring an understanding of the mine workings and risks.

10.1.4 Evaluation of the Environmental Awareness Plan

The evaluation of the Environmental Awareness Plan will be conducted by either the management or qualified sub-contractors chosen by the mine. This evaluation will entail the auditing of the operation in both the construction and operation phase once activity has commenced.

The EAP described above will make all those involved with the project aware of the risks that may occur as well as the necessary mitigation required to minimise these risks. This awareness plan displays that Lanxess is serious about the environment's wellbeing, empowerment of the local people and returning the land to the appropriate use in the future.

Environmental issues will be highlighted at regular meetings scheduled at the mine.

10.2 Item 1(m)(2): Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Phase	Aspect	Environmental Risk	Communication Strategy				Mitigation Activity
			Management	Administration	Mine workers	Contractors	
Operational Phase	Soil	Loss of structure and fertility. Contamination of soils. Loss of soil through erosion.	Workshop	Course	Induction & Monthly Meetings	Induction & Monthly Meetings	Stockpiled to height of less than 4 m and vegetated. Hydrocarbon spill kit kept on site and rehabilitation area designated. Areas of erosion reported on a monthly basis and rehabilitated.
	Animals	Habitat loss Fire Hazard Disturbance					Remediation of the soil and re-vegetation will restore animal habitat. Hunting and trapping prohibited on the mine property. Open fires will be prohibited on the property. Report any rare or endangered species.
	Vegetation	Removal of vegetation Invader species					Red Data species reported and protected. Invader species will be eradicated on site. Disturbed areas will be rehabilitated and re-vegetated.
	Surface water	Contaminated runoff from the mining property					All contaminated water to be stored and treated on site before being returned to the catchment.

Phase	Aspect	Environmental Risk	Communication Strategy				Mitigation Activity
			Management	Administration	Mine workers	Contractors	
	Groundwater	Acid mine drainage could cause contamination. Potential to de-water natural springs.	Workshop	Course	Induction & Monthly Meetings	Induction & Monthly Meetings	AMD generation will be communicated to mine management to allow an understanding of the process. Exposure to oxygen of acid generating material will be limited through cladding or flooding. Water ingress into the pits will be prevented to limit AMD. All dirty water will be collected in the dirty water system during the operational phase.
	Air quality	Dust generation by blasting and trucks					Dust will be suppressed by water cart on the haul roads and in the disturbed area of the mine.
Decommissioning Phase	Soil	Lack of soil fertility	Workshop	Course	Induction	Induction	Fertilisation programmes will be introduced.
	Vegetation	Alien Species					Remove alien species & plant only indigenous vegetation.
	Surface water	Acid mine drainage – Decrease quality of the water source/s	Workshop	Course	Induction	Induction	Monitoring of water sources
	Groundwater	Acid mine drainage – Contamination of aquifers					Monitoring of water sources

11 Item 1(n): Specific information required by the Competent Authority

No request for other information has been made by any other competent authority as yet. The Applicant has confirmed that the financial provision will be reviewed annually and this is likewise confirmed by the EAP.

12 Item 2: Undertaking

The EAP herewith confirms:-

2(a) the correctness of the information provided in the reports

2(b) the inclusion of comments and inputs from stakeholders and I&APs ;

2(c) the inclusion of inputs and recommendations from the specialist reports where relevant; and

2(d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

The EAP hereby confirms the above.

Appendix 1: EAP CV and Qualifications

Appendix 2: Locality Map

Appendix 3: Infrastructure Plan

Appendix 4: PPP Documents

Appendix 5: Air Quality Assessment

Appendix 6: Fauna & Flora Assessment

Appendix 7: Surface Water Report

Appendix 8: Groundwater Report

DIGBY WELLS ENVIRONMENTAL

Appendix 9: Soil, Land Use and Land Capability Report

Appendix 10: Visual Report

Appendix 11: Noise Report

Appendix 12: Heritage Report

Appendix 13: Rehabilitation Plan

Appendix 14: Composite Map

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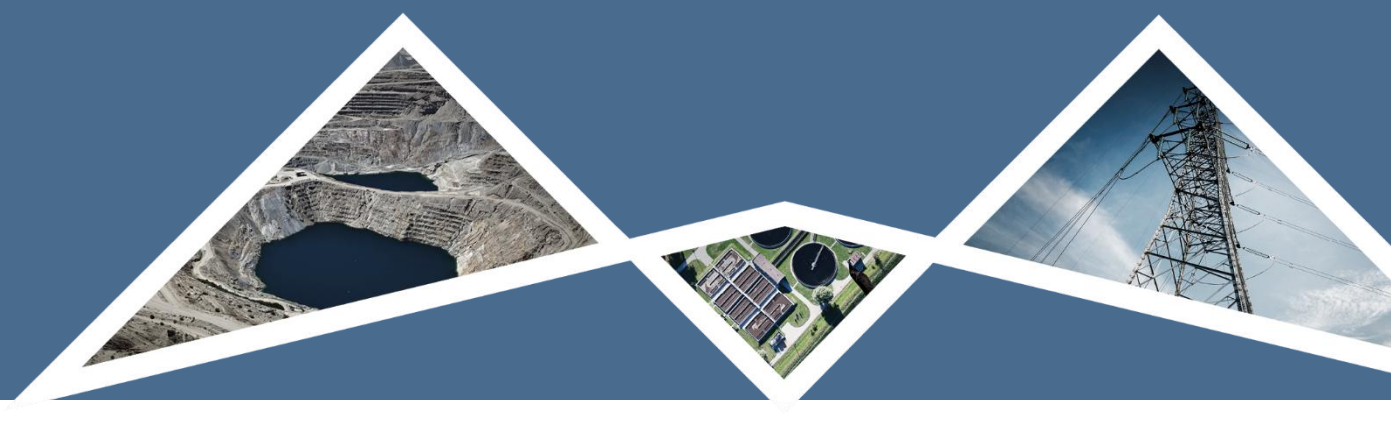
ADDENDUM TO ENVIRONMENTAL MANAGEMENT PROGRAMME

