Earth Science Solutions

# Ilima Amendment Report (EIR and EMPR) in support of the expansion of the mining areas at Ilima Colliery

**DMR REFERENCE NUMBER: MP30/5/1/2/2/112MR**

REPORT

2017/11/09

**Sustaining the Environment**

Our Ref: 1201

Stonecap Trading 14 (Pty) Ltd

Date: 2017/11/09

Dear Sir/Madam,

This Amended Report is made available for your review and comment. Kindly note that the closing date for comments is the 11th of December 2017.

Yours faithfully,

Ian Jones B.Sc. Pr.Sci.Nat (EAP Certified)

**EARTH SCIENCE AND ENVIRONMENTAL CONSULTANTS**

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# Table of Contents

# List of Figures

# List of Tables

# Appendices

**Appendix A:** Details of the EAP

**Appendix B:** Interested and Affected Parties Database

**Appendix C:** Proof of Notification - Registered Letters, Faxes and Emails

**Appendix D:** Issues and Response Report

**Appendix E:** Impact Assessment

**Appendix F:** Final Site Map

**Appendix G:** Master Plan Map

**Appendix H:** Social Study Report (2005)

**Appendix I:** Heritage and Cultural Resources

**Appendix I1:** Heritage study (2004)

**Appendix I2:** Heritage study (2013)

**Appendix I3:** Heritage Study for proposed underground mining on Zandvoort 10 IT (2015)

**Appendix I4:** Heritage Study for mining on Kwaggafontein 8IT (2017)

**Appendix I5:** Palaeontological Studies for Zandvoort 10IT and Kwaggafontein 8IT (2017)

**Appendix I6:** Heritage and Palaeontology study for proposed extension of Ilima mining operations (2017)

**Appendix J:** Ecology

**Appendix J1:** Fauna and Flora Report (2004)

**Appendix J2:** Ecology (Flora & Fauna) study for Zandvoort underground mining expansion (2015)

**Appendix J3:** Biodiversity Study for Kwaggafontein (2017)

**Appendix J4:** Biodiversity study for the proposed Ilima coal mining operations (2017)

**Appendix K:** Geohydrology

**Appendix K1:** Groundwater study (2012)

**Appendix K2:** Groundwater study (2015)

**Appendix K3:** Groundwater study (2017)

**Appendix L:** Surface Water Study Report (2005)

**Appendix M:** Wetland Biodiversity Assessment (2011)

**Appendix N:** Soils

**Appendix N1:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 1 and 4 of the Farm Haarlem 39 IT (2004)

**Appendix N2:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 5 of the Farm Haarlem 39 IT (2004)

**Appendix N3:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 4 and R/E of the Farm Haarlem 39 IT and Portion 3 and 9 of The Farm Appeldoorn 38 IT (2004)

**Appendix N4:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 2 and RE of the Farm Paardeplaats 12 IT (2004)

**Appendix N5:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 8 of the Farm Twyfelaar 11 IT (2004)

**Appendix N6:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 9 and 10 of the Farm Twyfelaar 11 IT (2004)

**Appendix N7:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 6, 7, 8 and 17 of the Farm Groenvallei 40 IT (2004)

**Appendix N8:** Pre-mining Soil Assessment of the Proposed Opencast Area on Portion LG of the Farm Groenvallei 40 IT (2004)

**Appendix N9:** Zandvoort Soil Assessment (2015)

**Appendix N10:** Specialist Soils, Land Use and Land Capability Studies (2017)

**Appendix O:** EAP's Motivation

**Appendix P:** Closure Cost Report (2016)

**Appendix Q:** Composite Map

**Appendix R:** Full Resolution Maps

# 1 EXECUTIVE SUMMARY

## 1.1 INTRODUCTION TO THE PROJECT

The Applicant, Ilima Coal (Pty) Ltd. (formerly Pembani Coal Carolina (Pty) Ltd. and before that, Worldwide Coal Carolina (Pty) Ltd.), has an approved mining right and Environmental Management Programme (EMPR) in terms of the Minerals and Petroleum Resources Development Act (Act 28 of 2002, as amended) (MPRDA) for the mining of coal at the Ilima Colliery (previously Pembani Colliery). In 2017, the Department of Mineral Resources (DMR) authorized the inclusion of the farm Zandvoort 10 IT into the existing Mining Right.

Ilima wishes to amend the approved Environmental Authorisation (EA) and associated EMPR to include the proposed future mining areas (all within the existing mining right boundary), namely:

- New underground mining operations:
  - Portions of the farm Haarlem 39 IT; and
  - Portion RE/9 of the farm Appeldoorn 38 IT.
- New opencast mining operations:
  - Portions RE and 1 of the farm Zandvoort 10 IT;
  - Portion 6 of the farm Kwaggafontein 8 IT;
  - Portions RE and 2 of the farm Haarlem 10 IT;
  - Portions 2, 8 and 16 of the farm Groenvallei 40 IT;
  - Portion 2 and 12 of the farm Paardeplaats 12 IT;
  - Portion 9 of the farm Appeldoorn 38 IT; and
  - Portion RE of the farm Leeupoort 13 IT.

In order to amend the EA and EMPR to include (and therefore authorise) the proposed future mining areas, a Part 2 amendment is being sought in terms of the National Environmental Management Act (Act 107 of 1998), GNR 982 Regulation 31. Ilima is required to assess all the impacts related to the proposed change the advantages and disadvantages associated with the proposed change and the measures to ensure avoidance, management and mitigation of impacts associated with the proposed change. Consequently, a revised consolidated EMPR is required.

The proposed amendments aim to allow for the continuation of mining operations currently underway and extend the Colliery's current Life of Mine (LoM) by a number of years which will have indirect benefits on job continuation. Coal will be transported and processed according to the existing mines current approved operations.

Ilima has an approved existing old order Mining License (ML) in terms of the Minerals Act (MA), over Portion 5 of the farm Groenvallei 40 IT (MP 30/5/1/2/2/221 MR OT 5/3/2/600), as well as an approved EMPR (MP30/5/1/2/2/112MR). An application for conversion to a New Order Mining Right (NOMR), in terms of the MPRDA, was lodged with the DMR on 19 April 2007. An EMP amendment, for the inclusion of underground mining, the Imbani Wash Plant (previously referred to as the Carolina Coal Wash Plant), co-disposal and pollution control dams (PCD's), was submitted on 28 July 2009, as supporting document to the conversion. The old order mining licence is to date still awaiting conversion.

The Ilima Colliery is situated east of Carolina, immediately north of the R38, in the Mpumalanga Province, South Africa. The Ilima Colliery has been in operation since approximately 2008 and is situated in the magisterial district of Carolina and falls under the Chief Albert Luthuli Local Municipality, situated in the Gert Sibande District Municipality.

## 1.2 PURPOSE OF THIS DOCUMENT

Ilima Colliery wishes to expand upon their opencast and underground mining footprint to extend the LoM. Furthermore, Ilima need to amend the existing Mine Works Programme (MWP) to include additional underground and opencast mining at Ilima Colliery.

It is the intention of this Environmental Impact Assessment Report (EIR) and Environmental Management Programme Report (EMPR) to provide the necessary information, impact assessment, mitigation measures and monitoring programmes regarding the proposed inclusion of additional mining areas within the existing Mining Right.

Due to the changes in the MWP, to include additional mining areas, and proposed mine design, it is important that Interested and Affected Parties (I&AP's) are provided with an opportunity to review and comment on the amended EIR and EMPR, thereby contributing to the Environmental Impact Assessment (EIA) Process and assisting in identifying any additional risks or impacts that may be experienced. As such this document shall be available to I&AP's for review and comment for a period of 30 days from 10 November 2017 to the 11 December 2017, before it is finalised to include the results of the consultation and submitted to the competent authority for adjudication.

## 1.3 BRIEF PROJECT SUMMARY

The Ilima Colliery is situated within the northern part of the Ermelo Coalfield, which forms part of the coal-bearing Vryheid Formation of the Ecca Group. The B Seam and the E Seam are the main economic coal seams present within the mining area and these are exploited by means of opencast and underground mining operations. The average depth of the E seam is 53 metres (m) and 27.6 m for the B seam.

The Ilima Colliery has been in operation for several years and as such there have been numerous EIA studies and a number of licenses and authorisations are held by the mine. The following rights, authorisations and approvals are currently in place and have been considered in the compilation of the report:

- A NOMR;
- A Prospecting Right;
- A Mining License (currently in process of conversion to a NOMR);
- An Environmental Authorisation in terms of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA); and

- An Integrated Water Use Licence (IWUL) in terms of the National Water Act (NWA).

The mining operations at Ilima Colliery involve a combination of both opencast and underground mining methods. The opencast operations are undertaken in the form of strip mining where the strips are laid out to follow the surface contours. As the strips progress, the previous pit is rehabilitated, thus resulting in minimal surface disturbance.

Historically, several opencast pits were mined however no progressive rehabilitation was undertaken. As such, in addition to the current opencast mining which follows the strip mining approach with progressive rehabilitation, there are historical opencast pits in various stages of rehabilitation. The EMPR includes an environmental management framework that will ensure that adequate rehabilitation is undertaken for the existing opencast areas and that future mining is undertaken together with progressive rehabilitation in accordance with regulatory requirements.

The mining methods currently employed and to be employed for future underground mining are standard bord and pillar techniques. The coal will then be transported by truck to the existing Imbani Wash Plant located on the farm Paardeplaats 12 IT (Portion 7 of Portion 3). From the plant, the coal is transported to local markets or the Droogvallei siding for rail transportation.

## 1.4 MINE INFRASTRUCTURE

At present the Ilima Colliery consists of the following main infrastructure:

- Opencast pits in various stages of rehabilitation;
- Haul roads;
- Storm water management infrastructure;
- Camp including workshop, diesel storage, offices and ablution facilities;
- Raw water dams and Pollution Control Dams (PCD's);
- Water pipelines and associated water management infrastructure;
- Co-disposal facility
- Imbani Wash Plant;
- Administrative offices;
- Security and fencing;
- Product stockpiles;
- Discard and overburden stockpiles;
- Topsoil stockpiles;
- Monitoring boreholes;
- Highwall entrance to underground;
- Underground mining sections; and

- Site camp associated with underground mine entrance.

## 1.5 ENVIRONMENTAL SPECIALIST STUDIES

A comprehensive baseline assessment was undertaken during the EIA in support of the Mining Right Application from 2004 – 2006. Since then, various amendments have been supported by additional specialist assessments. In addition to these studies, four additional specialist studies were undertaken in 2017 in support of the proposed future mining areas, namely:

- Heritage and Palaeontology Assessment;
- Hydrogeology;
- Fauna and Flora Assessment; and
- Soils, Land Use and Land Capability Assessment.

## 1.6 ENVIRONMENTAL IMPACT ASSESSMENT

A screening assessment was undertaken to identify all the potential risks and impacts associated with each phase of the mining operations. The background information from existing EIA and specialist studies undertaken for the site were consulted as well as a screening of all the activities underway and planned for the mine to ensure that all the potential impacts have been identified. Each of the identified risks and impacts for these phases was assessed using the impact assessment methodology described in the body of the report. The assessment criteria include the nature, extent, duration, magnitude/intensity, reversibility, probability, public response, cumulative impact, and irreplaceable loss of resources.

The most significant risks and impacts were those that remain high in terms of significance even post mitigation measures being considered. The following impacts were determined to have a high negative final significance:

- Impacts on geology;
- Pollution of surface water resources/decreased water quality;
- Dewatering of groundwater aquifers;
- Pollution of groundwater/decreased water quality;
- Acid Mine Drainage (AMD);
- Decant from underground workings;
- Loss and disturbance of wetland habitat; and
- Destruction/damage of heritage resources.

In terms of positive impacts, the following key benefits have been identified:

- Discovery and preservation of fossils;
- Coal supply for energy security;
- Economic growth; and
- Employment Opportunities.

## 1.7 SUMMARY OF KEY FINDINGS

Four new environmental specialist studies were undertaken for the amendment application and it was determined/confirmed that several sensitive features exist on this farm. Heritage sites were identified which include graves and graveyards as well as historical structures. It was also determined that there are some remaining natural areas on this property which have a high biodiversity value. Based on the soil assessment as well as the biodiversity assessment findings, the proposed future mining areas were amended (i.e.: reduced in size and extent) to exclude wetlands or the 100m buffer around wetlands.

In terms of site sensitivities, the most sensitive features which will require protection on site may be summarised as follows:

- Critical Biodiversity Areas;
- Ecologically Sensitive Areas;
- Heritage sites (including graveyards and historical structures); and
- Watercourses, wetlands and dams.

## 1.8 EIR AND EMPR MITIGATION MEASURES

The EIR and EMPR have identified appropriate mechanisms for avoidance and mitigation of negative impacts. It is anticipated that the implementation of the Environmental and Social Management System (ESMS) and mitigation measures stipulated in this EIR and EMPR will result in effective mitigation of the negative impacts. Conversely the implementation of the mitigation measures designed to maximise the positive aspects of the project will result in a significant positive influence as a result of the mines operation.

Some of the key mitigation measures which have been identified to promote sound environmental and social performance are as follows:

- The Applicant shall develop an effective ESMS as described in the EMPR that is appropriate to the nature and scale of the project.
- The Applicant shall develop and implement social and environmental plans and procedures to support the successful implementation of the ESMS. The ESMS shall dictate which plans and procedures are required.
- An Integrated Rehabilitation and Closure Plan must be developed by a specialist for implementation within one year of the approval of the EIR and EMPR. The Plan shall be viewed as a dynamic document and shall be subjected to independent review on an annual basis along with the quantum for financial provision.
- The Applicant shall appoint a suitably qualified and competent Independent Environmental Control Officer (ECO) who shall be tasked with auditing the mines environmental compliance. The ECO shall undertake monthly site inspections and prepare audit reports to be submitted to the mines management. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field and experience in the implementation of environmental management specifications.
- The EIR and EMPR must be made binding on all contractors, sub-contractors or agents operating on behalf of the Mining Right Holder.

- If graves, or cemeteries are found, they must be relocated, and a full grave relocation process must be undertaken that complies with legal requirements and includes comprehensive social consultation.
- The Applicant shall take the necessary precautions to avoid any impacts to wetlands outside of the required construction and/or mining footprint. These areas should be considered as no-go areas, and the restriction should be enforced. Should the Applicant not be able to comply with these conditions, the relevant authorisations, exemptions or licences will be obtained and complied with.

## 1.9 ENVIRONMENTAL MANAGEMENT SYSTEM

In addition to mitigation of environmental impacts, this EIR and EMPR provides a framework for holistic environmental management at the mine through the implementation of an ESMS. The mine shall be required to appoint a suitably qualified specialist to develop the ESMS to be implemented on the mine. Adequate resources (people, financial and technical) shall be made available to ensure effective establishment, implementation, maintenance and continual improvements of the ESMS. The ESMS shall include the requirement to constantly monitor environmental performance and assess the adequacy of environmental resources provided for the mine. If required, the mine would need to procure further environmental resources to ensure the successful implementation of the ESMS and EMPR.

## 1.10 NEED AND DESIRABILITY OF THE PROJECT

The major benefits of the project are as follows:

- The Ilima Colliery has created direct employment for up to 171 workers and through the indirect employment of hiring contractors and obtaining supplies;
- The extension of Life of Mine (LoM), afforded by new opencast and underground areas, extends these job opportunities and postpones the need for large-scale retrenchment associated with mine closure;
- The Ilima Colliery mining operations make a significant contribution to the inland coal market and as an earner of foreign currency;
- The Ilima Colliery is a major contributor of rates and taxes to the Regional Services Council of Carolina, who will use the funds to develop the area; and
- Ilima invests in social capital by undertaking their Social and Labour Plan (SLP), and promoting sustainable local economic development within the surrounding area.

# 2 INTRODUCTION

The Applicant, Ilima Coal Company (Pty) Ltd (Ilima) (formerly Pembani Coal (Pty) Ltd), has an approved Mining Right (MR) and Environmental Management Programme (EMPR) in terms of the Minerals and Petroleum Resources Development Act (Act 28 of 2002, as amended) (MPRDA) for the mining of coal at the Ilima Colliery (formerly Pembani Colliery). Ilima Coal proposes to include the mining of additional coal resources that all fall within the existing approved Mining Right boundary. Furthermore, the proposed new mining areas also all fall within the list of properties approved under the National Environmental Management Act (NEMA) (Ref #: (EA) 17/2/3/GS-44) for a range of listed activities associated with the mining activities. The proposed extent of the mining activities envisaged in the existing mining right, as well as the current NEMA authorisations, expands on what was originally approved. Such expansion includes expansions to existing active and past mining areas, as well as the establishment of new mining areas within the approved properties.

As per Regulation 31 of GNR 982, promulgated under the NEMA, it is understood that the Environmental Authorisation (EA) ((EA) 17/2/3/GS-44) may be amended (on application) by following the process prescribed in Part 2 (Regulation 31 of GNR982), if the amendment will result in a change to the scope of the EA where such change will result in an increased level or change in the nature of the impact where such level or change was not:

1. Assessed and included in the initial application for EA; or
2. Taken into consideration in the initial EA.

A prerequisite of following a Part 2 amendment process is that the changes do not, on their own, constitute a listed or specified activity. In this regard, whilst it is understood that the proposed mining expansions will constitute a listed or specified activity, such listed activities have already been approved on the specific properties, albeit in different locations and with different extents. In this respect, the planned expansions of the mining (future mining areas) was not included in the initial application for EA, nor considered in the EA. Consequently, an amendment application aligned with the Part 2 process must be followed, in an effort to obtain an amended EA and associated EMPR.

It should be noted that Ilima has an approved existing old order Mining License (ML) in terms of the Minerals Act (MA), over Portion 5 of the farm Groenvallei 40 IT (MP 30/5/1/2/2/221 MR OT 5/3/2/600), as well as an approved EMP, dated March 2003. An application for conversion to a NOMR, in terms of the MPRDA, was lodged with the DMR on 19 April 2007. An EMP amendment, for the inclusion of underground mining, the Imbani Wash Plant (previously referred to as the Carolina Coal Wash Plant), co-disposal and pollution control dams (PCD's), was submitted on 28 July 2009, as supporting document to the conversion. The old order mining licence is to date still awaiting conversion and as such is not included in this amendment application, but is referred to in this report as a comprehensive description of the entire mining operation.

The Ilima Colliery is situated east of Carolina, immediately north of the R38, in the Mpumalanga Province, South Africa. The Ilima Colliery has been in operation since 2008 and is situated in the magisterial district of Carolina and falls under the Chief Albert Luthuli Local Municipality, situated in the Gert Sibande District Municipality.

The Ilima Colliery is situated within the northern part of the Ermelo Coalfield, which forms part of the coal-bearing Vryheid Formation of the Ecca Group. The B Seam and the E Seam are the main economic coal seams present within the mining area and these are exploited by means of opencast and underground mining operations. The average depth of the E seam is 53 metres (m) and 27.6 m for the B seam.

As an existing operational mine, the Ilima Colliery has been subject to several environmental approval processes in terms of the following legislation:

- MPRDA;
- Minerals Act, 1991 (MA, Act 50 of 1991);
- National Environmental Management Act (NEMA, Act No. 107 of 1998); and
- National Water Act (NWA, Act No. 36 of 1998).

The Ilima Colliery has been in operation for several years and as such there have been numerous EIA studies and a number of licenses and authorisations are held by the mine. The following rights, licenses, authorisations and approvals are currently in place and have been considered in the compilation of this report:

**Table 1: Approval & Authorisation History**

| Reference # | Relevant Legislative Provisions | Activities approved | Properties |
|---|---|---|---|
| **(Mining Licence (ML)) MP 30/5/1/2/2/221 MR** | MPRDA: Mining Licence | Mining | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |
| **(ML) MP 30/5/1/2/2/221 MR**<br><br>**OT 5/3/2/600 (pending)** | MPRDA: Amendment to 221MR | Mining and processing | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT; and<br><br>Portion 7 (a Portion of Portion 3) of Paardeplaats 12 IT |
| **(MR) MP 30/5/1/2/2/112 MR** | MPRDA: Mining Right | Mining and processing | Portions 3, 4, 8, 9, and 10 of Twyfelaar 11 IT;<br><br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br><br>Portions 2 and RE of Paardeplaats 12 IT;<br><br>Portions RE, 1, and 2 of Droogvallei 41 IT; |

| Reference # | Relevant Legislative Provisions | Activities approved | Properties |
|---|---|---|---|
| | | | Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br><br>Portions RE and 9 of Appeldoorn 38 IT;<br><br>Leeuwpoort 13 IT;<br><br>Portions RE, 1, 2, and 3 of Hawerfontein 7 IT; and<br><br>Portion RE of Kwaggafontein 8 IT |
| **(EA) 17/2/4/G (GS) -33** | NEMA: S24 G Rectification for unlawful commencement. | Mining | Portions RE, 4, and 5 of Haarlem 39 IT;<br><br>Portions 16 and RE of Portion 1 of Groenvallei 40 IT;<br><br>Portion RE of Portion 8 of Twyfelaar 11 IT; and<br><br>Portion 8 of Kwaggafontein 8 IT |
| **(EA) 17/2/3 GS-78** | NEMA: Environmental Authorisation | • R.544, 18 June 2010: The construction of a portion of road approximately 700m in length, with a reserve of 25m.<br>• R.545, 18 June 2010: The deviation of a road administered by a provincial authority. | Portions 4 and RE of Haarlem 39 IT |

| Reference # | Relevant Legislative Provisions | Activities approved | Properties |
|---|---|---|---|
| **(EA) 17/2/3/GS-44** | NEMA: Environmental Authorisation | • GNR544: Activities 9, 11, 12, 18, 22, 23, 28, 47 and 56.<br>• GNR545: Activities 5, 15, and 20.<br>• GNR 546: Activities 4(a), 10(a), and 12. | Portions RE, 9, and 10 of Appeldoorn 38 IT;<br>Portions RE 1, 5, RE of Portion 7, RE of Portion 8, RE of Portion 11, 12, 13, 14, 15, 16,17, and 19 of Groenvallei 40 IT<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE of Portion 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 13 of Hawerfontein 7 IT;<br>Portions RE of Portion 6, RE of Portion 7, 8, 9, 10, and 11 of Kwaggafontein 8 IT;<br>Leeuwpoort 13 IT;<br>Portions RE, 2, 4, 5, and 7 of Paardeplaats 12 IT;<br>Portions 3, 4, RE of Portion 5, 6, 10, 11, 12, and 13 of Twyfelaar 11 IT; and<br>Portions RE and 1 of Zandvoort 10 IT |
| **(IWUL) 16/2/7X100/C180 (Updated IWUL, Licensed 07 July 2016, Licence No. 05/X11B/ACGIJ/4704)** | NWA: Water Use Licence | 21 (a), (c), (g), (i), (j); and GN704 exemptions. | Portions RE of Portion 6, portion 8 of Kwaggafontein 8 IT; Portions RE, 2, 7 of Paardeplaats 12 IT; Portions RE and 1 of Zandvoort 10 IT;<br>Portions 8, 10, and 13 of Twyfelaar 11 IT; Portions RE 1, 5, RE of Portion 7, RE of Portion 8, 16 of Groenvallei 40 IT; |

| Reference # | Relevant Legislative Provisions | Activities approved | Properties |
|---|---|---|---|
| | | | Portions RE, and 4 of Haarlem 39 IT; Portion 9 of Appeldoorn 38 IT. |
| **(MR) MP 30/5/1/2/2/112 MR-** | MPRDA: Section 102<br><br>NEMA: Environmental Authorisation | NEMA EA:<br><br>MPRDA S102 to amend EMPR and MWP.<br><br>NEMA Amendment to EMPR. | NEMA EA: Portions RE and 1 of Zandvoort 10 IT<br><br>NEMA/MPRDA EMPR Amendment- all mining areas. |

This EIR is, therefore, an amendment application that is aligned with the Part 2 process of GNR 982, promulgated under the NEMA, in an effort to obtain an amended EA and associated EMPR. Coal will be transported and processed according to the existing mines current approved operations. Ilima is required to assess any new environmental impacts associated with the change in the mining areas, and to establish appropriate mitigation measures to address the impacts. Earth Science Solutions (Pty) Ltd. (ESS) has been appointed by Ilima as the independent Environmental Assessment Practitioner (EAP) to manage the Amendment Application. This EIR amendment report will be made available for public review and comment from the 10th November2017 to 10th December 2017.

## 2.1 REPORT STRUCTURE

This report reflects an amendment to the existing approved EIR and EMPR and as such is compliant with the requirements of the NEMA Regulations. Table 2 below provides a summary of the NEMA requirements in terms of Appendix 3 of the EIA regulations (GNR 982), and an indication in which section the supporting information and documentation can be found.

**Table 2: Report Structure**

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| **NEMA Regulation 982 (2014) Appendix 3** | | |
| **Appendix 3(3)(a):** | Details of –<br>i. The EAP who prepared the report; and<br>ii. The expertise of the EAP, including a curriculum vitae; | Section 2.2<br>Section 2.3<br>Appendix A |
| **Appendix 3(3)(b):** | The location of the activity, including:<br>i. The 21-digit Surveyor General code of each cadastral land parcel;<br>ii. Where available, the physical address and farm name; and<br>iii. Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties; | Section 2.4 |
| **Appendix 3(3)(c):** | A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is –<br>i. A linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;<br>ii. On land where the property has not been defined, the coordinates within which the activity is to be undertaken; | Figure 2 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| **Appendix 3(3)(d):** | A description of the scope of the proposed activity, including –<br>i. All listed and specified activities triggered and being applied for; and<br>ii. A description of the associated structures and infrastructure related to the development; | Section 3 |
| **Appendix 3(3)(e):** | A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context; | Section 4 |
| **Appendix 3(3)(f):** | A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location; | Section 5 |
| **Appendix 3(3)(g):** | A motivation for the preferred development footprint within the approved site; | Section 6 |
| **Appendix 3(3)(h):** | A full description of the process followed to reach the proposed development footprint within the approved site, including:<br>i. Details of the development footprint alternatives considered;<br>ii. Details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;<br>iii. A summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;<br>iv. The environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage, and cultural aspects; | Section 6.1<br>Section 7<br>Section 8<br>Section 9<br>Section 10.1<br>Section 10.2 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| | v. The impacts and risks identified including the nature, significance, consequence, extent, duration, and probability of the impacts, including the degree to which these impacts – <br> a) Can be reversed; <br> b) May cause irreplaceable loss of resources; and <br> c) Can be avoided, managed or mitigated; <br> vi. The methodology used in determining and ranking the nature, significance, consequences, extent duration and probability of potential environmental impacts and risks; <br> vii. Positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community, that may be affected focusing on the geographical, physical, biological social, economic, heritage and cultural aspects; <br> viii. The possible mitigation measures that could be applied and level of residual risk; <br> ix. If no alternative development locations for the activity were investigated, the motivation for not considering such; and <br> x. A concluding statement indicating the preferred alternative development location within the approved site; | |
| **Appendix 3(3)(i):** | A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including – <br> i. A description of all environmental issues and risks that were identified during the environmental impact assessment process; and <br> ii. An assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures; | Section 10 |
| **Appendix 3(3)(j):** | An assessment of each identified potentially significant impact and risk, including – <br> i. Cumulative impacts; <br> ii. The nature, significance and consequence of the impact and risk; <br> iii. The extent and duration of the impact and risk; | Section 10 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| | iv. The probability of the impact and risk occurring;<br>v. The degree to which the impact and risk can be reversed;<br>vi. The degree to which the impact and risk may cause irreplaceable loss of resources;<br>vii. The degree to which the impact and risk can be mitigated; | |
| **Appendix 3(3)(k):** | Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report; | Section 9 |
| **Appendix 3(3)(l):** | An environmental impact statement which contains –<br>i. A summary of the key findings of the environmental impact assessment;<br>ii. A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicting any areas that should be avoided, including buffers; and<br>iii. A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives; | Section 12<br>Figure 39, Figure 40, Figure 41, Figure 42, Figure 43, Figure 44 |
| **Appendix 3(3)(m):** | Based on the assessment, and where applicable, recommendations from the specialist reports, the recording of proposed impact management objectives and the impact management outcomes for the development for inclusion in the EMPR as well as for inclusion as conditions of authorisation; | Section 12.2 |
| **Appendix 3(3)(n):** | The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment; | Section 6 |

| Environmental Regulation | Description | Section in Report |
| --- | --- | --- |
| **Appendix 3(3)(o):** | Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation; | Section 11 |
| **Appendix 3(3)(p):** | A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed; | Section 11 |
| **Appendix 3(3)(q):** | A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation; | Section 12 |
| **Appendix 3(3)(r):** | Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded, and the post construction monitoring requirements finalised; | Section 13 |
| **Appendix 3(3)(s):** | An undertaking under oath or affirmation by the EAP in relation to:<br>i. The correctness of the information provided in the reports;<br>ii. The inclusion of comments and inputs from stakeholders and I&Ps;<br>iii. The inclusion of inputs and recommendations from the specialist reports where relevant; and<br>iv. Any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties; | Section 14 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| **Appendix 3(3)(t):** | Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts; | Section 15 |
| **Appendix 3(3)(u):** | An indication of any deviation from the approved scoping report, including the plan of study, including – <br> i. Any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and <br> ii. A motivation for the deviation; | Section 16 |
| **Appendix 3(3)(v):** | Any specific information that may be required by the competent authority; and | Section 17 |
| **Appendix 3(3)(w):** | Any other matters required in terms of section 24(4)(a) and (b) of the Act. | Section 18 |
| **NEMA Regulation 982 (2014) Appendix 4** | | |
| **Appendix 4(1)(1)(a):** | Details of – <br> i. The EAP who prepared the EMPR; and <br> ii. The expertise of that EAP to prepare an EMPR, including a curriculum vitae; | Section 20.1 and Appendix A |
| **Appendix 4(1)(1)(b):** | A detailed description of the aspects of the activity that are covered by the EMPR as identified by the project description; | Section 20.2 |
| **Appendix 4(1)(1)(c):** | A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the | Section 20.3 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| | preferred site, indicating any areas that any areas that should be avoided, including buffers; | |
| **Appendix 4(1)(1)(d):** | A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified though the environmental impact assessment process for all phases of the development including –<br>i. Planning and design;<br>ii. Pre-construction activities;<br>iii. Construction activities;<br>iv. Rehabilitation of the environment after construction and where applicable post closure; and<br>v. Where relevant, operation activities; | Section 23 |
| **Appendix 4(1)(1)(e):** | A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d); | Section 23.10 |
| **Appendix 4(1)(1)(f):** | A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to –<br>i. Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;<br>ii. Comply with any prescribed environmental management standards or practices; | Section 23.11 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| | iii. Comply with any applicable provisions of the ac regarding closure, where applicable; and<br>iv. Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable; | |
| **Appendix 4(1)(1)(g):** | The method of monitoring the implementation of the impact management actions contemplated in paragraph (f); | Section 25 |
| **Appendix 4(1)(1)(h):** | The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f); | Section 25 |
| **Appendix 4(1)(1)(i):** | An indication of the persons who will be responsible for the implementation of the impact management actions; | Section 25 |
| **Appendix 4(1)(1)(j):** | The time periods within which the impact management actions contemplated in paragraph (f) must be implemented; | Section 25 |
| **Appendix 4(1)(1)(k):** | The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f); | Section 25 |
| **Appendix 4(1)(1)(l):** | A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations; | Section 25 |
| **Appendix 4(1)(1)(m):** | An environmental awareness plan describing the manner in which – | Section 27.7 |

| Environmental Regulation | Description | Section in Report |
|---|---|---|
| | i. The applicant intends to inform his or her employees of any environmental risk which may result from their work; and<br>ii. Risks must be dealt with in order to avoid pollution or the degradation of the environment; and | |
| **Appendix 4(1)(1)(n):** | Any specific information that may be required by the competent authority. | Section 28 |

## 2.2 DETAILS OF THE EAP

Earth Science Solutions (ESS) was appointed by the Applicant as the EAP to compile this report. The contact details of the EAP are as follows:

Name of the Practitioner: Ian Jones

Tel No.: 044 381 0097

Fax No.: 044 873 2094

E-mail address: ian@earthscience.co.za

## 2.3 EXPERTISE OF THE EAP

### 2.3.1 QUALIFICATIONS OF THE EAP

In terms of Regulation 13 of the 2014 EIA Regulations (Government Notice R. (GNR) 982), an independent EAP, must be appointed by the applicant to manage the application. ESS has been appointed by the Applicant as the EAP and is compliant with the definition of an EAP as defined in Regulations 1 and 13 of the EIA Regulations and Section 1 of the NEMA. This includes, inter alia, the requirement that ESS is:

- Objective and Independent;
- Has expertise in conducting EIA's;
- Comply with the NEMA, the Regulations and all other applicable legislation;
- Takes into account all relevant factors relating to the application; and
- Provides full disclosure to the applicant and the relevant environmental authority.

Furthermore, ESS has appointed a team of specialists to undertake additional studies required for the project. ESS is responsible for project management and the compilation of the EIA and EMPR amendment with the guidance and input from the independent specialists. The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessment and relevant application processes) of the EAP is attached as Appendix A.

### 2.3.2 SUMMARY OF EAP'S PAST EXPERIENCE

Ian Jones has been involved with a wide range of aspects of geological exploration, pedology and the earth sciences studies, with specialisation in the environmental aspects of mining and industrial development, and has a wide and general knowledge on hydrogeological, hydrological and Environmental Impact Assessment (EIA) for Agricultural (including Forestry), mining and the Industrial fields. Having worked in Southern Africa for the past 36 years, Ian has developed a large amount of experience, most of which is related to the investigation and evaluation of the environmental (soil and water) impacts of development. Examples of expertise include:

- Environmental Monitoring and Hydrogeological evaluation for a variety of Mining and Industrial Developments;
- Pedological Investigations – Both Reconnaissance & Detailed;
- Contamination Studies;

- Environmental Investigations;
- Groundwater Resource Development;
- Regional Hydrogeological Investigation;
- Mining Related Geology; and
- Waste Disposal Investigations.

### 2.3.3 SPECIALIST CONSULTANTS

Specialist studies have been done for the previous assessments and additional studies were only done for the future mine areas, where the EAP identified this necessary to support this application. Specialist studies were undertaken to address the key issues that required further investigation, namely the impact on biodiversity, groundwater, heritage and palaeontological, and soils, land use and land capability.

The specialist studies involved the gathering of data relevant to identifying and assessing environmental impacts that may occur as a result of the proposed project. These impacts were then assessed according to pre-defined rating scales (see Section 10). Specialists also recommended appropriate mitigation / control or optimisation measures to minimise potential negative impacts or enhance potential benefits, respectively. The findings of these studies have been included in the EIR Amendment.

The specialist consultants that provided inputs into this report are summarised in

Table **3** below.

**Table 3: List of specialists appointed to the project**

| Aspect | Component | Company Responsible | Consultant |
|---|---|---|---|
| Soils | Soil, Land Capability and Land Use | Earth Science Solutions (ESS) | Ian Jones |
| Heritage Impact Assessment | Heritage and Palaeontology | Professional Grave Solutions (PGS) | Wouter Fourie |
| Ecology | Vegetation and Animal Report | Earth Science Solutions (ESS) | Philip Patton |
| Geohydrology | Groundwater Impact Assessment | ASST (Pty) Ltd. and Future Flow Groundwater & Project Management Solutions cc | Lucas Smith and Martiens Prinsloo |

## 2.4 DESCRIPTION OF THE PROPERTY

The Ilima Colliery covers approximately 17 776 hectares (ha). **Table 4** below indicates the farm portions that fall within the Mining Right Area and includes the Mining Right Application Area, as well as the properties for which Ilima is amending its EIR (refer **Table 4** below).

**Table 4: Locality Details**

<table>
<tr><td rowspan="2">Farm Name</td><td colspan="3"><u>Mining Right holder</u><br><br>Ilima Coal Company (Pty) Ltd. is the holder of a Mining Right in respect of the following properties within the existing Ilima Colliery:<br>• Appeldoorn 38 IT Remaining Extent (RE); Portion 9 and Portion 10;<br>• Groenvallei 40 IT Remaining Extent (RE) of Portion 1; RE of Portion 7; (RE) of Portion 8; (RE) of Portion 11; Portion 12; Portion 13; Portion 14 Portion 15; Portion 16; Portion 17 and Portion 19.<br>• Haarlem 39 IT Remaining Extent (RE); Portion 2; Portion 3; Portion 4 and Portion 5.<br>• Hawerfontein 7 IT Remaining Extent (RE) of Portion 1; Portion2; Portion 3; Portion 4; Portion 5; Portion 6; Portion 7; Portion 8; Portion 9; Portion 10 and Portion 13.<br>• Kwaggafontein 8 IT Remaining Extent (RE) of Portion 6; (RE) of Portion 7; Portion 8; Portion 9; Portion 10; and Portion 11.<br>• Leeuwpoort 13 IT Remaining Extent (RE);<br>• Paardeplaats 12 IT Remaining Extent (RE); Portion 2; Portion 4; Portion 5; Portion 6; Portion 10; Portion 11; Portion 12 and Portion 13.<br>• Twyfelaar 11 IT Portion 3; Portion4; Portion 6; Portion 11; Portion 12 and Portion 13; RE of Portion 5 and RE of Portion 8. and<br>• Zandvoort 10 IT Remaining Extent (RE); and Portion 1.</td></tr>
<tr></tr>
<tr><td>Mining Right Area (Ha)</td><td colspan="3">The Ilima Colliery Mining Rights covers approximately 17 302 ha.</td></tr>
<tr><td>Magisterial District</td><td colspan="3">Magisterial District of Carolina</td></tr>
<tr><td>Distance and direction from nearest town</td><td colspan="3">The Ilima Colliery is situated east of Carolina, immediately north of the R38, in the Mpumalanga Province, South Africa. The Ilima Colliery is situated in the magisterial district of Carolina and falls under the Chief Albert Luthuli Local Municipality, situated in the Gert Sibande District Municipality. The closest town to the mining area is Carolina, situated approximately 3 km to the West of the proposed mining sites. Table 5 below indicates the distances and directions of the mine to the closest towns.</td></tr>
<tr><td rowspan="8">21-digit Surveyor General Code for each Portion</td><td>Farm Name:</td><td>Portion:</td><td>SG Codes:</td></tr>
<tr><td>1. Appeldoorn 38 IT</td><td>RE</td><td>T0IT00000000003800000</td></tr>
<tr><td>2. Appeldoorn 38 IT</td><td>9</td><td>T0IT00000000003800009</td></tr>
<tr><td>3. Appeldoorn 38 IT</td><td>10</td><td>T0IT00000000003800010</td></tr>
<tr><td>4. Groenvallei 40 IT</td><td>RE of 1</td><td>T0IT00000000004000001</td></tr>
<tr><td>5. Groenvallei 40 IT</td><td>RE of 7</td><td>T0IT00000000004000007</td></tr>
<tr><td>6. Groenvallei 40 IT</td><td>RE of 8</td><td>T0IT00000000004000008</td></tr>
<tr><td>7. Groenvallei 40 IT</td><td>RE of 11</td><td>T0IT00000000004000011</td></tr>
</table>

| | | | |
|---|---|---|---|
| | 8. Groenvallei 40 IT | 12 | T0IT00000000004000012 |
| | 9. Groenvallei 40 IT | 13 | T0IT00000000004000013 |
| | 10. Groenvallei 40 IT | 14 | T0IT00000000004000014 |
| | 11. Groenvallei 40 IT | 15 | T0IT00000000004000015 |
| | 12. Groenvallei 40 IT | 16 | T0IT00000000004000016 |
| | 13. Groenvallei 40 IT | 17 | T0IT00000000004000017 |
| | 14. Groenvallei 40 IT | 19 | T0IT00000000004000019 |
| | 15. Haarlem 39 IT | RE | T0IT00000000003900000 |
| | 16. Haarlem 39 IT | 2 | T0IT00000000003900002 |
| | 17. Haarlem 39 IT | 3 | T0IT00000000003900003 |
| | 18. Haarlem 39 IT | 4 | T0IT00000000003900004 |
| | 19. Haarlem 39 IT | 5 | T0IT00000000003900005 |
| | 20. Hawerfontein 7 IT | RE of 1 | T0IT00000000000700001 |
| | 21. Hawerfontein 7 IT | 2 | T0IT00000000000700002 |
| | 22. Hawerfontein 7 IT | 3 | T0IT00000000000700003 |
| | 23. Hawerfontein 7 IT | 4 | T0IT00000000000700004 |
| | 24. Hawerfontein 7 IT | 5 | T0IT00000000000700005 |
| | 25. Hawerfontein 7 IT | 6 | T0IT00000000000700006 |
| | 26. Hawerfontein 7 IT | 7 | T0IT00000000000700007 |
| | 27. Hawerfontein 7 IT | 8 | T0IT00000000000700008 |
| | 28. Hawerfontein 7 IT | 9 | T0IT00000000000700009 |
| | 29. Hawerfontein 7 IT | 10 | T0IT00000000000700010 |
| | 30. Hawerfontein 7 IT | 13 | T0IT00000000000700013 |
| | 31. Kwaggafontein 8 IT | RE of 6 | T0IT00000000000800006 |
| | 32. Kwaggafontein 8 IT | RE of 7 | T0IT00000000000800007 |
| | 33. Kwaggafontein 8 IT | 8 | T0IT00000000000800008 |
| | 34. Kwaggafontein 8 IT | 9 | T0IT00000000000800009 |
| | 35. Kwaggafontein 8 IT | 10 | T0IT00000000000800010 |

| | | | |
|---|---|---|---|
| | 36. Kwaggafontein 8 IT | 11 | T0IT00000000000800011 |
| | 37. Leeuwpoort 13 IT | RE | T0IT00000000001300000 |
| | 38. Paardeplaats 12 IT | RE | T0IT00000000001200000 |
| | 39. Paardeplaats 12 IT | 2 | T0IT00000000001200002 |
| | 40. Paardeplaats 12 IT | 4 | T0IT00000000001200004 |
| | 41. Paardeplaats 12 IT | 5 | T0IT00000000001200005 |
| | 42. Twyfelaar 11 IT | 3 | T0IT00000000001100003 |
| | 43. Twyfelaar 11 IT | 4 | T0IT00000000001100004 |
| | 44. Twyfelaar 11 IT | 6 | T0IT00000000001100005 |
| | 45. Twyfelaar 11 IT | 10 | T0IT00000000001100006 |
| | 46. Twyfelaar 11 IT | 11 | T0IT00000000001100008 |
| | 47. Twyfelaar 11 IT | 12 | T0IT00000000001100010 |
| | 48. Twyfelaar 11 IT | 13 | T0IT00000000001100011 |
| | 49. Twyfelaar 11 IT | RE of 5 | T0IT00000000001100012 |
| | 50. Twyfelaar 11 IT | RE of 8 | T0IT00000000001100013 |
| | 51. Zandvoort 10 IT | RE | T0IT00000000001000002 |
| | 52. Zandvoort 10 IT | 1 | T0IT00000000001000001 |

**Table 5: Distances and directions to neighbouring towns**

| Town | Distance | Direction |
|---|---|---|
| Carolina | 4.6 km | West |
| Badplaas | 41.6 km | East |
| Machadodorp | 45 km | North |
| Chrissiesmeer | 23 km | South |

A description of the Title Deeds, registered landowners, and existing authorisations for each of these properties is provided in Table 6 below.

**Table 6: Description of the land on which the Ilima Colliery is located**

| Farm Name | Portion | 21-digit Surveyor General Code | Title Deed | Registered Landowner | Existing Authorisations |
|---|---|---|---|---|---|
| Appeldoorn 38 IT | Remaining Extent | T0IT00000000003800000 | T31304/1966 | Karel Jan Doyer | (MR) MP 30/5/1/2/2/112 MR |
| | Portions 9 | T0IT00000000003800009 | T31304/1966 | Karel Jan Doyer | (MR) MP 30/5/1/2/2/112 MR (EA)17/2/3 GS-44 |
| | Portion 10 | T0IT00000000003800010 | T10647/1983 | Anton Uys | (MR) MP 30/5/1/2/2/112 MR |
| Groenvallei 40 IT | Remaining Extent of Portion 1 | T0IT00000000004000001 | T155494/2000 | Groenvallei Landbougrond CC | (MR) MP 30/5/1/2/2/112 MR (EA) 17/2/4 G (GS) - 33 |
| | Remaining Extent of Portion 7 | T0IT00000000004000007 | T170532/2003 | Van Rensburg Family Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Remaining Extent of Portion 8 | T0IT00000000004000008 | T170532/2003 | Van Rensburg Family Trust | (MR) MP 30/5/1/2/2/112 MR (EA)17/2/3 GS-44 |
| | Portion 1 | T0IT00000000004000001 | T155494/2000 | Groenvallei Landbougrond Pty Ltd | (EA)17/2/3 GS-44 |
| | Portion 5 | T0IT00000000004000005 | T45546/2002 | Carolina Coal Pty Ltd | (ML) MP 30/5/1/2/2/221 MR (IWUL) 05/X11D/AGJ/466 |
| | Portion 7 | T0IT00000000004000007 | T170532/2003 | Van Rensburg | (EA)17/2/3 GS-44 |
| | Remaining Extent of Portion 11 | T0IT00000000004000011 | T7060/2014 | Nkosi Jane Promise | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 12 | T0IT00000000004000012 | T3829/1991 | Goss Jan Francois | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 13 | T0IT00000000004000013 | T3392/1923 | Preddy Charles | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 14 | T0IT00000000004000014 | T3829/1991 | Goss Jan Francois | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 15 | T0IT00000000004000015 | T98948/2007 | Potgieter Eduard Willem | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 16 | T0IT00000000004000016 | T38096/1995 | Luus Familie Trust | (MR) MP 30/5/1/2/2/112 MR (EA) 17/2/4 G (GS) - 33 |

| Farm Name | Portion | 21-digit Surveyor General Code | Title Deed | Registered Landowner | Existing Authorisations |
|---|---|---|---|---|---|
| | Portion 17 | T0IT00000000004000017 | T94002/1992 | Groenvallei Landbougrond CC | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 19 | T0IT00000000004000019 | T9713/2013 | Uys Roule | (MR) MP 30/5/1/2/2/112 MR |
| Haarlem 39 IT | Remaining Extent | T0IT00000000003900000 | T13851/2008 | Worldwide Coal Carolina Pty Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA) 17/2/4 G (GS) - 33<br>(EA) 17/2/3 GS-78 |
| | Portion 2 | T0IT00000000003900002 | T14436/1985 | St. Louis Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 3 | T0IT00000000003900003 | T1905/2013 | National Government of the Republic of South Africa | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 4 | T0IT00000000003900004 | T129297/2006 | Imbani Coal Pty Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA) 17/2/4 G (GS) - 33<br>(EA) 17/2/3 GS-78 |
| | Portion 5 | T0IT00000000003900005 | T17145/2008 | Worldwide Coal Carolina Pty Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA) 17/2/4 G (GS) - 33 |
| Hawerfontein 7 IT | Remaining Extent of Portion 1 | T0IT00000000000700001 | T46737/1984 | Hawerfontein Boerdery Belange Pty Ltd | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 2 | T0IT00000000000700002 | T121625/2007 | Niehaus Diederich Wilhelm | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 3 | T0IT00000000000700003 | U B Trust | T121624/2007 | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 4 | T0IT00000000000700004 | T28420/2006 | Niehaus Diederich Wilhelm | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 5 | T0IT00000000000700005 | T121625/2007 | Niehaus Diederich Wilhelm | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 6 | T0IT00000000000700006 | T5101/1995 | Uys Johannes Cornelis Isak | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 7 | T0IT00000000000700007 | T2342/2011 | Khulamnotfo Co-Operative LTD | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 8 | T0IT00000000000700008 | T18980/2008 | F J van Rensburg Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 9 | T0IT00000000000700009 | T4088/1927 | Transnet LTD | (MR) MP 30/5/1/2/2/112 MR |

| Farm Name | Portion | 21-digit Surveyor General Code | Title Deed | Registered Landowner | Existing Authorisations |
|---|---|---|---|---|---|
| | Portion 10 | T0IT00000000000700010 | T2342/2011 | Khulamnotfo Co-Operative LTD | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 13 | T0IT00000000000700013 | T50568/2002 | Kruger Aletta Elizabeth Dorothea Regina | (MR) MP 30/5/1/2/2/112 MR |
| Kwaggafontein 8 IT | Remaining Extent of Portion 6 | T0IT00000000000800006 | T12843/2000 | McGinn Helen Jennifer | (MR) MP 30/5/1/2/2/112 MR |
| | Remaining Extent of Portion 7 | T0IT00000000000800007 | T12843/2000 | McGinn Helen Jennifer | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 8 | T0IT00000000000800008 | T6984/2009 | Worldwide Coal Carolina (Pty) Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA)17/2/3 GS-44<br>(EA) 17/2/4 G (GS) - 33 |
| | Portion 9 | T0IT00000000000800009 | T93133/2001 | Wet Jan De Bruin De | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 10 | T0IT00000000000800010 | T157814/2002 | Taute Jan Hendrik Stander | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 11 | T0IT00000000000800011 | T121624/2007 | U B Trust | (MR) MP 30/5/1/2/2/112 MR |
| Leeuwpoort 13 IT | The entire farm | T0IT00000000001300000 | T70525/2007 | Worldwide Coal Carolina (Pty) Ltd | (MR) MP 30/5/1/2/2/112 MR |
| Paardeplaats 12 IT | Remaining Extent | T0IT00000000001200000 | T15680/2010 | National Government of the Republic of South Africa | (MR) MP 30/5/1/2/2/112 MR<br>(IWUL) 05/X11D/AGJ/466<br>(EA)17/2/3 GS-44 |
| | Portion 2 | T0IT00000000001200002 | T15314/1996 | Versfeld-Schoeman Familie Trust | (MR) MP 30/5/1/2/2/112 MR<br>(IWUL) 05/X11D/AGJ/466<br>(EA)17/2/3 GS-44 |
| | Portion 4 | T0IT00000000001200004 | T14436/1985 | St Louis Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 5 | T0IT00000000001200005 | T77628/2000 | Arents Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 7 (A portion of portion 3) | T0IT00000000001200007 | T140320/2000 | Asithandaneni Communal Property Assoc | IMBANI WASH PLANT (ML) MP 30/5/1/2/2/221 MR OT 5/3/2/600 (pending) |
| Twyfelaar 11 IT | Portion 3 | T0IT00000000001100003 | T70525/2007 | Nick Viljoen Familie Trust | (MR) MP 30/5/1/2/2/112 MR |

| Farm Name | Portion | 21-digit Surveyor General Code | Title Deed | Registered Landowner | Existing Authorisations |
|---|---|---|---|---|---|
| | Portion 4 | T0IT00000000001100004 | T70525/2007 | Nick Viljoen Familie Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Remaining Extent of Portion 5 | T0IT00000000001100005 | T155560/2003 | M J Pieterse Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 6 | T0IT00000000001100006 | T16021/2008 | Carolina Ontwikkelings Trust | (MR) MP 30/5/1/2/2/112 MR |
| | Remaining Extent of Portion 8 | T0IT00000000001100008 | T6985/2009 | Worldwide Coal Carolina (Pty) Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA)17/2/3 GS-44<br>(EA) 17/2/4 G (GS) - 33 |
| | Portion 10 | T0IT00000000001100010 | T6985/2009 | Worldwide Coal Carolina (Pty) Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA)17/2/3 GS-44 |
| | Portion 11 | T0IT00000000001100011 | T173727/2003 | Ekwaluseni Farming Enterprises | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 12 | T0IT00000000001100012 | T34412/2005 | Tau Kwena General Construction CC | (MR) MP 30/5/1/2/2/112 MR |
| | Portion 13 | T0IT00000000001100013 | T6984/2009 | Worldwide Coal Carolina (Pty) Ltd | (MR) MP 30/5/1/2/2/112 MR<br>(EA)17/2/3 GS-44 |
| Zandvoort 10 IT | Remaining Extent | T0IT00000000001000002 | T5103/1977 | Davel Johannes Stephanus- Trustees | (MR) MP 30/5/1/2/2/112 MR<br>(EA)17/2/3 GS-44 |
| | Portion 1 | T0IT00000000001000001 | T5103/1977 | Davel Johannes Stephanus- Trustees | (MR) MP 30/5/1/2/2/112 MR<br>(EA)17/2/3 GS-44 |

## 2.5 LOCALITY MAP

Figure 1 below indicates the locality of the Ilima Colliery, as well as the old mining licence and the existing Mining Right boundaries.

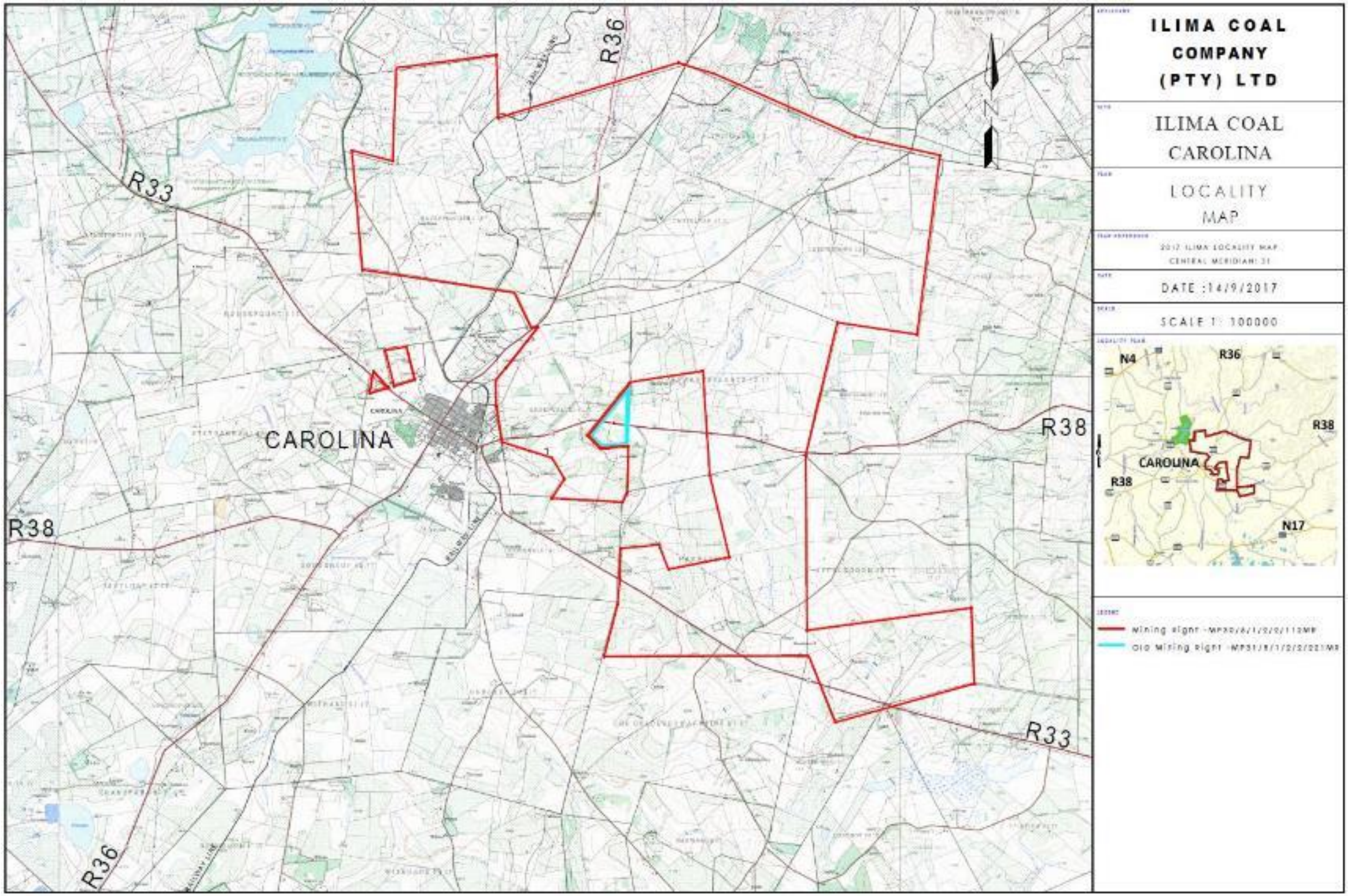
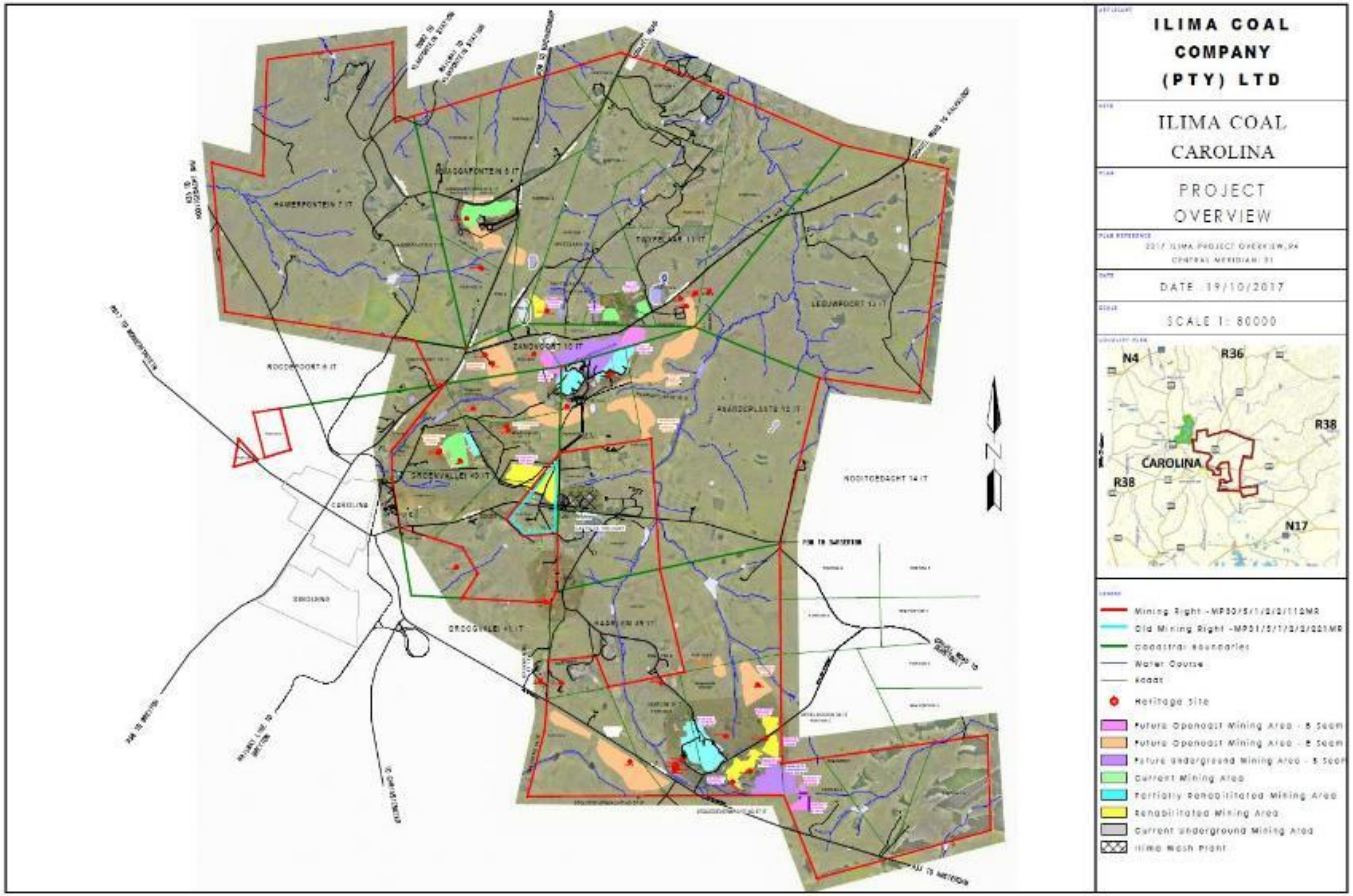



Figure 1: Locality Map of the Ilima Colliery.

# 3 DESCRIPTION AND SCOPE OF THE PROPOSED ACTIVITY

Ilima Coal Company (Pty) Ltd (previously Pembani Coal Company), hereafter referred to as Ilima, wishes to expand their current approved mining operations on their Ilima Colliery (previously Pembani Colliery). Ilima Coal Company (Pty) Ltd. has an approved Mining Right (MP 30/5/1/2/2/112 MR) and EMPR in terms of the MPRDA for the mining of coal at Ilima Coal. Furthermore, the proposed new mining areas also all fall within the list of properties approved under the NEMA (Ref #: (EA) 17/2/3/GS-44) for a range of listed activities associated with the mining activities.

Table 1 provides a list of the current (and pending) authorisations held by Ilima in respect of this colliery. The proposed new mining areas are presented in Figure 2 and relate to the mining of coal through both open cast and underground mining. As can be seen from Figure 2 the proposed new mining areas all fall within the existing approved Mining Right boundary. **Figure 2 presents the initial proposed future mining areas however based on the impact assessment undertaken and presented in this report, certain of the future mining areas have been amended to exclude wetland areas. The final proposed mining areas are presented in the LoM planning maps included in Section 20.3.** The proposed extent of the mining activities envisaged in the original Mining Right, as well as the current NEMA authorisations, expands on what was originally approved. Such expansion includes expansions to existing active and past mining areas, as well as the establishment of new mining areas within the approved properties.



ILIMA COAL
COMPANY
(PTY) LTD
ILIMA COAL
CAROLINA
PROJECT
OVERVIEW
DATE 19/10/2017
SCALE 1: 80000
N4
R36
R38
CAROLINA
R38
N17
Water Course
Heritage Site
Current Mining Area
Partially Rehabilitated Mining Area
Rehabilitated Mining Area
Current Underground Mining Area
Ilima Wash Plant

Figure 2: Project overview plan.

## 3.1 LISTED AND SPECIFIED ACTIVITIES

The EA in terms of the NEMA for Ilima was originally issued on 6 August 2012 and amended on 31 July 2013 by the Mpumalanga Department of Economic Development, Environment and Tourism (MDEDET), now the Mpumalanga Department of Agriculture, Rural Development, Land, and Environmental Affairs (MDARDLEA). The listed activities in terms of Chapter 3 of the National Environmental Management Act (NEMA), 1998 approved as part of the EA includes:

- Activity 9, 11, 12, 18, 22, 23, 28, 47, 56 of Government Notice (GN) R544;
- Activity 5, 15, 20 of GN R545; and
- Activity 4 (a), 10 (a) and 12 of GN R546.

In terms of the NEMA 2014 EIA Regulations, GNR 984 Listed Activity 17 specifies that any activity which requires a mining right as contemplated in Section 22 of the MPRDA triggers the requirement for Environmental Authorisation. As this is a new requirement and according to the 2014 amendment to the MPRDA, the currently approved EMPR is deemed to be an EA, the Ilima Colliery is, therefore, considered to have an authorisation for this Listed Activity. Further, Regulation 52 (2) of GNR 982 states that “Any authorisation issued in terms of the previous NEMA Regulations must be regarded to be an environmental authorisation issued in terms of these regulations”.

It is, therefore, understood that insofar as the proposed additional mining areas, within the existing Mining Right are concrete-, that all the relevant NEMA listed activities have been authorised. Consequently, these additional mining areas and changes to the Mine Works Programme (MWP) are subject to an Amendment Application process. This EIA process will serve to support the amendment application.

The proposed mine infrastructure will include:

- Opencast pits or underground mining;
- Haul roads;
- Storm water management infrastructure;
- Contractors camp including workshop, diesel storage, offices and ablution facilities;
- Raw water dams and PCD’s;
- Water pipelines and associated water management infrastructure;
- Administrative offices;
- Security and fencing;
- Product stockpiles;
- Discard and overburden stockpiles;
- Topsoil stockpiles;
- Monitoring boreholes;

- Highwall entrance to underground;
- Underground mining sections;
- Opencast mining sections;
- Conveyors (underground conveyors transporting coal to surface); and
- Site camp associated with underground mine entrance.

## 3.2 DESCRIPTION OF ACTIVITIES TO BE UNDERTAKEN

It is the intention of this Environmental Impact Assessment Report amendment to provide information on the proposed changes with regards to the amendment to include additional underground and opencast mining of coal resources at Ilima Colliery. The proposed future mining areas (within the existing mining right) include:

- New underground mining operations:
    - Portions of the farm Haarlem 39 IT; and
    - Portion RE/9 of the farm Appeldoorn 38 IT.
- New opencast mining operations:
    - Portions RE and 1 of the farm Zandvoort 10 IT;
    - Portion 6 of the farm Kwaggafontein 8 IT;
    - Portions RE and 2 of the farm Haarlem 10 IT;
    - Portions 2, 8 and 16 of the farm Groenvallei 40 IT;
    - Portion 2 and 12 of the farm Paardeplaats 12 IT;
    - Portion 9 of the farm Appeldoorn 38 IT; and
    - Portion RE of the farm Leeupoort 13 IT.

The Ilima Colliery is an existing mine which has been in operation for several years. As such the construction of the majority of the mine infrastructure has been completed, including mine offices, a wash plant, workshop facilities, dirty water containment facilities, etc. Extensive opencast mining has also taken place, although the mine has only recently commenced with underground mining. Due to the large area under the mining right, the mining activities (opencast and underground) have and will be approached as a phased development over the LoM (30 years). The activities associated with each phase of the mining operation are described in Table 7.

Table 7: Activities associated with the mining operation

| Main Activity/Action/Process | Ancillary Activity |
|---|---|
| Planning and Design | |
| General mine management | Employment;<br>Human Resource Management; and |

| Main Activity/Action/Process | Ancillary Activity |
|---|---|
| | Interaction with local Community. |
| Drilling for monitoring boreholes | Drilling |
| Drilling for continued resource evaluation | Drilling |
| Site visits | Vehicle and foot traffic on site |
| Construction | |
| General mine management | Employment<br>Human Resource Management<br>Interaction with local Community |
| Drilling monitoring boreholes | Drilling |
| Drilling for continued resource evaluation | Drilling |
| General construction management | Human Resource Management<br>Employment<br>Interaction with local Community |
| Site establishment – Contractors Camp | Construction camp sewage management<br>Dust suppression<br>Earthworks<br>Fencing<br>Fuel Storage and refueling<br>Hazardous substances management<br>Site security<br>Soil Management<br>Truck and heavy machinery operation<br>Utilization of portable toilets and generation of sewage<br>Vegetation clearance |

| Main Activity/Action/Process | Ancillary Activity |
|---|---|
| | Waste Management |
| Construction of mineral processing facilities | Concrete works<br>Dust suppression<br>Earthworks<br>Fencing<br>Fuel Storage and refueling<br>Hazardous substances management<br>Power supply connections<br>Soil Management<br>Vegetation clearance<br>Waste Management |
| Mine area site preparation | Clearance and preparation of soil stockpile areas<br>Dust suppression<br>Establishment of storm water management infrastructure for road network<br>Fuel Storage and refueling<br>Road construction<br>Truck and heavy machinery operation |
| Site establishment – Permanent site office infrastructure | Concrete works<br>Dust suppression<br>Earthworks<br>Fencing<br>Fuel Storage and refueling<br>Hazardous substances management<br>Power supply connections<br>Site security<br>Soil Management<br>Truck and heavy machinery operation<br>Utilization of portable toilets and generation of sewage<br>Vegetation clearance |

| Main Activity/Action/Process | Ancillary Activity |
|---|---|
| | Waste Management |
| Water management infrastructure construction | Construct the dirty and clean water management features<br>Construction of culverts, berms and crossings<br>Construction of PCD's<br>Dust suppression<br>Installation of pipelines for water management<br>Installation of pumps, flow meters<br>Truck and heavy machinery operation<br>Vegetation clearance<br>Rehabilitation of Vegetation where necessary |
| Operation | |
| General mine management | Employment<br>Human Resource Management<br>Interaction with local Community |
| Drilling monitoring boreholes | Drilling |
| Drilling for continued resource evaluation | Drilling |
| Maintenance and operation of site infrastructure and facilities | Alien vegetation management<br>Maintenance and management of portable toilets by contractor<br>Operation of generators if and when required<br>Power line supply<br>Sewage and sanitation<br>Site security<br>Storage and handling of diesel/hydrocarbons<br>Storage and handling of explosives<br>Waste management<br>Water management |
| Opencast mining | Blasting (overburden and coal)<br>Dust suppression<br>Erection of in pit infrastructure<br>Fuel Storage and refuelling<br>Hauling Coal for mineral processing<br>Pumping of in-pit water/Dewatering<br>Raw coal stockpiling<br>Removal of coal seam - Strip Mining - Truck and Shovel<br>Soil Stockpile Management |

| Main Activity/Action/Process | Ancillary Activity |
|---|---|
| | Storage of in pit water in sump<br>Truck and heavy machinery operation<br>Use and maintenance of portable toilets<br>Vegetation clearance |
| Underground mining | Blasting<br>Construction of underground Adits from opencast pits<br>Dewatering<br>Discard trucked to co-disposal dump facility<br>Fuel Storage and refueling<br>Hauling Coal Offsite<br>Hauling coal on site for mineral processing<br>Installation of underground mine infrastructure<br>Mine ventilation<br>Removal of coal seams - Bord and pillar mining<br>Soil management<br>Temporary stockpiling of RoM coal<br>Use and maintenance of portable toilets |
| Mineral processing | Coal Processing - washing<br>Coal stockpile management<br>Dust suppression<br>Fuel Storage and refueling<br>Hauling processed coal<br>Operation of co-disposal facility<br>Slurry disposal at co-disposal facility<br>Water management |
| Decommissioning | |
| General mine management | Employment<br>Human Resource Management<br>Interaction with local Community |
| Drilling monitoring boreholes | Drilling |
| General decommissioning activities | Dust suppression<br>Recycling of recyclable/reclaimable waste<br>Removal of waste |
| Decommissioning of co-disposal dump | Profiling of co-disposal dump and preparation for final rehabilitation |

| Main Activity/Action/Process | Ancillary Activity |
|---|---|
| | Truck and heavy machinery operation |
| Infrastructure removal | Decommissioning/removal of water pipelines<br>Disconnection of services (power supply, water connections)<br>Dismantling, removal and rehabilitation of unnecessary infrastructure<br>Final removal of all berms, trenches and any dams no longer required<br>Removal of fencing |
| Filling opencast voids | Filling the final opencast voids |
| Decommissioning of underground mine infrastructure | Sealing and closure of underground mining sections<br>Sealing shafts and adits |
| Rehabilitation and Closure | |
| General mine management | Employment<br>Human Resource Management<br>Interaction with local Community |
| Drilling monitoring boreholes | Drilling |
| General surface rehabilitation | Profiling of all areas<br>Replacement of subsoil and topsoil<br>Ripping of roads and other compacted areas<br>Managing the site for all post mining impacts to prevent any further pollution<br>Vehicle and foot traffic on site |
| Storm water management | Construction of contour berms or other erosion control measures |
| Re-vegetation | Dust suppression<br>Fertilization<br>Seeding with local indigenous species |
| Post closure monitoring and maintenance | Alien vegetation management<br>Environmental monitoring of rehabilitated areas<br>Maintenance of storm water and erosion control measures |
| Water treatment (as required by WUL) | Construction of water treatment plant<br>Operation of water treatment plant |
| Application for closure certificate | Operation of water treatment plant |

## 3.3 MINING OPERATIONS

Below is a description of the mining operations including the mineral resource and the mining methods for Ilima.

### 3.3.1 THE MINERAL RESOURCE

The Ilima Colliery is situated within the northern part of the Ermelo Coalfield, which forms part of the coal-bearing Vryheid Formation of the Ecca Group. The Ecca Group forms part of the larger Karoo Super group. The coal seams present, within the Ermelo Coalfield, are named from the base to the top, E to A. In the northern parts of the coal field the E Seam attains a thickness of over 3m and consists of mainly bright coal and ranges from the surface to about 100 m. The less prominent D Seam (< 0.6 m) is usually too thin to be of economic value although being predominantly bright coal and ranges from surface to about 70 m. The C Seam is usually sub-divided into the C Upper and the C Lower due to several plies that vary in thickness. The C Lower is usually thin and seldom thicker than 0.6 m however thickens towards the Dirkiesdorp District reaching thicknesses of up to 3 m. In contrast to the other seams the C Upper is well developed in the entire coal field but is of poor quality and tends to be torbanitic over large areas. Thicknesses usually vary from 0.4 m – 4 m depending on the area. The B Seam is usually split into the B, B1, and BX however in the Ermelo district only the B (Lower) and the BX (Upper) are considered feasible for mining. The B Seam may reach thicknesses of up to 3 m and consists of mainly dull coal (high sulphur content), capped by a glauconitic sandstone. The A Seam is of moderate to low quality across the coal field and occurs as outliers in the central and northern parts of the coal field (Greenshields, 1986).

The B Seam and the E Seam are the main economic coal seams present within the mining area and these are exploited by means of opencast and underground mining operations. The average depth of the E seam is 53 m and 27.6 m for the B seam.

### 3.3.2 MINING METHOD TO BE EMPLOYED

The Ilima Colliery has access to extensive coal reserves which are to be exploited by both above ground (opencast mining) and below ground mining methods (bord and pillar underground mining). Extensive opencast mining has also taken place, although the mine has only recently commenced with underground mining. The mining methods that will be employed in the future are discussed in the sections that follow.

#### *3.3.2.1* OPENCAST MINING

Opencast mining will be undertaken in the form of strip mining where the strips are laid out to follow the surface contours. As the strips progress, the previous pit is rehabilitated, thus resulting in minimal surface disturbance (i.e.: role over mining method). The coal is transported by truck to the existing Imbani Wash Plant where wet processing of the coal will take place. Certain temporary infrastructure associated with the opencast mining activities (such as storm water management infrastructure) will move as the opencast mining progresses along the coal seams to the new pit areas.

#### *3.3.2.2* UNDERGROUND MINING

Further to the opencast, mining the remainder of the deeper coal reserves will be mined using the bord and pillar underground mining method. The entire infrastructure will be situated around the entrance to the underground workings (either box-cut or highwall). The entire area at each underground operation within the security fence will cover less than 20 ha. The underground infrastructure shall typically include the following:

- Ventilation fans
- Short Conveyors (bringing coal to surface)
- ROM stockpiles;
- Substation;
- Parking Area;
- Lamp Room;
- Stores;
- Cable Shop;
- Workshop;
- Washbay;
- Refueling Bay;
- Stone Dust Shed;
- 10m x 10m sump;
- Service Water Dams;
- Potable Water Dam.

Coal will be transported to the surface via conveyor for temporary storage at the RoM stockpile. All coal will either be directly transported by means of coal trucks to the processing plant or will be crushed by means of a mobile crusher and directly sold to Eskom and/or other clients from pre-qualified stockpiles situated near the underground access. The typical layout and design of the infrastructure for underground mining is illustrated in Figure 3 below.

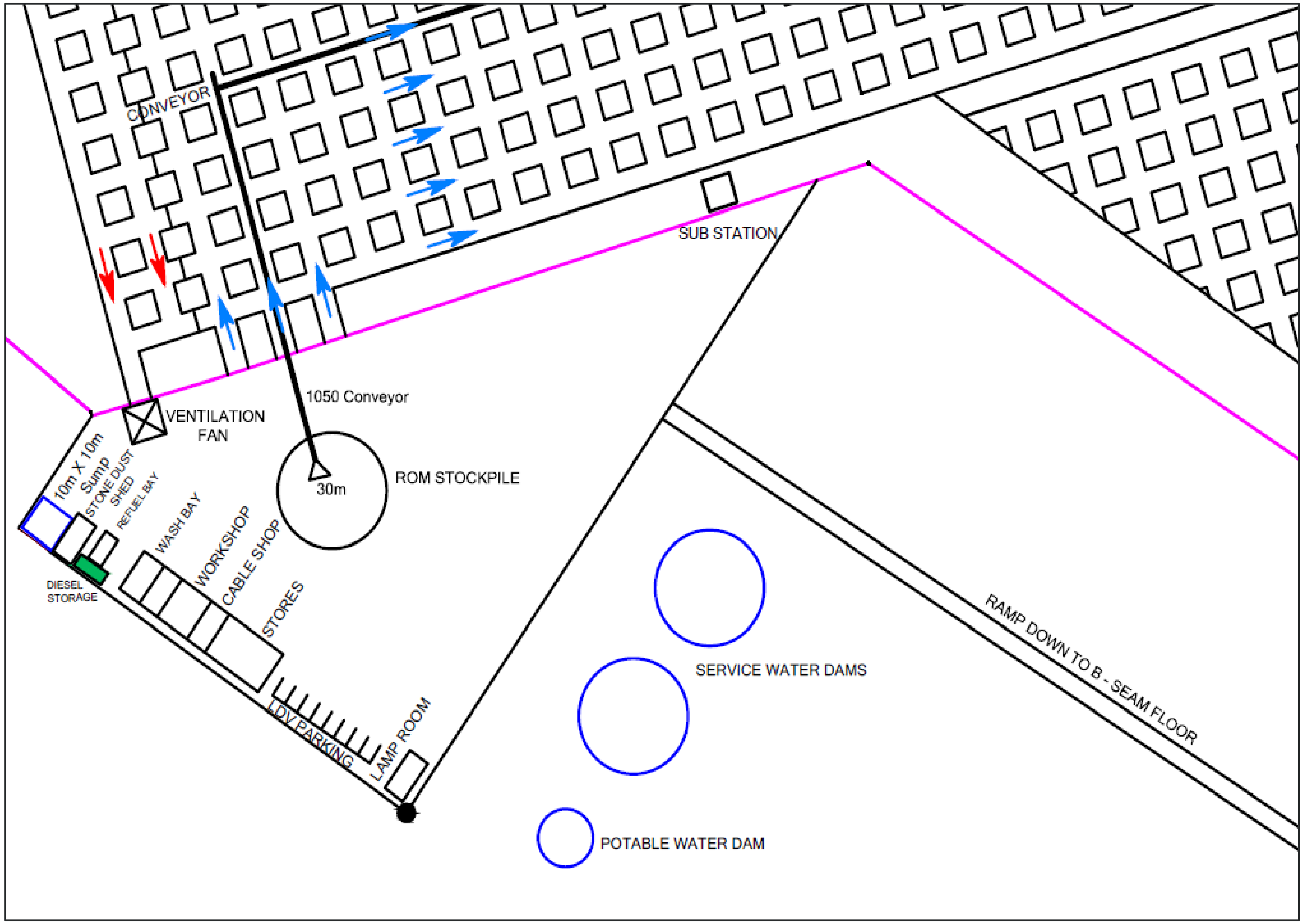



Figure 3: Mine Infrastructure Dedicated to each Underground Operation (Typical drawing)

### 3.3.3 MINE AREAS

The mining plan layout as indicated in Figure 2 illustrates the future underground and opencast mine areas. These future mine areas are indicated in Table 8 below.

Table 8: Future Mine Areas

| # | Name | Property |
|---|---|---|
| **1** | Kwagga Opencast B Seam | Kwaggafontein 8 IT Portion 6<br>Kwaggafontein 8 IT Portion 8 |
| **2** | TZP2 Opencast E Seam | Zandvoort 10 IT (RE)<br>Groenvallei 40 IT Portion16<br>Groenvallei 40 IT Remainder Portion 8<br>Paardeplaats 12 IT Portion 2 |
| **3** | TZP4 Opencast B Seam | Zandvoort 10 IT (RE)<br>Zandvoort 10 IT Portion 1<br>Groenvallei 40 IT Remainder Portion 8<br>Paardeplaats 12 IT Portion 2 |
| **4** | TZP5 Opencast B Seam | Zandvoort 10 IT Portion 1<br>Paardeplaats 12 IT Portion 2<br>Paardeplaats 12 IT (RE) |
| **5** | TZP4 Underground B Seam | Zandvoort 10 IT (RE)<br>Zandvoort 10 IT Portion 1<br>Groenvallei 40 IT Remainder Portion 8<br>Paardeplaats 12 IT Portion 2 |
| **6** | Paardeplaats North Opencast E Seam | Zandvoort 10 IT Portion 1<br>Paardeplaats 12 IT (RE)<br>Leeupoort 13 IT<br>Twyfelaar 11 IT Portion 3<br>Twyfelaar 11 IT Portion 12 |

### 3.3.4 MINERALS PROCESSING

The processing of raw coal is undertaken at the Imbani Wash Plant, and all coal from the future mine areas will also be processed at the Imbani Wash Plant (refer to Figure 4). The Imbani Wash Plant is located on the farm Paardeplaats (Portion 7 of Portion 3). This plant was previously owned and operated by Siphete Coal (previously called Carolina Coal) and was acquired by the mine in 2003. The plant consists of a crusher, screener and wash plant.

Raw coal is fed from a RoM stockpile into a crusher, and crushed to market related sizing. The <3mm particles are screened out and the >3mm are washed in a dense medium separation plant (DMS) at the Imbani Wash Plant. The underflow from the DMS is discarded to the discard bin, whereas the overflow forms part of the product line. The <3mm coal is put through a cyclone and the >1 mm is added to the product line as duff. Duff is fine dry coal (usually anthracite) obtained through coal processing operations. The size range for duff is 4.8 mm to 0 mm.

During the beneficiation process, the slurry produced contains approximately 80% water and 20% solids. Slurry is routed to a filter press, where the slurry is dried to a filter cake before being added to the saleable product. During emergencies and maintenance, the slurry is disposed of onto the existing co-disposal facility. Here the supernatant water is piped off for reuse at the wash plant.

Discard that is not sold immediately is placed onto the co-disposal facility located on Portion 7 of Portion 3 of the farm Paardeplaats 12 IT. Once the slurry on the co-disposal facility has dried it is reclaimed for sale.

The water requirements of the plant are approximately 0.25m$^3$ per run of mine feed ton. Currently the plant feed is approximately 2,640 tons per day. The water requirements for the wash plant are met from dewatering of the various opencast pits. Water from the pits is pumped to the reservoirs before being fed to the raw water dam which in turn feeds the plant. Water is also obtained from the plant PCDs. Water is recycled as far as possible. Run of mine coal and washed product is stockpiled within the dirty footprint area of the plant.


Figure 4: Imbani Wash Plant

Discard that is not sold immediately is now placed onto the co-disposal facility located on Portion 7 of Portion 3 of the farm Paardeplaats 12 IT. Once the slurry on the co-disposal facility has dried it is reclaimed for sale. The processing plant operates 24 hours a day. From the plant, the coal is transported to local markets or the Droogvallei siding for rail transportation to distribution centers or end users.

### 3.3.5 WASTE

Waste generated from the mining areas will include minimal construction and domestic waste, some hydrocarbon and explosive waste and sewage. These will be all collected and disposed of as part of the mines waste management plan and or managed by contractors. Waste is recycled as far as possible. Portable toilets are used at the mining areas.

#### *3.3.5.1* DOMESTIC/GENERAL WASTE

General waste includes domestic refuse, office waste, soiled paper, non-hazardous plastic containers, detergent containers (washing-up liquid etc.) and cardboard. This waste will be collected in clearly demarcated bins situated around the site. The waste will be trucked to the Carolina municipal dump/landfill site on a weekly basis. No littering or dumping will be tolerated on site. Chemical toilets (Porta-potties) are utilised at the mining area. The chemical toilets are emptied regularly by the chemical toilet supply company and the waste is disposed of in the correct manner at the respective registered sewage treatment works. Ilima ensures a cradle-to-grave policy with regards to following up on correct disposal by contractors managing their portable toilets and general waste disposal.

#### *3.3.5.2* INDUSTRIAL WASTE (SCRAP METAL)

Scrap metal includes any ferrous metals and non-ferrous metals that is not contaminated with hazardous material. Scrap metal should be placed in an appropriately labelled bin at the mine and transferred to central collection and recycling point and sold as scrap metal or removed and transported to an appropriate landfill site.

#### *3.3.5.3* HAZARDOUS INDUSTRIAL WASTE

Hydrocarbon waste includes used oil and grease, filters, contaminated containers, rags, equipment and soil, engine oil, transmission oil, hydraulic oil, transformer oil, or oil of any kind. All used oil generated at the Service Bays and Workshops is stored in designated storage tanks and periodically transferred to collection and storage points for collection and disposal by an authorised contractor.

### 3.3.6 MINE RESIDUE

Mine residue (slurry and discard) are generated at the Imbani Wash Plant area. Slurry is routed to a filter press, where the slurry is dried to a filter cake before being added to the saleable product. During emergencies and maintenance, the slurry is disposed of onto the existing, licensed co-disposal facility. Here the supernatant water is piped off for reuse at the wash plant.

Discard that is not sold immediately is placed onto the co-disposal facility located on Portion 7 of Portion 3 of the farm Paardeplaats 12 IT. Once the slurry on the co-disposal facility has dried it is reclaimed for sale.

### 3.3.7 SOIL STOCKPILES

Various stockpiles will be required on site including topsoil, subsoil, soft overburden and hard overburden stockpiles, all of which will be erected as close as possible to the final void to aid in infilling and rehabilitation of final voids. In addition, the mine will have duff, product and RoM coal stockpiles which will be temporary in nature. Coal within these stockpiles is moved on a “first-in-first-out” basis to reduce the risk of spontaneous combustion.

The extraction of coal requires temporary coal stockpiles at the each of the mine sections, these stockpiles are estimated to be between 22,500 and 31,500 tons. The coal stockpile areas are compacted and made as impermeable as possible to limit seepage through the stockpiles into the strata below. The stockpile areas will be lightly sloped to drain water away from the pits and towards the PCDs. Dirty water trenches will be placed downslope of these stockpiles to collect and divert dirty water runoff. Where necessary (in areas where upslope areas are clean areas), upslope berms of soil will be placed around these stockpiles to divert clean water.

### 3.3.8 ADMINISTRATION BUILDINGS, ENGINEERING BAYS, WORKSHOPS, AND OTHER BUILDINGS

#### *3.3.8.1* ADMINISTRATION BUILDINGS

The main offices, ablution facilities and change house are located at the Imbani Wash Plant. Temporary containers will be utilised as administration blocks at the various pit areas.

#### *3.3.8.2* WORKSHOP

Workshops will be utilised for the servicing of diesel driven equipment on site within the camp. Workshops will also be constructed at the underground mining contractors' camp at the underground access points. Workshops are constructed with impervious concrete slabs fitted with oil and silt traps. In addition, all wash bays will be required to have the necessary oil management facilities such as oil and silt traps.

#### *3.3.8.3* ABLUTION FACILITIES

Portable chemical toilets are utilised at the mining areas. The chemical toilets are emptied regularly by the chemical toilet supply company and the waste is disposed of in the correct manner at a registered sewage treatment works. One septic tank/french drain exists at the Imbani Wash Plant area, and services the change house, security house and administration block.

### 3.3.9 DANGEROUS GOOD STORAGE

#### *3.3.9.1* DIESEL SUPPLY

Mining equipment, including drills, trucks and shovels, front-end loaders and 30-ton trucks for coal haulage are diesel operated. At the Imbani Wash Plant the hydrocarbons (and used hydrocarbon drums and rags) and diesel bowsers are stored within bunded areas designed to applicable standards, with a bunding volume of 110% of total storage volume. The bunded area is fitted with a tap which is only opened under controlled circumstances to release any water that has accumulated within the bunding. The hydrocarbons from these oil traps are cleared out at regular intervals and incorporated into hydrocarbon waste drums which are stored within the same bunded area until removal from site by a registered contractor for hydrocarbon waste. All water from the bunded areas is considered hazardous waste and must be disposed of accordingly. Spillage kits and handling and emergency procedures are available on site.

#### *3.3.9.2* EXPLOSIVES

The biggest consumable during the mining operation is the explosives required to break the hard overburden. Drill rods and drill bits will be used to drill the hard overburden above the coal seam. Explosives are kept in an explosive magazine on site.

### 3.3.10 WATER SUPPLY

#### *3.3.10.1* POTABLE WATER SUPPLY

For the main offices, potable water is purchased off site and trucked to the premises. A borehole is used to supply potable water for the mine contractors. Filtered water from the raw water dam supplies the change house and admin block. Potable water tanks will be utilised for the mining areas.

#### *3.3.10.2* PROCESS WATER SUPPLY

Water will be recycled onsite as far as possible. Process water needs, such as dust suppression and water for the wash plant and/or for drilling will be supplied from the PCDs or in-pit sumps.

### 3.3.11 CLEAN AND DIRTY WATER PROCESSES

In general storm water management and drainage infrastructure onsite accommodates a 1:50 year storm event as required by legislation. Clean and dirty water is separated and all dirty water is channelled into dirty water containment facilities at the Imbani Wash Plant area. Dirty water runoff at the opencast areas will drain into in-pit sumps and from these will be pumped to the PCDs. Clean water will be diverted around various dirty footprints by means of channels and berms to the natural environment.

#### *3.3.11.1* CLEAN WATER PROCESSES

All storm water falling within the Imbani Wash Plant's 15 ha dirty footprint area is stored within the dirty water system for use within the plant. Clean water is diverted around the property. Clean water diversion berms are situated up slope and interception trenches and drains are cut down slope of the dirty footprint area. Active mining areas will have berms and trenches constructed around their facilities to keep clean water runoff from entering mine workings and to divert clean water around the site.

#### *3.3.11.2* SUMPS AND PUMPS

Dewatering activities are carried out on site to allow for the safe continuation of mining. Diesel pumps are utilised to dewater the opencast pits and underground workings and dispose of mine affected water into the relevant PCD and/or pumped to the process water reservoirs for use at the Imbani Wash Plant.

#### *3.3.11.3* POLLUTION CONTROL DAM (PCD) AND ASSOCIATED DIRTY WATER MANAGEMENT

Lined PCDs will also be constructed at the various opencast areas to manage dirty water runoff and ingress into the pits/workings. These PCDs will require that an amendment is made to the existing Water Use Licence (WUL) of Ilima Coal. The position of these PCDs have been determined based on the results of the groundwater study and the potential decant points as identified, this way the position of the dams will be suitable for operational and closure management objectives.

#### *3.3.11.4* STORMWATER MANAGEMENT PLAN

The storm water management plan is indicated in Figure 5 to Figure 9 below.

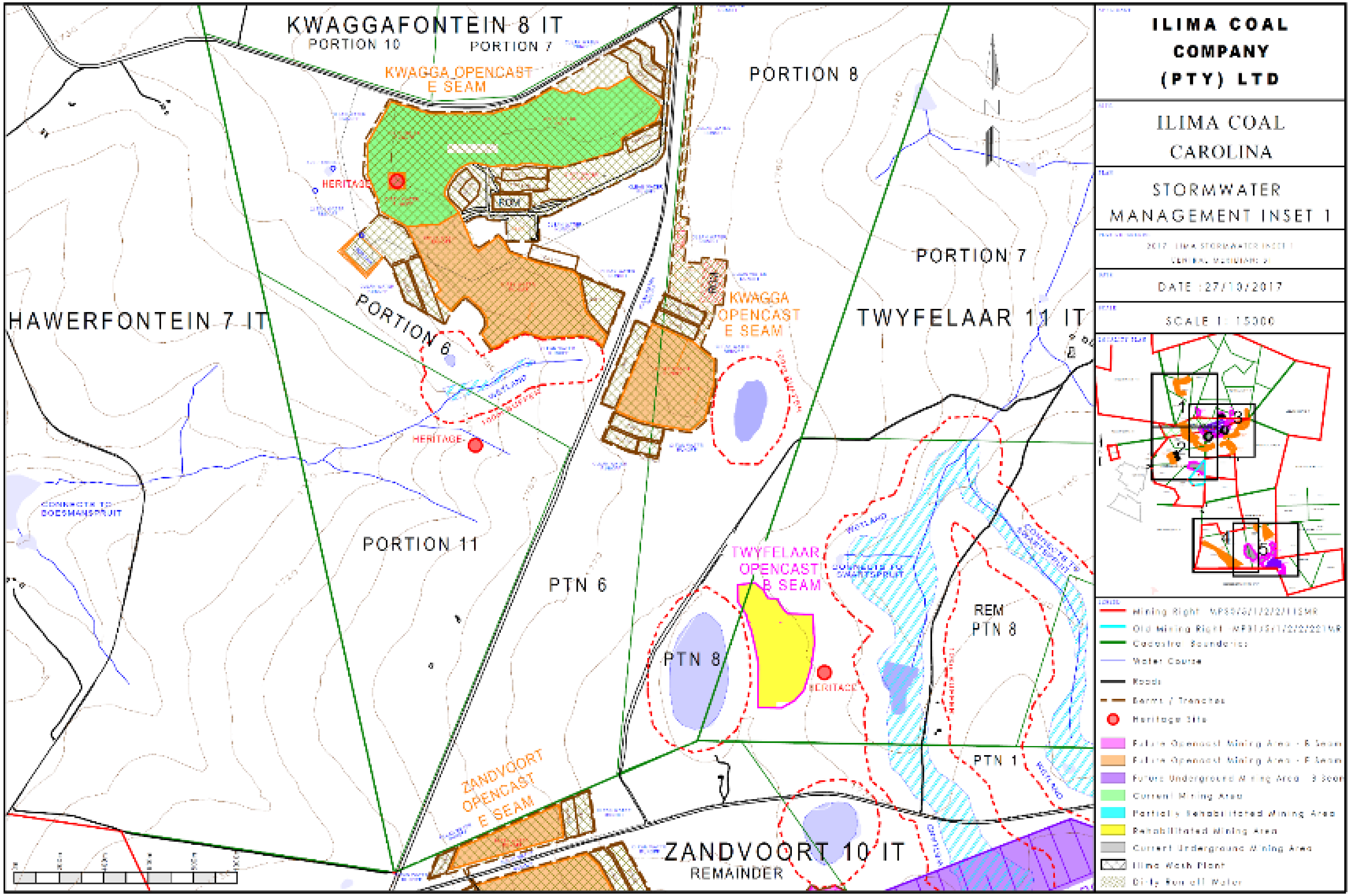



Figure 5: Storm Water Management Plan (Inset 1).

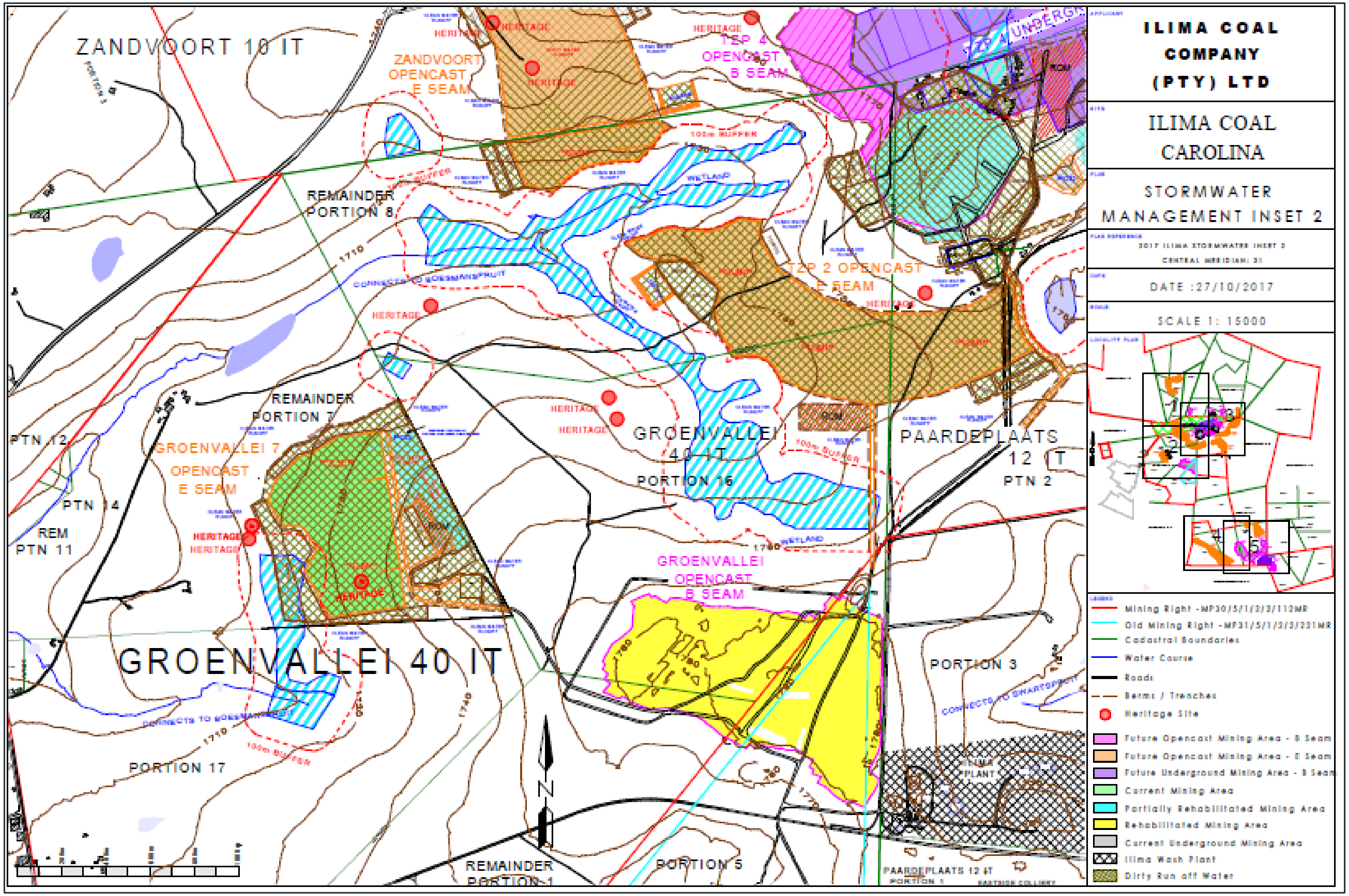



Figure 6: Storm Water Management Plan (Inset 2).