RUSTENBURG CHROME MINE EXPANSION PROJECT

OPEN CAST AREA 3

NW30/5/1/2/2/336 MR

NOVEMBER 2025



DOCUMENT DETAILS

EIMS REFERENCE:	1727
DOCUMENT TITLE:	Addendum to Environmental Management Programme: Rustenburg Chrome Mine Expansion Project – Open Cast Area 3 ((NW30/5/1/2/2/336 MR)

DOCUMENT CONTROL

	NAME	SIGNATURE	DATE
COMPILED:	Monica Niehof		2025/12/02
CHECKED:	Liam Whitlow		202512/02
AUTHORIZED:	Liam Whitlow		2025/12/02

REVISION AND AMENDMENTS

REVISION DATE:	REV #	DESCRIPTION
2025/12/02	ORIGINAL DOCUMENT	Addendum to Environmental Management Programme for public review

Abbreviations:

AIP	:	Alien Invasive Plant Management Plan
ASTM	:	American Society for Testing Materials
EA	:	Environmental Authorisation
ECO	:	Environmental Control Officer
EMPr	:	Environmental Management Programme
MHSA	:	Mine Health and Safety Act No 29 of 1996
NCR	:	Noise Control Regulations (GN R. 154 of 1992)
NDCR	:	National Dust Control Regulations, 2013
NEMBA	:	National Environmental Management: Biodiversity Act No. 10 of 2004
NHRA	:	National Heritage Resources Act No. 25 of 1999
OHSA	:	Occupational Health and Safety Act No. 85 of 1993
PAOI	:	Project Area of Influence
RCM	:	Rustenburg Chrome Mine
SLP	:	Social and Labour Plan
SWMP	:	Stormwater Management Plan