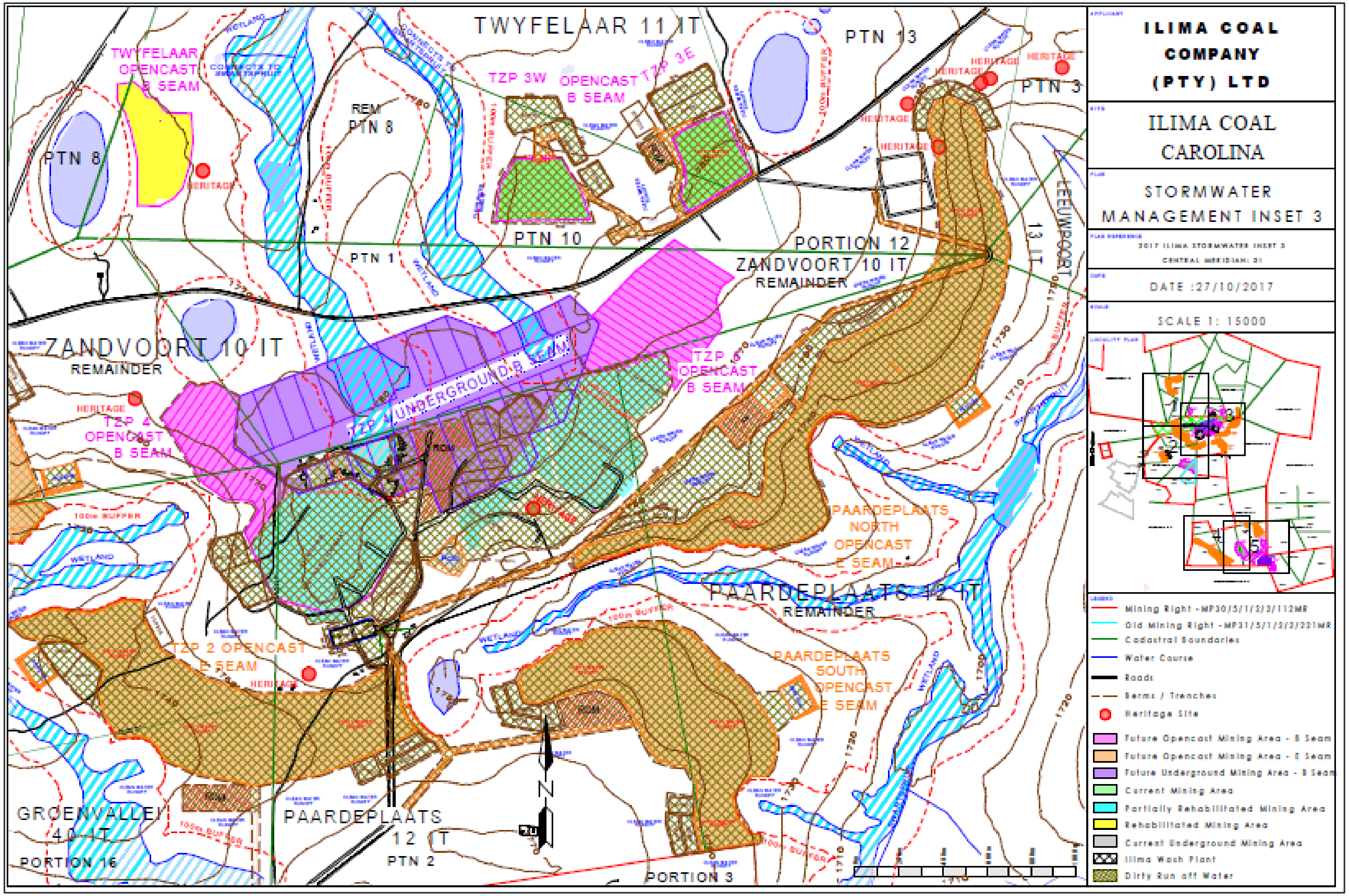



Figure 7: Storm Water Management Plan (Inset 3).

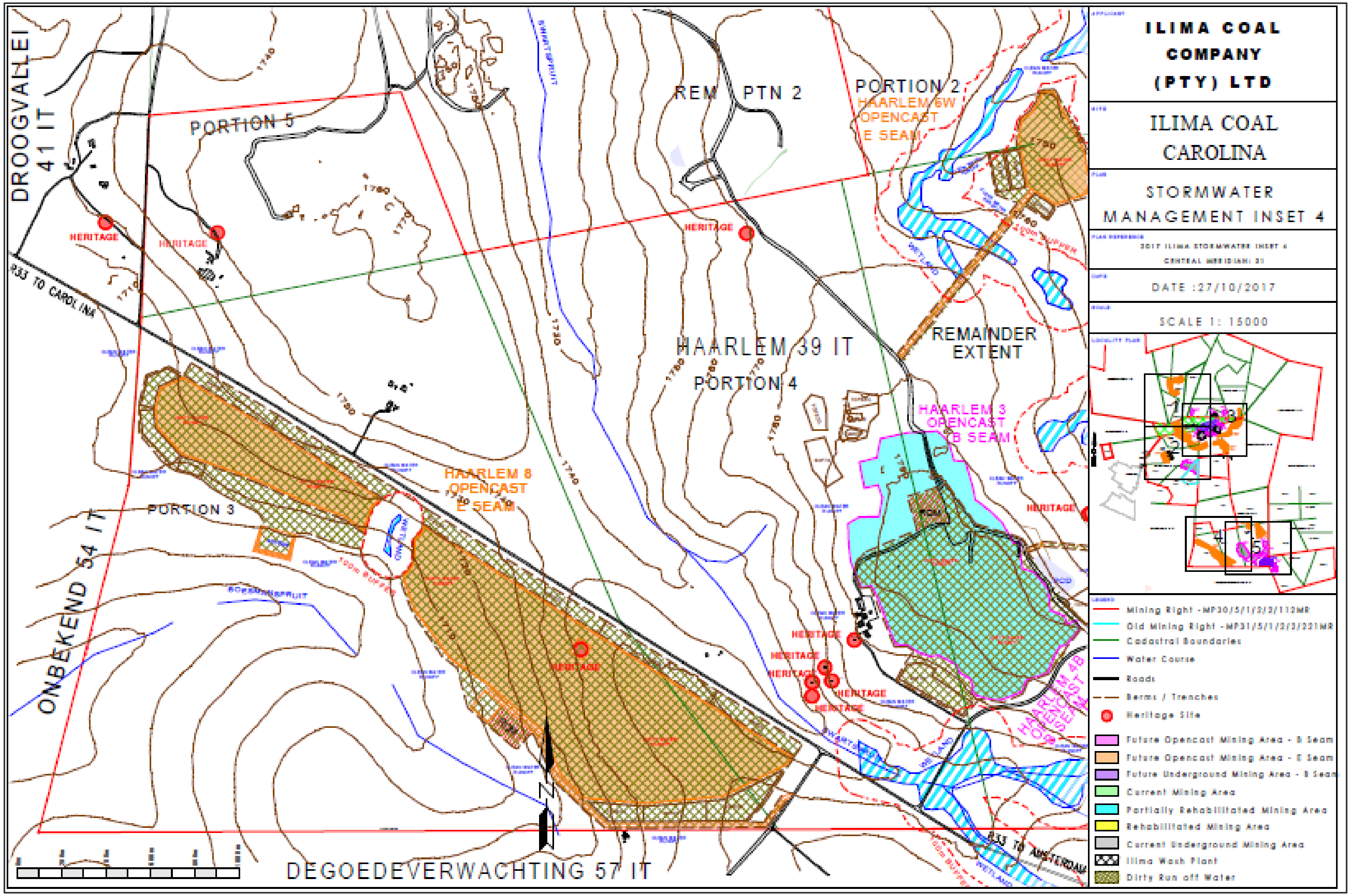



Figure 8: Storm Water Management Plan (Inset 4).

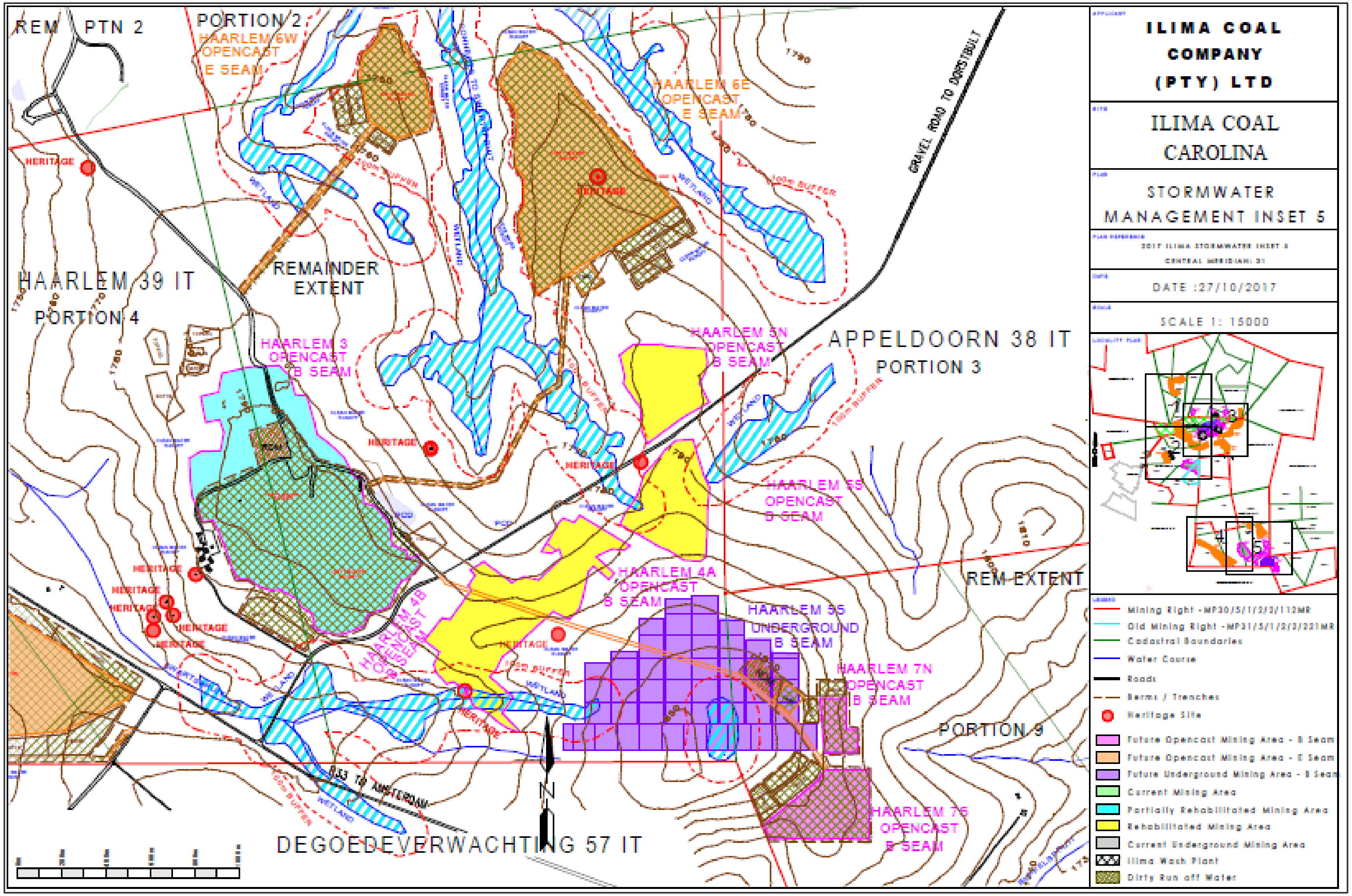



Figure 9: Storm Water Management Plan (Inset 5).

#### *3.3.11.5* WATER AND SALT BALANCE

The current water balance is based on the fact that there will only be one active opencast and underground mining area at a time. This is as a result that different mining areas will commence and be decommissioned at different times during the remaining 8-year LoM.

For the water balance the following assumptions have been made:

- It is assumed that rainfall will only enter the active mining areas. Opencast (300m x 100m). Underground Adit (50m x 50m).
- It is assumed that rainfall and groundwater seepage in the workings will migrate to the lowest point in the workings and be temporary stored in a sump (25m x 25m).
- It is assumed that dust suppression will be at a rate of 0.0025m/$m^2$/day.
- It is assumed that each ROM stockpiling area will be 3m high and cover an area of 10000$m^2$.
- It is assumed that each person consumes 25l per day.

The current water balance for Ilima Coal will be updated to include the future mining areas.

### 3.3.12 DUST SUPPRESSION

Water for dust suppression will be sourced from the various PCDs, and/or extracted from the pits directly. Water for dust suppression will only be used within the dirty footprint of the mine, to prevent contamination of clean areas with dirty water.

### 3.3.13 ROAD, RAIL, AND POWER

A number of haul and access roads will be constructed on site. Storm water is managed on the roads with a system of berms which direct the runoff to small settlement ponds (approximately 1.5 $m^2$ in size) to allow for the settlement of fines thereby reducing silt laden runoff.

Electricity at the plant area is currently sourced from Eskom. Mining will be done with diesel driven equipment. Diesel generators will be utilised within the mining areas for lighting, pumping, etc. There is no railway system at Ilima Colliery, as coal is transported via truck.

### 3.3.14 GASEOUS EMISSIONS

Greenhouse Gases (GHG's) are gaseous molecules in the atmosphere that absorb and emit thermal infrared radiation. Water vapour ($H_2O$), carbon dioxide ($CO_2$), and methane ($CH_4$) are three of the primary GHG's in the Earth's atmosphere. The geological processes of coal formation produce $CH_4$ and $CO_2$.

$CH_4$ is the major GHG emitted from coal mining and handling (Department of Environmental Affairs, 2013). In underground mines, ventilation of the mines causes significant amounts of $CH_4$ to be pumped into the atmosphere. Such ventilation is the main source of $CH_4$ emissions in hard coal mining activities. $CH_4$ releases from surface coal mining operation are low. In addition, $CH_4$ can continue to be emitted from abandoned coal mines after mining has ceased.

Vehicles and machinery will emit fumes, but will be serviced and maintained regularly to keep these emissions within the relevant vehicle/machine's specifications. The liberation of $CH_4$ during the coal mining is the most significant source of GHG emissions from Ilima Colliery operations (expressed as $tCO_2eq$), accounting for ~75% of the total GHG emissions. The burning of fuels is the second most significant source, accounting for ~25%. The contribution of explosives to the total GHG emissions from the operations is very small, accounting for less than 0.1%.

According to the Greenhouse Gas Emissions Inventory and Estimated Carbon Tax Assessment undertaken in 2015, the Ilima Colliery emits a total of 32 843.25 $tCO_{2eq}$ per annum based on the figures provided for 2014/2015.

### 3.3.15 TRANSPORTATION OF RUN OF MINE

Coal will be transported to the processing plant via truck. The processing plant operates 24 hours a day. From the plant, the coal will be transported to local markets or the Droogvallei siding for rail transportation.

### 3.3.16 LIST OF MAIN MINING ACTIONS, ACTIVITIES, AND PROCESSES OCCURRING ON SITE

The main activities and processes occurring on site are listed in Table 9 below. All actions, activities and processes have been grouped into each of the relevant project phases namely: planning and design, construction, operation, decommissioning, and rehabilitation and closure. For the purpose of this report, the following broad definitions apply:

- Planning and design refers to the phase in which planning takes place;
- Construction refers to the phase in which the site is prepared and infrastructure is established;
- Operation refers to the phase in which physical mining and production takes place;
- Decommissioning refers to the phase in which infrastructure is removed and rehabilitation efforts are applied and their success monitored; and
- Rehabilitation and closure refers to the phase in which maintenance and rehabilitation monitoring are undertaken to ensure that the mines closure objectives are met.

Table 9: List of main actions, activities, and processes on site per phase

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| General mine management | Human Resource Management | | | | | |
| | Employment | | | | | |
| | Interaction with local Community | | | | | |
| | | | | | | |
| Drilling monitoring boreholes | Drilling | | | | | |
| | | | | | | |
| Drilling for continued resource evaluation | Drilling | | | | | |
| | | | | | | |
| Site visits | Vehicle and foot traffic on site | | | | | |
| | | | | | | |
| General construction management | Human Resource Management | | | | | |
| | Employment | | | | | |
| | Interaction with local Community | | | | | |
| | | | | | | |
| Site establishment – Contractors camp | Construction camp sewage management | | | | | |
| | Dust suppression | | | | | |
| | Earthworks | | | | | |
| | Fencing | | | | | |
| | Fuel Storage and refuelling | | | | | |
| | Hazardous substances management | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | Site security | | | | | |
| | Soil Management | | | | | |
| | Truck and heavy machinery operation | | | | | |
| | Utilization of portable toilets and generation of sewage | | | | | |
| | Vegetation clearance | | | | | |
| | Waste Management | | | | | |
| | | | | | | |
| Construction of mineral processing facilities | Concrete works | | | | | |
| | Dust suppression | | | | | |
| | Earthworks | | | | | |
| | Fencing | | | | | |
| | Fuel Storage and refuelling | | | | | |
| | Hazardous substances management | | | | | |
| | Power supply connections | | | | | |
| | Soil Management | | | | | |
| | Vegetation clearance | | | | | |
| | Waste Management | | | | | |
| | | | | | | |
| Mine area site preparation | Clearance and preparation of soil stockpile areas | | | | | |
| | Dust suppression | | | | | |
| | Establishment of storm water management infrastructure for road network | | | | | |
| | Fuel Storage and refuelling | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | Road construction | | | | | |
| | Truck and heavy machinery operation | | | | | |
| | | | | | | |
| Site establishment – Permanent site office infrastructure | Concrete works | | | | | |
| | Dust suppression | | | | | |
| | Earthworks | | | | | |
| | Fencing | | | | | |
| | Fuel Storage and refuelling | | | | | |
| | Hazardous substances management | | | | | |
| | Power supply connections | | | | | |
| | Site security | | | | | |
| | Soil Management | | | | | |
| | Truck and heavy machinery operation | | | | | |
| | Utilization of portable toilets and generation of sewage | | | | | |
| | Vegetation clearance | | | | | |
| | Waste Management | | | | | |
| | | | | | | |
| Water management infrastructure construction | Construct the dirty and clean water management features | | | | | |
| | Construction of culverts, berms and crossings | | | | | |
| | Construction of PCD’s | | | | | |
| | Dust suppression | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | Installation of pipelines for water management | | | | | |
| | Installation of pumps, flow meters | | | | | |
| | Truck and heavy machinery operation | | | | | |
| | Vegetation clearance | | | | | |
| | | | | | | |
| Maintenance and operation of site infrastructure and facilities | Alien vegetation management | | | | | |
| | Maintenance and management of portable toilets by contractor | | | | | |
| | Operation of generators if and when required | | | | | |
| | Power line supply | | | | | |
| | Sewage and sanitation | | | | | |
| | Site security | | | | | |
| | Storage and handling of diesel/hydrocarbons | | | | | |
| | Storage and handling of explosives | | | | | |
| | Waste management | | | | | |
| | Water management | | | | | |
| | | | | | | |
| Opencast mining | Blasting (overburden and coal) | | | | | |
| | Dust suppression | | | | | |
| | Erection of in pit infrastructure | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | Fuel Storage and refuelling | | | | | |
| | Hauling Coal for mineral processing | | | | | |
| | Pumping of in-pit water/Dewatering | | | | | |
| | Raw coal stockpiling | | | | | |
| | Removal of coal seam - Strip Mining - Truck and Shovel | | | | | |
| | Soil Stockpile Management | | | | | |
| | Storage of in pit water in sump | | | | | |
| | Truck and heavy machinery operation | | | | | |
| | Use and maintenance of portable toilets | | | | | |
| | Vegetation clearance | | | | | |
| | | | | | | |
| Underground mining | Blasting | | | | | |
| | Construction of underground Adits from opencast pits | | | | | |
| | Dewatering | | | | | |
| | Discard trucked to co-disposal dump facility | | | | | |
| | Fuel Storage and refuelling | | | | | |
| | Hauling Coal Offsite | | | | | |
| | Hauling coal on site for mineral processing | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | Installation of underground mine infrastructure | | | | | |
| | Mine ventilation | | | | | |
| | Removal of coal seams - Bord and pillar mining | | | | | |
| | Soil management | | | | | |
| | Temporary stockpiling of RoM coal | | | | | |
| | Use and maintenance of portable toilets | | | | | |
| | | | | | | |
| Mineral processing | Coal Processing - washing | | | | | |
| | Coal stockpile management | | | | | |
| | Dust suppression | | | | | |
| | Fuel Storage and refuelling | | | | | |
| | Hauling processed coal | | | | | |
| | Operation of co-disposal facility | | | | | |
| | Slurry disposal at co-disposal facility | | | | | |
| | Water management | | | | | |
| | | | | | | |
| General decommissioning activities | Dust suppression | | | | | |
| | Recycling of recyclable/reclaimable waste | | | | | |
| | Removal of waste | | | | | |
| | | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| Decommissioning of the co-disposal dump | Profiling of co-disposal dump and preparation for final rehabilitation | | | | | |
| | Truck and heavy machinery operation | | | | | |
| | | | | | | |
| Infrastructure removal | Decommissioning/removal of water pipelines | | | | | |
| | Disconnection of services (power supply, water connections) | | | | | |
| | Dismantling, removal and rehabilitation of unnecessary infrastructure | | | | | |
| | Final removal of all berms, trenches and any dams no longer required | | | | | |
| | Removal of fencing | | | | | |
| | | | | | | |
| Back filling opencast voids | Filling the final opencast voids | | | | | |
| | | | | | | |
| Decommissioning of underground mine infrastructure | Sealing and closure of underground mining sections | | | | | |
| | Sealing shafts and adits | | | | | |
| | | | | | | |
| General surface rehabilitation | Profiling of all areas | | | | | |
| | Replacement of subsoil and topsoil | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | Ripping of roads and other compacted areas | | | | | |
| | | | | | | |
| Storm water management | Construction of contour berms or other erosion control measures | | | | | |
| | | | | | | |
| Re-vegetation | Dust suppression | | | | | |
| | Fertilization | | | | | |
| | Seeding with local indigenous species | | | | | |
| | | | | | | |
| Post closure monitoring and maintenance | Managing the site for all post mining impacts to prevent any further pollution | | | | | |
| | Vehicle and foot traffic on site | | | | | |
| | Alien vegetation management | | | | | |
| | Environmental monitoring of rehabilitated areas | | | | | |
| | Maintenance of storm water and erosion control measures | | | | | |
| | | | | | | |
| Water treatment (as required by WUL) | Construction of water treatment plant | | | | | |
| | Operation of water treatment plant | | | | | |

| Main Activity/Action/Process | Ancillary Activity | Planning | Construction | Operation | Decommissioning | Rehabilitation and Closure |
|---|---|---|---|---|---|---|
| | | | | | | |
| Application for closure certificate | Operation of water treatment plant | | | | | |

# 4 POLICY AND LEGISLATIVE CONTEXT

Although this EMPR Amendment is governed by the NEMA, there are numerous other Acts, policies and guidelines that are applicable to the proposed Ilima Colliery Amendment and have, therefore, been considered for the Amendment process that was undertaken for this project, to varying degrees. A summary of the applicable legislation is provided in Table 10 below. More detail on the legislative framework is presented in Section 4.1 below.

**Table 10: Applicable Legislation and guidelines**

| Applicable Legislation and Guidelines | Reference Where Applied |
|---|---|
| **APPLICABLE LEGISLATION** | |
| **<u>Constitution of the Republic of South Africa, Act 108 of 1996</u>**<br>**The constitution of any country is the supreme law of that country. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act 108 of 1996) makes provisions for environmental issues and declares that: “Everyone has the right -**<br>**(a) to an environment that is not harmful to their health or well-being; and**<br>**(b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:**<br>**(i) prevent pollution and ecological degradation;**<br>**(ii) promote conservation; and**<br>**(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”**<br>**Therefore, the EIA is conducted to fulfill the requirement of the Bill of Rights.** | Throughout the EIR Amendment process |
| **National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) and the EIA Regulations (2014) thereunder:**<br>**As per Regulation 31 of GNR 982, promulgated under the NEMA, it is understood that the EA ((EA) 17/2/3/GS-44) may be amended (on application) by following the process prescribed in Part 2 (Regulation 31 of GNR982), if the amendment will result in a change to the scope of the EA where such change will result in an increased level or change in the nature of the impact where such level or change was not:**<br>1. **Assessed and included in the initial application for EA; or**<br>2. **Taken into consideration in the initial EA.** | Throughout the EIR Amendment process |

| | |
|---|---|
| **A prerequisite of following a Part 2 amendment process is that the changes do not, on their own, constitute a listed or specified activity. In this regard, whilst it is understood that the proposed mining expansions will constitute a listed or specified activity, such listed activities have already been approved on the specific properties, albeit in different locations and with different extents. The planned expansions of the mining (future mining areas) was not included in the initial application for EA, nor considered in the granting of the EA. Consequently, it is understood that an amendment application aligned with the Part 2 process must be followed, in an effort to obtain an amended EA and associated EMPR.** This understanding and opinion was presented to the DMR as the competent authority, in the Application. | |
| **Minerals and Petroleum Resources Development Act (MPRDA) (Act No 28 of 2002), as amended and Mineral and Petroleum Resource Development Regulations, 2004, (MPRDR) as amended:**<br><br>**Ilima Colliery has an existing Mining Right** (currently held by Pembani Coal Carolina pending a Section 11 Transfer)**, and will be extending its mining areas within the existing Mining Right.** | Throughout the EIR Amendment process |
| **National Water Act (NWA) (Act 36 of 1998):**<br><br>**The NWA recognises that water is a scarce and unevenly distributed national resource which must be managed encompassing all aspects of water resources.**<br><br>**The proposed new mining areas will trigger additional water uses under Section 21 of the NWA (i.e.: require licensing), including but not limited to new pollution control dams (PCD's), waste rock stockpiles, dewatering activities and activities within proximity to watercourse/wetland areas. Ilima will apply to the Department of Water and Sanitation (DWS) for these new water uses as well as the amendments to the existing Integrated Water and Waste Management Plan (IWWMP)**. | Throughout the process – all water related aspects |
| **National Heritage Resources Act, 1999 (Act no 25 of 1999):**<br>**The National Heritage Resources Act aims to promote good management of cultural heritage resources and paleontological resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations. Due to the extent of the project, and based on the findings of the Heritage and Palaeontological Specialist Study, some heritage resources do occur within or near to certain of the future mining areas.** | Heritage and paleontological specialist study, Paleontological Study, EIA and EMP amendment. |

| | |
|---|---|
| **Specific Environmental Management Acts (SEMAs):**<br>**The SEMAs refer to specific portions of the environment where additional legislation over and above the NEMA (1998) is applicable. SEMAs relevant to this application include the following:**<br>• **National Environmental Management: Protected Areas Act, 2003 (Act no 57 of 2003).**<br>• **National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004).**<br>• **National Environmental Management: Air Quality Act, 2004 (Act no 39 of 2004).**<br>• **National Environmental Management: Waste Act, 2008 (Act no 59 of 2008).** | Specialist studies, Baseline description and EMP amendment |
| **APPLICABLE GUIDELINES** | |
| **Integrated Environmental Management Information Guidelines series:**<br>**This series of guidelines was published by the Department of Environmental Affairs (DEA), and refers to various environmental aspects. Applicable guidelines in the series include:**<br>• **Guideline 7: Public Participation.**<br>• **Guideline 9: Need and desirability.** | These guidelines are considered throughout the Amendment process. |
| **Best Practice Guideline (BPG) series:**<br>**The BPG series is a series of publications by the then Department of Water Affair and Forestry (now DWS – Department of Water and Sanitation) providing best practice principles and guidelines relevant to certain aspects of water management. Best practice guidelines relevant to this project include the following:**<br>• **BPG A4: Pollution Control Dams.**<br>• **BPG H1: Integrated Mine Water Management.**<br>• **BPG H2: Pollution Prevention and Minimisation of Impacts.**<br>• **BPG H3: Water Reuse and Reclamation.**<br>• **BPG H4: Water treatment.**<br>• **BPG G1: Storm Water Management.**<br>• **BPG G2: Water and Salt balances.**<br>• **BPG G3: Water Monitoring Systems.**<br>• **BPG G4: Impact Prediction** | Surface water and groundwater specialist studies, and throughout the Amendment process where water related aspects are considered. |

In addition to the above, there are various pieces of legislation which govern certain aspects of the mining operations and these are summarised in **Table 11** below, together with the main legislative requirements mentioned above.

**Table 11: Applicable legislation and guidelines**

| Applicable Legislation and Guidelines | Reference Where Applied | How does this Development Comply with and Respond to the Legislation and Policy Context |
|---|---|---|
| **Minerals and Petroleum Resources Development Act (Act 28 of 2002) Section 102.** | This amendment report will form part of the Section 102 application. | This report is being submitted as part of the EMPR Amendment application process to extend mining within the existing mining right area (MP 30/5/1/2/2/112 MR) to include the mining of additional coal resources. The outcome of this amendment application will inform the subsequent Section 102 amendment application. |
| **National Environmental Management Act (Act 107 of 1998)** | This entire report has been compiled in consultation with the NEMA and adheres to the relevant NEMA regulations and guidelines. | In terms of the NEMA, the mine has obtained environmental authorization for the existing mining activities currently underway (17/2/3/GS-44). This amendment application is aimed at amending the approved EMPR in line with the NEMA requirements for such. |
| **National Environmental Management Biodiversity Act (Act 10 of 2004)** | A framework for management of alien invasive species is presented in section 29 of this report. | The management of alien invasive species is governed under the NEMBA. This report includes a framework for the management of alien and invasive species. The mine will be required to develop a detailed alien invasive species management plan. |
| **National Environmental Management Waste Act (Act 26 of 2014)** | A framework for management of waste is presented in 29 of this report. | In terms of the NEMWA, the mine is considered to be undertaking existing lawful activities with regards to waste management in terms of the existing approved Mining Right. Section 54 of the NEMWA allows for the variation of a WML on written request from the |

| | | |
|---|---|---|
| | | holder, subject to the licence holder taking appropriate steps to bring the request to the attention of relevant organs of state, interested persons and the public, if the variation of the licence is to authorise an increase in the environmental impact regulated by the WML. In this regard it could be interpreted that the approved EMPR is a WML and can be varied or amended. Consequently, the establishment of new residue stockpiles and deposits associated with the planned expansions of the Ilima Colliery will need to be approved by the DMR as an amendment. This application for amendment should, therefore, include such variation as is envisaged by Section 54 (3) of the NEMWA. This position and understanding has been presented to the DMR in the application for amendment, for their confirmation and approval.<br><br>The future mining areas will trigger activities which are governed by the NEMWA List of waste management activities. All new residue deposits and stockpiles must comply with the requirements of the NEMWA Regulations on residue deposits (Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits, 2015 – GNR 632). |
| **National Environmental Management: Air Quality Act (Act 39 of 2004)** | The framework for an air quality management programme is | The mine has appointed an independent specialist to undertake a Greenhouse Gas Emissions Inventory. |

| | | |
|---|---|---|
| | presented in section 29 of this EIR and EMPR amendment. | The Ilima Colliery undertakes dust monitoring to estimate the impact of fugitive emissions. |
| **National Water Act (Act 36 of 1998) Section 21** | The Ilima Colliery has an established water monitoring programme as well as an approved IWUL for the existing water uses. | In terms of the National Water Act, the mine has an existing Water Use Licence (05/X11D/AGJ/466) for Section 21 (a), Section 21(j), and Section 21(g) water uses. The mine also applied for an amendment to the existing licence (16/2/7X100/C180) to licence additional water uses, including Section 21(c) and Section 21(i) water uses. The IWUL was granted on 07 July 2016 (Licence No. 05/X11B/ACGIJ/4704. The mine will need to apply for a Water Use Licence or amendment to the existing WUL for all new Water Uses triggered by the future mining areas. |
| **National Heritage Resources Act (Act 25 of 1999)** | The framework for a Heritage Management Plan is provided in section 29 of this EIR and EMPR Amendment. | A specialist heritage impact study was undertaken in support of the 2006 mining right application. A second study was conducted in 2013. Additionally, a specialist heritage impact assessment was undertaken over the farm Zandvoort 10 IT in 2015, as well as for Kwaggafontein 8IT in 2016. A heritage study has been undertaken in 2017 for this EMPR and EIR amendment. Appropriate mitigation measures are included in this report to ensure heritage resources are adequately protected. It is further anticipated that a heritage management procedure shall be developed by the mine. |

| | | |
|---|---|---|
| **Department of Water Affairs and Forestry (DWAF) 2006 Best practice guidelines.** | This report has been drafted in consultation with the Department of Water Affairs and Forestry (DWAF). 2006 Best practice guidelines. | Mitigation measures have been included in this Amendment report in that all dirty water infrastructure at the Ilima Colliery be designed by professional engineers and adhere to the principles of the DWAF best practice guidelines. |
| **Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute. 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector. Pretoria.** | This report has been drafted in consultation with the Mining and Biodiversity Guideline. | The assessment of risks and impacts along with the mitigation measures developed is in accordance with the Mining and Biodiversity Guideline.<br>The overall guiding principles of the environmental management for the mine as set out in the ESMS presented in this report adheres to the principles and guidelines of the Mining and Biodiversity Guideline as far as is feasible and relevant for an existing mining operation. |
| **Carbon Tax** | Relevant information from the Greenhouse Gas Emissions Inventory and Estimated Carbon Tax Assessment has been incorporated into this report in keeping with responsible air quality management. | In the 2015 Budget Speech (25 February) by Nhlanhla Nene (Minister of Finance) it was stated that carbon tax will be introduced in 2016. In preparation of the proposed carbon taxation, Ilima appointed an Independent specialist to undertake a Greenhouse Gas Emissions Inventory and Estimated Carbon Tax Assessment for the Ilima Colliery. Relevant information from this study has been incorporated into this report in keeping with responsible air quality management. |

## 4.1 APPLICABLE NATIONAL LEGISLATION

The legal framework within which the Ilima Colliery is governed, includes many Acts, Regulations, Standards, and Guidelines on an international, national, provincial and local level. Legislation applicable to the project is described in the subsections below.

### 4.1.1 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT

The MPRDA aims to "make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. In support of the amendment application submitted by Ilima Coal Company (Pty) Ltd., the applicant is required to conduct an EIR and EMPR Amendment and I&AP consultation that need to be submitted to the DMR for adjudication. The EIR and EMPR Amendment will be submitted to the DMR for review. Section 102 (S102) of the MPRDA states that a mining right, mining works programme (MWP), EMPR, or EA may not be amended without the written consent of the Minister. It is understood that this amendment application will be utilised in support of the subsequent Section 102 amendment application.

### 4.1.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The main aim of the NEMA is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA Environmental Impact Assessment (EIA) regulations, the applicant is required to appoint an environmental assessment practitioner (EAP) to undertake the EIA, as well as the public participation process. In South Africa, EIA became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant environmental authorisation. On 21 April 2006 the Minister of Environmental Affairs and Tourism promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended in June 2010, again in December 2014 and in April 2017. The April 2017 NEMA regulations are applicable to this project.

The objective of the Regulations is to establish the procedures that must be followed in the consideration, investigation, assessment and reporting of the activities that have been identified. The purpose of these procedures is to provide the competent authority with adequate information to make decisions which ensure that activities which may impact negatively on the environment to an unacceptable degree are not authorized, and that activities which are authorized are undertaken in such a manner that the environmental impacts are managed to acceptable levels.

A Scoping and EIA process is reserved for activities which have the potential to result in significant impacts which are complex to assess. Scoping and EIA accordingly provides a mechanism for the comprehensive assessment of activities that are likely to have more significant environmental impacts.

The previous owners of the mine were granted EA, Authorisation Number 17/2/3 GS – 44 on 6 August 2012, in terms of:

- Items 9, 12, 22, 47 and 56 of Government Notice R544;
- Items 5, 15, 20 and 4(a) of Government Notice R545; and

- Items 10(a) and 12 of Government Notice R546 of 18 June 2010, in terms of Chapter 5 of the NEMA, respectively.

The EA was to undertake the following activities:

- Construction of pollution control dams and dirty water storage reservoirs with a combined capacity of 50 000 $m^3$ or more. The dam wall height falls below 5m;
- Construction of access roads and haul roads where the road is wider than 8m;
- Extending of existing farm roads/ haul roads by more than 1km;
- Physical alteration of vacant agricultural land for mining. The total area to be transformed exceeds 20 hectares;
- Construction of a fuel storage facility; and
- Construction of clean and dirty water canals in and around the mining areas with a width of more than 36 cm.

An amendment to the EA, Authorisation Number 17/2/3 GS – 44 was granted on 15 March 2013, due to the exclusion of activities and farm portions, by the then Department of Economic Development, Environment and Tourism (DEDET) (now MARDLEA), with the original EA. The amended activities include Items 11, 18 and 28 of Government Notice R544.

It is, therefore, understood that insofar as the proposed additional mining areas, within the existing Mining Right are concerned-, that all the relevant NEMA listed activities have been authorised.

Ilima is planning to expand their current approved mining operations on their Ilima Colliery. The proposed new mining areas all fall within the existing approved Mining Right boundary. Furthermore, the proposed new mining areas also all fall within the list of properties approved under the NEMA (Ref #: (EA) 17/2/3/GS-44) for a range of listed activities associated with the mining activities. However, the proposed extent of the mining activities envisaged in the original mining right, as well as the current NEMA authorisations, expands on what was originally approved. Such expansion includes expansions to existing active and past mining areas, as well as the establishment of new mining areas within the approved properties.

With reference to Regulation 31 of GNR 982, promulgated under the NEMA, it is understood that the EA ((EA) 17/2/3/GS-44) may be amended (on application) by following the process prescribed in Part 2 (Regulation 31 of GNR982), if the amendment will result in a change to the scope of the EA where such change will result in an increased level or change in the nature of the impact where such level or change was not:

1. Assessed and included in the initial application for EA; or
2. Taken into consideration in the initial EA.

A prerequisite of following a Part 2 amendment process is that the changes do not, on their own, constitute a listed or specified activity. In this regard, whilst it is understood that the proposed mining expansions will constitute a listed or specified activity, such listed activities have already been approved on the specific properties, albeit in different locations and with different extents.

In this respect it is understood that the planned expansions of the mining (future mining areas) was not included in the initial application for EA, nor considered in the EA. Consequently, an amendment application aligned with the Part 2 process must be followed, in an effort to obtain an amended EA and associated EMPR. This position and understanding has been presented to the DMR in the application for amendment, for their confirmation and approval.

### 4.1.3 THE NATIONAL WATER ACT

The National Water Act, 1998 (Act 36 of 1998) (NWA) makes provision for two types of applications for water use licences, namely individual applications and compulsory applications. The NWA also provides that the responsible authority may require an assessment by the applicant of the likely effect of the proposed licence on the resource quality, and that such assessment be subject to the EIA regulations. A person may use water, if the use is-

- Permissible as a continuation of an existing lawful water use (ELWU);
- Permissible in terms of a general authorisation (GA);
- Permissible under Schedule 1; or
- Authorised by a licence.

The NWA defines 11 water uses. A water use may only be undertaken if authorised by the Department of Water and Sanitation (DWS). Water users are required to register certain water uses that actually took place on the date of registration, irrespective of whether the use was lawful or not. The water uses for which an authorisation issued can be issued includes:

a) taking water from a water resource;

b) storing water;

c) impeding or diverting the flow of water in a watercourse;

d) engaging in a stream flow reduction activity contemplated in section 36;

e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1);

f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduits;

g) disposing of waste in a manner which may detrimentally impact on a water resource;

h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process;

i) altering the bed, banks, course or characteristics of a watercourse;

j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people; and

k) using water for recreational purposes.

The previous mine owners were granted an Integrated Water Use Licence (IWUL) in terms of Chapter 4 of the NWA, Licence No: 05/X11D/AGJ/466 and File No: 16/2/7/X100/C180, dated 1 April 2011, for the following water uses:

- Section 21(a): Taking of water from a water resource;
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(j): Removing, discharging or disposing of water found underground.

Further to the issued IWUL, additional water uses were identified and an Integrated Water Use License Application (IWULA) was compiled and submitted to the DWS (previously the Department of Water Affairs (DWA)). The IWUL was granted on 07 July 2016 (Licence No. 05/X11B/ACGIJ/4704) The following water uses are included additionally in the new IWULA:

- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse; and
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.

The proposed new mining areas will trigger the need for licencing new water uses, including but not limited to new pollution control dams (PCD's), waste rock stockpiles, dewatering, and activities within proximity to watercourse/wetland areas. Ilima Coal will apply to the DWS for these new water uses as well as the necessary amendments to the existing approved IWWMP.

### 4.1.4 CATCHMENT MANAGEMENT STRATEGIES

Catchment Management Areas (CMAs) are tasked with coordinating the water demands, interests and responsibilities of all relevant government departments, institutions and water users within a specific CMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a CMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources. Ilima fall within the Inkomati Catchment Management Agency (ICMA).

### 4.1.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT

On 2 June 2014 the National Environmental Management: Waste Amendment Act came into force. Waste is accordingly no longer governed by the MPRDA, but is subject to all the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA).

Section 16 of the NEMWA must also be considered which states as follows:

1. A holder of waste must, within the holders power, take all reasonable measures to-
    a) "Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;

b) Reduce, re-use, recycle and recover waste;

c) Where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

d) Manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour, or visual impacts;

e) Prevent any employee or any person under his or her supervision from contravening the Act; and

f) Prevent the waste from being used for unauthorised purposes."

These general principles of responsible waste management will be incorporated into the requirements in the EMPr amendment to be implemented for this project.

Waste can be defined as either hazardous or general in accordance to Schedule 3 of the NEMWA (2014) as amended. "Schedule 3: Defined Wastes" has been broken down into two categories – Category A being hazardous waste; and Category B being general waste. Under Category A (hazardous waste), the act makes allowance for, but not limited to, "wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal; Oil wastes and wastes of liquid fuels; and Construction wastes".

In order to attempt to understand the implications of these waste groups, it is important to ensure that the definitions of all the relevant terminologies are defined:

- Hazardous waste: means "any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles."
- Residue deposits: means "any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right."
- Residue stockpile: means "any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act."
- General waste: means "waste that does not pose an immediate hazard or threat to health or to the environment, and includes – domestic waste; building and demolition waste; business waste; inert waste; or any waste classified as non-hazardous waste in terms of the regulations made under Section 69."

General (domestic waste, scrap metal, building rubble, etc.) and hazardous (used filters, oil and diesel, condensate, domestic sewage, etc.) waste will be produced from future mining areas. All waste generated, general or hazardous will be handled, stored and/or disposed of in accordance to the requirements of relevant waste legislation.

The establishment of a residue stockpile or residue deposit resulting from activities that require a Mining Right are currently listed as waste management activities which require a Waste Management Licence (WML). The process of obtaining a WML would involve a full Environmental Impact Assessment process. The existing mining operations associated with the Mining Right commenced prior to the inclusion of residue stockpile and residue deposits into the NEMWA in July 2015. The transitional arrangements provided for in GNR633 of 24 July 2015, states that: "*An environmental management programme or plan approved in terms of the MPRDA shall be deemed to have been approved and issued in terms of this Act (i.e. the NEMWA)*". In this regard the existing approved EMPR ((MR) MP 30/5/1/2/2/112 MR) for the Ilima Colliery may be deemed to fulfil the requirements of the NEMWA, and is effectively a WML.

Section 54 of the NEMWA allows for the variation of a WML on written request from the holder, subject to the licence holder taking appropriate steps to bring the request to the attention of relevant organs of state, interested persons and the public, if the variation of the licence is to authorise an increase in the environmental impact regulated by the WML. In this regard it could be interpreted that the approved EMPR is a WML and can be varied or amended. Consequently, the establishment of new residue stockpiles and deposits associated with the planned expansions of the Ilima Colliery will need to be approved by the DMR as an amendment. This application for amendment should, therefore, include such variation as is envisaged by Section 54 (3) of the NEMWA. This position and understanding has been presented to the DMR in the application for amendment, for their confirmation and approval.

### 4.1.6 NEMWA NATIONAL NORMS AND STANDARDS FOR THE ASSESSMENT OF WASTE FOR LANDFILL DISPOSAL, 2013 (GN R. 635)

These norms and standards prescribe the requirements for the assessment of waste prior to disposal to landfill. The aim of the waste assessment tests is to characterise the material to be deposited or stored in terms of the above-mentioned waste assessment guidelines set by the DEA.

### 4.1.7 NEMWA WASTE CLASSIFICATION AND MANAGEMENT REGULATIONS, 2013 (GN R. 634)

Chapter 9 of the above-mentioned Regulations stipulates the requirements for a motivation for and consideration of listed Waste Management Activities that do not require a Waste Management License. The motivation must:

- Demonstrate that the waste management activity can be implemented without unacceptable impacts on, or risk to, the environment or health;
- Must provide a description of the waste;
- Description of waste minimisation or waste management plans; and
- Description of potential impacts, etc.

The transitional provisions under Chapter 6 of this Regulation prescribes timeframes in which all waste must be classified within 18 months from the date of commencement of these regulations (23 August 2013). Waste streams generated from mine activities will, where applicable, be classified accordingly to determine their nature (i.e. general or hazardous), and subsequently managed and disposed of in accordance with the relevant legislative requirements.

### 4.1.8 NEMWA PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS (2015) (GN R. 632)

The purpose of these Regulations is to regulate the planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation. The identification and assessment of environmental impacts arising from residue stockpiles and residue deposits must be done as part of the environmental impact assessment conducted in terms of the NEMA. A risk analysis based on the characteristics and the classification set out in regulation 4 and 5 must be used to determine the appropriate mitigation and management measures. The pollution control barrier system shall be defined by the-

- National Norms and Standards for the Assessment of Waste for Landfill Disposal, 2013; and
- National Norms and Standards for Disposal of Waste to Landfill, 2013.

The planning, management and reporting of residue stockpiles and residue deposits is shown schematically in Figure 10 below.

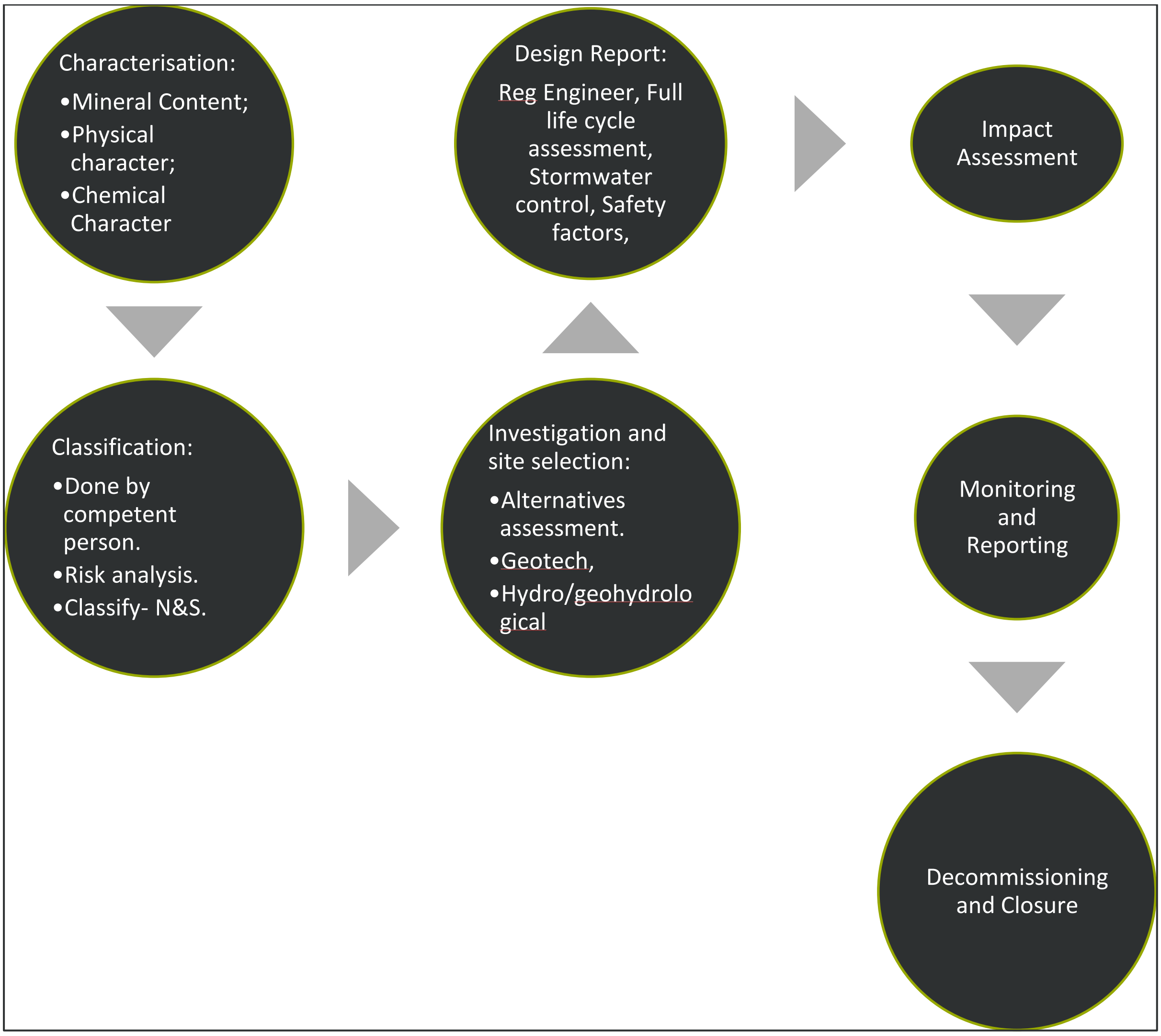



Figure 10: Planning, Management and Reporting of Residue Stockpiles and Residue Deposits.

### 4.1.9 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT

The National Environmental Management: Air Quality Act (NEMAQA) is the main legislative tool for the management of air pollution and related activities. The object of the Act is:

- To protect the environment by providing reasonable measures for-
    i. the protection and enhancement of the quality of air in the republic;
    ii. the prevention of air pollution and ecological degradation; and
    iii. securing ecologically sustainable development while promoting justifiable economic and social development; and
- Generally to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

The NEMAQA (Act No. 39 of 2004 as amended) mandates the Minister of Environment to publish a list of activities which result in atmospheric emissions and consequently cause significant detrimental effects on the environment, human health and social welfare. All scheduled processes as previously stipulated under the Air Pollution Prevention Act (APPA) are included as listed activities with additional activities being added to the list. The updated Listed Activities and Minimum National Emission Standards were published on the 22nd November 2013 (Government Gazette No. 37054).

According to the Air Quality Act, air quality management control and enforcement is in the hands of local government with District and Metropolitan Municipalities as the licensing authorities. Provincial government is primarily responsible for ambient monitoring and ensuring municipalities fulfil their legal obligations, with national government primarily as policy maker and co-ordinator. Each sphere of government must appoint an Air Quality Officer responsible for co-ordinating matters pertaining to air quality management.

Air quality guidelines and standards are fundamental to effective air quality management, providing the link between the source of atmospheric emissions and the user of that air at the downstream receptor site. The ambient air quality limits are intended to indicate safe daily exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. Air quality guidelines and standards are normally given for specific averaging periods. These averaging periods refer to the time-span over which the air concentration of the pollutant was monitored at a location. Generally, five averaging periods are applicable, namely an instantaneous peak, 1-hour average, 24-hour average, 1-month average, and annual average. The application of these standards varies, with some countries allowing a certain number of exceedances of each of the standards per year.

In terms of the GN R. 827 of 1 November 2013 as promulgated under the NEMAQA, a standard for the acceptable dust fall rate is as stipulated in Table 12 below for residential and non-residential areas.

Table 12: Acceptable Dust Fall Rates (GNR. 827)

| Restriction area | Dust fall rate (D) (mg/m$^2$/day, 30-days average) | Permitted frequency of exceeding dust fall rate |
|---|---|---|

| | | |
|---|---|---|
| **Residential area** | D < 600 | Two within a year, not sequential months. |
| **Non-Residential area** | 600 < D < 1200 | Two within a year, not sequential months. |

Section 32 of the NEMAQA also makes reference to the fact that the Minister may, inter alia, prescribe measures for the control of dust and measures to be taken to prevent nuisance caused by dust. In addition section 9(1) of the NEMAQA makes allowance for the Minister to publish a list of national ambient air quality standards to be implemented throughout South Africa. GNR 1210 of December 2009 provides these standards for various ambient pollutants. With respect to the future mining areas, the notice makes provision for an ambient air quality standard for Particulate Matter (i.e. dust) as presented in Table 13. Ilima must ensure that these ambient standards are met during construction and operation.

Table 13: National Ambient Air Quality Standard for Particulate Matter

| Averaging period | Concentration | Frequency of exceedance | Compliance date |
|---|---|---|---|
| **24 hours** | 120 µg/$m^3$ | 4 | Immediate- 31 December 2014 |
| **24 hours** | 75 µg/$m^3$ | 4 | 1 January 2015 |
| **1 year** | 50 µg/$m^3$ | 0 | Immediate – 31 December 2014 |
| **1 year** | 40 µg/$m^3$ | 0 | 1 January 2015 |
| **The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN12341.** | | | |

#### *4.1.9.1* THE NATIONAL GREENHOUSE GAS EMISSION REPORTING REGULATIONS, 2016

On the 3rd April 2017, the Minister of Environmental Affairs (the Minister) issued a notice under the NEM:AQA implementing the National Greenhouse Gas (GHG) Emission Reporting Regulations (GHG Reporting Regulations). The GHG Reporting Regulations aim to introduce a single national reporting system for the transparent reporting of GHG emissions, which will be used predominantly to update and maintain a National Greenhouse Gas Inventory and will assist South Africa in meeting its international obligations in relation to climate change mitigation.

The rationale for an integrated GHG reporting system is based on the imminent imposition of the carbon tax for identified affected sectors in South Africa. These sectors will be identified based on their GHG emission concentrations. The GHG Reporting Regulations are one of the implementation tools which will be used to regulate the reporting of data and information from identified point, non-point and mobile sources of atmospheric emissions to the National Air Emission Inventory System (NAEIS) with a view to compiling atmospheric emission inventories to inform the proposed carbon tax.

The GHG Regulations differentiate between Category A data providers (which include persons controlling or conducting activities which emit GHGs) and Category B data providers (which include public bodies and academic/research institutions which hold GHG emission data for the purposes of calculating GHG emissions). These data providers are required to report on GHG emissions activities at their facilities in line with the identified categories of emissions sources set out in Annexure 1 to the GHG Reporting Regulations.

Coal mines fall into Category A data providers and **must** submit the GHG emissions and activity data for all of their facilities and in accordance with the data and format requirements specified in Annexure 3 for each preceding calendar year, to the competent authority by the 31st March of each year (or the next working day). The competent authority has 60 days following a submission to approve a Category A data provider's data or to request that such data be validated and verified. Ilima Colliery is, therefore, required to comply to these regulations and submit an annual report as per the requirements of the GHG Reporting Regulations.

#### *4.1.9.2* THE HIGHVELD PRIORITY AREA AIR MANAGEMENT PLAN

The Highveld Priority Area Air Management Plan has been declared as a priority area because the ambient air quality standards are being, or may be, exceeded in the area, or any other situation exists which is causing, or may cause, a significant negative impact on air quality in the area; and the area requires specific air quality management action to rectify the situation.

### 4.1.10 THE NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act (NHRA) (Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, *"no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…"* The NHRA is utilized as the basis for the identification, evaluation and management of heritage resources and in the case of CRM those resources specifically impacted on by development as stipulated in Section 38 of NHRA, and those developments administered through NEMA, MPRDA and the DFA legislation. In the latter cases the feedback from the relevant heritage resources authority is required by the State and Provincial Departments managing these Acts before any authorizations are granted for development. The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Sections of these Acts relevant to heritage (Fourie, 2008b):

The NEMA 23(2)(b) states that an integrated environmental management plan should, *"…identify, predict and evaluate the actual and potential impact on the environment, socio-economic conditions and cultural heritage".*

A study of subsections (23)(2)(d), (29)(1)(d), (32)(2)(d) and (34)(b) and their requirements reveals the compulsory inclusion of the identification of cultural resources, the evaluation of the impacts of the proposed activity on these resources, the identification of alternatives and the management procedures for such cultural resources for each of the documents noted in the Environmental Regulations. A further important aspect to be taken account of in the Regulations under NEMA is the Specialist Report requirements laid down in Section 33 (Fourie, 2008b).

The MPRDA defines 'environment' as it is in the NEMA and, therefore, acknowledges cultural resources as part of the environment. Section 39(3)(b) of this Act specifically refers to the evaluation, assessment and identification of impacts on all heritage resources as identified in Section 3(2) of the National Heritage Resources Act that are to be impacted on by activities governed by the MPRDA. Section 40 of the same Act requires the consultation with any State Department administering any law that has relevance on such an application through Section 39 of the MPRDA. This implies the evaluation of Heritage Assessment Reports in Environmental Management Plans or Programmes by the relevant heritage authorities (Fourie, 2008b).

In accordance with the legislative requirements and EIA rating criteria, the regulations of the South African Heritage Resources Agency (SAHRA) and Association of Southern African Professional Archaeologists (ASAPA) have also been incorporated to ensure that a comprehensive and legally compatible Heritage Report is compiled.

#### 4.1.11 THE NATIONAL FORESTS ACT

According to this act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. The prohibitions provide that "*no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister*."

#### 4.1.12 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT: ALIEN AND INVASIVE SPECIES LIST

This Act is applicable as it protects the quality and quantity of arable land in South Africa. Loss of arable land should be avoided and declared Weeds and Invaders in South Africa are categorised according to one of the following categories, and require control or removal:

- Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;
- Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;
- Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and
- Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

The provisions of this Act have been considered and where relevant incorporated into the mitigation measures and requirements of the EMPr amendment.

#### 4.1.13 THE SUB-DIVISION OF AGRICULTURAL LAND ACT

In terms of the Subdivision of Agricultural Land Act (Act 70 of 1970), any application for change of land use must be approved by the Minister of Agriculture, while under the Conservation of Agricultural Resources Act (Act 43 of 1983) no degradation of natural land is permitted.

### 4.1.14 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT

The law on Conservation of Agricultural Resources (Act 43 of 1983) states that the degradation of the agricultural potential of soil is illegal. The Conservation of Agriculture Resources Act (Act 43 of 1983) requires the protection of land against soil erosion and the prevention of water logging and salinization of soils by means of suitable soil conservation works to be constructed and maintained. The utilisation of marshes, water sponges and watercourses are also addressed.

### 4.1.15 THE SPATIAL PLANNING AND LAND USE MANAGEMENT ACT

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) promotes optimal exploitation of minerals and mineral resources. The act provides a framework for a planning system for the country. The Act introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes (LUS); and municipal planning tribunals. In terms of the SPLUMA, the holder of a mining right must apply for the rezoning of the land where it intends to exercise its mining right.

### 4.1.16 NOISE CONTROL REGULATIONS, 1992 (GN R.154)

In terms of Section 25 of the ECA, the National Noise Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) were promulgated. The NCRs were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations.

The noise control regulations will need to be considered in relation to the potential noise that may be generated mainly during the construction and decommissioning phases of the proposed project. The two key aspects of the noise control regulations relate to disturbing noise and noise nuisance.

Section 4 of the regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the regulations as ‘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 dBA or more.

Section 5 of the noise control regulations in essence prohibits the creation of a noise nuisance. A noise nuisance is defined as ‘any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person’. Noise nuisance is anticipated from the proposed project particularly to those residents that are situated in close proximity to the project sites.

South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these regulations. A noise specialist study is proposed for the EIA process.

### 4.1.17 NOISE STANDARDS

There are a few South African scientific standards (SABS) relevant to noise from mines, industry and roads. They are:

- South African National Standard (SANS) 10103:2008. 'The measurement and rating of environmental noise with respect to annoyance and to speech communication';
- SANS 10210:2004. 'Calculating and predicting road traffic noise';
- SANS 10328:2008. 'Methods for environmental noise impact assessments'.
- SANS 10357:2004. 'The calculation of sound propagation by the Concave method';
- SANS 10181:2003. 'The Measurement of Noise Emitted by Road Vehicles when Stationary'; and
- SANS 10205:2003. 'The Measurement of Noise Emitted by Motor Vehicles in Motion'.

The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se.

#### 4.1.18 ENVIRONMENT CONSERVATION ACT

The Environment Conservation Act (Act 73 of 1989) (ECA) was, prior to the promulgation of the NEMA, the backbone of environmental legislation in South Africa. To date the majority of the ECA has been repealed by various other Acts, however Section 25 of the Act and the Noise Regulations (GNR 154 of 1992) promulgated under this section are still in effect. These regulations serve to control noise and general prohibitions relating to noise impact and nuisance.

# 5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITIES

This section will examine the need and desirability of the proposed Ilima Colliery amendment to the mining areas. This section will examine the importance of coal as a resource as well as the desirability of continuing and expanding coal mining operations at the existing Ilima Colliery.

## 5.1 THE IMPORTANCE OF COAL AS A RESOURCE

Coal, because of its strategic importance, is one of the five minerals selected by the DMR for local beneficiation as it is considered critical to the on-going development of South Africa (Beneficiation Strategy for the Minerals Industry, June 2011). The driving force behind the emphasis of the importance of coal, coal mining and local beneficiation is primarily due to concerns voiced by Eskom over the future security of supply in both the medium and long term of the mineral to its coal fired electricity generating power stations.

South Africa's energy is predominately coal fuelled. Eskom's existing coal fired power stations are critical in terms of electricity production and in meeting the growing energy requirements of South Africa as a whole. Coal and coal supply is consequently seen as critical and its importance is detailed in the Eskom Transmission Ten Year Development Plan 2011 to 2020 (Eskom, 2011). Without steady, secure supply of the mineral, it is unlikely that Eskom will be able to meet the energy demands of the country. As a result, coal mining, beneficiation and supply is of paramount importance to South Africa for continued electricity generation in order to meet the rising energy demands of the country in the short, medium and long term.

Coal produced is used locally and also exported. Eskom is the largest local buyer while China is the major export buyer. Demand for coal is generally very high for both market segments. Selling prices are generally regarded as stable both currently and in the foreseeable future.

## 5.2 ILIMA COLLIERY OPEN CAST PIT AND UNDERGROUND MINING EXTENSION

As an existing operational mine, the need and desirability of the current mining operations has been described in several previous environmental authorisation processes. The extension of the proposed underground mining operations and opencast mine workings within the existing Mining Right of Ilima Colliery will allow the continued contribution of the mine to favourable economic impacts on both the local and regional economies. The current approved LoM reserves will be depleted by the end of 2018, which will result in a loss of jobs and economy in the region. Therefore, the Ilima coal mine extension will extend the profitability and life of the coal operation by an additional few years (±2024), and secure the jobs of the current employees. If the project were not to proceed, the additional economic activity, skills development and available jobs would not be created or maintained, and the coal reserves would remain unutilised and available for another mining applicant to apply for mining rights.

The proposed activities do fit in with the developments and land use of the area, which is currently mining. If Ilima were not to proceed with the proposed operation, mining of these coal reserves will not necessarily be avoided, as another application in terms of the MPRDA, Act 28 of 2002 can be made by another company. Unless the government declares the area “off limits” to mining, or the demand for coal subsides, mining houses will continue to attempt to mine the coal reserves. In summary, the proposed Ilima amendment to the mining areas will allow the applicant to continue producing a secure, steady supply of coal until ±2024.

The needs and desirability analysis component of the “Guideline on need and desirability in terms of the Environmental Impact EIA Regulations (Notice 819 of 2014)” includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development’s ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.). Table 14 below present the needs and desirability analysis undertaken for the Ilima EIR and EMPR Amendment.

Table 14: Needs and desirability analysis for the Ilima EIR and EMPR Amendment.

| Ref No. | Question | Answer |
|---|---|---|
| **1** | **Securing ecological sustainable development and use of natural resources** | |
| **1.1** | How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities. | The following specialist studies have been conducted:<br>• Biodiversity study;<br>• Hydrogeological study;<br>• Heritage and paleontological study; and<br>• Soil and Land Capability study.<br>The conclusions of these studies, and the identified impacts and mitigation measures stemming therefrom is included in the updated EMPr. The need of the project in terms of the Nkangala District Municipal SDF has also be further considered in this Amendment application. |
| **1.2** | How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | Refer to ecological baseline information in Section 9.1.7, and the impact assessment and mitigation measures in Section 10.2.6 of this report. Various No-Go areas have been identified by the Ecological Specialist and are incorporated into the Sensitivity Map (refer to Figure 39 to Figure 44). |
| **1.3** | How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these | |

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| | impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | |
| **1.4** | What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste? | Refer to waste generation and disposal in Section 23 of this report. |
| **1.5** | How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | A heritage and paleontological specialist has conducted a Phase 1 Heritage Impact Assessment and a Paleontological Study. The results of this study are included in the EMPr Amendment. |
| **1.6** | How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | Refer to the impact assessment and mitigation methods in Section 23 of this report.<br>It is noted that due to the nature of this project (mining of coal), this project will contribute to the depletion of a non-renewable resource. Coal mining does, however contribute significantly to the country's economy and power generation needs, and therefore, at the current stage and in line with South Africa's energy needs, mining of coal is still needed. |

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| **1.7** | How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? | Refer to the impact assessment and mitigation methods in Section 23 of this report. |
| **1.7.1** | Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? | The proposed project will rely on / depend on the extraction of a natural, non-renewable resource (coal). |
| **1.7.2** | Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used? | The proposed project will extend the life of the mine in an area where coal reserves have already been identified, and are already being mined. Coal is used predominantly for energy generation and as such, the intended use of this resource is in line with South Africa's energy plans.<br>Refer to Section 6 on alternatives in this report. |
| **1.7.3** | Do the proposed location, type and scale of development promote a reduced dependency on resources? | The Ilima Colliery is already an existing mine and the proposed project will be an extension of the existing mine partially utilising existing infrastructure whilst some additional / new infrastructure will be required in order to mine the additional coal. |
| **1.8** | **How were a risk-averse and cautious approach applied in terms of ecological impacts?** | |

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| **1.8.1** | What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? | In terms of the ecological impacts, the current knowledge gaps are indicated in Section 11.6 of this report. |
| **1.8.2** | What is the level of risk associated with the limits of current knowledge? | The level of risk is low as previous specialist studies have been conducted in the areas surrounding the proposed project location, and therefore some information is already available. |
| **1.8.3** | Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development? | General mitigation measures have been put forward to limit the impacts to areas not designated as highly sensitive. In addition, pre-construction mitigation measures have been put forward to further refine and/or identify the current knowledge of the future mining areas in order to minimise adverse impacts on ecology. |
| **1.9** | **How will the ecological impacts resulting from this development impact on people's environmental right in terms of the following?** | |
| **1.9.1** | Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? | Refer to the impact assessment and mitigation measures in Section 9 in this report. |
| **1.9.2** | Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts? | |
| **1.10** | Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio- | Refer to Section 9 in this report. |

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| | economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)? | |
| **1.11** | Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area? | Refer to the impact assessment and mitigation measures in Section 9 in this report. |
| **1.12** | Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations? | Refer to Section 6, details of the alternatives considered, and Section 9 the advantages and disadvantages of the proposed activity, of this report. |
| **1.13** | Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area? | Refer to Section 9 of this report. |
| **2** | **Promoting justifiable economic and social development** | |
| **2.1** | **What is the socio-economic context of the area, based on, amongst other considerations, the following:** | |
| **2.1.1** | The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area, | The Albert Luthuli Local Municipality Integrated Development Plan (IDP) for the period of 2016 - 2017, with an unemployment rate of 32.7%.<br>The proposed mining expansion will extend the Life of Mine of Ilima, thus allowing Ilima to continue supplying jobs at that mine for a longer time period. The surrounding communities will also continue to benefit through direct and indirect income; as well as the mine's use of local contractors and suppliers. |
| **2.1.2** | Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated | The mine will make use of labourers from the local community as far as possible. Ilima has an existing Social |

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| | communities, need to upgrade informal settlements, need for densification, etc.), | Labour Plan (SLP) which sets forth the spatial priorities and desired spatial patterns. |
| **2.1.3** | Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and | Refer to the baseline environment in Section 9 and the impact on the socio-economic conditions in Section 9 of this report. |
| **2.1.4** | Municipal Economic Development Strategy ("LED Strategy"). | The project will promote and support the sustainability of existing business; and assist in increasing local beneficiation and shared economic growth, through extending the life of the Ilima Colliery. |
| **2.2** | Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? | Refer to the impact assessment and mitigation measures in Section 10 in this report. |
| **2.2.1** | Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs? | The project will increase the life of mine of Ilima Colliery, which will ensure that any community projects initiated by the mine will have an increased life. This will complement the local socio-economic initiatives identified for the area. |
| **2.3** | How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities? | Refer to the public participation process in Section 7 of this report. |
| **2.4** | Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term? | Refer to the impact assessment and mitigation measures in Section 10 of this report. |
| **2.5** | **In terms of location, describe how the placement of the proposed development will:** | |
| **2.5.1** | Result in the creation of residential and employment opportunities in close proximity to or integrated with each other. | Refer to Section 6, details of alternative considered, in this report. |

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| **2.5.2** | Reduce the need for transport of people and goods. | |
| **2.5.3** | Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport), | |
| **2.5.4** | Compliment other uses in the area, | Refer to item 1.3 of this table (above). The proposed project entails the mining of additional areas within the exiting approved Mining Right boundary. The existing land use and mining of coal will therefore be complimented by the continuation of the project. |
| **2.5.5** | Be in line with the planning for the area. | Refer to item 2.2.1 of this table (above). |
| **2.5.6** | For urban related development, make use of underutilized land available with the urban edge. | Not applicable. |
| **2.5.7** | Optimise the use of existing resources and infrastructure, | |
| **2.5.8** | Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), | |
| **2.5.9** | Discourage "urban sprawl" and contribute to compaction / densification. | The proposed project will result in the continued employment of workers, however, new job opportunities are not foreseen at this stage. Therefore, influx of additional workers to the area as a direct result of the proposed project is not anticipated and as such, no impact on urban sprawl is foreseen. |
| **2.5.10** | Contribute to the correction of the historically distorted spatial patterns of settlements and | Refer to items 2.5.7 – 2.5.9 of this table (above). |

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| | to the optimum use of existing infrastructure in excess of current needs, | |
| **2.5.11** | Encourage environmentally sustainable land development practices and processes | The rehabilitation upon completion of mining will be aimed at ensuring sustainability of the environment in the long term. |
| **2.5.12** | Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), | Refer to item 1.7.3 of this table (above). The proposed project is associated with a portion of a strategic mineral resource (coal reserve). |
| **2.5.13** | The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential). | The proposed project will allow the mine to continue contributing to the local, regional and national Gross Domestic Product (GDPs), and also provide benefits to the local communities through continued employment of employees and local contractors, as well as other influences that the mine has in the community, such as contributions through their SLP. |
| **2.5.14** | Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and | Refer to impact assessment and mitigation measures in Section 10 of this report. |
| **2.5.15** | In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement? | The proposed project will ensure continued employment in the region which will indirectly result in more integrated settlements within the local area. |
| **2.6** | **How was a risk-averse and cautious approach applied in terms of socio-economic impacts:** | |
| **2.6.1** | What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? | A public consultation process was included in this amendment application in order to gain any inputs from the public with regards to any gaps in knowledge. Any issues not raised by the public and not presented in this assessment would be considered a limit to the current knowledge. |
| **2.6.2** | What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable | As this project extends a current mining operation, and does not constitute a new mine, and furthermore, due to |

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| | communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? | the extensive studies undertaken for the mine over the last few years, the level of risk associated with the limits of the current knowledge is considered to be low. |
| **2.6.3** | Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development? | As this project extends a current mining operation, and does not constitute a new mine, a cautious approach has been implemented. |
| **2.7** | **How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following:** | |
| **2.7.1** | Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? | Refer to the impact assessment and mitigation measures in Section 10 of this report. |
| **2.7.2** | Positive impacts. What measures were taken to enhance positive impacts? | Refer to the impact assessment and mitigation measures in Section 10 of this report. |
| **2.8** | Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)? | Refer to the impact assessment and mitigation measures in Section 10 of this report. |
| **2.9** | What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations? | Refer to the impact assessment and mitigation measures in Section 10 of this report. |
| **2.10** | What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and | Refer to the impact assessment and mitigation measures in Section 10 of this report. Ilima Colliery is committed to compliance with the regulatory requirements, and provide financial provision to ensure that the mitigation measures proposed can be carried out. |

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| | disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered? | |
| **2.11** | What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination? | By conducting an amendment application process inclusive of public consultation, the applicant ensures that equitable access has been considered. Refer to the impact assessment and mitigation measures in Section 10 of this report. |
| **2.12** | What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle? | Refer to the impact assessment and mitigation measures in Section 10 of this report which specify timeframes within which mitigation measures must be implemented. |
| **2.13** | **What measures were taken to:** | |
| **2.13.1** | Ensure the participation of all interested and affected parties. | Refer to Section 7 of this report, describing the public participation process. |
| **2.13.2** | Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, | Refer to Section 7 of this report, describing the public participation process implemented for the project. |
| **2.13.3** | Ensure participation by vulnerable and disadvantaged persons, | |
| **2.13.4** | Promote community wellbeing and empowerment through environmental education, the raising of environmental | |

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| | awareness, the sharing of knowledge and experience and other appropriate means, | |
| **2.13.5** | Ensure openness and transparency, and access to information in terms of the process, | |
| **2.13.6** | Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, | |
| **2.13.7** | Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted? | |
| **2.14** | Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)? | Refer to Section 7 of this report, describing the public participation process for the project. |
| **2.15** | What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected? | Workers are educated on a regular basis as to the environmental risks that may occur within their work environment. Adequate measures have been taken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work and the requirements of their job. |
| **2.16** | **Describe how the development will impact on job creation in terms of, amongst other aspects:** | |
| **2.16.1** | The number of temporary versus permanent jobs that will be created. | |

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| **2.16.2** | Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area). | It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period of time. |
| **2.16.3** | The distance from where labourers will have to travel. | |
| **2.16.4** | The location of jobs opportunities versus the location of impacts. | It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period of time. |
| **2.16.5** | The opportunity costs in terms of job creation. | |
| **2.17** | **What measures were taken to ensure:** | |
| **2.17.1** | That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment. | The Amendment process requires governmental departments to communicate regarding any application. In addition, all relevant departments have been notified of the project. |
| **2.17.2** | That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures. | |
| **2.18** | What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage? | Refer to Section 7 of this report, describing the public participation process to be implemented for the proposed project. |
| **2.19** | Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left? | Refer to the impact assessment and mitigation measures in Section 10 of the report. |
| **2.20** | What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental | A Closure Cost Report was prepared in 2016 (refer to Appendix P). Ilima will be required to address and align its financial provisioning according to the GNR 1147 by February 2019. |

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| | damage or adverse health effects will be paid for by those responsible for harming the environment? | |
| **2.21** | Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations? | Refer to Section 6, description of the process followed to reach the proposed preferred site. |
| **2.22** | Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area? | Refer to Section 10 of this report. |

In summary, the extension of the underground and opencast mining areas will allow for the following:

- Extension of LoM and associated extension of existing employment opportunities;
- Continued and improved contributions to the local and export market;
- Continued contribution of rates and taxes to the Regional Services Council of Carolina; and
- Continued and improved investment in social capital through the undertaking of Ilima's SLP promoting local economic development in the surrounding area.

# 6 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT

## 6.1 DETAILS OF DEVELOPMENT FOOTPRINT ALTERNATIVES

As an existing operational mine, Ilima has been subject to several previous environmental processes. These processes have, where relevant, considered alternatives in the form of both development and land use alternatives prior to approval.

Given that both opencast and underground mining operations are currently underway and that the land use of the application area is now considered to be predominantly one of mining and related activities, there is no practical development alternative for the current Ilima Colliery mining area. The proposed extension of the mining areas within the existing mining right boundary has been explored, taking into consideration economic viability, practicality, and environmental characteristics.

Based on the below considerations, no further development alternatives can be considered or assessed as no other development alternative can be considered feasible. In areas where mining operations have ceased, rehabilitation should be undertaken to return the land to usable and viable land uses, as defined in the closure planning.

## 6.2 CONSIDERATION OF PROPERTY

The proposed extension of opencast mining on Portions 6 and 8 of Kwaggafontein 8IT, Parts of Portion Re. and 1 of Zandvoort 10 IT, Parts of Portions Re. and 16 of Groenvallei 40 IT, Portions Re and 2 of Paardeplaats 12 IT, Part of Leeupoort 13 IT, Parts of Portion 3 and 12 of Twyfelaar 11 IT, Parts of Portion 9 of Appeldoorn 38 IT and Parts of Portions Re and 3 of Haarlem 39 IT, has been selected based on the results of prospecting activities undertaken on the property which indicate a viable coal deposit that can be economically exploited. Underground mining is proposed on parts of Portion Re and 1 of Zandvoort 10IT, parts of Portion Re. of Haarlem 39 IT and part of Remainder of Portion 9 of Appeldoorn 38 IT due to feasible coal deposits being available, therefore, no other alternatives have been considered in terms of property.

## 6.3 TYPE OF ACTIVITY

The option of the proposed underground mining on parts of Portion Re and 1 of Zandvoort 10 IT, parts of Portion Re. of Haarlem 39 IT and a part of Remainder of Portion 9 of Appeldoorn 38 IT allows for the continuation of the existing land use, which in turn allows for the concurrent existence of both land uses, namely agriculture and mining, which will result in fewer socio-economic disruptions to the livelihoods of people living and working in the area. In addition, the proposed underground extension of mining operations allows for a reduction in the temporal and spatial scales of mining related impacts as the mining operations will not result in any surface disturbance or require additional infrastructure to be placed on site. The reduction in these impact scales is significant in terms of cumulative impacts and improves the Applicants' capacity to manage the environmental impacts, as well as remediate environmental pollution and contamination.

However, opencast mining operations on Portions 6 and 8 of Kwaggafontein 8IT, Parts of Portion Re. and 1 of Zandvoort 10 IT, Parts of Portions Re. and 16 of Groenvallei 40 IT, Portions Re and 2 of Paardeplaats 12 IT, Part of Leeupoort 13 IT, Parts of Portion 3 and 12 of Twyfelaar 11 IT, Parts of Portion 9 of Appeldoorn 38 IT and Parts of Portions Re and 3 of Haarlem 39 IT will allow for mining in smaller areas where certain underground mining techniques would not be appropriate.

## 6.4 DESIGN OR LAYOUT OF THE ACTIVITY

The proposed extension of underground mining activities to parts of parts of Portion Re and 1 of Zandvoort 10 IT, parts of Portion Re. of Haarlem 39 IT and a part of Remainder of Portion 9 of Appeldoorn 38 IT correlates to the location of a viable mineral resource that can be accessed from existing mine workings. Opencast mining operations on Portions 6 and 8 of Kwaggafontein 9 IT, Parts of Portion Re. and 1 of Zandvoort 10 IT, Parts of Portions Re. and 16 of Groenvallei 40 IT, Portions Re and 2 of Paardeplaats 12 IT, Part of Leeupoort 13 IT, Parts of Portion 3 and 12 of Twyfelaar 11 IT, Parts of Portion 9 of Appeldoorn 38 IT and Parts of Portions Re and 3 of Haarlem 39 IT will allow for mining in smaller areas where certain underground mining techniques would not be appropriate. As such there are no design or layout alternatives to consider.

## 6.5 TECHNOLOGY TO BE USED IN THE ACTIVITY

As an existing operational mine, the Ilima Colliery has been subject to several previous environmental processes. These processes have, where relevant, considered technology alternatives prior to approval and are currently in use at the Ilima Colliery. As such no further technology alternatives are considered.

## 6.6 OPERATIONAL ASPECTS OF THE ACTIVITY

As an existing operational mine, the Ilima Colliery has been subject to several previous environmental processes. These processes have, where relevant, considered operational aspect alternatives prior to approval. Given that both opencast and underground mining operations are currently underway, and that the land use of the application area is now considered to be predominantly one of mining and related activities, there is no practical operational aspect alternative for the mining area.

## 6.7 NO-GO

The implication of not implementing the proposed extension of mining within the existing mining right boundary to include the mining of additional coal resources, both underground and opencast on the areas, as indicated in the MWP, includes a reduction in the existing mining operations overall LoM, as well as compromising the ability of Ilima to ensure consistent coal supply to Eskom for electricity generation and extended local and regional economic benefits.

The area is currently viewed as a mining area and if the No go option is used then most likely the mine will cease to operate and the existing mining areas will be rehabilitated. An opportunity will still remain for a future mine applicant to apply for rights to access the coal reserves remaining and thereby re-activate mining and the associated environmental impacts.

# 7 PUBLIC PARTICIPATION PROCESS

## 7.1 HISTORICAL PUBLIC PARTICIPATION

A full Public Participation Process (PPP) was undertaken in 2004 by Digby Wells for the mining operation and all its associated activities during the compilation of the EIA/EMP as per the MPRDA, whereby the following steps were undertaken:

- A number of Interested and Affected Parties I&APs) were identified and an Interested and Affected Party (I&AP) register was opened and maintained. These included farmers, farm labourers, communities, individuals and organisations;
- A Background Information Document (BID) was compiled containing information on the proposed project, and this was circulated to all I&APs along with registration forms;
- Notices were erected by means of advertisements as well as posters informing people of the project, and requesting the public to register as I&APs;
- An authorities meeting was held; and
- A PPP meeting was held.

Further to the initial PPP, numerous additional authorisation processes have been undertaken and have included additional PPP for consideration by authorities in the decision-making process for these applications.

The Public Participation Processes followed thus far for Ilima Colliery includes the following:

- Public Participation for the original MPRDA Mining Right Application EIA in 2006;
- Public Participation for the EIA/EMP amendment for the Groenvallei 5 Underground Mining and the adjacent Imbani Wash plant undertaken in July 2009;
- Public Participation for the NEMA S24G EIA in 2011
- Partial Public Participation Process conducted for the EIA/EMP for Mining Related Activities at the Worldwide Coal Carolina Colliery: Appeldoorn 38 IT, Groenvallei 40 IT, Haarlem 39 IT, Kwaggafontein 8 IT, Paardeplaats 12 IT and Twyfelaar 11 IT in 2012
- Public Participation for the WULA in 2016
- Public Participation for the Section 102 Application and EMPR in 2016;
- Public Participation for the Basic Assessment in 2016; and
- Public Participation for the Environmental Authorisation for the inclusion of Zandvoort in 2017.

Ilima has maintained an open and transparent relationship with the I&APs. A summary of the results of previously conducted public consultation is provided below, however, the reader is directed to the original reports for the details of previous public participation:

- Depletion of indigenous vegetation due to mining activities;
- Destruction of red data species, and species which are of medicinal value;
- Damage of wetlands systems;
- The degradation of local roads associated with transporting the coal via road trucks;

- The presence of alien plant species, which should be removed by the mine;
- Negative impacts on water quality and quantity in the local area;
- Dust and noise pollution;
- Disruption of the aesthetic beauty of the area;
- Degradation of grazing land;
- Damage to buildings due to blasting;
- Negative impact on fish farming (particularly trout) due to pollution;
- Influx of job-seekers into the area;
- Increase in social ills (such as crime, abuse etc);
- The loss of Carolina as a possible tourist destination; and
- Potential negative impact on the natural gas pipeline from Mozambique.
- The impact of blasting on property;
- Lack of rehabilitation being conducted by the mine;
- Impacts on the water resources and the decanting of water.
- The validity of the prospecting right for Zandvoort 10IT has been queried; and
- The perceived / real lack of compliance shown by the mine in the past.

These issues and concerns have all been noted, and will be addressed in this EIR and EMPR.

## 7.2 PUBLIC PARTICIPATION METHODOLOGY

The Public Participation Process (PPP) is a requirement of several pieces of South African Legislation and aims to ensure that all relevant Interested and Affected Parties (I&APs) are consulted, involved and their opinions are taken into account and a record included in the reports submitted to Authorities. The process ensures that all stakeholders are provided this opportunity as part of a transparent process which allows for a robust and comprehensive environmental study. The PPP for the proposed project needs to be managed sensitively and according to best practises in order to ensure and promote:

- Compliance with international best practise options;
- Compliance with national legislation;
- Establish and manage relationships with key stakeholder groups; and
- Encourage involvement and participation in the environmental study and authorisation/approval process.

As such, the purpose of the PPP and stakeholder engagement process is to:

- Provide an opportunity for I&APs to obtain clear, accurate and comprehensible information about the proposed activity, its alternatives or the decision and the environmental impacts thereof;
- Provide I&APs with an opportunity to indicate their viewpoints, issues and concerns regarding the activity, alternatives and / or the decision;

- Provide I&APs with the opportunity to suggest ways of avoiding, reducing or mitigating negative impacts of an activity and enhancing positive impacts;
- Enable the Applicant to incorporate the needs, preferences and values of I&APs into the activity;
- Provide opportunities to avoid and resolve disputes and reconcile conflicting interests;
- Enhance transparency and accountability in decision-making;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent environmental impacts associated with the project.

The PPP for this application will be/has been undertaken in accordance with the requirements of the MPRDA and NEMA, in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project.

### 7.2.1 IDENTIFICATION OF I&AP'S

The I&AP databases compiled from various past environmental authorisation processes have been updated to compile a new register of key I&AP's identified for notification of the Amendment Application. The I&AP database includes amongst others landowners, communities, regulatory authorities and other specialist interest groups.

### 7.2.2 LIST OF AUTHORITIES IDENTIFIED AND NOTIFIED

The following Regulatory Authorities have been identified over the life of project, and are included in the updated I&AP register:

- The Albert Luthuli Local Municipality;
- The Gert Sibande District Municipality;
- The Department of Mineral Resources (DMR);
- Mpumalanga Department of Agriculture, Rural development, Land and Environmental Affairs (DARDLEA);
- The Department of Water and Sanitation (DWS);
- The Mpumalanga Parks Board (MPB);
- The South African Heritage Resources Agency (SAHRA); and
- The Department of Public Works, Roads and Transport.
- Department of Rural Development and Land Reform.

Please see the I&AP database attached in Appendix B.

### 7.2.3 LIST OF KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

A number I&APs were identified and an updated I&AP register was opened and maintained. These included farmers, communities, individuals and organisations.

- Endangered Wildlife Trust;
- Wildlife and Environment Society of South Africa (WESSA);
- Mpumalanga Wetland Forums;
- Federation for Sustainable Development;
- NAFU Mpumalanga;
- Agricultural Research Council;
- SANBI Working for Wetlands;
- Ekangala Grassland Trust; and
- South African Crane Working Group.

### 7.2.4 LIST OF SURFACE RIGHTS/LAND OWNERS IDENTIFIED AND NOTIFIED

Please see the updated I&AP database attached in Appendix B for the full list of surface rights/land owners identified and notified, as well as **Table 6** of this report.

### 7.2.5 NOTIFICATION OF I&AP'S FOR THE EMPR AMENDMENT

This Amendment application includes a public participation process whereupon I&AP's are given an opportunity to comment on the Amendment application report. All registered I&AP's, including regulatory authorities and existing engagement structures are notified of the availability of the Amendment report for review and comment by means of registered post, facsimile, and e-mail. All I&AP's are afforded a 30-day review period, the results of which are included in the final submission to the DMR.

#### *7.2.5.1* REGISTERED LETTERS, FAXES, AND EMAILS

Letters, emails and facsimiles were composed and sent to the identified authorities, adjacent landowners, ward councillors and registered I&APs of the proposed Ilima Project.

### 7.2.6 AMENDMENT REPORT AVAILABILITY

The Amendment Report will be made available for public review and comment for a total period of 30 days, from the 10 November 2017 to the 11 December 2017. All registered I&AP's were notified of the availability of the report and where to locate it. Copies of the Draft Environmental Impact Report Amendment will be made available at public areas for perusal and comment by all I&APs. Comment received from I&APs will be included in the Issues and Responses Report (IRR) to be submitted to DMR for consideration.

### 7.2.7 CONSULTATION MEETINGS

This section briefly outlines the consultation meetings that will be scheduled to be held for the project.

#### *7.2.7.1* AUTHORITY MEETINGS

An Authority meeting was scheduled on 21 August 2017 before the start of the process in order to determine the way forward with the proposed Ilima Project. Should any Authority require a meeting further during the process, one will be arranged. The purpose of the Authority meeting was to explain the project in detail to authorities and to clarify the process going forward.

#### *7.2.7.2* PUBLIC OPEN DAYS

As part of the Section 102 amendment Application that was submitted to the DMR in October 2016, together with the supporting EMPR, a PPP was undertaken and, therefore, a public open day is currently not proposed to be held for this amendment application.

#### *7.2.7.3* HOW ISSUES RAISED WERE ADDRESSED

The 30-day commenting, and review period of the Amendment report will take place from the 10 November 2017 to 11 December 2017. All comments received will be included in the final submission to the DMR for review and decision making.

## 7.3 SUMMARY OF ISSUES RAISED BY I&AP'S

The Amendment report was placed out for public review from 10 November 2017 to 11 December 2017 (30 days). **A summary of the key issues raised during the public review period will be included in this section once the review period has been concluded.**

# 8 IMPACTS AND RISKS IDENTIFIED

Impacts and risk were identified through the review of previous reports, current activities taking place on site and those proposed to take place in the future.

It is important to note that as an operational mine, Ilima has been subject to previous impact and risk identification and this information combined with onsite observation, as well as proposed activities form the basis of impact and risk identification. As such Table 15 presents the impacts and risk per environmental aspect that have been identified for each project phase:

Table 15: Aspects and Impacts identified.

| Aspect | Impact |
|---|---|
| Planning and Design Phase | |
| Soils | Soil compaction |
| Land use | Interference with existing land uses |
| Fauna and Flora | Direct and indirect mortality of flora and fauna |
| | Introduction/invasion by alien (non-native) species |
| Environmental Pollution | Hydrocarbon spills/contamination |
| Social | Crime and violence |
| | Influx of migrant workers |
| | Social vices |
| | Loss of sense of place |
| | Relocation |
| Socio-Economic | Education, Skills Development and Training |
| | Employment Opportunities |
| | Economic growth |
| | Impacts on local farm labour |
| | Loss of jobs and economic opportunities |
| | Perceptions and Expectations |
| | Re-instatement of livelihoods |
| Health and Safety | Community health and safety |
| | Health impacts |
| Air Quality | Fugitive emissions (Dust) |
| Noise | Disturbing and/or nuisance noise |
| Construction Phase | |
| Topography and Landform | Soil surface subsidence |
| | Alteration of topography |
| | Altered drainage patterns |
| Soils | Soil compaction, sterilisation and possible salinisation |
| | Soil Pollution/Contamination |
| | Erosion and sedimentation |
| Land Capability | Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability |
| | Loss of soil resource and its utilisation potential |
| Land use | Interference with existing land uses |
| | Impacts on ecosystems and services |
| Fauna and Flora | Direct and indirect mortality of flora and fauna |
| | Habitat fragmentation and blockage of seasonal and dispersal movements |
| | Introduction/invasion by alien (non-native) species |
| Surface Water | Pollution of surface water resources/decreased water quality |
| | Decrease in surface water quantity/availability |

| Aspect | Impact |
| --- | --- |
| Groundwater | Pollution of groundwater/decreased water quality |
| | Decrease in groundwater quantity/availability |
| Wetlands | Loss and disturbance of wetland habitat |
| | Decreased water-make to adjacent wetlands |
| Environmental Pollution | Sewage spills/contamination |
| | Hydrocarbon spills/contamination |
| Heritage | Destruction/damage of heritage resources |
| | Destruction/damage of palaeontological resources |
| Social | Crime and violence |
| | Influx of migrant workers |
| | Social vices |
| | Loss of sense of place |
| | Relocation |
| Socio-Economic | Education, Skills Development and Training |
| | Employment Opportunities |
| | Perceptions and Expectations |
| | Economic growth |
| | Impacts on local farm labour |
| | Loss of jobs and economic opportunities |
| | Re-instatement of livelihoods |
| Health and Safety | Community health and safety |
| | Fire and explosion hazard |
| | Health impacts |
| Transportation, Infrastructure and Traffic | Damage to road infrastructure |
| | Increased traffic |
| Visual | Visual impact of mine infrastructure, stockpiles and dust |
| | Visual impact of light at night |
| Air Quality | Fugitive emissions (Dust) |
| | Greenhouse gas emissions |
| Noise | Noise |
| Operation Phase | |
| Topography and Landform | Altered drainage patterns |
| | Alteration of topography |
| | Soil surface subsidence |
| Geology | Impacts on Geology |
| Soils | Soil compaction |
| | Soil Pollution/Contamination |
| | Erosion and sedimentation |
| Land Capability | Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability |
| | Loss of soil resource and its utilisation potential |
| Land use | Interference with existing land uses |
| | Impacts on services |
| Fauna and Flora | Direct and indirect mortality of flora and fauna |
| | Introduction/invasion by alien (non-native) species |
| | Habitat fragmentation and blockage of seasonal and dispersal movements |
| Surface Water | Pollution of surface water resources/decreased water quality |
| | Decrease in surface water quantity/availability |
| Groundwater | Pollution of groundwater/decreased water quality |
| | Decrease in groundwater quantity/availability |
| | Dewatering of groundwater aquifers |
| Wetlands | Decreased water-make to adjacent wetlands |

| Aspect | Impact |
|---|---|
| | Loss and disturbance of wetland habitat |
| | Undermining of wetlands - surface subsidence |
| Environmental Pollution | Hydrocarbon spills/contamination |
| | Sewage spills/contamination |
| | General Environmental Pollution |
| Heritage | Destruction/damage of heritage resources |
| | Destruction/damage of palaeontological resources |
| | Discovery and preservation of fossils |
| Social | Crime and violence |
| | Influx of migrant workers |
| | Social vices |
| | Loss of sense of place |
| | Relocation |
| Socio-Economic | Education, Skills Development and Training |
| | Employment Opportunities |
| | Perceptions and Expectations |
| | Economic growth |
| | Impacts on local farm labour |
| | Loss of jobs and economic opportunities |
| | Re-instatement of livelihoods |
| | Coal supply for energy security |
| Health and Safety | Community health and safety |
| | Health impacts |
| | Fire and explosion hazard |
| | Fly Rock |
| Transportation, Infrastructure and Traffic | Damage to road infrastructure |
| | Increased traffic |
| Visual | Visual impact of light at night |
| | Visual impact of mine infrastructure, stockpiles and dust |
| Air Quality | Fugitive emissions (Dust) |
| | Greenhouse gas emissions |
| Noise | Noise |
| Blasting and Vibration | Air Blast |
| | Ground Vibration and human perception |
| | Ground Vibration Impacts on productivity of farm animals (cattle, chickens, pigs, etc.) |
| | Impacts on Infrastructure (roads, communications infrastructure, services, houses, boreholes) |
| | Noxious fumes |
| Decommissioning Phase | |
| Topography and Landform | Altered drainage patterns |
| | Alteration of topography |
| | Soil surface subsidence and/or bulking on reinstated areas |
| Soils | Erosion and sedimentation |
| | Soil Pollution/Contamination |
| | Soil compaction |
| Land Capability | Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability |
| | Loss of soil resource and its utilisation potential |
| Land use | Interference with existing land uses |
| | Impacts on services |
| Fauna and Flora | Introduction/invasion by alien (non-native) species |
| | Direct and indirect mortality of flora and fauna |
| Surface Water | Pollution of surface water resources/decreased water quality |

| Aspect | Impact |
|---|---|
| Groundwater | Decrease in groundwater quantity/availability |
| | Pollution of groundwater/decreased water quality |
| | Dewatering of groundwater aquifers |
| Wetlands | Decreased water-make to adjacent wetlands |
| Environmental Pollution | Hydrocarbon spills/contamination |
| | General Environmental Pollution |
| | Sewage spills/contamination |
| Social | Crime and violence |
| | Influx of migrant workers |
| | Social vices |
| | Loss of sense of place |
| | Relocation |
| Socio-Economic | Employment Opportunities |
| | Economic growth |
| | Education, Skills Development and Training |
| | Impacts on local farm labour |
| | Loss of jobs and economic opportunities |
| | Re-instatement of livelihoods |
| Health and Safety | Community health and safety |
| | Health impacts |
| Transportation, Infrastructure and Traffic | Damage to road infrastructure |
| Visual | Visual impact of mine infrastructure, stockpiles and dust |
| Air Quality | Fugitive emissions (Dust) |
| | Greenhouse gas emissions |
| Noise | Noise |
| Rehabilitation and Closure Phase | |
| Topography and Landform | Alteration of topography |
| | Altered drainage patterns |
| | Soil surface subsidence and bulking on reinstated open cast areas |
| Soils | Soil compaction |
| | Erosion and sedimentation |
| | Soil Pollution/Contamination |
| Land Capability | Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability |
| | Loss of soil resource and its utilisation potential |
| Land use | Interference with existing land uses |
| | Impacts on services |
| Fauna and Flora | Direct and indirect mortality of flora and fauna |
| | Introduction/invasion by alien (non-native) species |
| | Habitat fragmentation and blockage of seasonal and dispersal movements |
| Surface Water | Pollution of surface water resources/decreased water quality |
| Groundwater | Dewatering of groundwater aquifers |
| | Acid Mine Drainage |
| | Pollution of groundwater/decreased water quality |
| | Decrease in groundwater quantity/availability |
| Wetlands | Loss and disturbance of wetland habitat |
| Environmental Pollution | Hydrocarbon spills/contamination |
| | Decant from underground workings |
| | General Environmental Pollution |
| | Sewage spills/contamination |
| Heritage | Destruction/damage of heritage resources |
| | Destruction/damage of palaeontological resources |

| Aspect | Impact |
|---|---|
| Social | Crime and violence |
| | Influx of migrant workers |
| | Social vices |
| | Loss of sense of place |
| | Relocation |
| Socio-Economic | Economic growth |
| | Education, Skills Development and Training |
| | Employment Opportunities |
| | Impacts on local farm labour |
| | Loss of jobs and economic opportunities |
| | Re-instatement of livelihoods |
| Health and Safety | Community health and safety |
| | Health impacts |
| Visual | Visual impact of mine infrastructure, stockpiles and dust |
| Air Quality | Fugitive emissions (Dust) |
| | Greenhouse gas emissions |
| Noise | Noise |

For the future mining operation, construction, operational, decommissioning, and rehabilitation and closure impacts have been assessed. Each of the identified risks and impacts for these phases was assessed using the assessment mythology described in section 8 below. The assessment criteria include the nature, extent, duration, magnitude/intensity, reversibility, probability, public response, cumulative impact and irreplaceable loss of resources. The full scoring of each impact is provided in the impact assessment table provided in Appendix E.