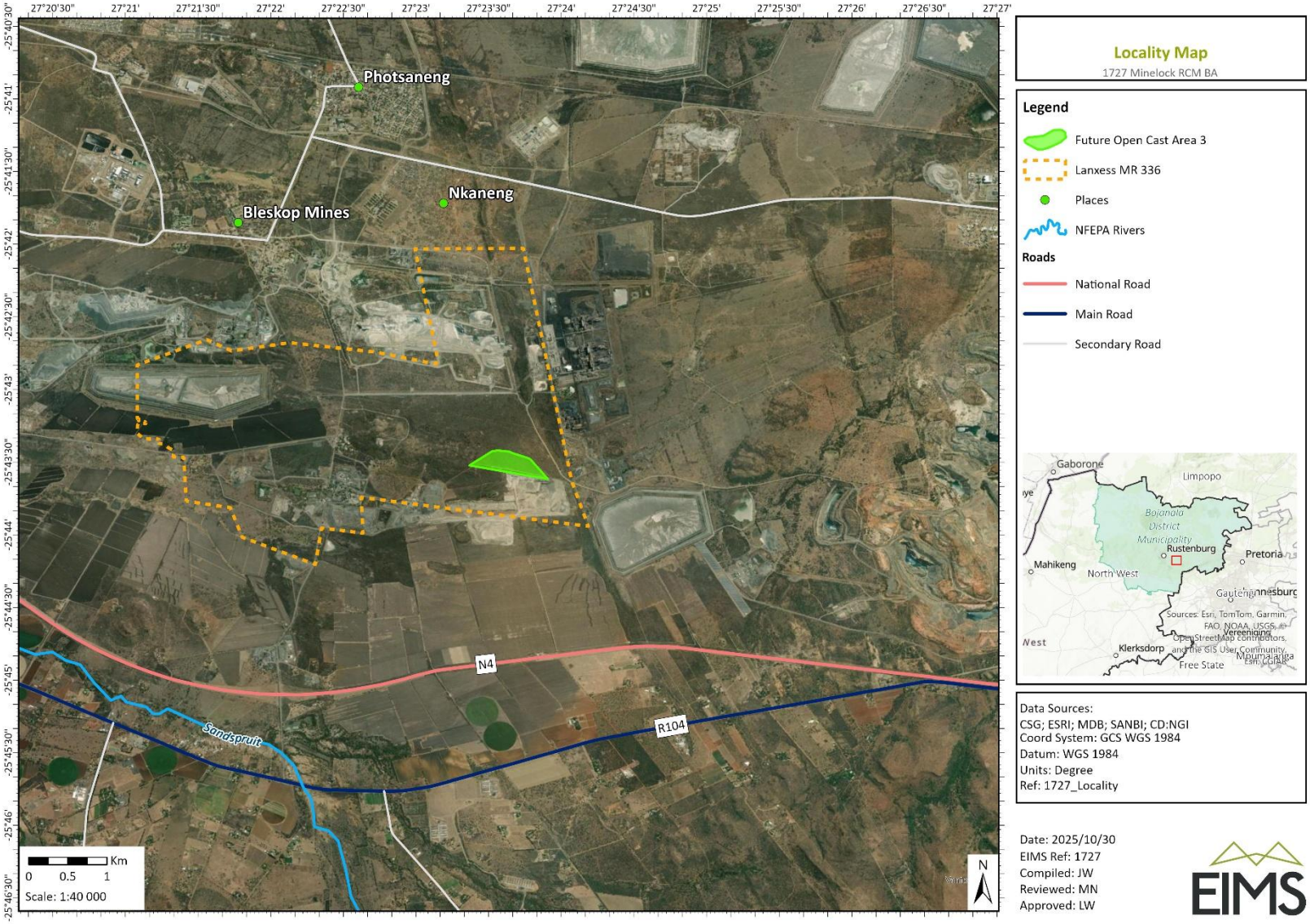


Figure 1: Locality Map

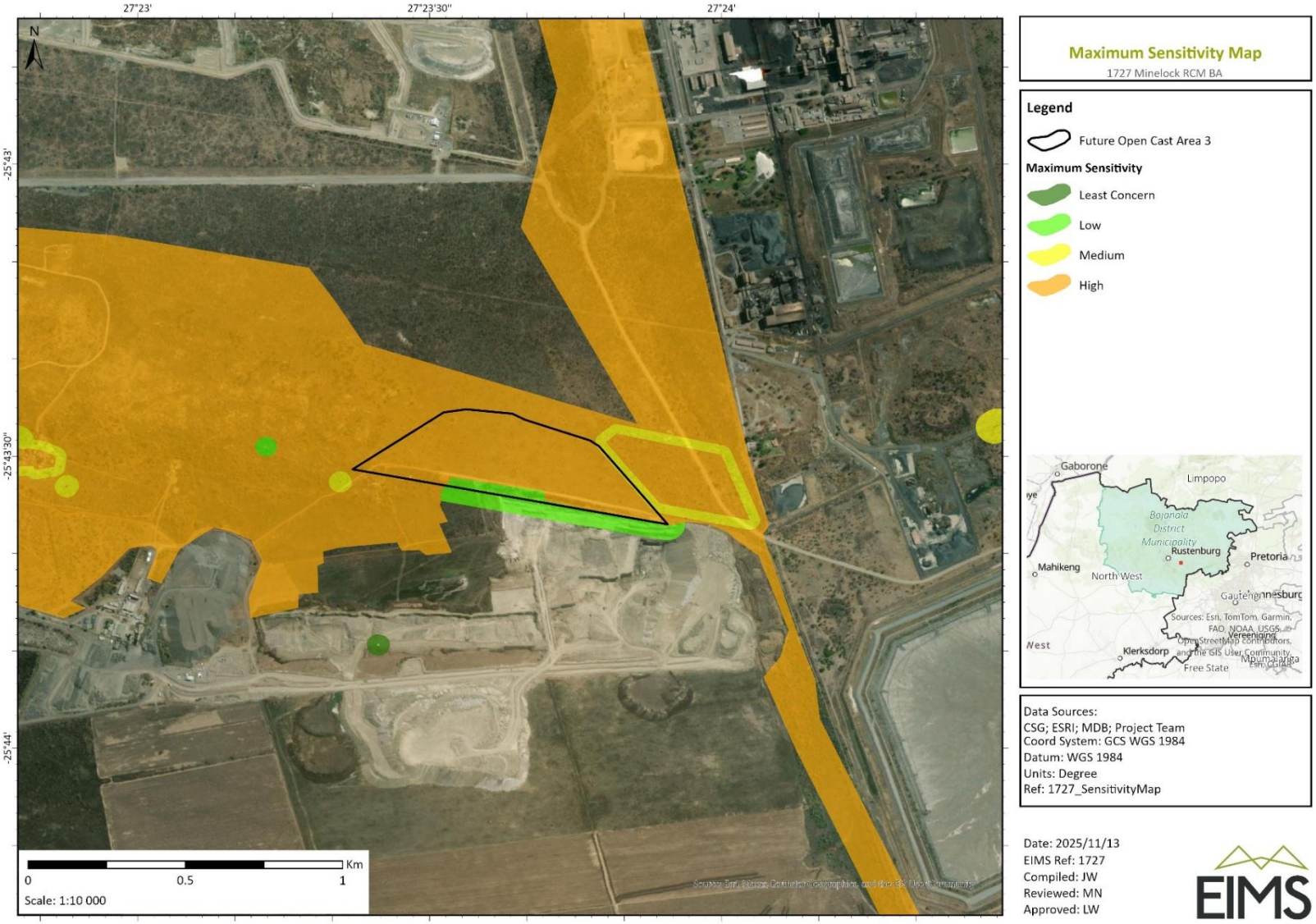


Figure 2: Combined Sensitivity Map

Table 1: Addendum to 2018 RCM EMPr – Additional Impact Management Actions

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
Dust generation activities and gaseous emissions from vehicles and equipment.	Construction	Air Quality - Air pollution	~16 Ha and surrounding areas.	No additional measures are required for the impact, however, it is recommended that the current dust fall monitoring network be maintained and updated where required, and the monthly dust fall results used as indicators to tract the effectiveness of the applied mitigation measures. Dust fall collection should follow the ASTM method as per the NDCRs. The ASTM method covers the procedure of collection of dust fall and its measurement and employs a simple device consisting of a cylindrical container exposed for one calendar month (30 ±2 days).	Control through management and monitoring.	ASTM method as per the NDCRs	Monitoring results and reports	Construction Phase – frequency as per current dust management plan and or EMPr.
Dust generation activities (i.e. blasting, hauling, crushing, and stockpiling).	Operation	Air Quality - Air pollution	~16 Ha and surrounding areas	No additional measures are required for the impact, however, it is recommended that the current dust fall monitoring network be maintained and updated where required, and the monthly dust fall results used as indicators to tract the effectiveness of the applied mitigation measures. Dust fall collection should follow the ASTM method as per the NDCRs. The ASTM method covers the procedure of collection of dust fall and its measurement and employs a simple device consisting of a cylindrical container exposed for one calendar month (30 ±2 days).	Control through management and monitoring.	ASTM method as per the NDCRs	Monitoring results and reports	Operational Phase – frequency as per current dust management plan and or EMPr.
Gaseous emissions from vehicles and equipment.	Operation	Air Quality - Air pollution	~16 Ha and surrounding areas	No additional measures are required for the impact, however, it is recommended that the current dust fall monitoring network be maintained and updated where required, and the monthly dust fall results used as indicators to tract the effectiveness of the applied mitigation measures. Dust fall collection should follow the ASTM method as per the NDCRs. The ASTM method covers the procedure of collection of dust fall and its measurement and employs a simple device consisting of a cylindrical container exposed for one calendar month (30 ±2 days).	Control through management and monitoring.	ASTM method as per the NDCRs	Monitoring results and reports	Operational Phase – frequency as per current dust management plan and or EMPr.
Earth-moving equipment affecting nearby communities and wildlife.	Construction	Ambient noise and vibrations	~16 Ha and surrounding areas	No additional measures are required for the impact, however, the noise and vibration / blasting monitoring plan should be amended and the network expanded to include the expanded open pit.	Control through management and monitoring.	NCR	Monitoring results and reports.	Construction Phase – frequency as per current plan and or EMPr.
Continuous low-frequency noise affecting local settlements and livestock.	Operation	Ambient noise and vibrations	~16 Ha and surrounding areas	No additional measures are required for the impact, however, the noise and vibration / blasting monitoring plan should be amended and the network expanded to include the expanded open pit.	Control through management and monitoring.	NCR	Monitoring results and reports.	Operational Phase - frequency as per current plan and or EMPr.