A summary of the impacts and their significance before and after mitigation is provided in Section 10 of this report.

# 9 ENVIRONMENTAL ATTRIBUTES ASSOCIATED WITH THE DEVELOPMENT ALTERNATIVES

## 9.1 THE BASELINE RECEIVING ENVIRONMENT

This section describes the baseline receiving environment of the mining area. Information in this section has been extracted from the previous environmental assessments undertaken, as well as additional specialist studies undertaken for the extension of the mining areas in 2017. As such, the descriptions below of environmental features represent a consolidation of relevant information and extend to the entire mining area. For ease of reference the Table 16 below indicates the specialist studies already completed and further indicates over which properties each specialist study and assessment was undertaken.

Table 16: Specialist Studies Completed for Ilima.

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| Heritage | Clean Stream Environmental Services (2003) | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| | Digby Wells (2004) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT; and<br>Portion RE of Kwaggafontein 8 IT |
| | Dr A.C. Van Vollenhoven (2013) | Portions RE and 2 of Paardeplaats 12 IT; and<br>Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |
| | PGS (2015) | Portions RE and 1 of Zandvoort 10 IT |
| Heritage and Palaeontology | PGS and Banzai Environmental (2017) | Portions RE and 1 of the farm Zandvoort 10 IT;<br>Portion 6 of the farm Kwaggafontein 8 IT;<br>Portions RE and 2 of the farm Haarlem 10 IT;<br>Portions 2, 8 and 16 of the farm Groenvallei 40 IT;<br>Portion 2 and 12 of the farm Paardeplaats 12 IT;<br>Portion 9 of the farm Appeldoorn 38 IT; and<br>Portion RE of the farm Leeupoort 13 IT. |
| Biodiversity (Fauna, Flora & Wetlands) | Clean Stream Environmental Services (2003) | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |
| | Digby Wells (2004) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT; |

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| | | Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3 ,4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT; and<br>Portion RE of Kwaggafontein 8 IT |
| | Strategic Environmental Focus (2011) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT;<br>Portion RE of Kwaggafontein 8 IT; and<br>Portions RE and 1 of Zandvoort 10 IT |
| | David Hoare (2015) | Portions RE and 1 of Zandvoort 10 IT |
| | The Biodiversity Company (2017) | Kwaggafontein 8 IT |
| | Philip Patton (2017) | Groenvallei 40 IT Portion16<br>Groenvallei 40 IT Remainder Portion 8 |

| Specialist Study | Consultant | Properties Assessed |
| --- | --- | --- |
| | | Haarlem 39 IT Portion 3<br>Kwaggafontein 8 IT Portion 6<br>Kwaggafontein 8 IT Portion 8<br>Leeupoort 13 IT<br>Paardeplaats 12 IT (RE)<br>Paardeplaats 12 IT Portion 2<br>Twyfelaar 11 IT Portion 12<br>Twyfelaar 11 IT Portion 3<br>Zandvoort 10 IT (RE)<br>Zandvoort 10 IT Portion 1 |
| Ground Water | Clean Stream Environmental Services (2003) | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |
| | Future Flow (2011) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT;<br>Portion RE of Kwaggafontein 8 IT; and<br>Portions RE and 1 of Zandvoort 10 IT |
| | Cabanga Concepts (2014) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT; |

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| | | Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT;<br>Portion RE of Kwaggafontein 8 IT; and<br>Portion RE and 1 of Zandvoort 10 IT |
| | Future Flow (2015) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT;<br>Portion RE of Kwaggafontein 8 IT; and<br>Portions RE and 1 of Zandvoort 10 IT |
| Groundwater | ASST Group and Future Flow | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT; |

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| | | Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT;<br>Portion RE of Kwaggafontein 8 IT; and<br>Portions RE and 1 of Zandvoort 10 IT |
| Surface Water | Clean Stream Environmental Services (2003) | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |
| | Digby Wells (2004) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT; and<br>Portion RE of Kwaggafontein 8 IT. |
| | Cabanga Concepts (2014) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT; |

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| | | Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT;<br>Portion RE of Kwaggafontein 8 IT; and<br>Portions RE and 1 of Zandvoort 10 IT |
| Socio-Economic | Digby Wells (2004) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT; and<br>Portion RE of Kwaggafontein 8 IT. |
| Soils | Clean Stream Environmental Services (2003) | Portion 5 (a Portion of Portion 1) of Groenvallei 40 IT |
| | Rehab Green Monitoring Consultants (2004) | Portions 3, 4, 8, 9, and 10 of Twyfellaar 11 IT;<br>Portions 1, 6, 7, 8, 16, and 17 of Groenvallei 40 IT;<br>Portions RE and 2 of Paardeplaats 12 IT;<br>Portions RE, 1, and 2 of Droogvallei 41 IT;<br>Portions RE, 2, 3, 4, and 5 of Haarlem 39 IT;<br>Portions RE and 9 of Appeldoorn 38 IT;<br>Leeuwpoort 13 IT;<br>Portions RE of Portion 1, 2, and 3 of Hawerfontein 7 IT; and<br>Portion RE of Kwaggafontein 8 IT. |

| Specialist Study | Consultant | Properties Assessed |
|---|---|---|
| | Agricultural Research Council (2015) | Portions RE and 1 of Zandvoort 10 IT |
| Soils, land use and land capability | Earth Science Solutions (2017) | Portions of Kwaggafontein 8IT, Haarlem 39IT, Paardeplaats 12IT and Zandvoort 10IT |

For further information, please refer to the above mentioned previous studies and assessments undertaken which are attached as appendices to this report.

### 9.1.1 TOPOGRAPHY

The gently undulating highland topography is typical of the central Mpumalanga Province, with fairly broad to narrowly incised valleys of the headwater drainages, with average height of 1600 in the north west and 1 080 metres above sea level in the south (Figure 11). There are a number of marshy areas or vleis in the upper parts of the valleys and numerous pans, which vary from insignificant vegetated depressions to large deeply etched features with bare clayey floors.

The study area stretches over a wide region and comprises of various topographical features. Several watersheds, pans, hills and valleys are incorporated within the mining area. These topographical features also play a role in how the coal is mined in the region.

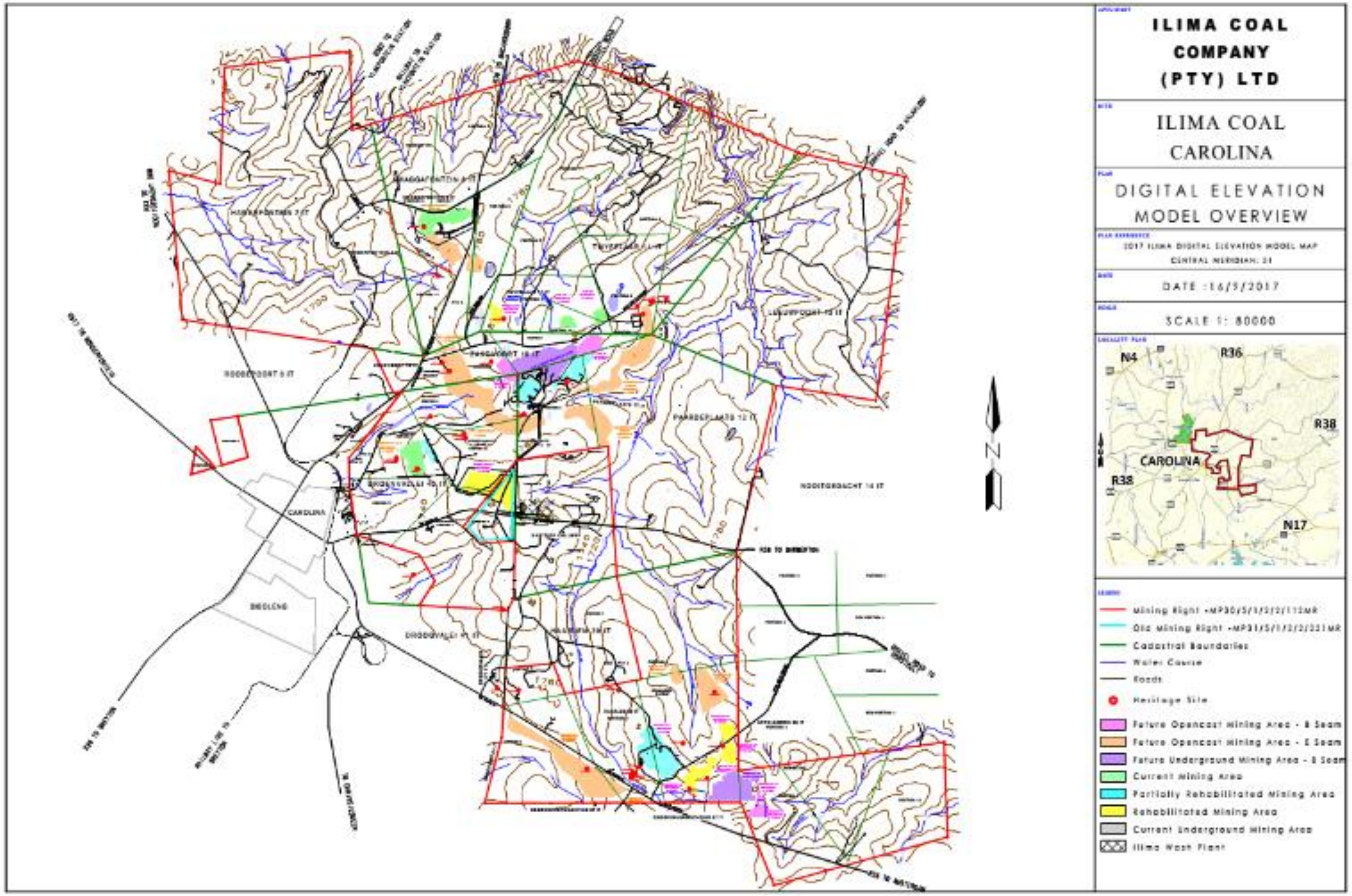



Figure 11: Digital Elevation Model (20 m contours) of the application area

### 9.1.2 GEOLOGY

The stratigraphy and depositional environment in the area is similar to that of the whole of the Eastern Transvaal coal field. The coalfield is underlain by pre-Karoo rocks which were subjected to glaciation which resulted in the deposition of tillite of the Dwyka formation over most of the area.

The Ecca group, which contains the coal-bearing Vryheid formation, rests on the Dwyka formation. The Vryheid formation contains five bituminous coal seams, named E, D, C, B and A (with E being at the bottom and A at the top) which are separated by mainly arenaceous sediments. The Vryheid formation reaches a maximum thickness of 120m. After being deposited, the Ecca sediments were subject to faulting and intrusion by dolerite sills and dykes.

The coal seams are numbered from E seam at the base to A seam at the top of the sequence. The E seam varies in thickness from 0.3 meters to 2.02 meters. This seam is a high quality low ash, low phosphorus highly volatile bituminous coal. Its deposition and lateral extent appears to be determined by paleontography. The E seam is overlain by a persistent shale member, followed by sandstones.

The D seam is thin and uneconomic and is made up of four members locally, but usually has two leaves separated by a thin shale parting. The seam, although laterally continuous, seldom exceeds 0,5 m in thickness in total. The D seam is overlain by a sandstone layer followed by a persistent shale layer, followed by further sandstone and another persistent shale layer.

The C seam contains the highest quality of coal but is not well developed in the Carolina area and can be narrow in places. The C seam, which averages 1,8 m in thickness, is usually composed of a C Upper (CU) and C Lower (CL) seam, separated by a parting of variable lithological composition. Locally the CU seam may split into two recognisable zones. It is overlain by a sandstone layer of variable thickness.

The B upper seam is low quality high ash coal. The B seam group is generally represented by two seams, termed the B and the BL1, separated by a sandstone parting. Locally the B seam may include the thin BX seam lying above the B seam. The B seam is overlain by sandstone which in turn is overlain by a persistent shale member. Thereafter there is an alternating sequence of sandstone and shale developments.

The A seam is seldom preserved as it has been removed by recent erosion. It is usually overlain by a glauconitic sandstone layer. The Beaufort group sediments do not occur in this area as they have been removed by erosion.

The Ilima Colliery is situated within the northern part of the Ermelo Coalfield, which forms part of the coal-bearing Vryheid Formation of the Ecca Group. The B Seam and the E Seam are the main economic coal seams present within the mining area and are exploited by means of opencast and underground mining operations. The average depth of the E seam is 53 metres (m) and 27.6 m for the B seam.

### 9.1.3 CLIMATE

The area falls within the central Mpumalanga climatic zone, or the "Highveld" climatic region which is characterized by warm summers with rainfall and warm (during the day) to cold (at night), dry winters with sharp frosts. A well-formed overland anticyclone high-pressure system in winter maintains dry air over the region and sharp frosts occur.

Table 17 below shows the mean minimum and maximum temperatures for the area. The hottest months are December/January and the coldest June/July.

Table 17: Mean monthly maximum and minimum temperatures and relative humidity

| Month | Mean Max (°C) | Mean Min. (°C) | Daily Mean (°C) |
|---|---|---|---|
| January | 24.3 | 13.4 | 18.9 |
| February | 23.7 | 13.1 | 18.5 |
| March | 23.0 | 12.0 | 17.5 |
| April | 20.7 | 8.7 | 14.7 |
| May | 18.9 | 5.3 | 12.3 |
| June | 16.5 | 1.8 | 9.1 |
| July | 16.9 | 2.6 | 9.8 |
| August | 19.1 | 4.4 | 11.8 |
| September | 22.1 | 7.3 | 14.5 |
| October | 23.2 | 9.5 | 16.6 |
| November | 23.2 | 11.5 | 17.3 |
| December | 23.6 | 12.2 | 17.9 |
| **ANNUAL AVERAGE** | 21.3 | 8.5 | 14.9 |

Ilima Colliery lies within an area of 700-800 mm mean annual precipitation. Table 18 shows the mean monthly and annual rainfall for the area. Rainfall occurs mainly in the form of showers and thunderstorms from October to March with maximum events occurring December to January. The winter months are typically dry with the combined rainfall for June, July and August making up only

3.9% of the annual average total of 744 mm. Rainstorms are often violent with up to 80 mm falling in one day, lightening, and strong winds and at times hail.

Table 18: Mean Monthly and Annual Rainfall for the Site

| Month | Mean (mm) | Annual Rainfall % |
|---|---|---|
| January | 128.51 | 17.25 |
| February | 98.41 | 13.21 |
| March | 80.83 | 10.85 |
| April | 44.33 | 5.95 |
| May | 17.14 | 2.30 |
| June | 8.49 | 1.14 |
| July | 7.3 | 0.98 |
| August | 8.34 | 1.12 |
| September | 30.25 | 4.06 |
| October | 74.95 | 10.06 |
| November | 124.19 | 16.67 |
| December | 121.66 | 16.33 |
| **ANNUAL MEAN** | 744 | 100 |

Table 19 below shows the maximum rainfall intensities per month. The highest rainfall intensities occur in the summer months.

Table 19: Rainfall intensities (in mm)

| Month | 60 Min (mm) | 24 Hours(mm) | 24 Hours – 50 Year |
|---|---|---|---|
| January | 63.6 | 74.4 | 60.2 |
| February | 49.8 | 80.0 | 57.0 |
| March | 26.0 | 42.0 | 56.6 |
| April | 25.0 | 48.2 | 56.9 |
| May | 18.5 | 22.0 | 26.6 |
| June | 6.4 | 37.5 | 14.6 |
| July | 7.8 | 23.4 | 22.6 |
| August | 11.5 | 17.4 | 27.2 |

| | | | |
|---|---|---|---|
| September | 22.0 | 54.0 | 61.2 |
| October | 22.0 | 51.5 | 89.4 |
| November | 50.1 | 53.0 | 64.6 |
| December | 44.0 | 48.0 | 68.6 |

The area is somewhat windier than is typical for the Eastern Mpumalanga Highveld because of its position near the escarpment. Wind speed averages around 3.1 m/s. September to December are the windiest months and average wind gust speed ranges between 12 and 14 m/s. Average wind gust speeds for the remainder of the year range between 10 and 12 m/s. Strong winds come predominantly from the northwest and northeast, however topography does affect wind direction in a specific location. Surface inversions occur during 80% of nights in winter and about 40% of nights in summer to a depth of 100-150 m above the surface. Nocturnal stability regularly occurs close to the ground causing stagnation and slow catabolic drift, particularly in winter.

Table 20 below shows the mean monthly evaporation for the area. The trends follow expectation for the Highveld climatic zone with higher evaporation in the summer and lower evaporation in winter. Evaporation is fairly high compared with the other Highveld areas due to windier conditions.

Table 20: Mean average evaporation (in mm)

| Mean | | | |
|---|---|---|---|
| **Month** | **S Pan (%)** | **S Pan (mm)** | **Lake Evaporation (mm)** |
| January | 11.28 | 164 | 138 |
| February | 9.67 | 140 | 123 |
| March | 9.49 | 138 | 121 |
| April | 7.2 | 104 | 92 |
| May | 6.28 | 91 | 79 |
| June | 5.16 | 75 | 64 |
| July | 5.57 | 81 | 67 |
| August | 7.05 | 102 | 83 |
| September | 8.5 | 123 | 100 |
| October | 9.5 | 138 | 112 |
| November | 9.48 | 137 | 112 |
| December | 10.77 | 156 | 129 |
| **Annual Total** | 100 | 1449 | 1220 |

### 9.1.4 SOILS

The original soil assessment for areas affected by the original mining footprint of the Ilima Colliery was undertaken by Rehab Green Monitoring Consultants cc in 2004, and in 2015 ARC undertook an additional assessment for Zandvoort. Earth Science Solutions (ESS) has undertaken a soil study for the EIR and EMPR Amendment in 2017.

Seventeen (17) soil units were identified in the 2005 assessment and are summarized in terms of the dominant and sub-dominant soil form and families, average depth, topsoil and sub-soil texture and a description of the dominant soil form horizons is provided in Table 21 below. Six (6) soil units were identified in the 2015 Zandvoort assessment and were assessed in terms of the dominant and sub-dominant soil form and families, average depth, characteristics, and agricultural potential in Table 22 below.

Table 21: Soil units (2005).

| Unit | Dominant Soil Form and Family | Other Forms and Families | Average Depth (mm) | Topsoil Texture | Sub-soil Texture | Summarized Description of Dominant Soil Form |
|---|---|---|---|---|---|---|
| Av | Avalon 1100 | Clovelly 1100<br>Glencoe 1100<br>Dresden 1000 | 400-600 | Sandy loam | Sandy loam – Sandy clay loam | Shallow; Greyish brown topsoil; Yellowish brown sub-soil on mottled soft plinthite; Structureless; Non-calcareous; Moderate arable potential. |
| Cv | Clovelly 1100 | Avalon 1100<br>Glencoe 1100 | 800-1200 | Sandy loam | Sandy loam – Sandy clay loam | Moderately deep to deep; Greyish brown topsoil; Yellowish brown sub-soil on weathered rock; Structureless; Non-calcareous; Moderate to high arable potential. |
| Cv1 | Clovelly 1100 | Avalon 1100<br>Glencoe 1100<br>Dresden 1000 | 600-900 | Sandy loam | Sandy loam – Sandy clay loam | Moderately deep; Greyish brown topsoil; Yellowish brown sub-soil on weathered rock; Structureless; Non-calcareous; Moderate arable potential. |

| Unit | Dominant Soil Form and Family | Other Forms and Families | Average Depth (mm) | Topsoil Texture | Sub-soil Texture | Summarized Description of Dominant Soil Form |
|---|---|---|---|---|---|---|
| Cv2 | Clovelly 1100 | Avalon 1100<br>Glencoe 1100<br>Dresden 1000 | 400-600 | Sandy loam | Sandy loam – Sandy clay loam | Shallow; Greyish brown topsoil; Yellowish brown sub-soil on weathered rock; Structureless; Noncalcareous; Moderate arable potential. |
| Dr | Dresden 1000 | Wasbank 1000<br>Dresden 2000<br>Glencoe 1100 | 100-300 | Sandy loam | - | Very Shallow; Yellowish brown topsoil underlain by hard plinthite; Structureless; Non-calcareous; Low arable potential. |
| Exc/ Dist | Hutton 1100 | Glencoe 1100<br>Dresden 1000<br>Wasbank 1000 | 0-800 | Sandy loam | Sandy loam – Sandy clay loam | Old mine area, partly excavated and disturbed, partly covered with topsoil stockpiles and mine residue deposits. Usable topsoil at some areas. |
| Gc | Glencoe 1100 | Clovelly 1100<br>Avalon 1100<br>Dresden 1000 | 400-600 | Sandy loam | Sandy loam – Sandy clay loam | Shallow; Greyish brown topsoil; Yellowish brown sub-soil on hard plinthite; Structureless; Non - calcareous; Low arable potential. |

| Unit | Dominant Soil Form and Family | Other Forms and Families | Average Depth (mm) | Topsoil Texture | Sub-soil Texture | Summarized Description of Dominant Soil Form |
|---|---|---|---|---|---|---|
| Gc1 | Glencoe 1100 | Clovelly 1100<br>Avalon 1100<br>Dresden 1000 | 500-900 | Sandy loam | Sandy loam – Sandy clay loam | Moderately deep; Greyish brown topsoil; Yellowish brown sub-soil on hard plinthite; Structureless; Non-calcareous; Moderate arable potential. |
| Gc2 | Glencoe 1100 | Clovelly 1100<br>Avalon 1100<br>Dresden 1000 | 300-500 | Sandy loam | Sandy loam – Sandy clay loam | Shallow; Greyish brown topsoil; Yellowish brown sub-soil on hard plinthite; Structureless; Non-calcareous; Low arable potential. |
| Hu | Hutton 2100 | Hutton 2200<br>Dresden 1000 | 600-900 | Sandy loam | Sandy loam – Sandy clay loam | Moderately deep; Reddish brown topsoil; Yellowish red to red sub-soil; Structureless; Noncalcareous; Moderate arable potential. |
| Hu1 | Hutton 1200 | Hutton 2200<br>Dresden 1000 | 1000-1500 | Sandy loam | Sandy loam – Sandy clay loam | Deep; Reddish brown topsoil; Yellowish red to red sub-soil; Structureless; Non-calcareous; High arable potential. |

| Unit | Dominant Soil Form and Family | Other Forms and Families | Average Depth (mm) | Topsoil Texture | Sub-soil Texture | Summarized Description of Dominant Soil Form |
|---|---|---|---|---|---|---|
| Hu2 | Hutton 1200 | Hutton 2200<br>Dresden 1000 | 300-500 | Sandy loam | Sandy loam – Sandy clay loam | Shallow; Reddish brown topsoil; Yellowish red to red sub-soil; Structureless; Non-calcareous; Low arable potential. |
| Ka | Katspruit 1000 | Longlands 1000<br>Kroonstad 1000<br>Wasbank 2000 | 200-400 | Sandy clay | Clay | Shallow; Dark greyish brown topsoil underlain by a grayish non-structured to structured clay horizon. No arable potential. |
| Kd | Kroonstad 1000 | Longlands 1000<br>Katspruit 1000<br>Wasbank 2000 | 400-600 | Loamy sand | Loamy sand | Shallow; Dark greyish brown topsoil; Bleached greyish brown to light gray sub-soil which overlies a grayish structured clay horizon. Low arable potential. |
| Lo | Longlands 1000 | Wasbank 1000<br>Dresden 2000 | 400-600 | Loamy sand | Loamy sand | Shallow; Dark greyish brown topsoil; Bleached greyish sub-soil on mottled soft plinthite; |

| Unit | Dominant Soil Form and Family | Other Forms and Families | Average Depth (mm) | Topsoil Texture | Sub-soil Texture | Summarized Description of Dominant Soil Form |
|---|---|---|---|---|---|---|
| | | Kroonstad 1000 | | | | Structureless; Non-calcareous; Low arable potential. |
| Ms/R | Mispah 1100 | Dresden 1000<br>Clovelly 1100 | 0-250 | Sandy loam | - | Very Shallow; Yellowish brown topsoil underlain by hard rock; Structureless; Non-calcareous; Low arable potential. Rock outcrops also occurs. |
| Wa | Wasbank 1000 | Longlands 1000<br>Dresden 2000 | 500-900 | Loamy sand | Loamy sand | Shallow to moderately deep; Greyish brown topsoil, Bleached light grey sub-soil on hard plinthite; Structureless; Non-calcareous; Low arable potential. |

Table 22: 2015 Zandvoort soils

| Map unit | Dominant soils | Sub-dominant soils | Depth (mm) | Characteristics | Agric. Potential | Area (ha) |
|---|---|---|---|---|---|---|
| **Hu** | Hutton | Lichtenburg, Clovelly | 600-1200+ | Reddish-brown, structureless, sandy loam topsoil on red, structureless to weakly structured, sandy clay loam to clay loam subsoil, on weathering rock, cemented ferricrete greyish (or occasionally on mottled soft plinthite). | Moderate to high | 143.7 |
| **Av** | Avalon | Clovelly, Glencoe, Hutton | 600-900 | Brown, structureless, loamy sand to sandy loam topsoil on yellow to yellow-brown (occasionally reddish-brown), structureless to weakly structured, loamy sand to sandy loam subsoil, on greyish, mottled soft plinthite (occasionally on cemented ferricrete or weathering rock) | Moderate to high | 46.1 |
| **Gc** | Glencoe | Avalon, Dresden | 450-800 | Brown, structureless, loamy sand to sandy loam topsoil on yellow to yellow-brown (occasionally greyish-brown), structureless to weakly structured, loamy sand to sandy clay loam subsoil, on cemented ferricrete or greyish, mottled soft plinthite | Low to moderate | 150.1 |
| **Ms** | Mispah | Dresden, Glencoe | 50-350 | Brown (occasionally reddish-brown), structureless, loamy sand to sandy loam topsoil on cemented ferricrete or weathered rock. Cemented ferricrete and rock outcrops occur in places. | Low | 131.1 |
| **Lo/W** | Longlands | Westleigh, Kroonstad, Katspruit | 250-900 | Dark greyish-brown to black, structureless to weakly structured, sandy loam to sandy clay loam topsoil on grey, weakly structured, sandy clay loam to sandy clay, mottled subsoil, often wet. Occurs in lower-lying parts and close to stream channels. | Very low | 105.5 |
| **Pan/W** | Katspruit | - | 0-50 | Surface water in closed pan; dark-brown to black, clay soils with mottled, gleyed subsoil around the pan. | None | 13.8 |
| | | | | | **Total** | **590.3** |

A soil study was conducted for this amendment application in August 2017. In terms of this study, the soils encountered can be broadly categorised into four major groupings, with a number of dominant and sub dominant forms that characterise the area of concern, as indicated in Figure 12 below.

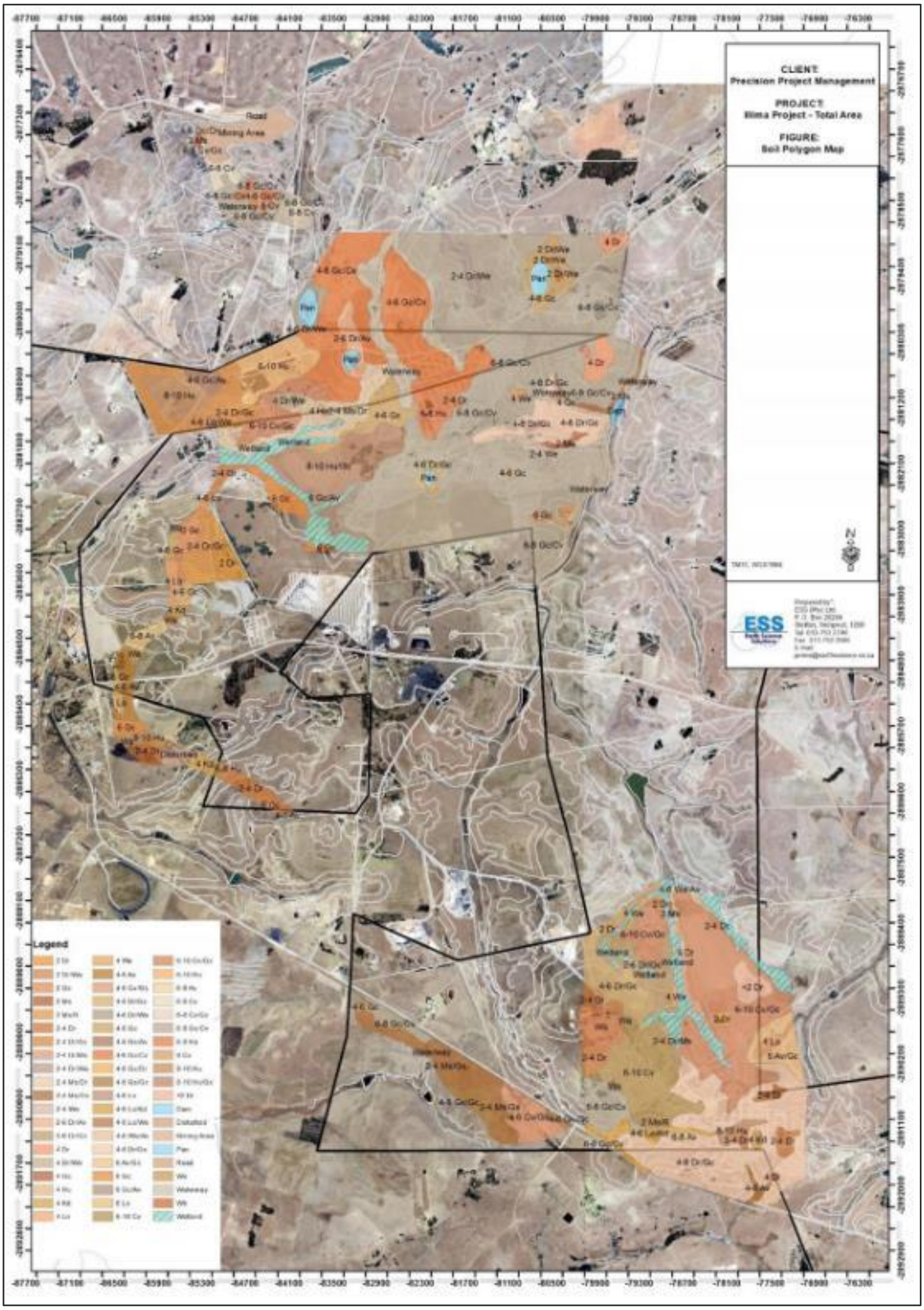



Figure 12: Soil Map.

The major soil forms are closely associated with the lithologies from which the soils are derived (insitu formation) as well as the topography and general geomorphology of the site, with the effects of slope and attitude of the land forms and the pedogenetic processes affecting the soil formation and ultimately the soil forms mapped.

The major/dominant soil forms have been described below as a consolidation of the material classification. It should be noted, however, that there are a number of other soil forms that were mapped during the study, but which are more isolated in spatial extent.

The descriptions are considered broadly representative of the soil form encountered across the study area, with the physical properties described for the soil as a unit and not a particular observation point.

The deeper red and red brown sandy clay loams returned fine grained apedel to single grained textures, pale brown to red/brown friable top soils that exhibit a plough pan on areas that have been or are presently cultivated, and strong colouration in the subsoil horizon (strong reds and red/browns). The clays vary from as low as 12% in the “A” horizon (average = 15%) to as high as 35% in the “B”. The water holding capabilities are considered moderate to high (80mm/m to 140mm/m) with good soil water retention, but adequate drainage (permeability) and the ability for plant utilisation. It is noted that the underlying “C” horizon is moderately restrictive and forms an inhibiting layer to soil water, the metal staining and occurrence of ferricrete nodules a testament to water retention at/on this interface. These soils are considered of the better agricultural soils in the study area and have been cultivated to cereal crops in almost all cases mapped. These soils classified as deep Hutton (Hu) forms for the most part with Griffin form soils where the red apedel form interfaces with the yellow and yellow brown apedel Clovelly form.

Aligned with and generally, contiguous to the Hutton (Hu) forms described above are a range of brown and yellow brown sandy loams and sandy clay loams that classify as Clovelly (Cv) form. The Clovelly soil form is often slightly shallower in rooting depth on the “B”, but has a deeper saprolitic horizon in the form of the underlying “C”. The colours, although paler are considered strong, a factor that is associated with the generally fine grained texture and moderately low infiltration rates that are found on soils derived from fine grained sediments (shale’s, siltstones and sandstones of the Karoo Formation).

The flat to slightly undulating topography has resulted in the in-situ formation of many of the soils, and a moderately predictable pedogenisis for the site. These features are associated with the retention of soil water within the vadose zone (lack of preferred horizontal flow due to clay retention and the horizontal bedding of the underlying lithologies) has resulted in the formation of an inhibiting layer (hard rock and lateritic horizons) within some of the soil profile, and the development of degrees of wetness just above the weathering rock layer/saprolite. This inhibiting layer or barrier to water movement enhances the horizontal versus vertical flow within the profile, a factor that is considered important to the ecology and biodiversity of an area and the mechanism around which the development of hydromorphic soil occurs.

The result of water retention in the soil over time is noted where signs of wetness at or close to the soil rock interface occur. This is generally reflected in metal staining on leached surfaces (red and yellow flecking on grey chroma colours). The degree of wetness and position of the wet based soils in the land form have contributed to the classification of these soils.

These hydromorphic form soils are of variable depth, texture and structure, comprising deep sandy loams with strong brown and yellow brown colour on a distinctive ferruginous gravel and/or thin soft plinthic layer (less than 5cm on average) (grey with yellow red flecking), to shallow and highly leached wet and saturated forms. The ferruginous gravels are generally not competent enough (hard) to classify as hard plinthite, albeit that relic hard pan ferricrete horizons where mapped in close proximity to the major pan structure.

These transitional form soils are often associated with a narrow hard sandstone outcrop on the shallower forms that occur in the lower midslope/lower slopes just outside of the streams and river environs. These soils classify on the one extreme as Westleigh form soils where significant leaching has occurred (W2 and W3), and as Pinedene form on the other extreme where the strong colours and degree of wetness is deeper and less obvious (W1). Wetness in the case of the Pinedene and deep Avalon form is sometimes noted in the “A” horizon associated with brown and strong yellow brown colours.

Isolated occurrences of Longlands (pale grey clay poor “E” on strong mottles of yellow and red “B”) and Katspruit form (dark grey with strong red and yellow mottles - > 40% clay) were described where lower slope seeps (Longlands) and Pan structures occur (Katspruit) respectively. The Longlands mapped are associated with active springs and/or seepage points and are saturated for at least two thirds of the year (W3).

The occurrence of ferricrete horizons within the soil profile classify as “relic” land forms for the most part, albeit that areas of more recent laterite development were mapped in association with the pan structures.

As a generalised statement, the relic land forms are commonly associated with mid and lower hillside seeps, springs and “sponge zones”, all of which are associated with possible wetland development. These layers occasionally outcrop at surface as ouklip or hardpan ferricrete and are also associated with many of the pan structures found within the sedimentary profile and landscape of the coalfields in this region. These features are important to the ecological and biodiversity cycle, and are regarded as sensitive to highly sensitive features.

The “transition zone” soils contribute to the wetland catchment systems and act as the sponge zones/stores and feeders of soil water that contribute to the base flow of the streams and rivers. These areas also need to be evaluated as part of the sites of moderate to high sensitivity.

When considering the sensitivity of a wet based soil, the depth to the inhibiting layer and the amount of redox reaction present (noted in the degree of mottling and more importantly the greyness of the matrix soil) within the profile dictates the degree of wetness in terms of the “wetland delineation classification”, and will have an influence on the ecological sensitivity of the site.

The soils classified are described in terms of their physical and chemical similarities and to some extent their topographic position and resultant geomorphology, with their spatial distribution being of importance to the management and planning recommendations (Refer to Figure X below).

As with any natural system, the transition from one system to another is often complex with multiple facets and variations over relatively small/short distances, a complex of soil dynamics that need to be simplified if the mining engineers and rehabilitation contractors are to manage the soil materials effectively.

In simplifying the trends mapped, the following major soil groupings were determined by the soil specialist (Figure 13):

- The deeper and more-sandy loam soils are considered Moderate to high Potential agricultural materials and are distinguished by the better than average depth of relatively free draining soil to a greater depth (> 1,200mm). This group is recognisable by the subtleness of the mottling (water within the profile for less than 30% of the season), is noted at greater depths within the profile (>500mm) and the land capability is rated as moderate arable and moderate to high grazing land potential depending on their production potential. These soils typically classify as Hutton (Hu)/Griffin (Gf), Clovelly (Cv), and areas of deep Pinedene/Avalon (Av) form soils.These soils are generally lower in clay than the associated wet based soils and more structured colluvial derived materials, have a distinctly weaker structure and are deeper and better drained (better permeability). The ability for water to permeate through these profiles is significantly better, the more sandy texture of this soil group rendering them more easily worked and of a lower sensitivity (Deep >500mm). This group of soils and their overall geomorphology (topographic position etc.) rate as moderate to high quality grazing lands or low potential arable land in terms of their land capability rating.
- In contrast, the shallower and more structured materials are considered to be more sensitive in terms of their workability and vulnerability to compaction and erosion, and will require greater management inputs if disturbed. This group of shallower and more sensitive soils (< 500mm) are associated almost exclusively with the sub outcropping of the parent materials (Karoo Sediments) (geology) at surface, and although they constitute a relatively small percentage of the overall area of study, they have a relatively large and important function in the sustainability of the overall biodiversity of the area. These soils classify as shallow Glenrosa and Mispah form soils the most part.
- The third group of soils comprise those that are associated with hydromorphic conditions, the presence of mottling and hard pan ferricrete within the shallow soil profile distinctive of these materials. The presence of low chroma colours, soft plinthic and hard pan ferricrete layers and perched soil water characterise this soil grouping. These soils include the shallow Pinedene (Pn), Avalon (Av) and Westleigh (We) forms with sub dominant forms inclusive of Dresden (Dr) and Glencoe (Gc) forms. These soils have a set of distinctive characteristics that are separated out due to their inherently much more difficult management characteristics. These soils are characterised by relatively much higher clay contents (sometimes of a swelling nature), lower intake rates (40mm/m to 80mm/m), poor drainage characteristics, generally poor liberation of soil water and a restricted soil rooting depth. These soils are generally associated with a wet base and wetland environments. These soils will be more difficult to work in the wet state, as well as being difficult to store and re-instate at closure.

No perched aquifers (groundwater) are reported, albeit that a significant area of welldeveloped ferricrete was mapped within the vadose zone around the Pan structures and as a relic land form to the base of many f the soils in the study area. These relic land forms are important features and often considered as sensitive landscapes. The development of wet based soils and moist grassland environments are mapped in association with these soil forms.

In addition, but not separated from the wet based soils are the group of materials that reflect wetness (wet based soils) within the top 500mm. These soils are easily recognised by the mottled red and yellow colours on low chroma background. These soils are regarded as highly sensitive zones that will require authorisation/permission if they are to be impacted. The legal implications (licensing) will need to be understood if these soils are to be considered within the development. The soils mapped classify as Westleigh (We), Pinedene (Pn)/Avalon (Av), isolated areas of Longlands and Katspruit (Ka).

The concentrations of natural salts and stores of nutrients within these soils are again a sensitive balance due to the extremes of rainfall, wind and temperature. The ability of a soil to retain moisture and nutrients, and in turn influence the sustainability of vegetative growth and dependence of animal life is determined by the consistency and degree of soil moisture retention within the profile and that is not influence of evaporation.

These conditions and associated sensitivities should be noted in terms of the overall biodiversity balance if the sustainability equation is to be managed and mitigation engineered. Pan structures and the associated shallow wet based soils are an important contributor to the ecological cycle.

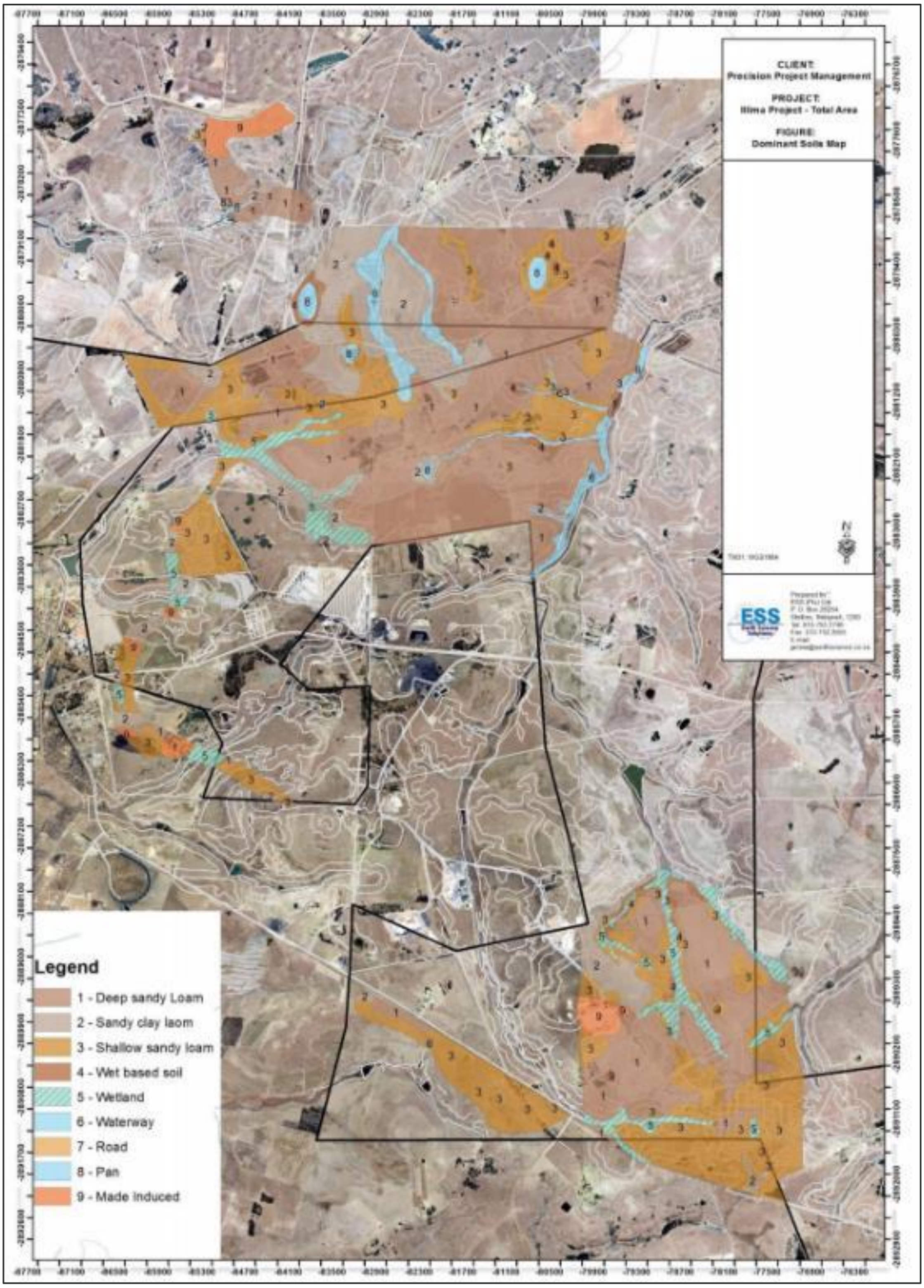



Figure 13: Dominant soils identified in the proposed mining areas within the existing Ilima Mining Right.

### 9.1.5 LAND CAPABILITY

Land capability was initially investigated as part of the soil studies in 2005. Land capability was assessed according to the definitions of the Chamber of Mines of South Africa, 1981. (Guidelines for the rehabilitation of disturbed land by surface coal mining in South Africa. Johannesburg). The soil units were classified in terms of four land capability classes: arable land, grazing land, wetlands and wilderness land. The area and percentage of each land capability class was assessed and individually discussed for each soil area evaluated. Additionally, Zandvoort was assessed during 2015 for the S102 application.

During the 2005 study, the land capability within the proposed mining area was determined to consist predominantly of areas with arable and grazing potential. Several areas of the land capability class wetland were identified. Due to the widespread cultivated land within the study area, the wilderness land capability class was considered to be limited.