Regular blasting leading to structural damage in nearby properties and disturbance to communities.	Operation	Ambient noise and vibrations and nearby infrastructure	~16 Ha and surrounding areas	This impact was not assessed in the original EIA/EMPr (2018) for opencast mining. The mitigation measures proposed for this impact are:
				• The Mandatory Code of Practice (COP) issued under the Mine Health and Safety Act (MHSA), which sets minimum standards should be implemented, minimum standards for the following should be included in the EMPr:
				  ○ Ground vibrations;
				  ○ Noise;
				  ○ Air-blast;
				  ○ Flyrock.
				• Blasting design and control can limit charge size per delay to reduce vibration intensity.
				• The use of electronic detonators for precise timing and reduced peak particle velocity could be implemented.
				• Increase stemming length in blast holes to contain explosive energy.
					Control through management and monitoring.	Mandatory Code of Practice (COP) issued under the Mine Health and Safety Act (MHSA)
						United States Bureau of Mines (USBM)
							Monitoring results and reports.	Operational Phase - frequency as per current plan and or EMPr.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				• Apply buffer zones between blasting sites and sensitive structures, based on vibration modelling. • Install seismographs at strategic locations to monitor ground vibrations and air-blast levels. • Conduct United States Bureau of Mines (USBM) analysis to compare measured vibrations against safe thresholds. • Use predictive modelling to estimate vibration impacts before each blast. • Offer free structural surveys to all properties within a defined radius (e.g., 500 m to 1 km). • Document existing cracks and structural conditions using photos, videos, and written reports. • Restrict blasting to weekday daytime hours; avoid weekends and public holidays. • Provide advance notice to affected communities, including: Blasting times and dates. • Audible warning signals before detonation. • Establish a complaints and claims process for residents to report damage. • Maintain a log of blasting events, including vibration readings and community feedback. • Implement dust suppression and fume control measures. • Monitor and mitigate fly rock risks using blast mats or containment barriers. • Ensure compliance with air-blast noise limits to prevent hearing damage and structural stress. • Conduct regular community meetings to share monitoring results and address concerns. • Include local representatives in the environmental oversight committee. • Provide transparent access to blasting data and mitigation reports.				

Clearing of vegetation.	Construction	Destruction, loss and fragmentation of the vegetation community and potential SCC other indigenous flora and habitat and terrestrial biodiversity.	~16 Ha and surrounding areas	• All mitigation measures in the EMPr relevant to clearing of vegetation should be implemented. In addition, the following is required specifically for Area 3:
				• Management Outcomes:
				  ○ Prevent the further loss and fragmentation of indigenous vegetation communities within the ecosystem in the vicinity of the PAOI;
				  ○ Reduce the negative fragmentation effects of the development and enable the safe movement of fauna species;
				  ○ Prevent the direct and indirect loss and disturbance of flora and fauna species and communities, including the negative effects associated with the introduction and proliferation of alien and invasive species;
				  ○ Adequately follow the guidelines for interpreting the Site Ecological Importance ratings assigned to the PAOI;
				  ○ Prevent and Control spread of Alien Species; and
				  ○ Enhance the remaining EN vegetation type to the north and north-west of the study area.
				• Management Actions:
				  ○ A site walkdown and a protected flora walkdown must be conducted during the correct flowering season (between October and March following sufficient rainfall to prompt flowering) prior to the commencement of development activities and all protected flora species must be avoided or the relevant permits must be obtained for activities which may result in the need to translocate, cut/damage, and/or destroy specimens.
				  ○ Pursue options to improve on the remaining EN vegetation types to the north and north-west of the study area falling within the CBA 2 area, by engaging with the landowner/s with the goal of developing and
					Implementation of recommended mitigation measures.
					Control through monitoring.
					Search and Rescue.
						AIP
						EMPr
						NEMBA
							ECO EMPr and EA Compliance Monitoring Reports	Construction Phase with/prior to clearing of vegetation.
								Ongoing.
								Operation.
								Ongoing.
								(re-vegetation): Quarterly for up to two years after the closure

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				implementing a biodiversity management plan by a registered and qualified ecologist. This plan should include as a minimum active rehabilitation measures and bi-annual alien invasive control and monitoring, as well as annual audits of the plan. o It is recommended that areas to be developed/disturbed be specifically demarcated so that during the construction/activity phase, only the demarcated areas be impacted upon. o Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should not be fragmented or disturbed further if possible. o All vehicles and personnel must make use of existing roads and walking paths as far as possible, especially construction/operational vehicles. o The clearing of vegetation must be minimised where possible. All activities must be restricted to within the authorised areas. o Materials may not be stored for extended periods of time and must be removed from the PAOI once the construction phase has been concluded. No permanent construction phase structures should be permitted. Construction buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. No storage of vehicles or equipment will be allowed outside of the designated laydown areas. o Areas that are denuded during construction need to be re-vegetated with indigenous vegetation according to a habitat rehabilitation plan, to prevent erosion during flood and wind events and to promote the regeneration of functional habitat. This will also reduce the likelihood of encroachment by alien invasive plant species. All grazing mammals must be kept out of the areas that have recently been re-planted. o A habitat rehabilitation plan must be implemented, and areas of bare ground must be revegetated with species indigenous to the region. o A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. The water resources must to be protected and all activities that could result in a spill should occur away from them. o Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. o No servicing of equipment on site unless necessary. o All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers. o Appropriately contain any generator diesel storage tanks, machinery spills (e.g., accidental spills of hydrocarbons oils, diesel etc.) in such a way as to prevent them from leaking and entering the environment. o Construction activities and vehicles could cause spillages of lubricants, fuels and waste material negatively affecting the functioning of the ecosystem. o All vehicles and equipment must be maintained, and all re-fuelling and servicing of equipment is to take place in demarcated areas outside of the PAOI. o It must be made an offence for any staff member to remove any indigenous plant species from the PAOI or bring any alien species in. This is to prevent the spread of exotic or alien species or the illegal collection of plants.				

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				○ All construction waste must be removed from site at the closure of the construction phase. ○ An Alien Invasive Plant (AIP) Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition. ○ The footprint area of the construction should be kept to a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas. Footprints of the roads must be kept to prescribed widths. ○ A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests. ○ Update Environmental Awareness Training Programme with the following: ▪ All personnel and contractors are to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. ▪ Discussions are required on sensitive environmental receptors within the PAOI in line with the Environmental Authorisation and within the EMPr. ▪ Contractors and employees must all undergo the induction and must be made aware of any sensitive areas to be avoided.				
Clearing of vegetation. Driving, noise, vibrations from vehicles, equipment and machinery, people talking loudly and general construction activities.	Construction	Displacement of faunal community due to habitat loss, direct mortalities and disturbance (road collisions, noise, light, dust, vibration and poaching) and potential loss of Species of Conservation Concern.	~16 Ha and surrounding areas	• A site walk through must be performed by a suitably qualified ecologist prior to any activities taking place and any SSC or protected species should be noted. In situations where these species are observed and must be removed, the proponent may only do so after the required permission/permits have been obtained in accordance with national and provincial legislation. In the abovementioned situation the development and implementation of a search, rescue and recovery program is suggested for the protection of these species. Should animals not move out of the area on their own, relevant specialists must be contacted to advise on how the species can be relocated. • Clearing and disturbance activities must be conducted in a progressive linear manner, always outwards and away from the centre of the PAOI and over several days, so as to provide an easy escape route for all small mammals and herpetofauna. • The areas to be disturbed must be specifically and responsibly demarcated to prevent the movement of staff or any individual into the surrounding environments, signs must be put up to enforce this. • The duration of the activities should be minimised to as short a term as possible, to reduce the period of disturbance on fauna. • Noise must be kept to an absolute minimum during the evenings and at night to minimise all possible disturbances to reptile species and nocturnal mammals. • No trapping, killing, or poisoning of any wildlife is to be allowed and signs must be put up to enforce this. Monitoring must take place in this regard. • Outside lighting should be designed and limited to minimise impacts on fauna. All outside lighting should be directed away from any sensitive areas. Fluorescent and mercury vapor lighting should be avoided, and sodium vapor (green/red) lights should be used wherever possible. • All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife. Speed limits must be enforced to ensure that road killings and erosion is limited.	Implementation of recommended mitigation measures. Control through monitoring. Search and Rescue.	AIP EMPr NEMBA	ECO EMPr and EA Compliance Monitoring Reports	At start of Construction phase, during construction phase. Ongoing. Life of operation.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				• Schedule activities and operations during least sensitive periods, to avoid migration, nesting, and breeding seasons. In this case, activities should take place during the day. • Any holes/deep excavations must be dug in a progressive manner and should not be left open overnight. Should any holes remain open overnight they must be properly covered temporarily to ensure that no small fauna species fall in. Holes must be subsequently inspected for fauna prior to backfilling. • If fencing is required: wildlife-permeable fencing with holes large enough for mongoose and other smaller mammals should be installed, the holes must not be placed in the fence where it is next to a major road as this will increase road killings in the area. • A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.				
Clearing of vegetation.	Construction	Clearing of vegetation leading to soil erosion and loss of topsoil.	~16 Ha and surrounding areas	• In addition to all the existing mitigation measures in the EMPr, the following is recommended to be implemented for Area 3: o Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds. o Only existing access routes and walking paths may be made use of. All new roads must be authorised. o Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events etc. o A stormwater management plan (SWMP) must be compiled and implemented, or amended, if existing to include Area 3.	Control through implementing mitigation measures and SWMP and monitoring.	SWMP	ECO EMPr and EA Compliance Monitoring Reports	During Construction and Operation.
Operation of construction vehicles, equipment and machinery on site.	Construction	Increased risk of contamination (soil and water resource) from fuel spills, construction waste, and hazardous materials.	~16 Ha and surrounding areas	All the existing mitigation measures in the EMPr for the opencast areas, also to be implemented for Area 3. No additional measures required.	Control through implementing mitigation measures and SWMP and Waste Management Plan and monitoring.	SWMP Waste Management Plan EMPr	ECO EMPr and EA Compliance Monitoring Reports	Construction. Life of Operation
Clearing of vegetation. Operation of construction vehicles, equipment and machinery on site, etc.	Construction	Introduction of alien species, especially plants.	~16 Ha and surrounding areas	All mitigation measures in the EMPr relevant to alien vegetation should be implemented. In addition, the following is required specifically for Area 3: • Management Outcome: o Prevent and Control spread of Alien Species. • Management Actions: o An Alien Invasive Plant (AIP) Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition. • A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.	Implementation of recommended mitigation measures. Control through monitoring. Search and Rescue.	AIP EMPr NEMBA	ECO EMPr and EA Compliance Monitoring Reports	At start of Construction phase, during construction phase. Ongoing. Twice a year update AIP. Life of operation.
Operation of construction vehicles, equipment and	Operation	Ongoing habitat destruction and disturbance to fauna from noise, dust, and	~16 Ha and surrounding areas	• All existing approved mitigation measures in the current EMPr and in this addendum related to noise, dust and artificial lighting, to be implemented for Area 3.	Implementation of recommended mitigation measures in EMPr.	EMPr	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
machinery on site, etc. Opencast Mining		artificial lighting.			Control through monitoring.			
Clearing of vegetation, opencast mining and general construction activities and impacts, litter, etc.	Operation	Increased human-wildlife conflicts due to habitat fragmentation (litter, pollution, road mortalities, poaching, etc.).	~16 Ha and surrounding areas	All existing approved mitigation measures in the current EMPr and in this addendum related to noise, dust and artificial lighting, waste management, etc. to be implemented for Area 3. In addition the following should also be implemented for Area 3: • Waste management must be a priority and all waste must be collected and stored effectively and responsibly according to a site-specific waste management plan. Dangerous waste such as metal wires and glass must only be stored in fully sealed and secure containers, before being moved off site as soon as possible. • Litter, spills, fuels, chemical and human waste in and around the PAOI must be minimised and controlled according to the waste management plan. • Cement mixing may not be performed on the ground. It is recommended that only closed side drum or pan type concrete mixers be utilised. Any spills must be immediately contained and isolated from the natural environment, before being removed from site. • Toilets at the recommended Health and Safety standards must be provided. These should be emptied regularly and once no longer required, they must be pumped dry to prevent leakage into the surrounding environment and removed from site. • The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility within every 10 days at least. • Where a registered disposal facility is not available close to the PAOI, the Contractor shall provide a method statement with regards to waste management. Under no circumstances may domestic waste be burned on site or buried on open pits. • Refuse bins will be responsibly emptied and secured. Temporary storage of domestic waste shall be in covered and secured waste skips. Maximum domestic waste storage period will be 10 days.	Control through implementing mitigation measures and SWMP and Waste Management Plan and monitoring.	SWMP Waste Management Plan EMPr	ECO EMPr and EA Compliance Monitoring Reports	Construction. Life of Operation