The baseline land capability of Zandvoort, as defined by the relevant guidelines (Coaltech, 2007), identified most of the soils as falling into the arable class, due to their favourable depth, texture and natural drainage. The Hu map unit, being somewhat deeper, will have a slightly higher arable capability than either the Gc or Av map unit. The Ms map unit, due to its severely restricted depth to a hard layer, is unsuited for cultivation, so that the land capability class is grazing. The Lo/W unit consists of soils in the land capability class of wetland, due to the position in the landscape, which causes gleyed subsoil material with signs of wetness to occur. The Pan/W unit has surface standing water due to almost continuous wetness.

In terms of this report a study was conducted in August 2017 (refer to Appendix N10). According to this study, the areas to be disturbed by open cast mining comprises a range of land capability classes, with significant areas of friable and good grazing potential class soil, smaller but highly sensitive sites that returned wet based soils, and a significant area of transition zone soil associated with the ferricrete and relic land forms.

Many of the colluvial derived soils are at best considered to have a low intensity grazing land potential or wilderness status. Figure 14 illustrates the distribution of land capability classes across the study area.

**Arable Land**

There are small but significant areas of arable land potential soils associated with this area, with contiguous areas of deep sandy loams that rate as having an arable status (>750mm) in terms of depth and soil structure. The growth potential (nutrient status and soil water capabilities) and ability of these soils to return a cropping yield equal to or better than the national average on natural soils is however debateable, with growth statistics indicating low yields for the soils in their natural state.

Fertility and rainfall contribute to the reported lower than average yields on ambient soil. These variables reflect the natural conditions, and do not include any man induced additives such as fertilisers or water (no irrigation).

**Grazing Land**

The classification of grazing land is generally confined to the shallower (less than 700mm) and transitional zone soils that are well drained and areas that do not meet the yield potential standards for economic returns. The grazing potential soils are not always free draining to a depth of 750mm but are capable of producing palatable plant species on a sustainable basis, especially since only the subsoil's (at a depth of >500mm) are periodically wetted. In addition, there should be no rocks or pedocrete fragments in the upper horizons of this soil group. If present it will limit the land capability to wilderness land. Most of the study area classifies as low intensity grazing land or wilderness status.

**Wilderness / Conservation Land**

The shallow rocky areas and soils with a structure stronger than strong blocky are characteristically poorly rooted and support at best very low intensity grazing, or more realistically are of a wilderness character and rating.

**Wetland (Areas with wetland status soils)**

Wetland areas (soils and land capability) are defined in terms of the wetland delineation guidelines, which use both soil characteristics, the topography as well as floral and faunal criteria to define the domain limits (Separate Wetland Delineation has been undertaken). Only the soils are described here.

These zones (wetlands) are dominated by hydromorphic soils (wet based) that often show signs of some structure, and have plant life (vegetation) that is associated with seasonal or permanent wetting of the soil profile (wetland study). The wetland soils are generally characterised by dark grey to black (organic carbon) in the topsoil horizons and are often high in transported clays and show variegated signs of mottling on gleyed backgrounds (pale grey colours) in the subsoil's. Wetland soils occur within the zone of soil water influence.

A significant proportion of the study area classifies as having wet based soils at variable depths, with shallow hydromorphic soils occurring within the proposed footprint of disturbance. Not all the wet based soils classify as wetlands in terms of the delineation document, but should be highlighted as potential zones of sensitivity with the potential for highly sensitive areas associated with the prominent waterway that cross cut the mining development. These zones are considered very important, highly sensitive and vulnerable due to their ability to contain and hold water for periods through the summers and into the dry winter seasons.

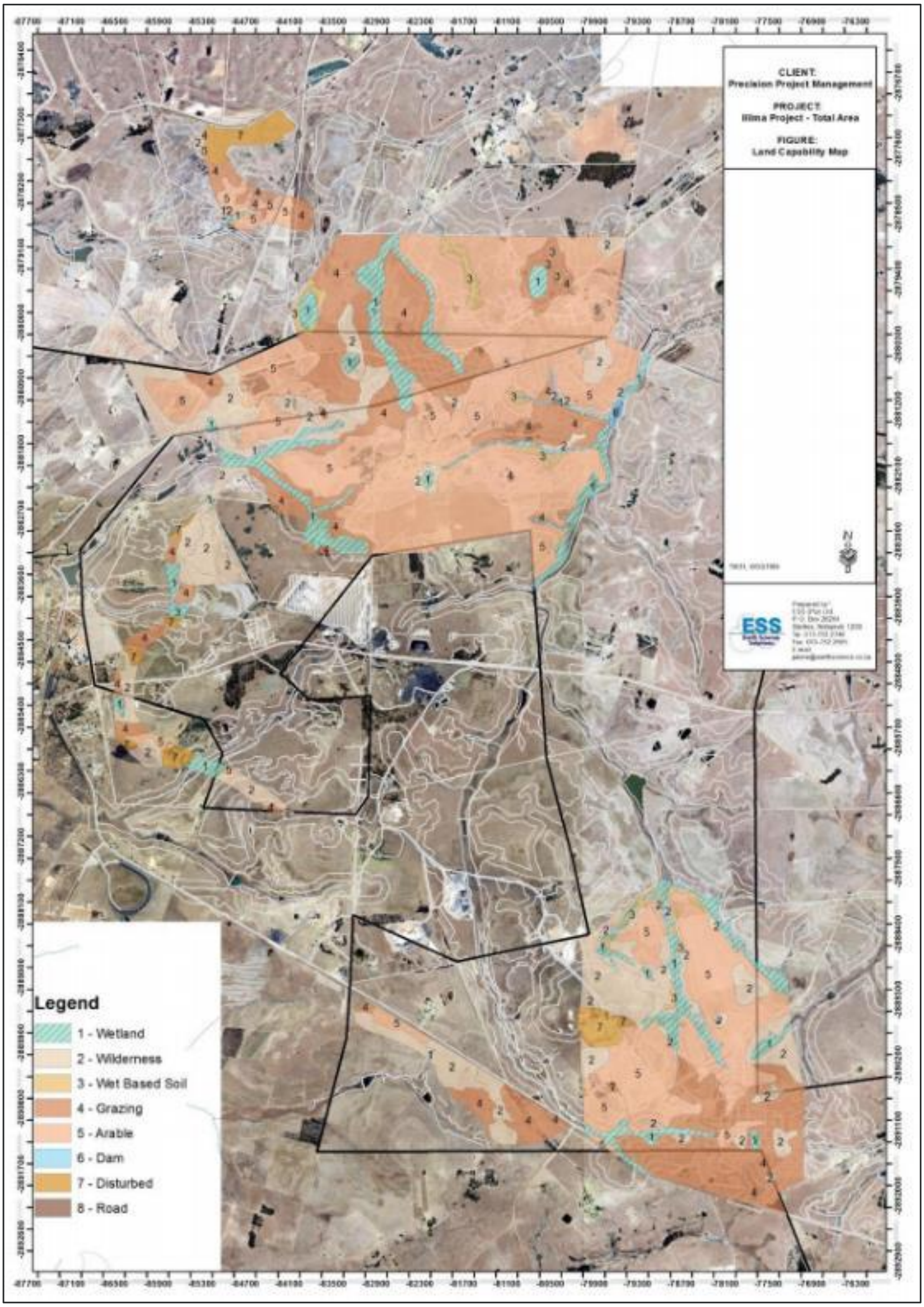



Figure 14: Land Capability Map.

### 9.1.6 LAND USE

The land use in the study area was assessed in August 2017, using a number of data sets, both historical as well as from recent studies, the aerial photographic coverage and discussions with the project team. In addition, the time spent in field while mapping the soils and classifying the land capability added to the understanding of the land use and land coverage.

In general, the land use of the study area is considered to be altered, with a significant portion of the study area having been changed from its original grassland biome to commercial grazing lands. The lower lying areas associated with the wetlands and wet based soils are for the most part unchanged, albeit that cultivation and utilisation of areas within this zone for livestock grazing and crop production are noted.

Existing coal mining is on-going as part of the original mining plan for which the area is being expanded. A more intensive study of the particular crop varieties and livestock ventures has not been undertaken.

### 9.1.7 FLORA

According to the ecology study undertaken in 2004 the mining right area is classified as a Grassland Biome and can be divided into three vegetation units (refer to Figure 15) namely:

- The Eastern Highveld Grassland vegetation unit;
- Eastern Temperate Freshwater wetlands (not visible on map); and
- KaNgwane Montane Grassland.

According to the draft National list of threatened ecosystems all three of the vegetation units are listed as vulnerable (Government Gazette No. 32689, 2009). Eastern Highveld Grassland occurs in the Gauteng and Mpumalanga Provinces and is by far the most dominant vegetation unit within the mining right. The species composition of this grassland unit comprises highveld grasses such as *Themeda triandra* (Red Grass), *Aristida congesta, Digitaria* species as well as *Tristachya leucothrix* and *T. rehmanni* (Mucina & Rutherford, 2006). The landscape usually includes undulating plains that support short, dense grassland, scattered rocky outcrops with sour grasses and tree species such as *Acacia caffra* (Sweet Thorn), *Celtis africana* (White Stinkwood) and *Diospyros lycioides subsp. lycioides* (Blue Bush). Only a small portion of Eastern Highveld Grassland is conserved in statutory reserves like the Nooitgedacht Dam or in private reserves. Almost half of this vegetation type has been transformed by cultivation, plantation, mining and the building of dams and it is therefore classified as an Endangered vegetation type (Mucina & Rutherford, 2006).

Channelled valley bottom wetlands were identified throughout the mining area. Common wetland indicator plant species included: *Typha capensis* (Common Bulrush), *Imperata cylindrica* (Cottonwool Grass), *Agrostis lachnantha* (Bent Grass), *Cyperus* species, *Setaria sphacelata* (Bristle Grass) and *Juncus effusus* (Common Rush). This plant community consists of long grassland with a dense and well-developed grass layer and is totally dominated by grass species. The landscape is slightly convex in an east-west direction. The grass layer is dominated by *Arundinella nepalensis, Agrostis eriantha, Aristida bipartita, Setaria nigrirostris* and *Cynodon dactylon*.

According to previous studies, the herb layer is poorly developed and the dense grass cover makes it difficult to notice any dominant herbs. The most prominent herbs included *Commelina africana, Crinum bulbispermum, Nemesia fruticans, Gladiolus dalenii, Pentanisia prunelloides* and *Pycnostachys reticulata*. (Digby Wells 2004)

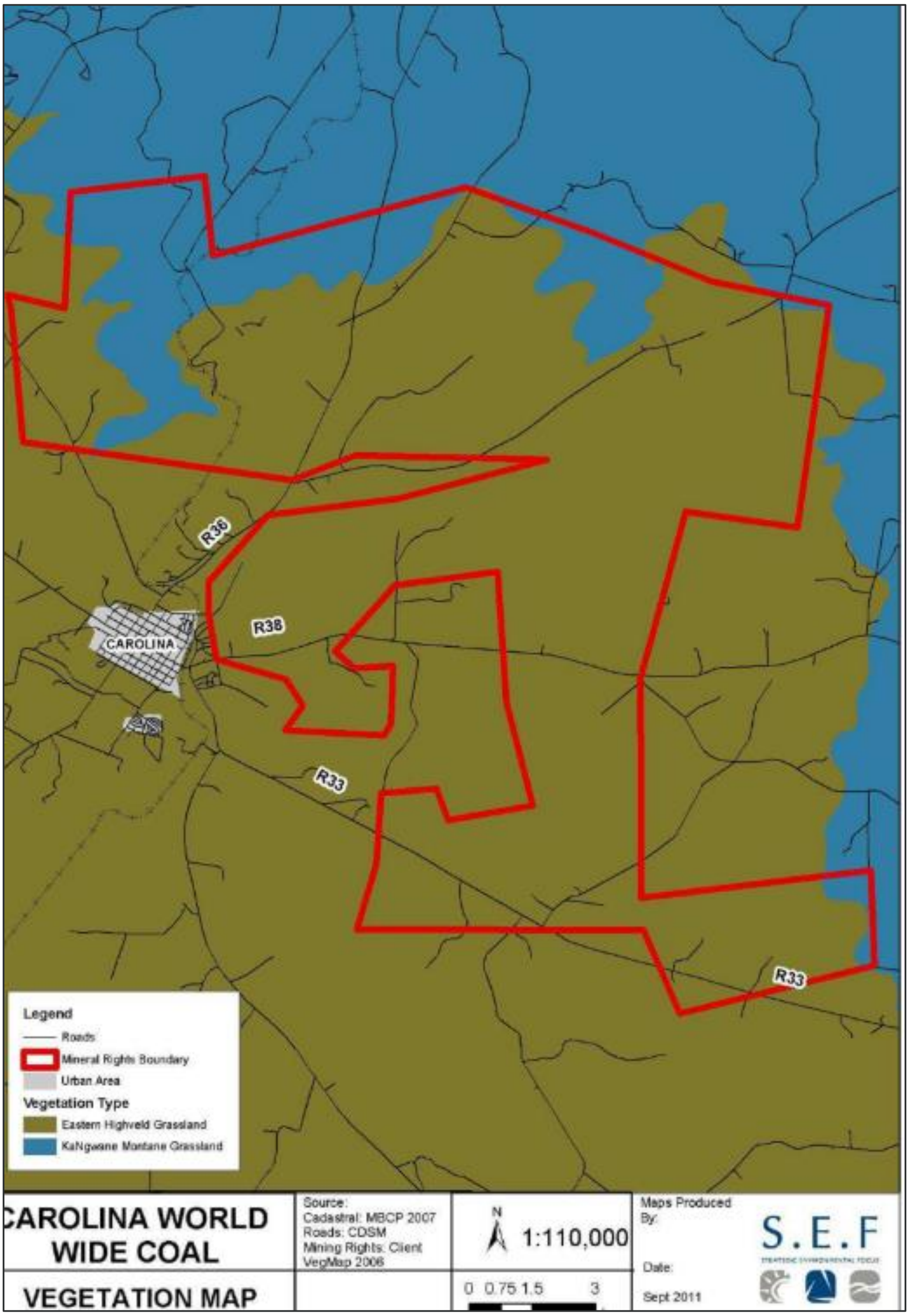



Figure 15: Vegetation units within the Ilima Colliery

The area that was surveyed in 2004 consists of a mosaic of cultivated fields, old fields, pastures and areas of natural vegetation. The majority of the surface is dedicated to agricultural practices. Due to the presence of pans wetland vegetation was also found at certain sites. The natural vegetation consists mainly of short, open grassland dominated by various grass species and some herbs. There are some sites where wattle trees have developed into small bushclumps. Separate dense stands of *Eucalyptus camaldulensis* / *Eucalyptus grandis* and *Populus sp.* are also present at certain sites. During the survey 294 plant species were recorded. This included 45 tree, shrub and shrublet species, 71 grass species and 177 herb species. Thirty-two exotic and / or invader species, four Red data plants and 104 plants that have medicinal, cultural or magical uses were recorded. Four species recorded have Red Data Status: *Nemesia fruticans*, *Eucomis autumnalis* (subsp.) *clavata*, *Lobelia erinus* and *Urginea modesta*. Many different plant communities were identified at the site of the proposed mining activities.

An additional Biodiversity Assessment was undertaken in 2017 and a total of 200 plant species were recorded for the quarter degree square: 2630AA, in which the study area occurs. Of these, seven have been listed on the national Red Data plant species list (refer to Table 23). Based on habitat requirements, three species are very likely to occur on site. The two *Crinum* species may occur within wetland areas and *Boophone disticha* may occur in terrestrial grassland.

Table 23: Red Data plant species recorded in the study area.

| Family | Species | Threat Status | Likelihood of Occurrence |
|---|---|---|---|
| EUPHORBIACEAE | *Acalypha caperonioides var. caperonioides* | Data deficient | Low |
| AMARYLLIDACEAE | *Boophone disticha* | Declining | High |
| AMARYLLIDACEAE | *Crinum bulbispermum* | Declining | High |
| AMARYLLIDACEAE | *Crinum macowanii* | Declining | High |
| ASTERACEAE | *Callilepis leptophylla* | Declining | Moderate |
| APIACEAE | *Alepidea longeciliata* | Endangered | Moderate |
| APOCYNACEAE | *Asclepias dissona* | Vulnerable | Moderate |

No Red Data or protected plant species were recorded on site, however, as aforementioned, additional species may occur that were not recorded during the site visit.

Three broad habitat types were identified (indicated in Figure 16 to Figure 18 below), although more sub-communities do occur:

- *Imperata* –dominated hydromorphic grassland;

- Secondary grassland; and
- *Eragrostis – Sporobolus* grassland.

The *Imperata*-dominated hydromorphic grassland is found adjacent to the stream systems and associated wetlands at all the project areas. Dominant and characteristic plant species found here include: *Imperata cylindrica* (Cottonwool Grass), *Setaria sphacelata* (Bristle Grass), *Juncus effuses* (Common Rush), *Agrostis lachnantha* (Bent Grass) in addition to *Typha capensis* in the permanently inundated areas.

The terrestrial habitat associated with the *Eragrostis – Sporobolus* grassland included species such as: *Sporobolus pyramidalis* (Giant Rat's Tail Grass), *Eragrostis* species and forbs such as: *Helichrysum nudifolium*, other members of the *Helichrysum* family and *Watsonia sp*. This vegetation was intact and in good ecological condition. Due to the time of sampling, many species that would ordinarily be expected to be present were not identified; however, it is likely that this habitat represents significant diversity of species.

The secondary grassland shows evidence of historical cultivation and as a result, shows low diversity and succession by pioneer species. *Eragrostis* was the dominant grass genus and alien plant species such as *Solanum sysimbriifolium* (Wild Tomato) and *Verbena brasiliensis* (Common Vervain) were common.

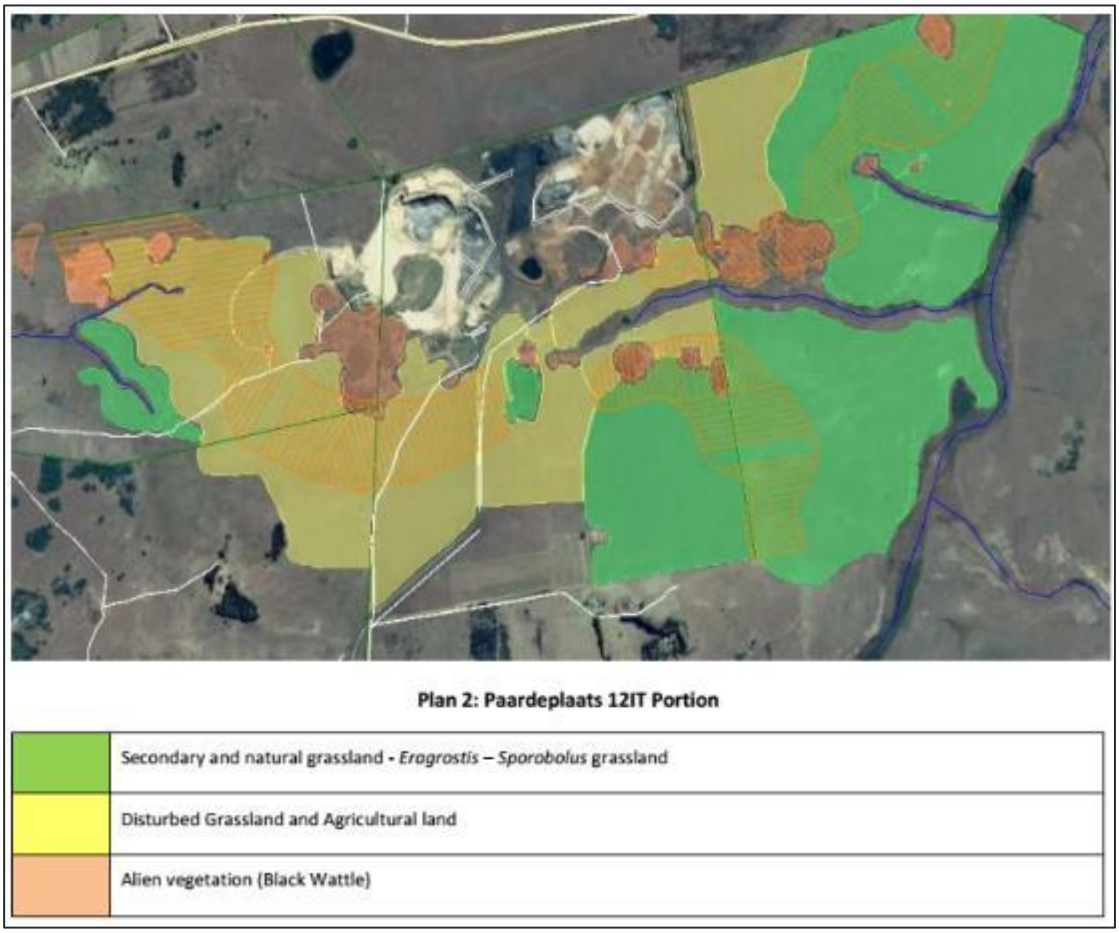
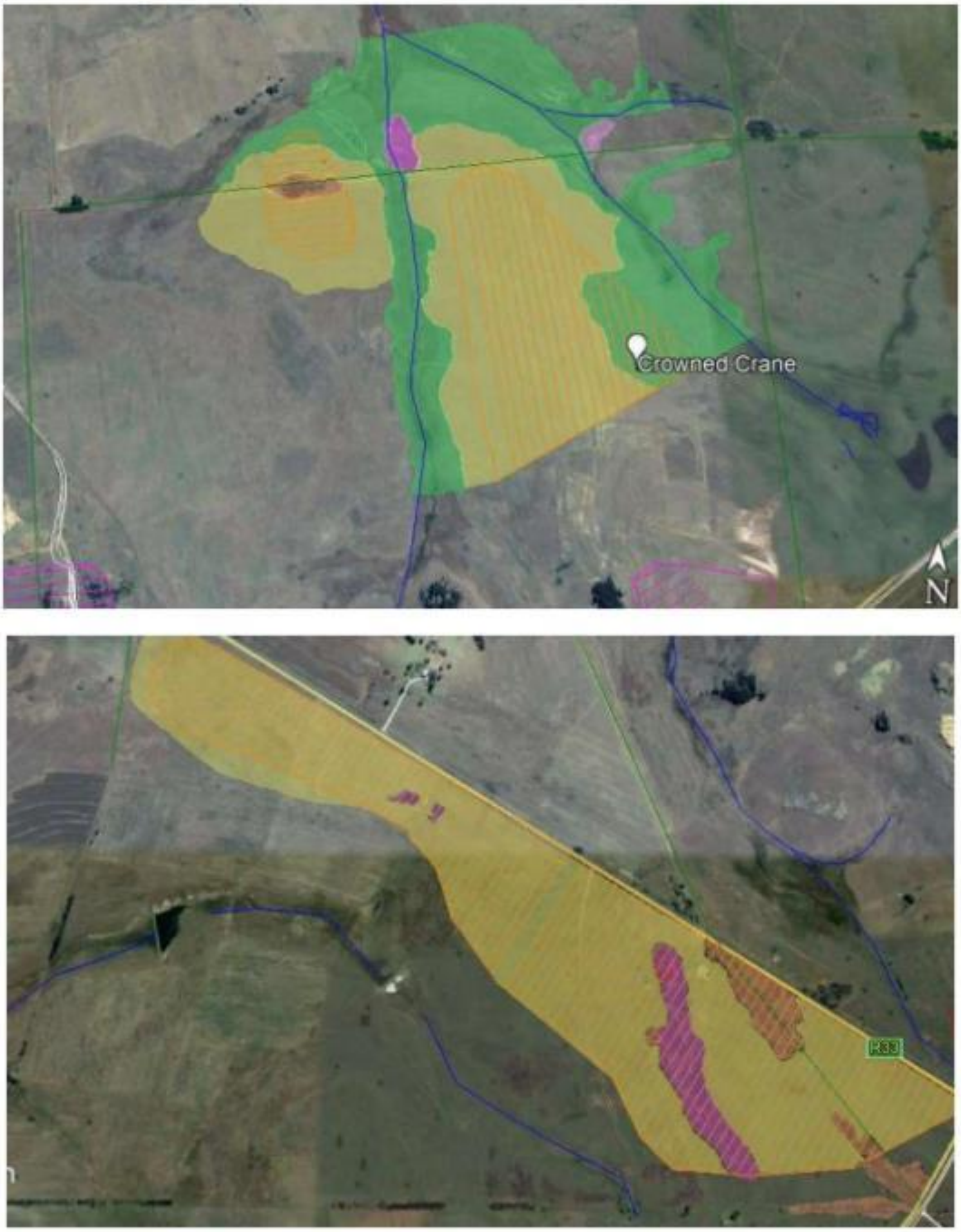



Figure 16: Habitat types within the Paardeplaats 12 IT Portion.


**Plan 3: Kwaggafontein Portion 8**

| | |
|---|---|
| | Secondary and natural grassland - *Eragrostis – Sporobolus* grassland |
| | Disturbed Grassland and Agricultural land |
| | Alien vegetation (Black Wattle) |
| | Freshwater pan – highly sensitive |

Figure 17: Habitat types within Kwaggafontein Portion 8.




**Plan 4 and 5: Haarlem 39 IT (Portion 3 below)**

| | |
|---|---|
| | Wetland vegetation – highly sensitive |
| | Disturbed Grassland and Agricultural land |
| | Alien vegetation (Black Wattle) |
| | Rocky outcrops – highly sensitive |

Figure 18: Habitat types within Haarlem 39IT.

The 2015 study conducted for Zandvoort shows that the site has more natural than disturbed habitat and that the natural habitat consists primarily of grasslands and various wetlands (refer to Figure 19 below). There is also a rocky ridge that runs through the site. The floristic survey was undertaken at the incorrect time of the year to properly characterise species composition, but initial indications are that there is a diversity of floristic communities on site and that these potentially harbour high species richness.

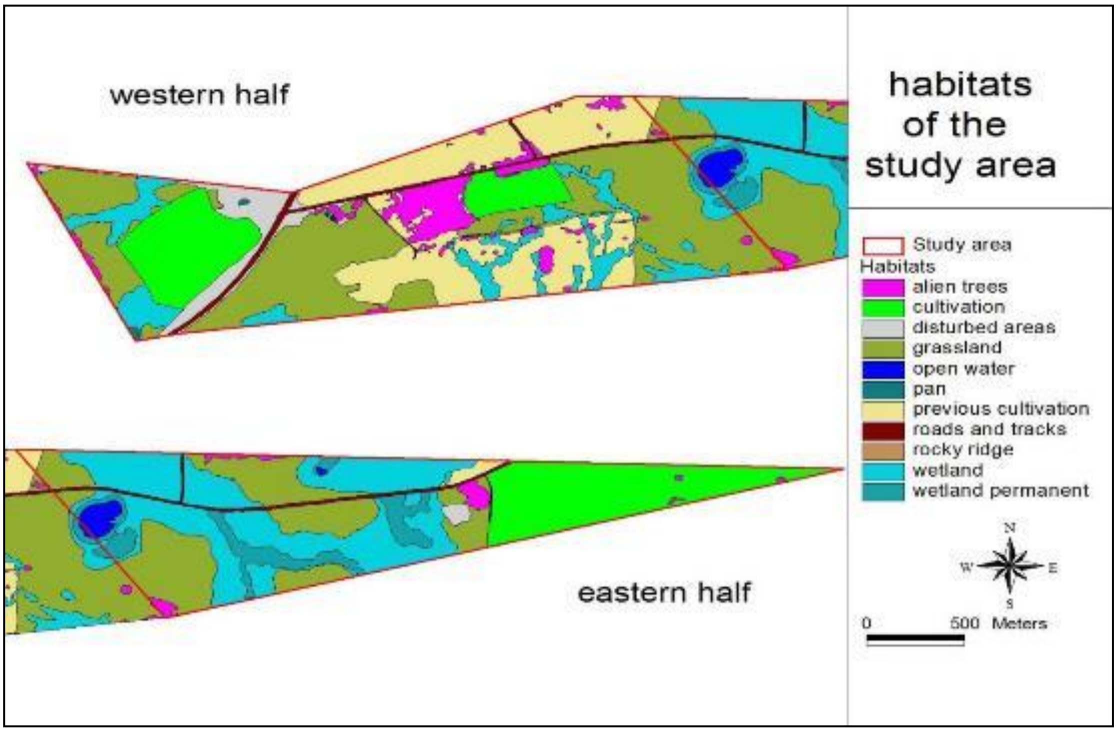



Figure 19: Habitats for Zandvoort.

Alien invasive plant species in South Africa are categorised and listed in the National Environmental Management: Biodiversity Act (no. 10 of 2004). Alien plant species identified on site include *Acacia mearnsii* (black wattle); *Eucalyptus camuldulensis* (Red River Gum); *Solanum sisymbriifolium* (Wild Tomato) and *Verbena brasiliensis* (Common Vervain).

Scattered, dense stands of wattle bush clump occur within all areas of the proposed mining area portions, the most dense being the Paardeplaats portion close to the existing opencast mining area. These areas consist of dense stands of black wattle (*Acacia mearnsii*) with a very poorly developed grass and herb layer. Eradication of these wattles takes place in certain localities and is a laborious process. The tree and / or shrub layers of these bush clumps are very well developed with dense stands, with a cover abundance of up to 50% in some areas. Large areas of bare soil occur underneath these bush clumps. Very few species occur under the canopy of these wattle bush clumps. This plant community had the lowest species richness of all communities identified during the survey.

### 9.1.8 FAUNA

A desktop study and on-site animal survey were undertaken in 2004 (Appendix J4) to ascertain what species of animals (mammals, birds, reptiles and amphibians) could potentially occur within the mining areas and surrounding areas. In this study the potential for each species to occur at the site and in the surrounding areas was based primarily on distribution maps. Habitat preferences were considered to a degree, but certain animals may use this site primarily as a thoroughfare, in which case the habitat does not have to be ideal.

The desktop study for mammals revealed that a total 125 mammal species can possibly be present in the proposed areas of development. These 125 species of mammals represent 25 species from the Order Artiodactyla, 25 species from the Carnivora, 18 species of bats (Chiroptera), 15 species from Insectivora, five species of primates (Primata), four species of the order Lagomorpha and 29 rodents (Rodentia) could potentially occur in the region of the proposed mining development. Four other species, representing four separate orders, could also occur in this region.

Of these mammals 24 are rare and endangered (Friedmann & Daly, 2004; Hoare, 2015). The Rough-haired Golden Mole is critically endangered and the Oribi, Tsessebe, Samango Monkey and Whitetailed Rat are endangered. It is, however, unlikely that the Samango Monkey will occur at this site as it does not support any suitable habitat. Fifteen Red Data species are near threatened and include many bat species such as Geoffrey's Horseshoe Bat, Darling's Horseshoe Bat, Lesser Long-fingered Bat, Schreiber's Long-fingered Bat, Temminck's Hairy Bat, Welwitsch's Hairy Bat and Lander's Horseshoe Bat. The potential for these bat species to occur at this site will depend largely on the availability of roosting sites. The other near threatened species are the Brown Hyaena, Serval, Side-striped Jackal, Honey Badger, Spotted-necked Otter, South African Hedgehog, Highveld Golden Mole and the Water Rat. The vulnerable species include the Black Rhinoceros, Maquassie Musk Shrew and the Pangolin. The Black Rhinoceros is a browser which predominantly consumes the leaves of members of the *Acacia* genus and is generally found where dense stand of these occur. It is therefore assumed that this species will not occur at the site.

A species list of bird species that can possibly be present within the entire area (Grid 2630AA) was drawn up from the Roberts' Multimedia of Birds of Southern Africa (2003). Potentially 361 species of birds could occur in the region of the proposed area of development within Grid 2630AA (Roberts, 2003).

There are 42 species of snakes, 22 species of lizards, a single species of tortoise and single species of terrapin that could potentially occur in the proposed area of development.

A desktop study of frogs that can possibly be present within the proposed area was done in order to list all frogs that can possibly be present within the area. A total of 21 species of frog could possibly be present in the proposed area of development and it surroundings (Carruthers, 2001).

A total of 6 different mammal species, 69 different bird species, three different reptile species, which represents one snake and two skinks, nine frog species and 35 different species of insects, of which 6 are different butterfly species, were recorded during the survey. No red data animal species, except for one bird species namely the blue Korhaan, were recorded during the animal survey.

In order to compile a list of bird species that could potentially occur at the site and in the surrounding areas Robert's Multimedia of Birds (2003) was consulted. A list of all birds officially recorded for grid

2630AA (in which the site is situated) was extracted. This list shows that 361 species of birds could occur in this grid. The actual occurrence of many of these species will depend on the availability of suitable habitat. Thirty-eight of these 361 birds have Red Data status. Four are critically endangered: the Eurasian Bittern, Wattled Crane, Rudd's Lark and the White-winged Flufftail. There is both open water and water covered by wetland vegetation so the occurrence of these species is not unlikely, based on habitat availability and distribution maps. The Botha's Lark is endangered and the other 33 species are near threatened or vulnerable, including the blue Korhaan, which was one of the 69 different bird species sighted during the animal survey.

There are 42 species of snakes, 22 species of lizards, one species of tortoise and one species of terrapin that could potentially occur in the area. During the desktop study, it was found that of the reptiles that could potentially occur here two snake species have Red Data status: the Southern African Python (vulnerable) and the Aurora House Snake (rare). A desktop study revealed that 21 species of frog could potentially be present in the area. Of these the Giant Bull Frog is listed as threatened in the Red Data Book. No Red Data species were observed during the animal survey.

The field survey was conducted in March and April 2004. Environmental conditions were not ideal for insects and butterfly sampling due to the rainy conditions. All mammals seen by the specialists from Digby Wells during the field survey were recorded. Interviews were also held with some of the farmers and all species seen by these farmers were also recorded.

Eight mammal species were recorded during the field survey. None of these have Red Data status. Burrows and holes of small mammals, which could belong to mice, rats, or suricates, to name a few, were abundant in the old fields and in the areas of natural vegetation. Individual suricates, mongoose, duikers (abundant) and steenbok were observed. Evidence of porcupine was also observed during the survey.

Sixty-nine bird species were observed and identified. Most of these birds were observed in close proximity to the pans and streams, natural vegetation, pastures and old fields. Not many were seen in the areas supporting crops. The Blue Korhaan (*Eupodotis caerulescens*), which has Red Data status, was seen during the survey.

One snake was encountered during the field survey. This was probably a Green Water Snake (*Philothamnus sp*.) but this could not be confirmed due to the quick disappearance of this snake into the grass near a small pan. Two skink species, the Spotted Skink (*Trachylepis punctatissima*) and the Variable Skink (*Trachylepis varia*) were also observed during the survey. No other reptiles were observed or recorded during the survey. No Red Data status reptiles were found during the animal surveys.

The terrestrial macroinvetebrate sampling yielded quite good results. A total number of 258 individuals of 7 different orders, 15 different families and 35 different species were recorded. Six of the 258 individuals were different butterfly species. A total of 8 individual spiders belonging to the same genus and species were recorded and only one tick was recorded during the animal survey.

An additional faunal assessment was undertaken for Zandvoort during 2015 (Appendix J2). The findings of this study were based on a desktop assessment, mapping from aerial imagery, and a field survey. The key habitats identified for faunal species on Zandvoort are grassland and wetland.

A total of 100 mammal species have a geographical distribution that includes the general study area in which the site is found. Of the species currently listed as threatened or protected, the following are considered to have a medium to high probability of occurring on site, based on habitat suitability: Honey Badger, Highveld Golden Mole, South African Hedgehog and Temminck's Ground Pangolin. The site is not considered to be important for the protection of any of these species. No mammal species are likely to be significantly negatively impacted by development on site.

A total of 19 frog species have a geographical distribution that includes the general study area in which the site is found. Of the frog species that could potentially occur in the study area, none have been listed in a threat category. There are, therefore, no frog species of conservation concern that could be negatively impacted by development on site.

A total of 64 reptile species have a geographical distribution that includes the general study area in which the site is found. Of the reptile species that have a geographical distribution that includes the study area, the Striped Harlequin Snake, Yellow-bellied House Snake, African Rock Python and Breyer's Long-tailed Seps have been listed in a threat category. The African Rock Python is considered unlikely to occur on site due to the absence of suitable habitat. The other three species could potentially occur in the grassland of the study area, but the chances of finding any of these species is slim, even if they occur there. There are, therefore, three reptile species of conservation concern that could potentially occur in the study area.

A total of 352 bird species have a geographical distribution that includes the general study area in which the site is found. A number of the bird species with a geographical distribution that includes the site have been listed in the Eskom Red Data Book of the Birds of South Africa, Lesotho and Swaziland. These are the African Marsh Harrier, Barrow's Korhaan, Blackbellied Bustard, Blackwinged Lapwing, Blackwinged Pratincole, Blue Crane, Blue Korhaan, Corn Crake, African Grass Owl, Grey-crowned Crane, Lanner Falcon, Lesser Kestrel, Pallid Harrier, Secretarybird, Southern Bald Ibis, Denham's (Stanley's) Bustard and the Yellowbreasted Pipit. It is concluded that the site contains habitat that is suitable for various bird species, many of which are of conservation concern. It is possible that some of these species are likely to be significantly negatively impacted by development of mining on site. Two species of concern were seen on site, namely the Southern Bald Ibis and the Secretarybird.

The site is not within an Important Bird Area (IBA), but there are three IBAs within relatively close proximity to the site, namely the Steenkampsberg IBA, 20 km to the north of the site, the Chrissie Pans IBA, 20 km to the south of the site, and the Amersfoort-Bethal-Carolina District IBA, 8 km to the south-east of the site. The general region is therefore probably important with respect to bird biodiversity.

The Amersfoort-Bethal-Carolina District IBA is the one that most closely matches the study area in terms of physical attributes and consists of a combination of grasslands, streams, pans, rocky slopes, gulleys and ravines. This site holds a large proportion of the global population of Botha's Lark (*Spizocorys fringillaris*). The grassland areas also hold Denham's Bustard (*Neotis denhami*), White-bellied Bustard (*Eupodotis senegalensis*), Buff-streaked Chat (*Saxicola bifasciata*), Sentinel Rock Thrush (*Monticola explorator*) and Southern Bald Ibis (*Geronticus calvus*). The Lesser Kestrel (*Falco naumanni*), Black-winged Pratincole (*Glareola nordmanni*) and (less frequently) Pallid Harrier (*Circus macrourus*) can be seen quartering the grasslands. Occasionally, all of South Africa's crane species can be found in the grasslands or cropfields within the site (BirdLife International 2015).

The main threats to birds and their habitats in this IBA have been identified and include agriculture, alien species invasions, habitat transformation, pollution, residential and commercial development and utilities.

There are sensitive biodiversity receptors within the study area, however none of these will be negatively impacted by the proposed project. This is due to the fact that there will be no surface disturbance of the site (only underground mining to be undertaken). No further studies are recommended.

In 2017, an additional biodiversity study was undertaken for Kwaggafontein as it was determined during the Scoping phase that a biodiversity study had not been previously been undertaken for Kwaggafontein, and it was noted by the specialist that mining has already begun on Kwaggafontein (Appendix J3). A total of 29 bird species were recorded in the project area during the January 2017 survey. No regionally or globally important bird species were recorded during the survey. Due to the degree of anthropogenic disturbance of the area surrounding the project area the likelihood of occurrence of a bird species of conservation concern on anything other than an incidental basis is considered to be low.

Mammal diversity on the Kwaggafontein site was low with no mammals observed, however, tracks and signs of 5 species were observed during the survey. Although the likelihood of additional mammal species occurring on the site is good, diversity is expected to remain low due to the degree of disturbance of the site. Tracks of *Leptailurus serval* (Serval), a species which is regionally listed as Near Threatened (NT) was observed in close proximity to the current opencast mining activities.

No reptile or amphibian species were recorded on the Kwaggafontein site during the January 2017 survey. The likelihood of some reptile and amphibian species occurring on the site is good, however diversity is expected to be low due to the high human density and the degree of disturbance and development of the areas around the site.

A site visit was also conducted in July and August 2017 for the amendment project. During the visit 89 bird species were observed throughout the project area The survey was conducted in the dry winter season when species diversity and density is at its lowest. Typical Red Data grassland indicator species that have been recorded in these four QDGCs by SABAP2 are Blue Korhaan (*Eupodotis caerulescens*), Denham's Bustard (*Neotis denhami*), Pallid Harrier (*Circus macrourus*), Secretarybird (*Sagittarius serpentarius*), White-bellied Korhaan (*Eupodotis senegalensis*), Blue Crane (*Grus paradisea*), Southern

Bald Ibis (*Geronticus calvus*) and Grey Crowned Crane (*Balearica regulorum*). However, the absence of other Red Data indicator species, specifically Botha's Lark (*Spizocorys fringillaris*) in the same SABAP2 dataset bears evidence to the impact of habitat fragmentation (largely cultivation) that is also evident in the QDGCs. This IBA is reported to contain >10% of the global population of the species (Barnes 1998). However, the grass cover within the project area may be too dense and high for the species, but this may change depending on rainfall and grazing pressure. It should, therefore, be assumed that the species could occur sporadically when habitat conditions are suitable.

The winter 2017 site visit also indicated spoor and droppings of Yellow Mongoose (*Cynictis penicillata*), Meerkat (*Suricata suricatta*), Cape Porcupine (*Hystrix africaeaustralis*), Serval (*Lep*tailurus serval), Common Duiker (Sylvicapra grimmia), and Aardwolf (Proteles cristata). Due to the site visits being conducted in mid-winter (July/August), no amphibians where observed throughout the proposed mining area. It is strongly recommended that a summer season survey is conducted on the wetland systems in particular to get an understanding of the amphibian ecology. Due to the timing of the survey being in the middle of the winter months of July and August very little reptile activity was observed. However, two skink species, namely the Spotted Skink (*Trachylepis punctatissima*) and the Variable Skink (*Trachylepis varia*) were observed during the survey within the derelict buildings located within the project area.

### 9.1.9 SURFACE WATER

Surface water resources includes rivers, streams, drainage lines, flow paths of storm water runoff, as well as water collection and channelling using irrigation furrows, canals, channels, and dams. Mining activities have the potential to alter surface water drainage patterns through actual mining methods employed as well as the placement of infrastructure. In addition, these activities also have the potential to result in the pollution and/or contamination of surface water resources through geological exposure, seepage, spillages and waste streams both mineralised and non-mineralised. A baseline surface water report was completed by Digby Wells in 2005 prior to the commencement of mining. The information below has largely been extracted from this report. For further information, please refer to the full surface water report which is included in Appendix L.

#### *9.1.9.1* WATER MANAGEMENT AREA

Ilima falls within the X11 and X12 sub-catchments of the Eastern Escarpment primary drainage region. Affected water courses include tributaries to the Boesmanspruit, the Swartspruit and the Buffelspruit as well as the stream that drains to the Transnet dam adjacent to Carolina. Drainage is predominantly to the north and east towards the Komati River. Figure 20 below indicates the relevant catchment areas and the location of the mining areas, while Figure 21 indicates all the surface water bodies in relation to the mining right.

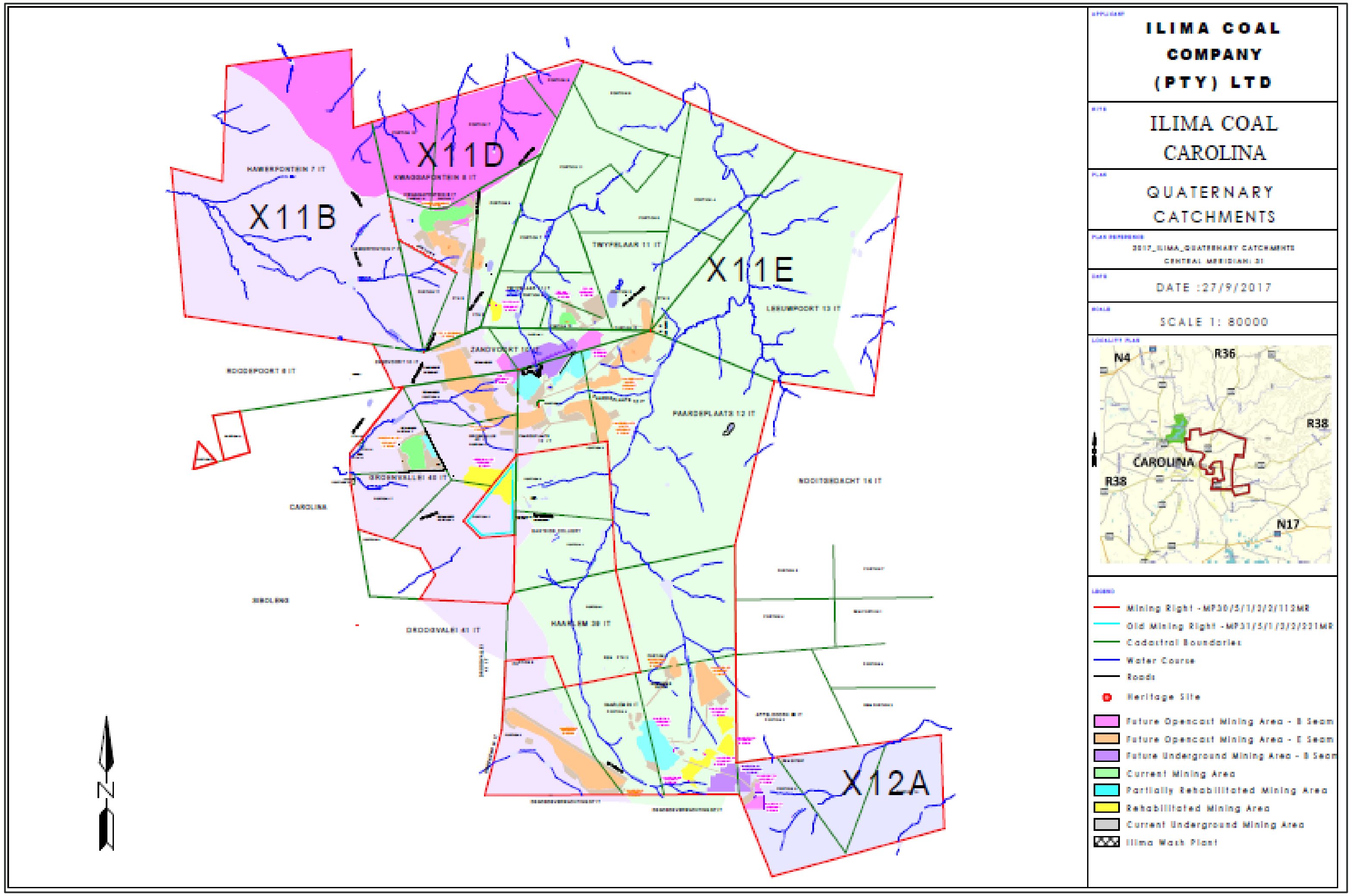



Figure 20: Catchment Areas and location of mining areas.