Operation of construction vehicles, equipment and machinery on site, etc. Opencast Mining	Operation	Environmental pollution due to water/ mine drainage runoff.	~16 Ha and surrounding areas	All the existing mitigation measures in the EMPr for the opencast areas, also to be implemented for Area 3. No additional measures required, except, a stormwater management plan must be compiled and implemented, or amended, if existing to include Area 3. This plan to include the development and maintenance of clean and dirty stormwater channels, where required.	Control through implementing mitigation measures and SWMP and Waste Management Plan and monitoring.	SWMP Waste Management Plan EMPr	ECO EMPr and EA Compliance Monitoring Reports	Construction. Life of Operation
Continuous stripping of topsoil for opencast mining.	Operation	Leading to ongoing land degradation, including erosion.	~16 Ha and surrounding areas	All the existing mitigation measures in the EMPr for the opencast areas, also to be implemented for Area 3. No additional measures required, other than the mitigation measures already provided in this EMPr for similar impacts. All existing approved mitigation measures in the current EMPr and in this addendum related to erosion and stripping of topsoil, to be implemented for Area 3.	Implementation of recommended mitigation measures in EMPr. Control through monitoring.	EMPr	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
Opencast mining	Operation	Continued encroachment by alien and invasive plant species	~16 Ha and surrounding areas	All mitigation measures in the EMPr relevant to alien vegetation should be implemented. In addition, the following is required specifically for Area 3: • Management Outcome: o Prevent and Control spread of Alien Species. • Management Actions: o An Alien Invasive Plant (AIP) Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition. o A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests.	Implementation of recommended mitigation measures. Control through monitoring.	AIP EMPr NEMBA	ECO EMPr and EA Compliance Monitoring Reports	At start of Construction phase, during construction phase. Ongoing. Twice a year update AIP. Life of operation.
Rehabilitation.	Rehab and Closure	Slow regrowth of natural vegetation and potential further spread of alien and invasive species.	~16 Ha and surrounding areas	All mitigation measures in the EMPr relevant to alien vegetation should be implemented. In addition, the following is required specifically for Area 3: • Management Outcome: o Prevent and Control spread of Alien Species. • Management Actions: o An Alien Invasive Plant (AIP) Management Plan must be compiled and implemented. This should regularly be updated to reflect the annual changed in AIP composition. o A pest control plan must be put in place and implemented; it is imperative that poisons not be used to control pests. o A habitat rehabilitation plan must be implemented, and areas of bare ground must be revegetated with species indigenous to the region.	Implementation of recommended mitigation measures. Control through monitoring.	AIP Pest Control Plan Habitat Rehabilitation Plan EMPr NEMBA	ECO EMPr and EA Compliance Monitoring Reports	Ongoing. Twice a year update AIP. Rehab and Closure.
Clearing of areas and operation of machinery and vehicles.	Construction	Increased bare surfaces, runoff and potential for erosion.	~16 Ha and surrounding areas	• All the existing mitigation measures in the EMPr for the opencast areas, also to be implemented for Area 3. • A stormwater management plan must be compiled and implemented, or amended, if existing to include Area 3. This plan to include prevention of potential for erosion. • Speed limits must be put in place to reduce erosion. Soil surfaces must be wetted as necessary to reduce the dust generated by the project activities. Speed bumps and signs must be erected to enforce slow speeds. • Only existing access routes and walking paths may be made use of. All new roads must be authorised. • Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events etc.	Control through implementing mitigation measures and SWMP and Waste Management Plan and monitoring.	SWMP Waste Management Plan EMPr	ECO EMPr and EA Compliance Monitoring Reports	Construction.
Impacts on water quantity by abstraction boreholes. (Pumping from production boreholes) and through passive groundwater ingress	Construction	Groundwater Quantity	~16 Ha and surrounding areas	• Area 3 is expected to be the deepest section of the opencast development and will ultimately serve as the access point into the underground. Given this, it is critical that the current flooded level within the surrounding underground workings is confirmed prior to mining progresses into that zone. This will ensure that inflow risks are properly understood, and that the necessary safeguards can be put in place ahead of time. • In addition, the drilling of two dedicated monitoring boreholes one upstream and one downstream of Area 3 is recommended prior to commencement of mining. These will assist in: o Identifying any geological structures or preferential pathways intersecting the pit that could link to other water-bearing zones, whether from adjacent flooded workings or natural aquifers o Confirming whether any connected water sources exist that could influence pit stability with underground workings, dewatering demand, or long-term water quality.	Prevent and manage through implementing recommended mitigation measures. Monitor.	SWMP Groundwater and Surface Water Monitoring Plan. (Quality and groundwater levels).	ECO EMPr and EA Compliance Monitoring Reports.	Groundwater Quarterly.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				○ Providing baseline and ongoing data to manage potential pollution risks associated with both open pit and underground activities. • 24-hour aquifer testing of boreholes to determine the aquifer parameters for the aquifer for the model to be updated; • Monitoring of abstraction volumes in pit sumps and monitoring boreholes water levels to ensure impacts are managed; • Quarterly monitoring of groundwater levels. • Monitoring of abstraction volumes of pit and monitoring boreholes water levels to ensure abstraction rates are sustainable and managed. • Stormwater management will be in place to mitigate the risk to groundwater and run off from rainwater into pit. • To finalize these mitigation measures and integrate them properly into the mine's water management strategy, the geohydrologist also requires updated and more detailed mining plans for both Area 3 and the future long term planned underground and the open pit phases, particularly around the planned interface points.				
Impacts on water quantity by abstraction boreholes. (Pumping from production boreholes) and through passive groundwater ingress	Operation	Groundwater quantity	~16 Ha and surrounding areas	• Area 3 is expected to be the deepest section of the opencast development and will ultimately serve as the access point into the underground. Given this, it is critical that the current flooded level within the surrounding underground workings is confirmed prior to mining progresses into that zone. This will ensure that inflow risks are properly understood, and that the necessary safeguards can be put in place ahead of time. • In addition, the drilling of two dedicated monitoring boreholes one upstream and one downstream of Area 3 is recommended prior to commencement of mining. These will assist in: ○ Identifying any geological structures or preferential pathways intersecting the pit that could link to other water-bearing zones, whether from adjacent flooded workings or natural aquifers ○ Confirming whether any connected water sources exist that could influence pit stability with underground workings, dewatering demand, or long-term water quality. ○ Providing baseline and ongoing data to manage potential pollution risks associated with both open pit and underground activities. • 24-hour aquifer testing of boreholes to determine the aquifer parameters for the aquifer for the model to be updated; • Monitoring of abstraction volumes in pit sumps and monitoring boreholes water levels to ensure impacts are managed; • Quarterly monitoring of groundwater levels. • Monitoring of abstraction volumes of pit and monitoring boreholes water levels to ensure abstraction rates are sustainable and managed. • Stormwater management will be in place to mitigate the risk to groundwater and run off from rainwater into pit. • To finalize these mitigation measures and integrate them properly into the mine's water management strategy, the geohydrologist also requires updated and more detailed mining plans for both Area 3 and the future long term planned underground and the open pit phases, particularly around the planned interface points.	Prevent and manage through implementing recommended mitigation measures. Monitor.	SWMP Groundwater and Surface Water Monitoring Plan. (Quality and groundwater levels).	ECO EMPr and EA Compliance Monitoring Reports.	Groundwater Quarterly.
Impacts on water quality captured by pit	Construction	Groundwater quality	~16 Ha and surrounding areas	• Currently there are no groundwater monitoring boreholes at the pit areas. Geophysical surveys need to be conducted on site and around the facility to determine the placement of monitoring boreholes in an upgradient position, on-site and down gradient position of the pit areas.	Prevent and manage through implementing recommended	SWMP Groundwater and Surface Water	ECO EMPr and EA Compliance Monitoring Reports.	Groundwater Quarterly.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				• Monthly Monitoring of boreholes drilled, water quality to be recorded to make sure the impact is monitored and managed. • Stormwater management will be in place to mitigate the risk to groundwater and run off from rainwater into pit.	mitigation measures. Monitor.	Monitoring Plan. (Groundwater quality).		
Impacts on water quality captured by pit	Operation	Groundwater quality	~16 Ha and surrounding areas	• Currently there are no groundwater monitoring boreholes at the pit areas. Geophysical surveys need to be conducted on site and around the facility to determine the placement of monitoring boreholes in an upgradient position, on-site and down gradient position of the pit areas. • Monthly Monitoring of boreholes drilled, water quality to be recorded to make sure the impact is monitored and managed. • Stormwater management will be in place to mitigate the risk to groundwater and run off from rainwater into pit.	Prevent and manage through implementing recommended mitigation measures. Monitor.	SWMP Groundwater and Surface Water Monitoring Plan. (Groundwater quality).	ECO EMPr and EA Compliance Monitoring Reports.	Groundwater Quarterly.
Clearing of vegetation and opencast mining (blasting etc.)	Construction	Potential destruction of Late Iron Age Archaeological sites	~16 Ha and surrounding areas	• Implement a chance to find procedures in case where possible heritage finds are uncovered. • The LIA site complex as indicated must be retained with a 50 m buffer or a Phase II mitigation process must be enacted. Here isolated sites will not be analysed but instead the entire site complex. Archaeological mitigation permits will be applied for under SAHRA and only after the Phase II report was submitted can destruction permits be applied for. Destruction permits for all the discovered features within the Area 3 and a 50m buffer, need to be obtained prior to commencing with the activity. Refer to Figure 54 for the locations of these features. These include: Ex 04, Ex 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29. 30, 31, 32, 33, 34, Ft/005, Ft/006. • Additionally, monitoring during site clearing in a 50 m radius from the identified archaeological LIA site complex through the implementing of an archaeological watching brief.	Chance find procedures Archaeological watching brief.	Chance find procedures	ECO EMPr and EA Compliance Monitoring Reports.	Chance find during construction. During site clearing.
Clearing of vegetation and opencast mining (blasting etc.)	Construction	Potential destruction of possible graves	~16 Ha and surrounding areas	• Possible BGG Ex34, should be retained and avoided with a buffer zone of 50 m as per SAHRA guidelines. If this is not possible, the graves could be relocated after completion of a detailed grave relocation process, that includes a thorough stakeholder engagement component, adhering to the requirements of section 36 of the NHRA and its regulations as well as the National Health Act (Act 61 of 2003) (NHA) and its regulations. (Refer to Figure 54 for the location and buffer zone of this site). The study area does not fall within the 50 m buffer of the site. Care should be taken, however, not to encroach into the buffer area. This is a no-go area, if Phase II mitigation will not be pursued. • If the structures are to be altered or demolished it will require a permit from the North West Provincial Heritage Resources Authority (PHRA) in accordance with section 34 of the NHRA. • If graves are discovered, the graves could be relocated after completion of a detailed grave relocation process, that includes a thorough stakeholder engagement component, adhering to the requirements of Section 36 of the NHRA and its regulations as well as the NHA and its regulations.	Chance find procedures Archaeological watching brief.	Chance find procedures	ECO EMPr and EA Compliance Monitoring Reports.	Chance find during construction. During site clearing.
Clearing of vegetation and opencast mining (blasting etc.)	Construction	Potential destruction of historical kraal walling made from LIA walling.	~16 Ha and surrounding areas	• Implement a chance to find procedures in case where possible heritage finds are uncovered. • The LIA site complex as indicated must be retained with a 50 m buffer or a Phase II mitigation process must be enacted. Here isolated sites will not be analysed but instead the entire site complex. Archaeological mitigation permits will be applied for under SAHRA and only after the Phase II report was submitted can destruction permits be applied for. Destruction permits for all the discovered features within the Area 3 and a 50m buffer, need to be obtained prior to commencing with the	Chance find procedures Archaeological watching brief.	Chance find procedures	ECO, EMPr and EA Compliance Monitoring Reports.	Chance find during construction. During site clearing.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
				activity. Refer to Figure 54 for the locations of these features. These include: Ex 04, Ex 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 28, 29. 30, 31, 32, 33, 34, Ft/005, Ft/006. • Additionally, monitoring during site clearing in a 50 m radius from the identified archaeological LIA site complex through the implementing of an archaeological watching brief.				
Clearing of vegetation and opencast mining (blasting etc.)	Construction	Loss of Palaeontological Resources.	~16 Ha and surrounding areas	If fossil remains or trace fossils are discovered during any phase of construction, either on the surface or exposed by excavations the ECO in charge of these developments must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation can be carried out by a palaeontologist.	Chance find procedures.	NHRA	ECO, EMPr and EA Compliance Monitoring Reports.	Chance find during construction. During site clearing.
Risk of accidents related to mining activities and transport of hazardous materials.	Operation	Risk of accidents related to mining activities and transport of hazardous materials.	~16 Ha and surrounding areas	• The existing mitigation measures in the existing approved EMPr to be implemented and all the health and safety procedures and protocols to be followed. • No additional mitigation measures.	Implementation of recommended mitigation measures in EMPr. Control through monitoring.	EMPr OHSA MHSA	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.
Continuation of jobs at the mine if Life of Mine is extended and economic benefits for the surrounding communities.	Operation	Continuation of jobs at the mine if Life of Mine is extended and economic benefits for the surrounding communities.	~16 Ha and surrounding areas	• Ensure the project is approved and sustainably managed by implementing all the mitigation measures and recommendations of the specialists and EAP. • No additional measures.	Implementation of recommended mitigation measures in EMPr. Control through monitoring.	EMPr OHSA MHSA	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.
Potential skills development and training programs for employees.	Operation	Potential skills development and training programs for employees.	~16 Ha and surrounding areas	• Implement existing and approved programs at the mine. • No measures.	Implementation of recommended mitigation measures in EMPr and SLP. Control through monitoring.	EMPr SLP	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.
Reduced availability of arable land for farming due to mining expansion into southern areas.	Operation	Reduced availability of arable land for farming due to mining expansion into southern areas.	~16 Ha and surrounding areas	• Addressing these conflicts requires inclusive land-use planning, stakeholder engagement, and the development of alternative livelihood programs to support affected communities.	Implementation of recommended mitigation measures in EMPr and Stakeholder Management Plan. Control through monitoring.	EMPr Stakeholder Management Plan.	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.