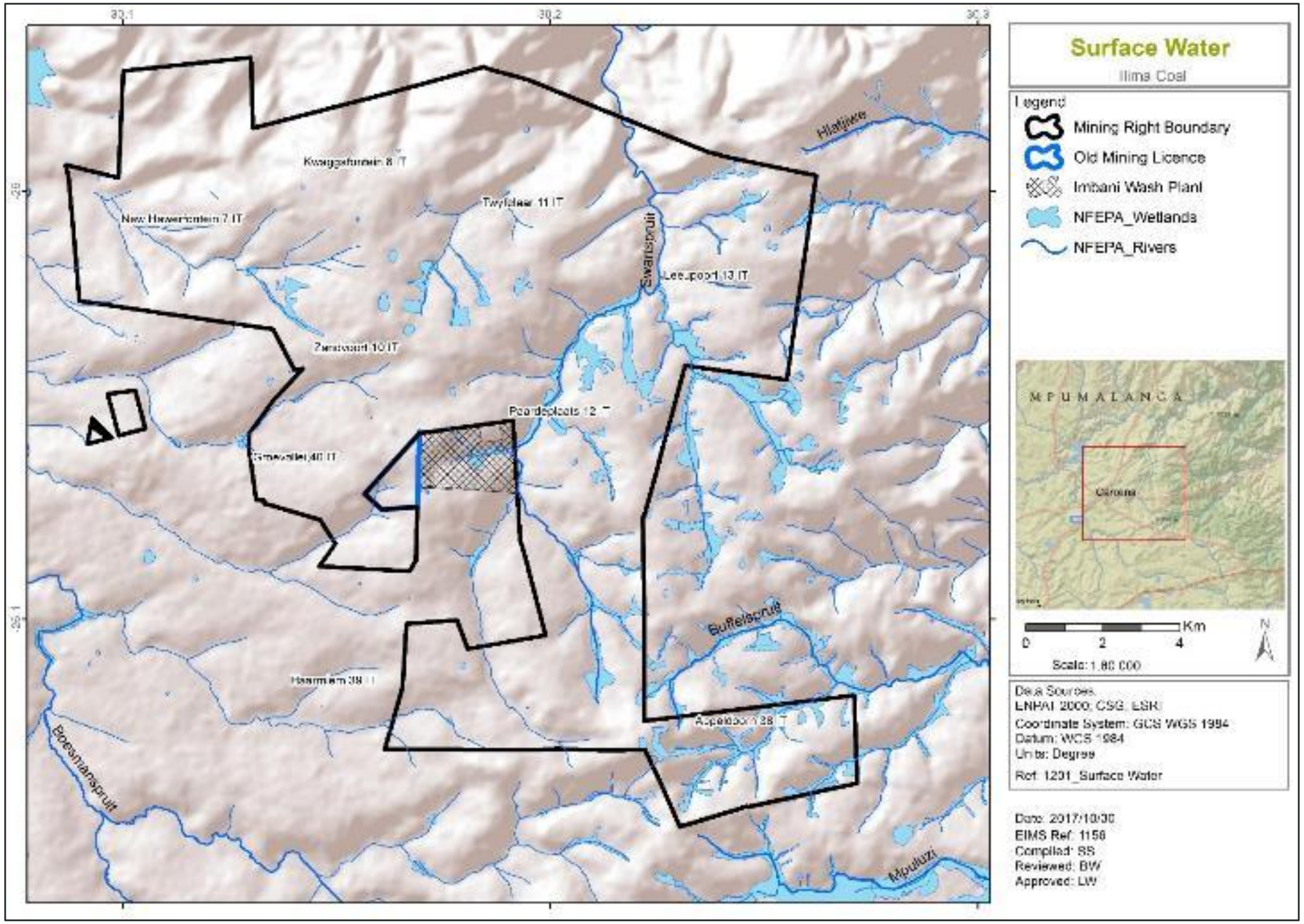



Figure 21: Surface water bodies in relation to the mining right.

#### 9.1.9.2 MEAN ANNUAL RUN-OFF

The surface water report indicates the streams that could be affected by the mining operations and the relevant catchment areas. The annual runoff for these eight (8) affected streams was determined using the quaternary catchment information for the WRC Report No 298/6.1/94 volume VI. These are summarised in Table 24 below.

Table 24: Mean annual run-off

| Area | Stream No. | Catchment ($km^2$) | MAR (Million $m^3$) | Tributary to Major Stream | Quaternary Catchment |
|---|---|---|---|---|---|
| Appeldoorn 38 IT and Haarlem 39 IT | Stream 1 | 0.788 | 0.41 | Buffelspruit | X12A |
| Haarlem 39 IT | Stream 2 | 1.069 | 0.105 | Swartspruit | X11E |
| Groenvallei 40 IT | Stream 3 | 5.238 | 0.23 | Boesmansprui t | X11B |
| Groenvallei 40 IT, Zandvoort 10 IT | Stream 8 | 1.263 | 0.055 | Boesmansprui t | X11B |
| Groenvallei 40 IT and Paardeplaats 12 IT | Stream 4 | 5.8 | 0.255 | Boesmansprui t | X11B |
| Twyfelaar 11 IT, Zandvoort 10 IT | Stream 5 | 0.663 | 0.065 | Swartspruit | X11E |
| Twyfelaar 11 IT | Stream 6 | 0.133 | 0.013 | Swartspruit | X11E |
| Twyfelaar 11 IT | Stream 7 | 0.969 | 0.095 | Swartspruit | X11E |

#### 9.1.9.3 NORMAL DRY WEATHER FLOW

Since most of the streams are situated very close to the watersheds of their relevant catchments, no flow is expected during the dry season.

#### 9.1.9.4 FLOOD PEAKS

Flood peaks were determined for affected streams using the Rational Method. These are summarised in Table 25 below.

Table 25: Flood peak flows at recurrence intervals based on years.

| Floods in ($m^3/s$) | 1:50 | 1:100 |
|---|---|---|
| Stream 1 | 18.29 | 23.67 |
| Stream 2 | 25.24 | 32.66 |
| Stream 3 | 41.65 | 51.44 |
| Stream 4 | 51.58 | 63.68 |
| Stream 5 | 9.72 | 11.83 |
| Stream 6 | 3.137 | 4.078 |

| | | |
|---|---|---|
| Stream 7 | 22.023 | 28.14 |
| Stream 8 | 24.62 | 30.775 |

#### *9.1.9.5* SURFACE WATER QUALITY

Ilima has an established surface water monitoring programme in place since March 2010, although sporadic sampling was also conducted prior to this.

Previously five up gradient sample sites' (PA-SW10, GR-SW13, HA-SW16, AP-SW17, and SS-SW20) water quality data over a year's period was averaged to obtain the Background Water Quality Limits. It must be noted that the Background Water Quality Limits are far more stringent than the SANS 241-1:2011 Drinking Water Standards, but are meant to represent up gradient surface water qualities in the area.

The water monitoring programme now consists of 30 surface water monitoring sites, based on the requirements of the WUL, plus an additional five surface water monitoring points are included in the surface water monitoring programme. Surface water monitoring sites include surrounding rivers, dams and pans. The surface water points are sampled monthly. The monitoring points are indicated in Table 26 and Figure 22 below.

Table 26: Surface water monitoring points.

| Locality | Locality Description | Coordinates WGS 84 ddd.ddddd | Monitoring Frequency |
|---|---|---|---|
| TD SW01 | Carolina Town Dam | S26.05950° E30.12880° | Monthly |
| WW SW02 | Raw Water Dam at Office | S26.06840° E30.17000° | Monthly |
| WW SW03 | Plant dam (2 compartments) | S26.06640° E30.17160° | Monthly |
| WW SW04 | Return Water Dam A at Co-disposal | S26.06590° E30.17530° | Monthly |
| WW SW05 | Return Water Dam B at Co-disposal | S26.06600° E30.17620° | Monthly |
| KW SW06 | Pan situated on Portion 8 of Kwaggafontein | S26.02540° E30.15980° | Monthly |
| ZV SW07 | Pan situated on RE of portion 2 of Zandvoort | S26.03110° E30.16770° | Monthly |
| TW SW08 | Pan situated on Portion 9 of Twyfelaar | S26.02420° E30.19170° | Monthly |
| TW SW09 | Dam situated on Twyfelaar | S26.02620° E30.17060° | Monthly |
| PA SW10 | Dam Situated on Portion 2 of Paardeplaats | S26.04370° E30.18260° | Monthly |
| PA SW11 | River: just of R28, Portion 5 of Paardeplaats | S26.06726° E30.19249° | Monthly |

| Locality | Locality Description | Coordinates WGS 84 ddd.ddddd | Monitoring Frequency |
|---|---|---|---|
| GR SW12 | Dam situated on Groenvallei | S26.07630° E30.15550° | Monthly |
| GR SW13 | Dam situated on Portion 5 of Groenvallei | S26.04840° E30.14020° | Monthly |
| HA SW14 | Dam situated on Portion 2 of Haarlem | S26.07133° E30.19316° | Monthly |
| HA SW15 | Farm Dam situated on RE of Haarlem | S26.12093° E30.21219° | Monthly |
| HA SW15 Bypass | Clean water bypass at Sub-surface drainage system | S26.12085° E30.21228° | Ad Hoc |
| HA SW16 | River just of R33 on Portion 4 of Haarlem | S26.12860° E30.20020° | Monthly |
| AP SW17 | Farm Dam situated on Portion 3 of Appeldoorn | S26.11080° E30.23220° | Monthly |
| TWY SW18 | River downstream of Twyfelaar mining activities | S26.00330° E30.18250° | Monthly |
| KW SW19 | Kwaggafontein stream draining towards Nooitgedacht dam | S2601320° E30.15350° | Monthly |
| SS SW20 | Swartspruit tributary draining towards Doornkop nature reserve | S26.02720° E30.23670° | Monthly |
| GR SW21 | Dam situated on Groenvallei | S26.09900° E30.15660° | Monthly |
| GR SW22 | River situated on Groenvallei | S26.08550° E30.14250° | Monthly |
| GR SW23 | River downstream of Groenvallei | S26.08860° E30.13010° | Monthly |
| PA SW24 | Stream downstream of Paardeplaats | S26.06120° E30.18960° | Monthly |
| HA SW25 | River downstream of HA SW16 downstream of Haarlem 3 | S26.11090° E30.18560° | Monthly |
| GR SW26 | Farm dam on Groenvallei / GR GW26 | S26.05730° E30.16020° | Monthly |
| GR SW27 | Stream situated on Groenvallei | S26.06990° E30.16530° | Monthly |
| PA SW28 | River downstream of PA SW11 and PA SW24 | S26.06011° E30.19241° | Monthly |
| LE SW29 | River on Leeuwpoort. Most downstream point of Paardeplaats | S26.00530° E30.22590° | Monthly |
| PA SW30 | Swartspruit tributary draining Paardeplaats | S26.03750° E30.20380° | Monthly |
| PA SW31 | River just upstream from Paardeplaats and PA SW11 | S26.07162° E30.19158° | Monthly |
| TW SW32 | Stream on Twyfelaar | S26.00332° E30.18986° | Ad Hoc |
| K8 | Stream downstream of Kwaggafontein draining towards Nooitgedacht Dam | S26.018148° E30.136140° | Ad Hoc |

| Locality | Locality Description | Coordinates WGS 84 ddd.ddddd | Monitoring Frequency |
|---|---|---|---|
| K9 | Stream upstream of Kwaggafontein draining towards Nooitgedacht Dam | S26.010864° E30.129756° | Ad Hoc |

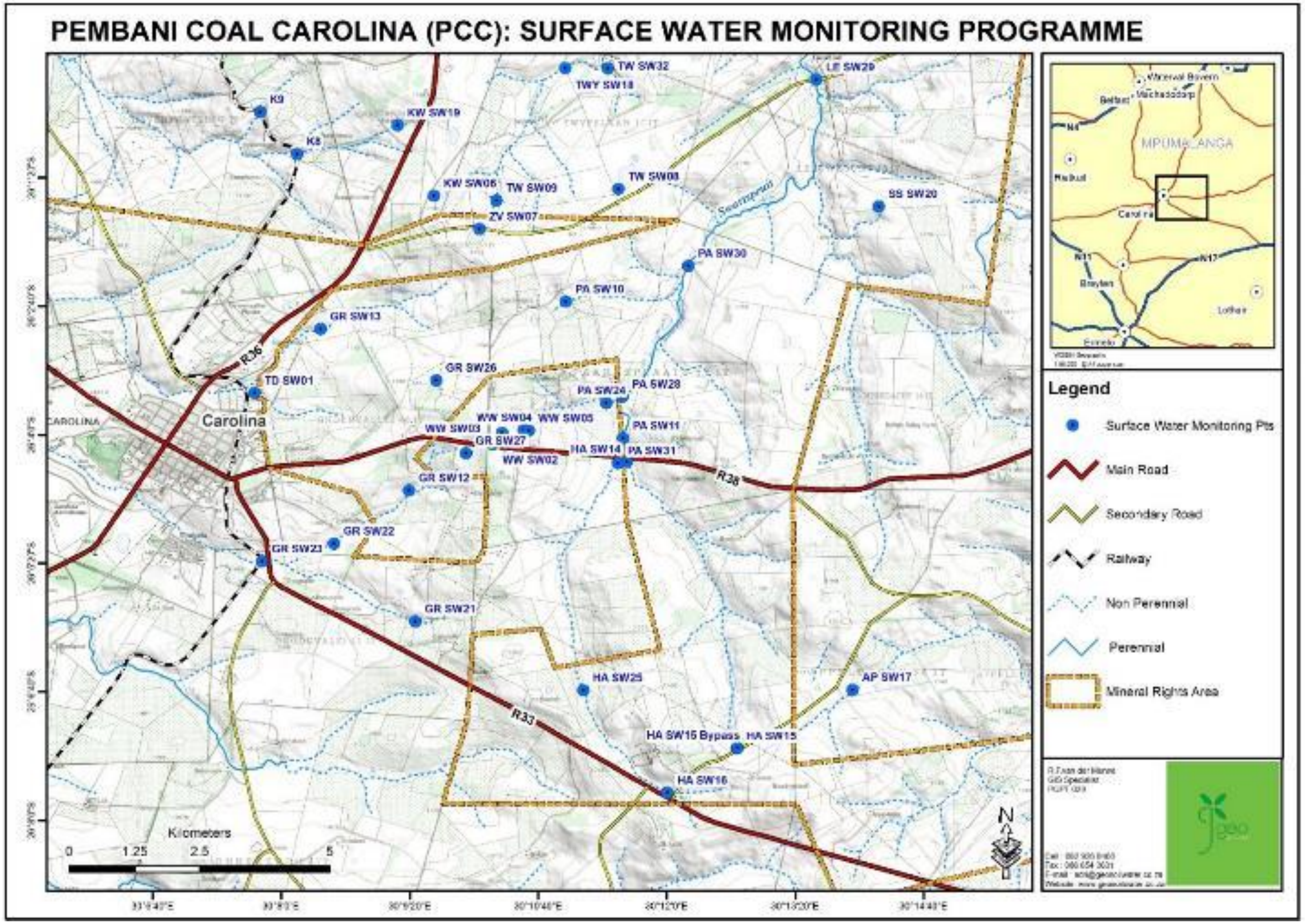



Figure 22: Surface water monitoring points.

Monthly surface water samples are analysed for:

- pH
- EC mS/m
- TDS mg/L
- Total Hardness mg/L
- Alkalinity $CaCO_3$/L
- Ca mg/L
- Mg mg/L
- Na mg/L
- K mg/L
- F mg/L
- Cl mg/L
- $SO_4$ mg/L
- $NO_3$ mg/L
- Al mg/L
- Fe mg/L
- Mn mg/L

All water samples are submitted to UIS Laboratories for chemical analyses. The water monitoring results are compared to the Komati X11B Resource Quality Objectives (RQOs), the DWS's Livestock Watering upper limit (1996) and the SANS 241:2015 drinking water standards.

**Paardeplaats Surface Water**

The Paardeplaats area includes the current main complex, where most of the infrastructure is located, as well as the northern Paardeplaats mining area, near Zandvoort. This area is drained by the Swartspruit.

Based on the Geo Soil and Water Annual Water Monitoring Report (2017) the surface water quality is generally good, with exceedances related to pH, Sulphate, Aluminium and Manganese. The pH of sampling points PA SW11, PA SW 28 and SS SW20 exceed the RQO limits, although these are still classified as acceptable according to the SANS241 drinking water guidelines. Sampling point PA SW24 indicated an acidic pH (4.3) during the previous annual reporting period; however, the value has stabilised over the past year.

Sampling points PA SW24 and PA SW28 indicated elevated Sulphate concentrations, exceeding the RQO limits, as well as elevated Aluminium (PA SW24) and Manganese (PA SW28) concentrations, exceeding the SANS 241:2015 drinking water standards. The acidic environment causes dissolution of heavy metals.

Sampling point PA SW24 is located downstream of historical underground mining activities, the SS-Outcrop decant point and the co-disposal area. Downstream from sampling points PA SW24 and PA SW28, the water quality improves towards sampling points PA SW30 and LE SW29. No impacts were recorded at LE SW29 – the most downstream monitoring point from the mine, in the Swartspruit.

**Twyfelaar, Kwaggafontein and Zandvoort Surface Water**

The Twyfelaar, Kwaggafontein and Zandvoort areas covers a large portion of historical, plus underground, and opencast mining areas, basically all the northern mining areas. This area is drained by a tributary of the Swartspruit (towards the north), as well as a tributary of the Boesmanspruit (towards the west).

Sampling points KW SW6 and TW SW8 recorded elevated Sodium concentrations. High Aluminium and Iron concentrations were recorded for most of the sampling points, exceeding the SANS 241:2015 drinking water standards.

Sampling points KWA SW19, K2 and K8 recorded low pH values, with elevated Aluminium and Manganese concentrations, however Sulphate concentrations are within acceptable limits. Elevated heavy metal concentrations can potentially be the result of leaching from the geological formations and decant upstream of K8. Sampling points KWA SW19 and K2 are natural springs.

It was noted that the pH at sampling point K8 remained low, and is indicative of the impact from the existing decant (from 1950's mining activities) entering the drainage lines to the Nooitgedacht Dam. Sulphate concentrations remained within all guideline values. The element concentrations of sampling point K9 (downstream of K2) remained low, as this monitoring point does not receive decant water.

**Groenvallei 1 Surface Water**

Groenvallei 1 covers the area south of the current main complex area, on route to the Haarlem area. The area is drained by a tributary of the Boesmanspruit and flows past the southern extent of Carolina town.

Most element concentrations are below the RQO limits and the SANS 241:2015 drinking water standards. Elevated Sulphate concentrations were recorded at sampling points GR SW21 and GR SW27, as well as pH levels below the RQO values for sampling points GR SW21, GR SW27 and GR SW23.

Elevated Manganese concentrations (drinking water limits) were recorded at sampling points GR SW23 and GR SW27, including an acidic pH. Sampling point GR SW22 exceeded the SANS 241:2015 drinking water standards for Aluminium.

**Groenvallei 7 Surface Water**

The Groenvallei 7 area is located northwest from the main infrastructure area. This area is drained by a tributary of the Boesmanspruit and flows past the northern extent of Carolina town.

Except for the low pH (drinking water limits) recorded at sampling point GR SW 13, which slightly exceeded the RQO limit, as well as elevated Aluminium concentrations recorded at GR SW 13 and TD

SW1, the remaining variable concentrations recorded for the surface water monitoring localities were of acceptable quality.

Although a sub soil stockpile berm breached upstream of GR SW13 and TD SW01 (reported to IUCMA) during November 2016, no signs of coal mine pollution were recorded during the reporting period. Element concentrations which increased during the dry season decreased dramatically with rainfall / inflow of fresh water. Although the sub-soil stockpile did not contain carbonations material and no impact on water quality was expected, a large amount of silt was transported during the breach.

**Haarlem Surface Water**

The Haarlem mining area is in the south and approximately 12 km from Carolina on the R33 road. This area is drained by the Swartspruit.

Historical signs of coal mine pollution seem to be on the decrease (*Geo Soil and Water, July 2017*). This can be attributed to the dilution effect of rainfall events during the wet season. Sampling point HA SW15 where known decant exists within the drainage lines of the upper Swartspruit, still indicate high Sulphate and Manganese concentrations. The decant water is being diverted via drains and surface water trenches/berms and contained in a lined PCD dam and is used for dust suppression.

The cleaner upstream water, separated from the decant water, bypasses the sump and enters the Swartspruit's natural drainage line. Sampling point HA SW14, downstream of HA SW15 recorded very low element concentrations (except for slightly elevated Aluminium concentrations).

#### *9.1.9.6* RECEIVING WATER QUALITY OBJECTIVES AND RESERVES

A study to determine the Water Resource Classes and Associated Resource Quality Objectives (RQO) in the Inkomati Water Management Area (IWMA) was conducted by the IUCMA and published in GNR. 1616 on 30 December 2016.

The Buffelspruit carries a Mpumalanga Highlands 1 river signature, which has a conservation status of Endangered, while the Boesmanspruit and Swartspruit carry a Highveld 2 river signature with a Critically Endangered status (Nel *et al*., 2004). According to the Water Resource Classes and Associated RQO's in the IWMA, all three rivers have an ecological category of B, which translates to largely natural with few modifications. With regards to the instream and riparian habitat narrative RQO, the flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.

Sites on the Swartspruit (SS1 and SS3) and the associated tributaries (TS1 and TS2) are in the Freshwater Ecosystem Priority Area (FEPA). These systems were identified as being in a Good condition (NFEPA – Nel et al., 2011) and, therefore, need to be maintained to contribute to the biodiversity of the area. Concurrently, site BS1 (Buffelspruit catchment) is in an Upstream Management Area. Anthropogenic activities taking place in these areas need to be monitored to prevent the degradation of FEPA's and Fish Support Areas located downstream. Sites TB1 and TB2, tributaries of the Boesmanspruit, are in a Fish Support Area (Nel *et al*., 2011). According to Nel *et al*. (2011), fish sanctuaries for rivers in a good condition (A or B ecological category) were identified as FEPAs, whereas the remaining fish sanctuaries associated with rivers with an ecological condition lower than an A or B were identified as Fish Support Areas.

#### *9.1.9.7* SURFACE WATER USER SURVEY

Surface water use in the area includes livestock watering, irrigation for crops and forestry and water supply for mining activities and domestic consumption. There are several registered users of water in the area.

### 9.1.10 GROUND WATER

Groundwater is defined as water located beneath the ground surface in lithological formations. Mining activities have the potential to impact on ground water resources through potential pollution and/or contamination as a result of activities such as the actual mining method employed and resultant geological exposure of oxidising materials, seepage, spillages and both mineralised and non-mineralised waste streams. Additional impacts related to mining activities also include dewatering cones of depression and loss of water supply to surrounding land users. The groundwater studies conducted for Ilima Colliery are attached in Appendix K and the below subsections represent the findings of the 2017 Ilima Geohydrology study (Appendix K3).

#### *9.1.10.1* AQUIFER CHARACTERISATION

Two aquifers occur in the area. These two aquifers are associated with a) the upper weathered material, and b) the underlying competent and fractured rock material.

**Upper weathered material aquifer**

The upper aquifer forms due to the vertical infiltration of recharging rainfall through the weathered material being retarded by the lower permeability of the underlying competent rock material. Groundwater collecting above the weathered / unweathered material contact migrates down gradient along the contact to lower lying areas. In places where the contact is near surface the groundwater can daylight on surface as springs or seepage into the various perennial and non-perennial pans that exist in the study area. Shallow seepage also contributes baseflow to the rivers and streams that occur in the area.

Exploration drilling logs from 607 boreholes show that the upper aquifer has an average depth of approximately 6.95 m, and can range between 1.5 and 26 m in thickness. These minimum and maximum values are not absolute values for the entire study area. Lesser thicknesses can occur at the numerous springs that occur in the area where daylighting of groundwater is evident and near the Swartspruit and its many tributaries that drain the study area. Deeper weathering can also occur in higher lying areas, and in zones associated with fracturing. However, the mentioned values are considered to provide a good general indication of the site conditions.

It is considered that effectively 3 % of the mean annual rainfall eventually reaches the groundwater table in the form of recharge to the aquifers. No aquifer tests were done that specifically targeted this aquifer, however, previous experience in similar environments in the Witbank Coal Fields show that typical transmissivity values for this aquifer range between 0.5 and 2 $m^2$/day.

**Lower fractured rock aquifer**

Although the lower permeability unweathered rock material will retard vertical infiltration of groundwater a percentage of the water in the upper aquifer will recharge the lower aquifer. Direct recharge from rainfall can occur along the banks of the Swartspruit and Boesmanspruit and their various tributaries where the fractured, competent rock outcrops. In areas where the stream base is located directly on top of the competent rock the aquifer can be directly recharged from the surface water bodies.

The competent rock is subjected to fracturing associated with tectonic movements that took place during intrusion of the dolerite dykes into the older Karoo aged sandstone and shale. Groundwater flows in the lower aquifer are associated with the secondary fracturing in the competent rock and as such will be along discrete pathways associated with the fractures. Faults and fractures in the sandstone and shale can be a significant source of groundwater depending on whether the fractures have been filled with secondary mineralisation.

The transmissivities of the aquifer were characterised through aquifer testing. In summary, it can be said that the general transmissivity of this aquifer ranges between 0.1 and 5 $m^2$/day. Fracture zones can have transmissivities of up to 10 to 15 $m^2$/day as can be seen from the GCS study that was done in 2008. These values are typical of the area and general geology.

**Aquifer Classification**

The general regional aquifer is classified as a minor aquifer, but of high importance to the local landowners as it is their only source of water.

**Groundwater zone**

The proposed mining area is situated on Karoo aquifers. Aquifer yields are typically low but groundwater is often considered to be vital as a water resource for domestic and stock watering. The perched aquifer is poorly developed in the Mining Right and may be regarded as the only possible primary type aquifer. This aquifer will only manifest during the wetter summer months when significant seepage in the shallow weathered zone occurs.

A number of dykes, sills and fracture zones exist within the mining areas. All significant groundwater strikes, indicating the presence of aquifers, occurred in fractures or fracture zones caused by faulting, bedding plane fractures or small discontinuity fractures developed on hard rock/soft rock interfaces or in unweathered bedrock. The aquifer yields are low, indicating poor fracture development, even in the dolerite sills. Information indicates that these fractures and the shallow parts of the dykes are water-bearing and that, with increasing depths, the dykes tend to be less permeable. The thicker dykes may also act as barriers to groundwater through-flow, resulting in the compartmentalization of the local groundwater systems. Based on the previous findings of the borehole drilled and tested, the following conclusion can be made:

- The borehole yields are generally low (< 0.1$m^3$/h);

- The aquifer permeability decreases with depth.

### *9.1.10.2* GROUNDWATER USE

Groundwater forms the sole source of water supply to the local landowners. Groundwater is abstracted through boreholes, windmill, and hand pumps for domestic and stock watering. Abstraction values could only be obtained from 26 boreholes, however a total of 42 boreholes are being actively used. Abstraction volumes from the 26 boreholes, identified during the hydrocensus, are calculated around 50 $m^3$ of water used daily. The average abstraction rate is 2 $m^3$ of water each day. If this average volume is applied to the 16 unknown abstraction volumes, then the total abstraction rate for the area is 82 $m^3$ of water daily.

The sub-catchments within which the study area falls measure approximately 1,083 $km^2$. Applying an average rainfall of 744 mm/annum, as obtained from the Ilima Colliery IWWMP (Cabanga Concepts, 2015), and an average recharge from rainfall of 3 %, it is calculated that the average annual recharge to the sub-catchments from rainfall is 24.17Mm$^3$ per annum (67 146 $m^3$/day). It can thus be calculated that less than 1 % of the recharged water is abstracted for private and stock watering use.

### *9.1.10.3* GROUNDWATER QUALITY

Ilima has an established groundwater monitoring programme in place. Forty-nine (49) groundwater monitoring points are included in Ilima Coal's groundwater monitoring programme (Table 27). Groundwater levels are recorded on a quarterly basis using an electronic water level meter.

The groundwater concentrations indicate seasonal fluctuations as rainfall recharge during the wet season replenishes local aquifers. Monitoring points GR GW8, GR GW15, ZV GW12 and TWF GW13 indicate potential perched aquifers which discharge water continuously. Figure 23 illustrates the location of the various groundwater monitoring points.

Table 27: Groundwater monitoring points.

| Locality | Locality Description | Coordinates WGS 84 ddd.ddddd |
|---|---|---|
| PA GW01 | Borehole situated at Wash plant area on Portion 3 or 7 of Paardeplaats | S26.06680° E30.17800° |
| PA GW02 | Borehole situated at Wash plant area on Portion 3 or 7 of Paardeplaats | S26.06670° E30.17790° |
| PA GW03 | Borehole situated at Wash plant area on Portion 3 or 7 of Paardeplaats | S26.05890° E30.16730° |
| PA GW04A | Borehole situated on Portion 2 of Paardeplaats. Mined Out - Area Rehabilitated | S26.03990° E30.17970° |
| PA GW04B | Borehole situated on Portion 2 of Paardeplaats. Mined Out - Area Rehabilitated | S26.04010° E30.17850° |
| PA GW05 | Borehole situated on Portion 2 of Paardeplaats. Mined Out - Area Rehabilitated | S26.04010° E30.17850° |
| GR GW06 | Borehole situated on Groenvallei – outside TZP4 stockpiles (Pump disconnected from borehole) | S26.03960° E30.16920° |
| GR GW07 | Fountain situated Portion 7 of Groenvallei | S26.04550° E30.17540° |

| Locality | Locality Description | Coordinates WGS 84 ddd.ddddd |
|---|---|---|
| GR GW08 | Fountain situated Portion 8 of Groenvallei | S26.05550° E30.13940° |
| GR GW09 | Borehole with pump in place situated on Portion 1 of Groenvallei | S26.07600° E30.16480° |
| GR GW10 | Borehole overflowing situated on Portion 1 of Groenvallei | S26.07420° E30.14890° |
| GR GW11 | Borehole with pump situated on Groenvallei 1 | S26.06720° E30.15450° |
| ZV GW12 | Fountain situated on Zandvoort | S26.03500° E30.16070° |
| TWF GW13 | Borehole situated on Twyfelaar | S26.01610° E30.17980° |
| GW14 | Borehole situated in the Droogvallei area | S26.09970° E30.16330° |
| GR GW15 | Fountain situated on Groenvallei | S26.05830° E30.14400° |
| GW16 | Borehole situated on Groenvallei. On private property – pump stolen. | S26.09210° E30.13320° |
| GW17 | Borehole situated on Paardeplaats | S26.06460° E30.17260° |
| PA GW18 | Fountain situated on Paardeplaats | S26.03930° E30.19010° |
| TWF GW19 | Fountain situated on Twyfelaar | S26.02139° E30.18729° |
| TWF GW20 | Borehole with pump situated on Twyfelaar | S26.00670° E30.18650° |
| TWF GW21 | Borehole with pump situated on Twyfelaar. Pump stolen – no access | S26.0247° E30.1994° |
| GR GW22 | Borehole situated on Groenvallei | S26.05339° E30.14219° |
| GR GW24 | Borehole situated on Groenvallei | S26.0868° E30.1645° |
| PA GW25 | Borehole situated on Paardeplaats | S26.04250° E30.18348° |
| GR GW26 | Borehole situated on Groenvallei – outside TZP stockpiles | S26.04097° E30.16672° |
| GR GW27 | Borehole/Windmill situated on Groenvallei 5 | S26.05730° E30.16020° |
| TWF GW27 | Borehole situated on Twyfelaar | S26.02640° E30.16784° |
| PA GW29 | Borehole situated on Paardeplaats at Co-disposal | S26.06570° E30.17506° |
| PA GW30 | Borehole situated on Paardeplaats at Co-disposal | S26.06580° E30.17482° |
| HA GW04 | Borehole situated on Haarlem 4 | S26.11680° E30.20767° |
| HA GW05 | Borehole situated on Haarlem 4 | S26.12020° E30.21233° |

| Locality | Locality Description | Coordinates WGS 84 ddd.ddddd |
|---|---|---|
| HA GW06 | Borehole situated on Haarlem 4 | S26.11830° E30.21586° |
| HA GW14 | Borehole situated on Haarlem 4 | S26.11570° E30.21598° |
| HA GW16 | Borehole situated on Haarlem/Appeldoorn boundary | S26.11800° E30.22230° |
| HA GW23 | Borehole situated on Haarlem | S26.11360° E30.22244° |
| HA GW28 | Borehole situated on Haarlem 3 | S26.12250° E30.19772° |
| AD 1 | Appeldoorn spring | S26.1331° E30.2248° |
| AD 2 | Appeldoorn spring | S26.1236° E30.2236° |
| AD 3 | Appeldoorn spring | S26.1258° E30.2262° |
| AD 4 | Appeldoorn spring | S26.1236° E30.2308° |
| AD 5 | Appeldoorn spring | S26.1294° E30.2277° |
| AD 6 | Appeldoorn spring | S26.1298° E30.2295° |
| AD 7 | Appeldoorn spring | S26.1354° E30.2361° |
| AD 8 | Appeldoorn spring | S26.1285° E30.2429° |
| AD 9 | Appeldoorn spring | S26.1230° E30.2472° |
| AD 10 | Appeldoorn spring | S26.1292° E30.2501° |
| AD 11 | Appeldoorn spring | S26.1393° E30.2485° |
| AD 12 | Appeldoorn spring | S26.1390° E30.2400° |

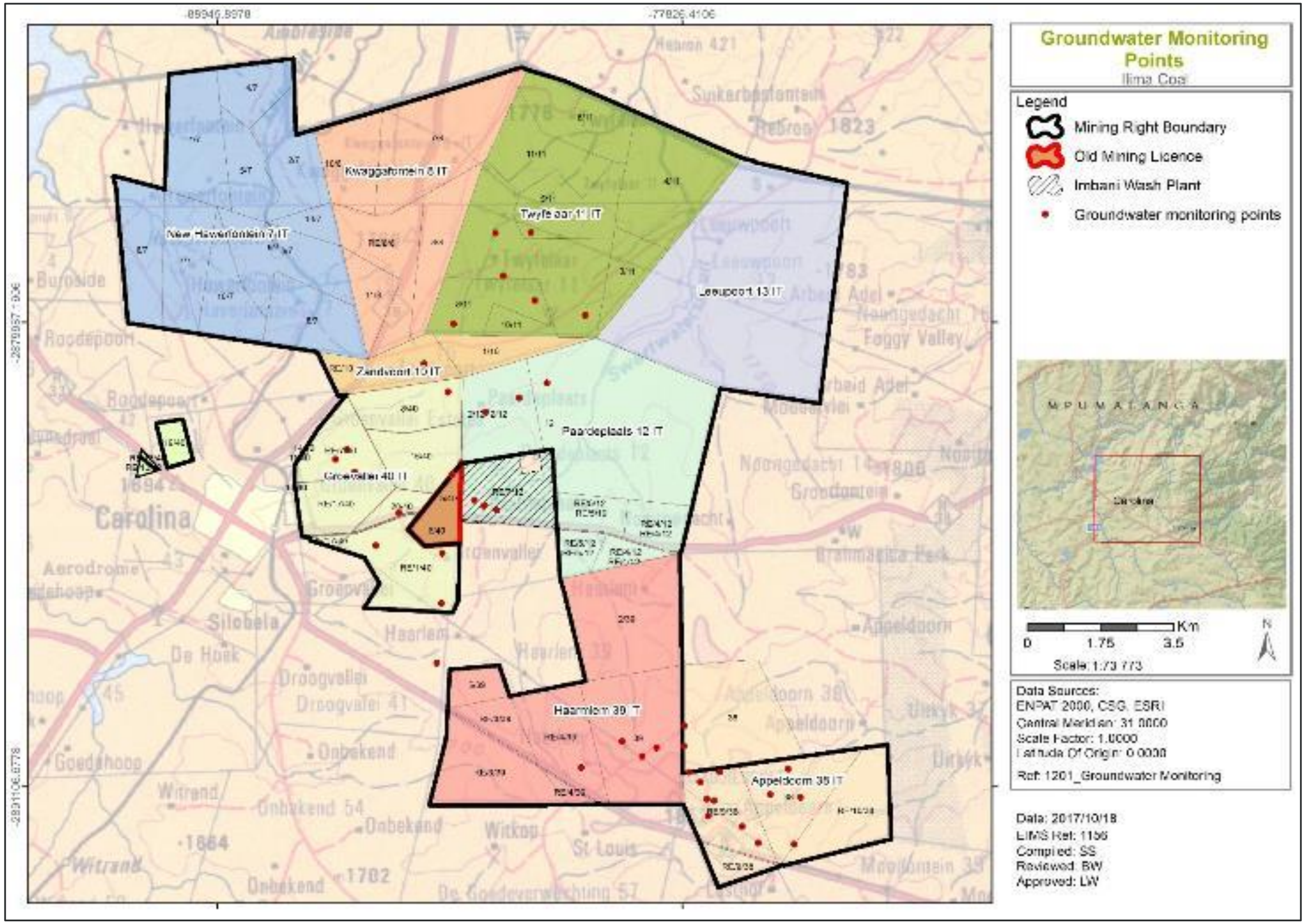



Figure 23: Groundwater monitoring points

**Paardeplaats Groundwater**

Groundwater from the Paardeplaats area indicate signs of coal mine pollution as several groundwater monitoring points recorded elevated element concentrations. High Sulphate, Aluminium, Iron and Manganese concentrations occur in the groundwater near the co-disposal facility (boreholes PA GW1, PA GW3, GW 17, PA GW29 and PA GW30). The pH concentrations of these monitoring localities fall outside the RQO limits; borehole PA GW29 has an average pH of 3.20.

Borehole PA GW29 demonstrated poor water quality with a low pH, and elevated Sulphate and heavy metals concentrations. Elevated Aluminium, Iron and Manganese concentrations are associated with the acidic environment, which causes dissolution of heavy metals. Coupled with an increasing Sulphate concentration, it can be assumed that AMD is currently occurring.

The remainder of the groundwater monitoring points (boreholes PA GW2 and PA GW25) recorded low element concentrations. The pH of borehole PA GW25 exceed the RQO limits, but is still within drinking water limits, and Manganese concentrations are elevated at borehole PA GW2, exceeding the SANS 241:2015 drinking water standards. These element concentrations are associated with natural conditions and the geology of the area.

**Twyfelaar, Kwaggafontein and Zandvoort Groundwater**

The groundwater quality associated with the Twyfelaar area is within acceptable water guilty limits, with low pH values (RQO limits), but still within drinking water limits, and no prominent signs of coal mine pollution. None of the element concentrations recorded at boreholes TWF GW13 and TWF GW19 exceeded the RQO limits, Livestock watering upper limit (1996) or the SANS 241:2015 drinking water standards.

The relatively low pH (between 6.0 and 6.5) recorded at boreholes ZV GW12, TWF GW20 and TWF GW27 may relate to the geology of the area, as the sum of the variables present is not sufficient to elevate the pH. Although the average pH of these monitoring localities exceeded the RQO limit for the reporting period, the pH is still neutral and complies with the SANS 241:2015 drinking water standards. Water quality or composition does not indicate coal mine pollution. Compared with the previous annual reporting period, these pH concentrations improved from acidic to neutral.

**Groenvallei 1 Groundwater**

Most element concentrations recorded for the 2016/ 2017 reporting period fell within the guideline limits. Borehole GW 14 exceeds the pH limit set by the RQO, however the pH is still neutral and there are no signs of elevated Sulphates or heavy metal concentrations. No signs of coal mine pollution were observed for any of the monitoring localities.

**Groenvallei 7 Groundwater**

Boreholes GR GW07 and GR GW15 recorded elevated Nitrate concentrations, exceeding the SANS 241:2015 drinking water standards. High Nitrate concentrations can potentially be attributed to blasting activities or other related anthropogenic activities.

Borehole GR GW08 recorded a low pH, with elevated Aluminium concentrations, however this can be ascribed to natural and background geological conditions as Sulphate concentrations remained normal.

Elevated Manganese concentrations of were recorded for boreholes GR GW22 and GR GW27, exceeding the SANS 241:2015 drinking water standards.

All groundwater monitoring points are located relatively close to historical mining activities. Boreholes GR GW01, GR GW02, GR GW03 and GR GW18 did not indicate any coal mining impacts (possible AMD, decant, low pH, high Sulphate) historically, or during the reporting period.

**Haarlem Groundwater**

The groundwater monitoring points downstream of the decant point (HA SW15) and previous mining activities (HA GW05, HA GW14 and HA GW28) indicated elevated concentrations of Sulphate and Manganese, however the pH remained neutral (within drinking water limits).

The pH of borehole HA GW28 exceeded the RQO limits, although it still fell within the drinking water limits. Further to these, elevated Sodium and Sulphate concentrations were recorded for this monitoring point.

**Appeldoorn (AD) Springs**

The AD Springs drain towards the Buffelspruit. They do not indicate signs of coal mine pollution as Sulphate concentrations measured within the prescribed RQO and drinking water limits. It was noted that the several of the monitoring localities indicate elevated Aluminium, Iron and Manganese concentrations, exceeding the SANS 241:2015 drinking water standards. It should be noted that monitoring localities AD2, AD9, AD10 and AD12 indicate high Aluminium and Iron concentrations.

#### *9.1.10.4* HYDROCENSUS

A hydrocensus was conducted across the prospecting right area by Future Flow cc, during the 2012 study. During the surveys they identified 113 boreholes and 34 springs (*Future Flow cc, 2012*) (Figure 24). The hydrocensus concentrated on identifying existing boreholes throughout the project area to enhance the knowledge of the groundwater systems and groundwater use.

Groundwater forms the sole source of water supply to the local landowners and is abstracted through boreholes, windmills, and hand pumps for domestic and stock watering use. The local aquifers are classified as minor aquifers, but of high importance to the local landowners as it is their only source of water. Surface water resources in the Carolina area are used for livestock watering, irrigation for crops and forestry and water supply for mining activities and domestic consumption.

It was possible to measure a groundwater level in 73 of the 113 identified boreholes. The remaining boreholes were inaccessible due to the equipment installed in the boreholes. The depth to groundwater level in general ranges between artesian (at or flowing out on surface) and 34 m below surface. Most of groundwater depths are recorded at less than 7 metres below surface (mbs).

Plotting the groundwater level elevation against topography normally indicates areas where external influences such as large-scale mine dewatering influences the groundwater concentrations. A 96% correlation was achieved between groundwater level depths and topographic elevation (*Future Flow cc, 2015*). From this it was concluded that the groundwater elevations mimic topography and is largely un-influenced by mining activities in the area.

Groundwater flow directions are directed towards the low-lying surface water channels. The groundwater gradient range between 1:300 in the high lying plateau areas, to 1:50 along the slopes around the streams (*Future Flow, May 2015*).

Abstraction values could be obtained from 26 of the 113 boreholes; however, a total of 42 boreholes were in use. Abstraction volumes from the 26 boreholes were approximately 50 $m^3$ per day. The average abstraction rate is 2 $m^3$ per day, per borehole. If this average volume is applied to the 16 unknown abstraction volumes then the total abstraction rate for the area is 82 $m^3$ per day (*Future Flow, May 2015*).

The local sub-catchments measure approximately 1,083 $km^2$. Applying an average rainfall of 744 mm/annum, as obtained from the IWWMP (*Cabanga Concepts, June 2014*), and an average recharge from rainfall of 3%, it is calculated that the average annual recharge to the sub-catchments from rainfall is 24.17M $m^3$ per annum (67,146 $m^3$/day). It can be calculated that less than 1% of the recharged water is abstracted for private and stock watering use (*Future Flow, May 2015*).

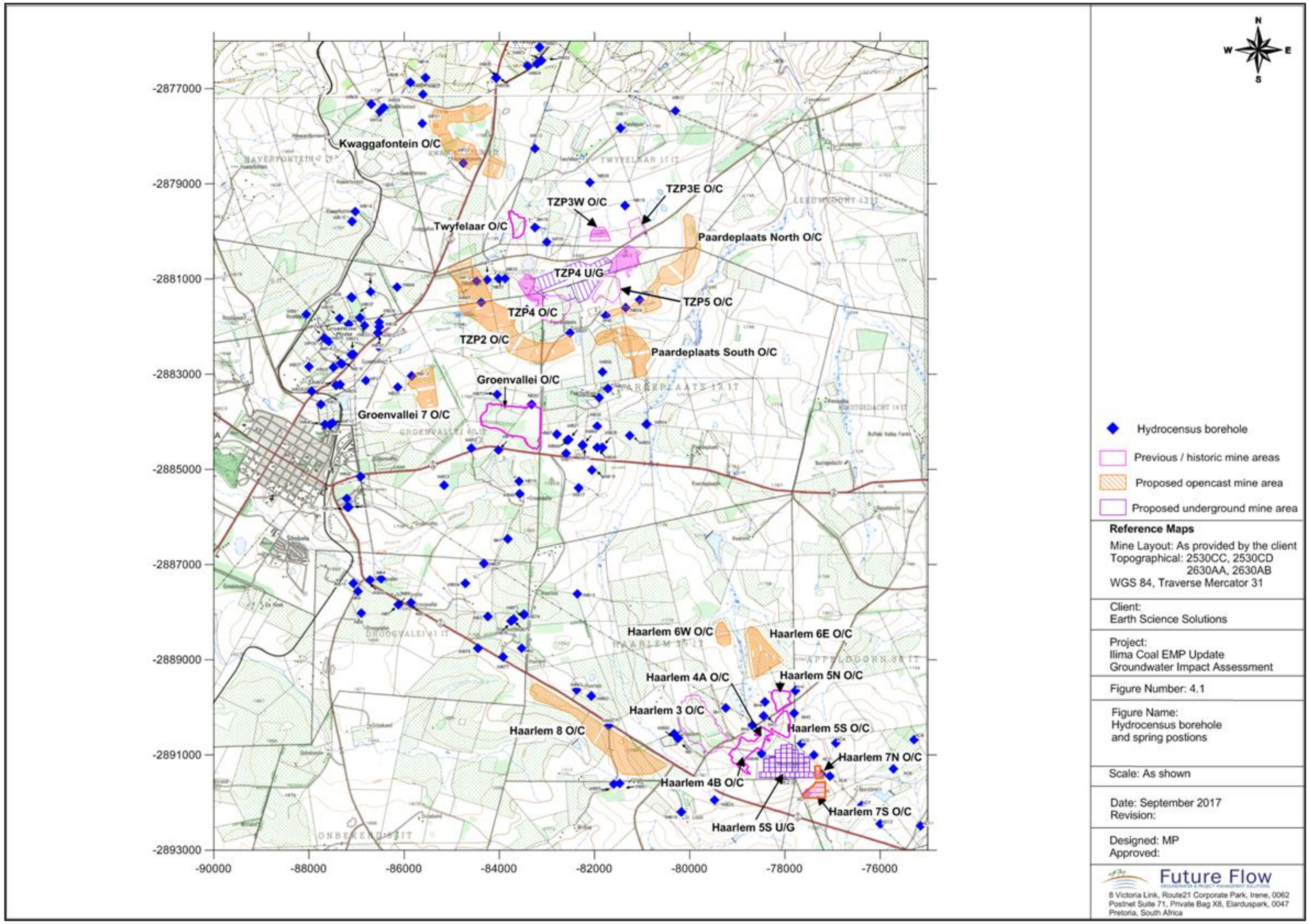



Figure 24: Hydrocensus borehole and spring positions.

## 9.1.11 WETLANDS

### *9.1.11.1* SENSITIVE AREAS SURVEY

Certain portions of the farm Appeldoorn 38 IT, which border the mining right area, have recently been declared as protected. The Chrissiesmeer Protected area, was declared on 22 January 2014 in Mpumalanga Provincial Government Gazette 2251, Notice No. 19 of 2014. The purposes for declaring the area a protected environment is to enable the owners of the land to take collective action to conserve biodiversity and to seek legal recognition for it; to protect the area if it is sensitive to development due to its biological diversity, natural characteristics, scenic and landscape value and the provision of environmental goods and services; to protect a specific ecosystem; and to ensure that the use of natural resources is sustainable.

The Chrissiesmeer IBA and associated protected areas support red data bird species such as Lesser Flamingo (*Phoeniconaias minor*), Greater Flamingo (*Phoenicopterus roseus*), Grey Crowned Crane (*Balearica regulorum*), Chestnut-banded Plover (*Charadrius pallidus*) and African Marsh Harrier (*Circus ranivorus*). The general wetlands also contain notable numbers of Great Crested Grebe (*Podiceps cristatus*), Yellow-billed Duck (*Anas undulata*), Cape Shoveler (*Anas smithii*), Southern Pochard (*Netta erythrophthalma*), Egyptian Goose (*Alopochen aegyptiaca*), Spur-winged Goose (*Plectropterus gambensis*), Red-knobbed Coot (*Fulica cristata*), Little Stint (*Calidris minuta*), Whitewinged Tern (*Chlidonias leucopterus*) and Pied Avocet (*Recurvirostra avosetta*). When the pans are waterlogged, total numbers regularly exceed 20 000 birds (Birdlife Africa, 2012). Although the Chrissiesmeer protected are does contain a variety of faunal and floral SSC, it is possible natural areas of that the Ilima Coal project site harbour the same species as they move along the wetland corridors.

A wetland delineation study was conducted by S.E.F. in September 2011 (Figure 26) and the sections below have been informed by this report and detail the findings of the study.