Activities	Phase	Aspect Affected	Size and scale of disturbance of the activity	Mitigation Measures	Mitigation Type	Standard to be achieved	Compliance with standards	Time period for Implementation
Competition for water resources between the mine and surrounding farmers	Operation	Competition for water resources between the mine and surrounding farmers	~16 Ha and surrounding areas	• Addressing these conflicts requires inclusive land-use planning, stakeholder engagement, and the development of alternative livelihood programs to support affected communities.	Implementation of recommended mitigation measures in EMPr and Stakeholder Management Plan. Control through monitoring.	EMPr Stakeholder Management Plan.	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.
Retrenchments leading to social and economic hardship in local communities.	Rehab and Closure	Retrenchments leading to social and economic hardship in local communities.	~16 Ha and surrounding areas	• Include measures in the SLP to ensure the transition period when the mine is approaching closure, plan (including financially) for alternative land uses and employment opportunities well in advance of closure of the mine.	Implementation of recommended mitigation measures in EMPr and SLP. Control through monitoring.	EMPr SLP	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.
Potential conversion of rehabilitated land for agriculture, conservation, or community use.	Rehab and Closure	Potential conversion of rehabilitated land for agriculture, conservation, or community use.	~16 Ha and surrounding areas	• Include measures in the SLP to ensure the transition period when the mine is approaching closure, plan (including financially) for alternative land uses and employment opportunities well in advance of closure of the mine.	Implementation of recommended mitigation measures in EMPr and SLP. Control through monitoring.	EMPr SLP	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.
Opportunities for eco-tourism or renewable energy projects.	Rehab and Closure	Opportunities for eco-tourism or renewable energy projects.	~16 Ha and surrounding areas	• Include measures in the SLP to ensure the transition period when the mine is approaching closure, plan (including financially) for alternative land uses and employment opportunities well in advance of closure of the mine.	Implementation of recommended mitigation measures in EMPr and SLP. Control through monitoring.	EMPr SLP	ECO EMPr and EA Compliance Monitoring Reports	All phases of the development.