The Mining Right area wetlands are classified as National Freshwater Ecosystem Priority Areas (NFEPA), which are wetlands containing special features such as species of conservation concern or extensive peat wetlands. The wetlands identified on site have the following key sensitivities:

- Boesmanspruit catchment is identified as a Fish Support Area for threatened fish species (i.e. fish sanctuary, translocation, and/or relocation zone not in Present Ecological State Class A or B), in this case a specific genetic lineage of *Barbus anoplus* (Chubbyhead Barb);
- Swartspruit catchment is identified as a Freshwater Ecosystem Priority Area and accordingly needs to stay in a good condition (i.e. Present Ecological State Class A or B) to achieve national biodiversity goals and protect water resources for human use; and
- Buffelspruit catchment is identified as an upstream management catchment required to prevent the downstream degradation of Freshwater Ecosystem Priority Areas and Fish Support Areas.

The largest portion of the Mining Right is considered to be highly significant in terms of the Mpumalanga Biodiversity Conservation Plan with one area considered to be irreplaceable although this area consists of an existing rehabilitated mining area (Figure 25).

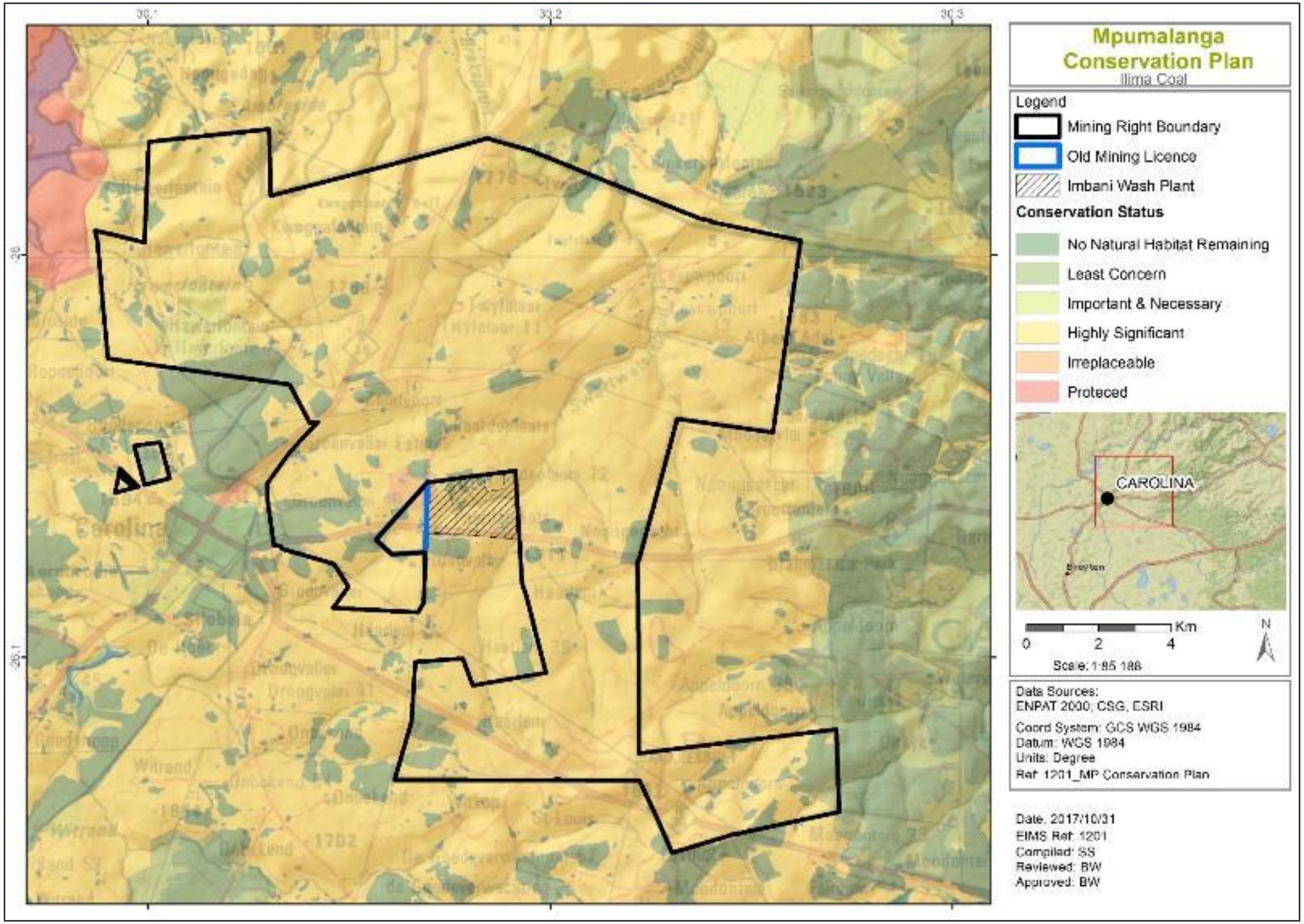



Figure 25: Mpumalanga Conservation Plan for the Mining Right.

Wetlands typically occur on the interface between aquatic and terrestrial habitats and therefore display a gradient of wetness – from permanent, to seasonal, to temporary zones of wetness - which is represented in their plant species composition, as well as their soil characteristics. It is important to take cognisance of the fact that not all wetlands have visible surface water. An area which has a high water table just below the surface of the soil is also a wetland, as well as a pan that only contains water for a few weeks during the year. Hydrophytes and hydric soils are subsequently used as the two main wetland indicators.

Hydro-geomorphic (HGM) units encompass three key elements:

- Geomorphic setting. This refers to the landform, its position in the landscape and how it evolved (e.g. through the deposition of river borne sediment);
- Water source. There are usually several sources, although their relative contributions will vary amongst wetlands, including precipitation, groundwater flow, stream flow, etc.; and
- Hydrodynamics, which refers to how water moves through the wetland.

Five different types of wetland areas were classified within the study area and were categorised HGM units A total of a 147 separate HGM units were identified and classified within the study area, and are presented in Figure 26. These included 11 valley bottom wetlands with a channel, 2 valley bottom wetlands without a channel, 45 hillslope seepage wetlands not feeding a watercourse, 80 hillslope seepage wetlands feeding a watercourse (including 25 valley head seepages) and 9 depression wetlands. Altogether, delineated wetlands occupy approximately 4,781 ha within the study area. Figure 27 presents the 2017 Soil Study land capability which additionally shows the extent of the wetland areas however this mapping is high level (mostly desktop) versus the ESS study.

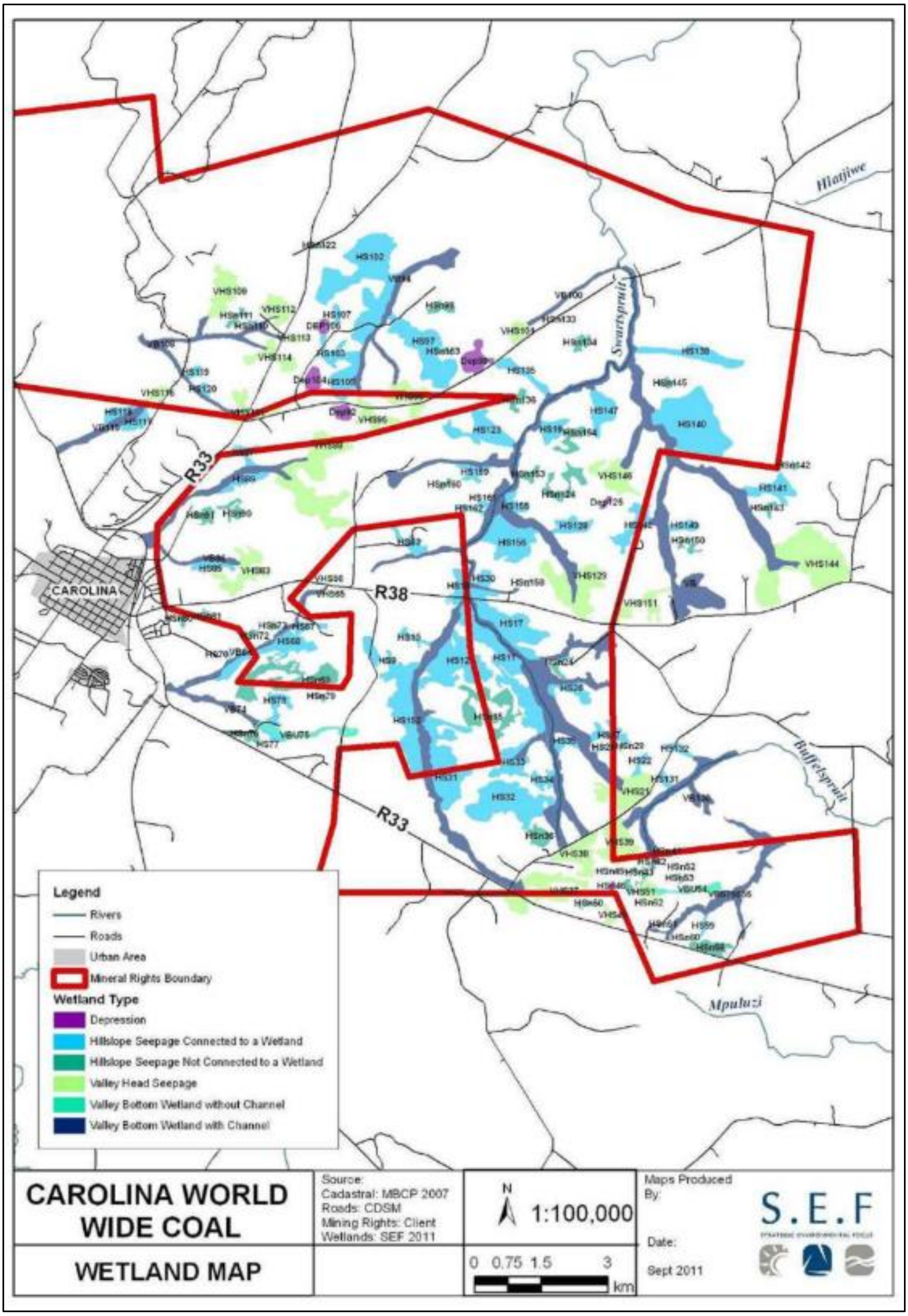



Figure 26: Identified Wetland types within the Mining Right (2011 Wetland Study).

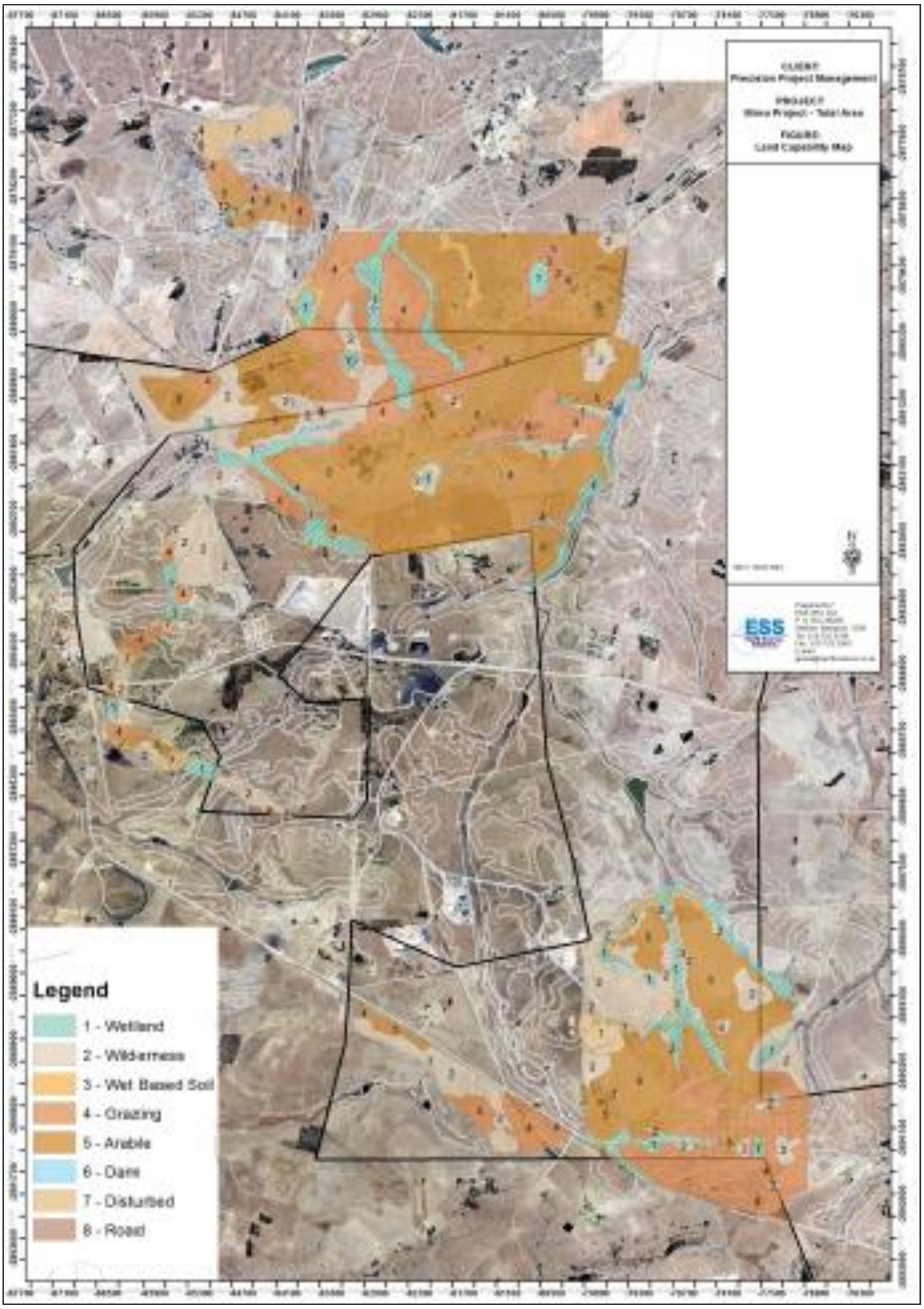



Figure 27: Land capability map depicting wetland areas (2017 Soil Study).

The wetland delineation study included a high-level assessment on the Present Ecological State (PES) of the area. This study indicated that the PES for the various wetlands varied and included examples of all the possible PES categories. Figure 28 below indicates the PES score for selected wetlands within the mining right area, whilst Table 28 interprets the ratings thereof.

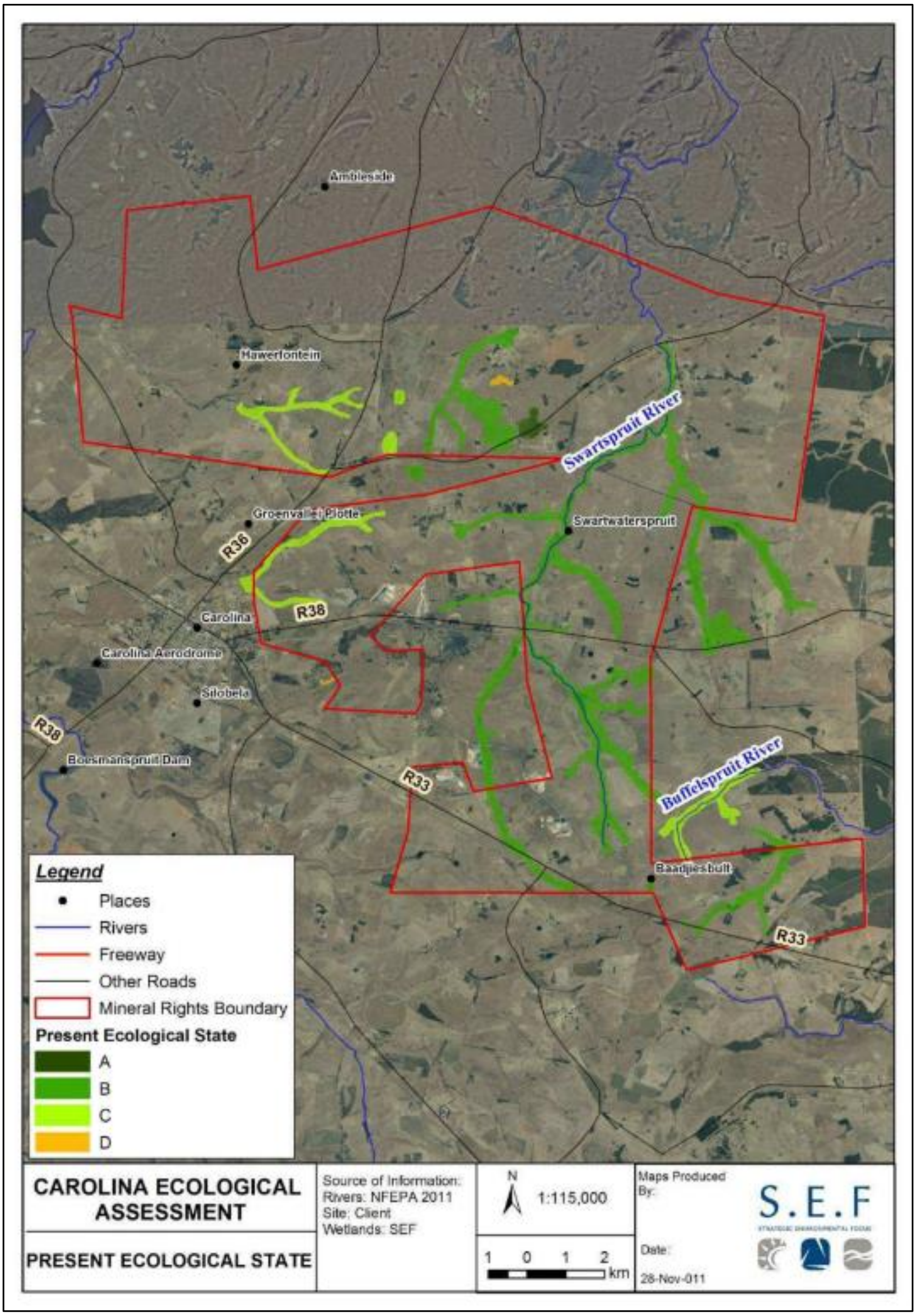



Figure 28: Present Ecological State of wetland within the Mining Right.

Table 28: Interpretation of PES status category.

| Class | Ecological category | Description |
|---|---|---|
| **A** | Natural | Unmodified state - Un-impacted state, conditions natural |

| Class | Ecological category | Description |
|---|---|---|
| **B** | Good | Largely natural - Few modifications, mostly natural |
| **C** | Fair | Moderately modified - Community modifications, some impairment of river health |
| **D** | Poor | Largely modified - Distinct impairment of river health, impacted state |
| **E** | Seriously modified | Seriously modified - Most community characteristics modified, seriously impacted state |
| **F** | Critically modified | Critically modified - Extremely low species diversity and abundance, unaccepted modified state |

From a preliminary perspective, PES for wetlands within the Mining Right varied greatly, with examples of all possible PES categories observed within the Mining Right. The PES of most of the valley bottom wetlands are classified as PES category C, moderately modified, with isolated hillslope seepages showing more variance, a likely result of exposure to divergent management regimes on different properties. Heavy grazing regimes and cultivation practices within wetland catchments was perceived to be the biggest modifiers of hydrology and water quality. From a geomorphic perspective, the largest impacts within wetlands was as a result of placement of impoundments (dams) throughout valley bottom systems as well as within hillslope seepages. The concentrated outlets / overflows from impoundments often cause unchanneled valley bottoms to become incised, changing them to channelled valley bottom systems with accompanied changes in wetland functionality. From a preliminary perspective, most of the valley bottom systems seems to have reached some form of equilibrium again with erosion processes stabilised to some extent, probably as a result of deposition of sediments mobilised from sheet erosion within heavily grazed or cultivated areas.

#### *9.1.11.2* RESOURCE CLASS AND RIVER HEALTH

The mine has an established bi-annual biomonitoring program in place. The latest survey was conducted in June 2017, at the sampling locations indicated in Figure 29 below. The sites were selected according to previous biomonitoring studies, and additional sites were included in the survey to effectively monitor the aquatic systems in the associated. Site TS1 is located on a tributary of the Swartspruit, upstream of the Ilima project area, Site SS0 is located downstream of TS1, before its confluence with the Swartspruit and Site SS1 is located on a tributary of the Swartspruit prior to their confluence. SS3 is located on the mid reaches of the Swartspruit downstream of mining activities. Site TS2 is located on the Dassiespruit which flows into the Swartspruit system. SS4 is located on the lower reaches of the Swartspruit before the confluence with the Inkomati River. Site. BS1 is located on the Buffelspruit, approximately 9 km from its origin, with Site TB1 characterised as a valley bottom wetland system and TB2 is characterised a channelized system due to bank and instream erosion. Site TB3 is located downstream of TB1 and the mining area.


Figure 29: Biomonitoring sample locations in comparison to the catchment and water management areas (The Biodiversity Company, 2017)

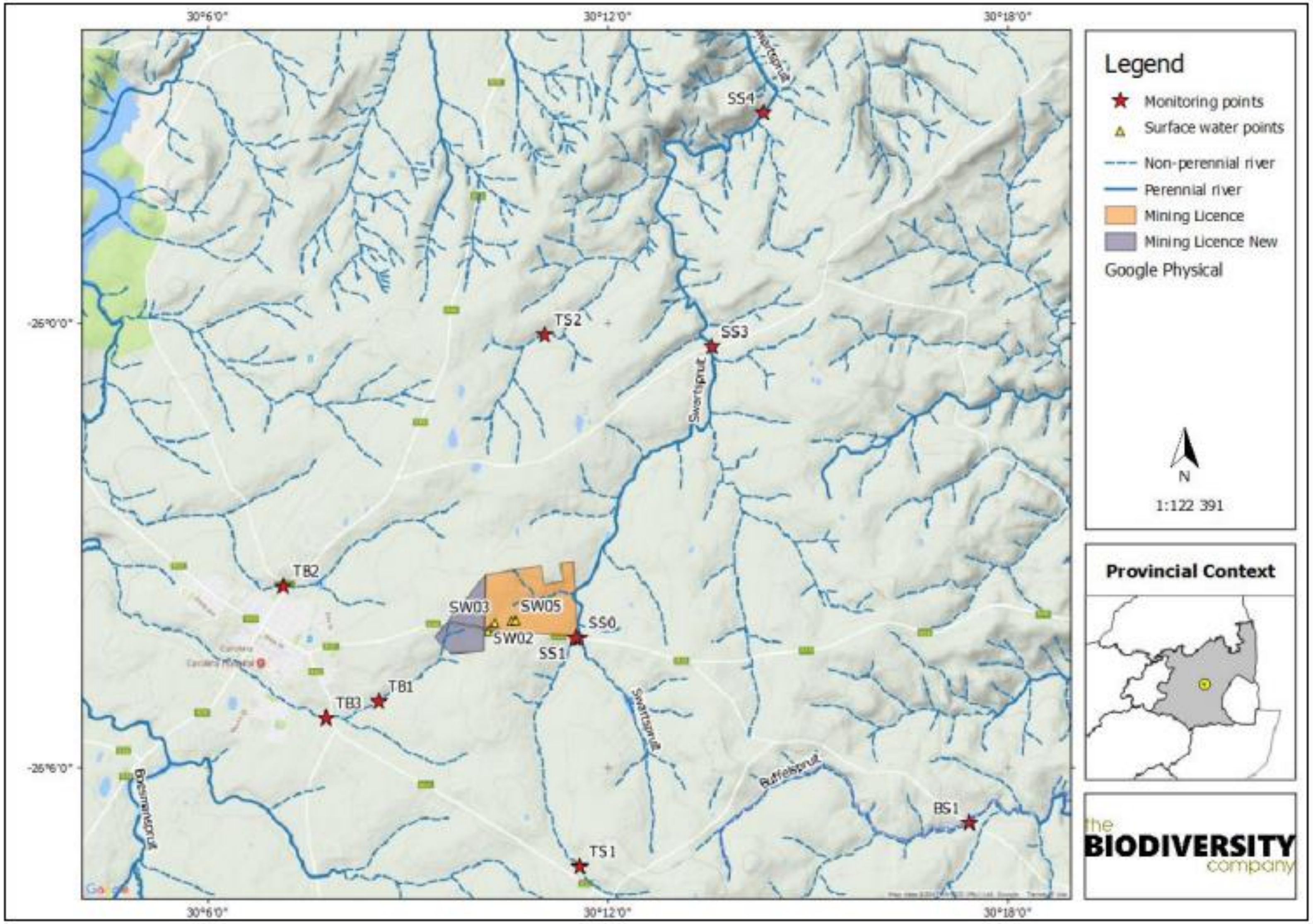



Figure 30: Sampling points for the 2016/2017 Ilima Biomonitoring project (SS0 located adjacent to SS1)

The main findings of the recent biomonitoring survey are summarized below.

The catchment is in a moderately modified state. Pressures from agricultural activity, urban development and subsequent sewage treatment works, old and current mining operations, have resulted in impacts to instream and riparian habitat, and water quality (flow, bed and channel modifications) within the reach, and have further compromised water quality through input of nutrients and pollutants in the reach. These water resources are under constant pressure from current activities, and potential pressure from development of agricultural and mining activities within the province are set to further impair water resources within the Water Management Area.

According to the 2016 biomonitoring survey, the tributaries (TS1, SS1 and TS2) draining into the Swartspruit were in a modified state. Weak organic pollutants occur within these systems according to diatom assemblages (medium term indicator). There was however, a moderate amount of pollution entering the Swartspruit at site SS0. The diatom community at site SS0 showed no preference in terms of trophic status and a preference for low salinity and nitrogen, and high levels of oxygen. Diatom assemblages at site TS1 were mesotrophic, showing a preference for very low nitrogen, low salinity levels and high oxygen levels. This was potentially due to weak eutrophication of this system. Diatom assemblages at site SS1 were eutrophic, showing a preference for low nitrogen and salinity levels and high oxygen levels. The in-situ water quality (short term indicator) modification and diatom assemblage at site TS1 is likely due to agricultural, livestock activities upstream of the site, while sites SS1 and SS0 are likely due to a combination agricultural, livestock and mining activities, as these activities occur adjacent to these sites.

According to macroinvertebrate communities sampled at sites SS3 and SS4 (Swartspruit), BS1 (Dassiespruit) and TS2 (Buffelspruit), the sampled rivers were in a stable state despite varying levels of modification. A good diversity of aquatic macroinvertebrates considered moderately sensitive to pollution were present. The SASS5 results show that the water quality has not been influenced by upstream activities.

The TB1 and TB3 tributary draining west into the Boesmanspruit was considered good, with weak pollutants or eutrophication occurring within these systems. The TB2 tributary was considered moderately modified, with weak / moderate pollutants occurring within this system. Sites TB1, TB2 and TB3 presented eutrophic diatom assemblages, indicating a preference for low salinity, nitrogen, and high levels of oxygen, indicating slightly impacted water quality or weak pollution. This is potentially due to weak eutrophication of the systems. According to the diatom assessment, the water quality at the Ilima biomonitoring sites were not impacted by heavy metals and/or pesticides to an extent that there was significant biological response at a primary producer level, even though sites varied from no pollution / weak pollution.

Results from the in-situ water quality analysis indicated abnormal dissolved oxygen conditions at sites SS0, SS1 and TB2. The slight fluctuations in water quality were attributed to natural fluctuations within the wetland systems, as dissolved oxygen is heavily dependent on metabolic processes within the wetland system. The diatoms assemblages indicate eutrophication and likely the reason for low dissolved oxygen. Potential chemical oxygen demand arising from agricultural runoff and mining activities is possible, however the systems were in a relatively stable state and no marked fluctuations were observed.

Ex situ chemical analyses of the Ilima catchment area showed elevated Aluminium and Iron levels at majority of the tested sites, while site TS2 had elevated manganese. These parameters need to be closely monitored to avoid toxicity to aquatic biota and environmental degradation of the aquatic areas. It is important to note that the diatom assessment indicated some level of eutrophication, however, the ex situ water quality results shows low ammonia, nitrogen, and phosphate levels within the associated aquatic systems. This highlights the need for medium term indicators such as diatoms for effective biomonitoring. Site TS1 occurs upstream of anthropogenic activities, indicating high background levels of aluminium arising from geological features. However, sites located downstream of mining activities, such as TB3, SS0, and SS3 should be monitored for increasing ex situ water quality levels.

Toxicity screening was conducted on four trophic levels for four sites, BS1, SS0, TS2, and TB2. Samples were considered Limited to Not Acutely Toxic.

The aquatic systems associated with the Ilima project area are in a moderately modified but stable state with modifications to water quality observed. Based on the report findings there was no apparent negative effect on aquatic ecosystems stemming from Ilima Colliery operations. The weak pollution and eutrophication may be attributed to a combination of agricultural and non-Ilima Colliery related mining activities present within the project area catchment.

It is recommended that diatom monitoring continue as they provide good insight into specific pollutants and the level of eutrophication within the systems.

### 9.1.12 CULTURAL AND HERITAGE RESOURCES

A heritage study was conducted by professional archaeological consultants in 2004 (refer to Appendix I1) to identify all heritage sites that occur in the proposed mining areas and document and assess their importance within local, provincial and national context. In 2013. A follow-up archaeological study was undertaken (Appendix I2) and an additional heritage study was undertaken in 2015 for Zandvoort (Appendix I3). As Kwaggafontein was not included in the previous heritage studies, a heritage study was conducted in 2017 and the results thereof are included in this report (Appendix I4). Palaeontological studies were conducted on Kwaggafontein and Zandvoort in 2017 (Appendix I5). A 2017 heritage study and palaeontological study has been conducted for this amendment application (Appendix I6).

Cultural and heritage resources include graves, cemeteries, Palaeolithic features and structures that are more than 60 years old. It is of great importance to identify these features prior to the proposed mining activities to ensure that they are correctly protected thereby attempting to prevent disturbance or damage to the features.

The province of Mpumalanga is known to be rich in archaeological sites that tell the story of humans and their predecessors in the region going back some 1.7 million years (Delius and Hay, 2009). The archaeological history of the area can broadly be divided into a Stone Age, Iron Age and Historic Period. Both the Stone and Iron Ages form part of what is referred to as the Pre-Colonial Period (Prehistoric Period) whereas the Historic Period is referred to as the Colonial Period. The archaeological and historical overview of the study area and surrounding landscape is summarised in a chronological order in Table 29 below.

**Table 29: Archaeological and Historical Overview of the Study Area and Surrounding Landscape**

| DATE | DESCRIPTION |
|---|---|
| 2.5 million to 250 000 years ago | The Earlier Stone Age is the first and oldest phase identified in South Africa's archaeological history and comprises two technological phases. The earliest of these is known as Oldowan and is associated with crude flakes and hammer stones. It dates to approximately 2 million years ago. The second technological phase is the Acheulian and comprises more refined and better made stone artefacts such as the cleaver and bifacial hand axe. The Acheulian dates back to approximately 1.5 million years ago.<br><br>No Early Stone Age sites are known from the study area or direct vicinity. This is more than likely rather due to lack of research focus in this area than an absence of such sites. |
| 250 000 to 40 000 years ago | The Middle Stone Age is the second oldest phase identified in South Africa's archaeological history. This phase is associated with flakes, points and blades manufactured by means of the so-called 'prepared core' technique.<br><br>No Middle Stone Age sites are known from the study area or direct vicinity. This is more than likely rather due to lack of research focus in this area than an absence of such sites. |
| 40 000 years ago to the historic past | The Later Stone Age is the third archaeological phase identified and is associated with an abundance of very small artefacts known as microliths.<br><br>Later Stone Age sites, including rock paintings, are known from the farm Groenvlei in localities roughly 5 km east of Carolina (Van Niekerk, 1984) (Bergh, 1999). The farm Groenvlei (or Groenvallei) is located adjacent to and directly south of Zandvoort and within the Ilima Colliery area. |
| AD 280 – AD 450 | The earliest phase in the Iron Age history of Southern African is known as the Early Iron Age. According to the distribution maps published by Huffman (2007) the only possible presence of Early Iron Age sites in the study area and surrounding landscape would be in the form of the so-called Silver Leaves facies of the Kwale Branch of the Urewe Tradition. This facies is dated to between AD 280 and AD 450. The key features on the decorated ceramics of |

| DATE | DESCRIPTION |
|---|---|
| | the Silver Leaves facies comprise multiple facets in the first position (Huffman, 2007). |
| AD 1650 – AD 1840 | The second phase in the Iron Age history of the study area and surrounding landscape is in the form of the Marateng facies of the Moloko Branch of the Urewe Tradition. The key features in the decorated ceramics of the Marateng facies are incised arcades on upper shoulder separating black and red (Huffman, 2007). |
| c. 1800 | At the time a group of people known as the Phuthing were living in the wider surroundings of the present study area (Bergh, 1999). According to this author the Phuthing were at the time living in the watershed between the upper reaches of the Vaal and Olifants Rivers. |
| c. 1821 | Across the Highveld this period was characterised by warfare and unrest. Known as the Mfecane, these years of upheaval originated primarily in the migration of three Nguni groups from present day Kwazulu-Natal into the present day Free State, North West, Gauteng and Mpumalanga as a result of the conquests of the Zulu under King Shaka. The three Nguni groups were the Hlubi of Mpangazitha, the Ngwane of Matiwane and the Khumalo Ndebele (Matabele) of Mzilikazi. Only the latter group is of relevance to the present study area and surroundings.<br><br>The Khumalo Ndebele left present day Kwazulu Natal and moved through the general vicinity of the present study area. In this general area they attacked the Phuthing who fled southward across the Vaal River (Bergh, 1999). |
| 1836 – 1850 | Although the first Voortrekker parties started crossing over the Vaal River in 1836, the years 1839 to 1840 saw the first widespread settlement of Voortrekkers north of the Vaal River in an area which encompasses the south-eastern end of the North West Province and the western end of Gauteng. Early towns such as Klerksdorp, Potchefstroom, Rustenburg and Pretoria were all included in this first settlement area. Between 1841 and 1850 an expansion of settlement took place which included present day towns of Bronkhorstspruit in the east, Thabazimbi in the north and Rooigrond in the west (Bergh, 1999). |
| 1845 – 1864 | The district of Lydenburg was established in 1845 and the study area fell within this district (Bergh, 1999). It can be expected that the general |

| DATE | DESCRIPTION |
|---|---|
| | surroundings of the study area would have increasingly being settled by Voortrekkers after the establishment of this district.<br><br>The permanent settlement of white farmers in the general vicinity of the study area would have resulted in the proclamation of individual farms and the establishment of permanent farmsteads. Features that can typically be associated with early farming history of the area include farm dwellings, sheds, rectangular stone kraals, canals, farm labourer accommodation and cemeteries.<br><br>While very few heritage sites associated with the very first establishment of white farmers in the study area would likely still be found, a number of farmsteads dating from the 1880s and 1890s are likely still in existence in the general vicinity of the study area.<br><br>The other sites often associated with these early farms are graves and cemeteries for both white farmers and black farm labourers. A large number of such cemeteries are located in the general vicinity of the study area. |
| 1872 - 1894 | During the early 1870s the general vicinity of Witbank was visited by a geologist from Eastern Europe Woolf Harris. During his visit Harris identified coal in the Van Dyksdrift area. He is also believed to have started the Maggie's Mine the following year. Following on these discoveries and events, a number of small coal mining operations were started in the general vicinity of Witbank as well. By 1889 there were four coal mines in the Witbank area, namely Brugspruit Adit, Maggie's Mine, Steenkoolspruit and Douglas (Falconer, 1990).<br><br>No coal mines are known from the Carolina area at this early point in time. |
| 26 October 1882 | The district of Ermelo was proclaimed (Bergh, 1999). The study area would now fall within this district for the next 11 years. |
| 16 June 1886 | The town of Carolina was officially proclaimed on this day (Myburgh, 1956) and was proclaimed on the farms Groenvlei and Goedehoop owned by Cornelius Johannes Coetzee. The name of the town is in honour of Coetzee's wife namely Magdalena Carolina Smit. |

| DATE | DESCRIPTION |
|---|---|
| 21 December 1893 | The district of Carolina was established on this day (Bergh, 1999). The study area now fell within this district. It would remain in this district for at least the next 100 years. |
| 1899 - 1902 | The South African War wreaked havoc across Southern Africa during this time. Although no record for any battles or skirmishes for the study area and its immediate surroundings could be located, a number of skirmishes and battles did take place in the surrounding landscape. On 14 August 1900 members of the Canadian force known as Stratchcona's Horse were about to occupy Carolina when they were fired upon by 14 Boers under the command of General Tobias Smuts. The skirmish took place in Dorp Street (Van der Westhuizen & Van der Westhuizen 2000) and the scene of the skirmish is located roughly 4 km south west of Zandvoort. Furthermore, on 7 November 1900, a battle took place at Leliefontein (the battle is also referred to as Witkloof). The farm Leliefontein is located roughly 10 km west by northwest of the present study area. Two senior Boer commanders at the battle, namely General Joachim Fourie and Commandant Hendrik Prinsloo were killed in a fatal frontal attack on a strong British position. Twenty-seven years after the battle, on 7 November 1927, General Smith-Dorrien, the British commander at the battle, erected a memorial on the battlefield in honour of Fourie and Prinsloo. The memorial was designed and built with funds raised from the public in Great Britain (Van der Westhuizen & Van der Westhuizen 2000). |

Sensitive heritage resources which were identified by the Heritage specialist during the 2017 study are shown in Figure 31 to Figure 33 below.

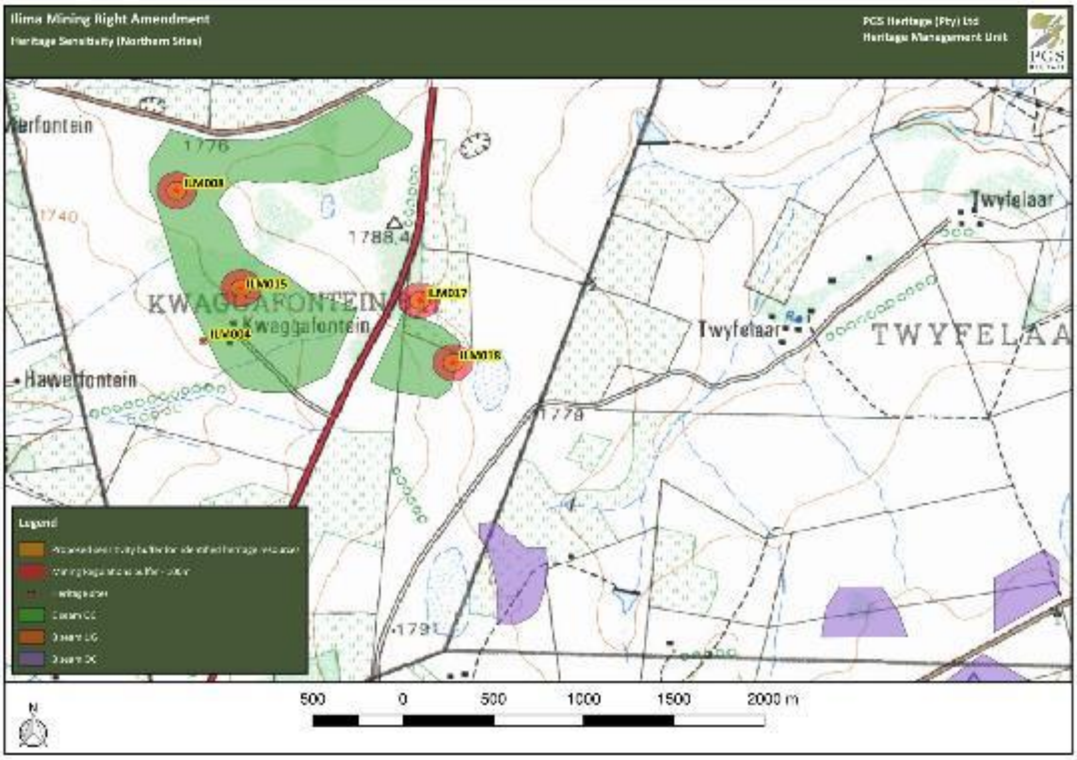



Figure 31 - Proposed management buffers based on heritage sensitivities of the resources identified – northern section.

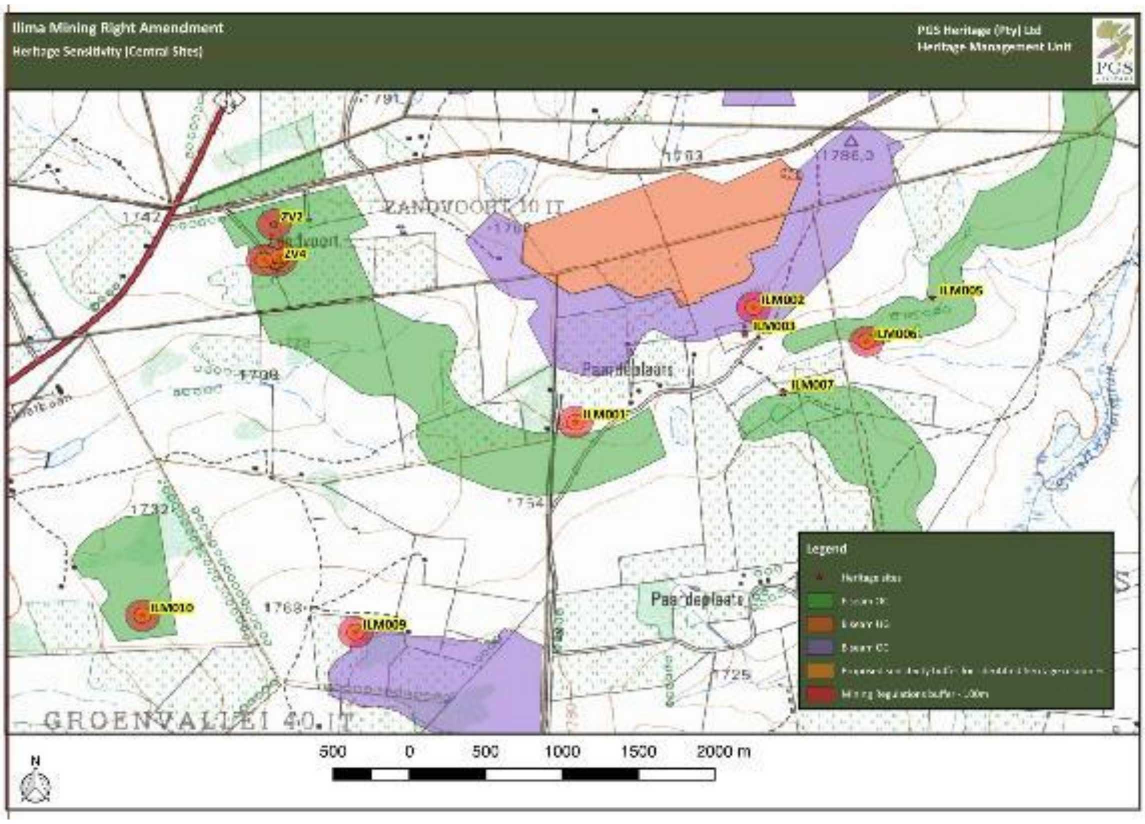



Figure 32 - Proposed management buffers based on heritage sensitivities of the resources identified – central section.

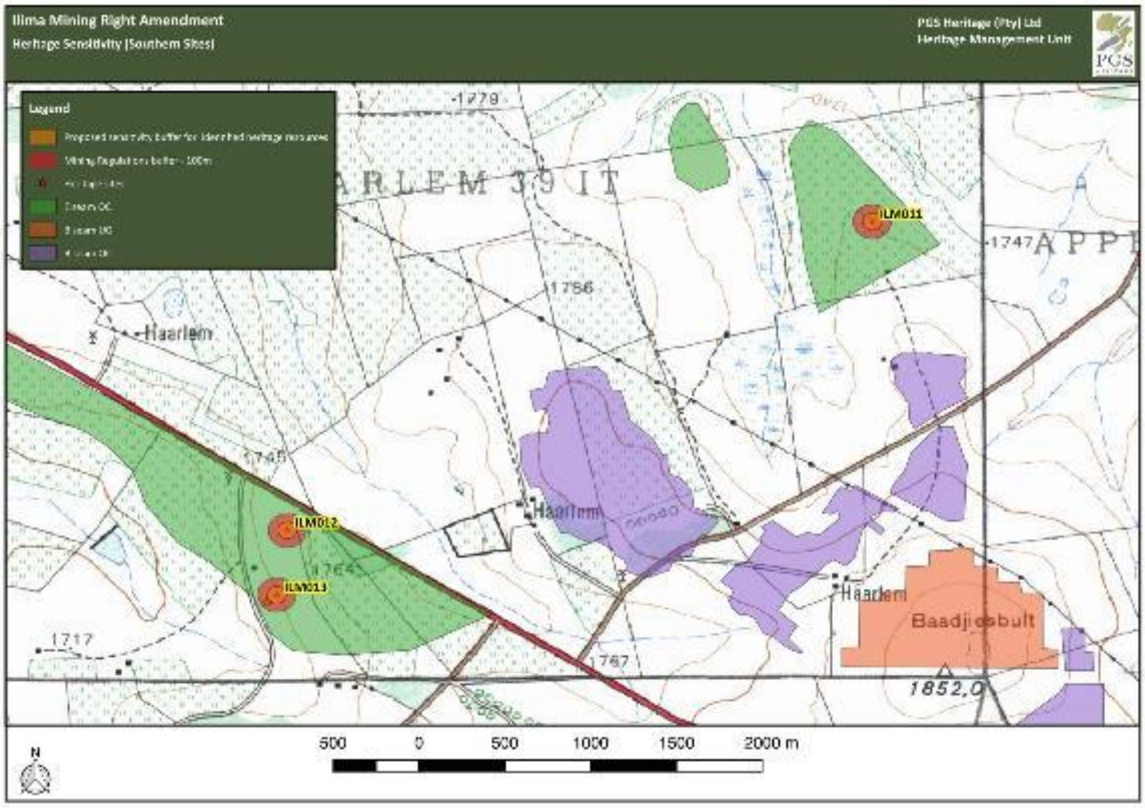



Figure 33 - Proposed management buffers based on heritage sensitivities of the resources identified – southern section

### *9.1.12.1* PALAEONTOLOGY

The proposed consolidation footprint of the Ilima Colliery is entirely underlain by sedimentary rocks of the Permo-Carboniferous Dwyka Group; Permian aged Vryheid Formation, (Ecca Group, Karoo Supergroup); Jurassic aged Dolerite (Karoo Supergroup) and Quaternary superficial deposits as topsoil. The Permo-Carboniferous Dwyka Group forms the lowermost and oldest deposit in the Karoo Supergroup. These deposits were deposited in a cold, glacially-dominated environment which occurred when South Africa lay beneath a massive ice sheet. Track ways, coprolites (fossilized faeces), body fossils of marine fish, gastropods and invertebrates have been recovered as well as fossil plants including fossilized leaves, wood, spores and pollens. The rocks of the Dwyka are of low palaeontological sensitivity as fossil assemblages is uncommon. The Vryheid Formation is well-known for its trace fossil assemblages of the non-marine *Mermia* Ichnofacies, palaeoniscoid fish, small crustaceans, insects, trace fossils track ways, organic-walled spores and pollens as well as petrified wood. The mesosaurid reptile, *Mesosaurus* may also be present in the development site. The sedimentary rocks of the Vryheid Formation have a very high fossiliferous potential and thus a very high palaeontological sensitivity. The Dolerite of the Jurassic has a very low Palaeontological Sensitivity as these rocks are unfossiliferous. The fossil assemblages of the Quaternary deposits (low palaeontological sensitivity) are usually rare, low in diversity, and occur over a wide geographic area. The fossil heritage of Quaternary deposits have been neglected in the past, although they sometimes contain important fossil biotas.

A palaeontological study of both Zandvoort and Kwaggafontein was undertaken in April 2017. During the field survey of the proposed Zandvoort development footprint no fossils were found. Similarly, no fossils were found during the thorough field survey of the Kwaggafontein development footprint area. Mining on Kwaggafontein, thus far, has also not recovered any fossils. However, the palaeontological specialist indicated that should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.

The September 2017, a field survey of the proposed development footprint within the Ilima Mining Right boundary did not recover any fossils. Mining thus far, has also not recovered any fossils. For this reason, a moderate palaeontological sensitivity is allocated to the development footprint. Regardless of the sparse and sporadic occurrence of fossils in this biozone a single fossil can have a huge scientific importance as many fossil taxa are known from a single fossil. Therefore, it is considered that the construction and operation of the development footprint and associated infrastructure is appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area.

#### *9.1.12.2* HERITAGE ASSESSMENTS

Twenty-four (24) heritage features were identified during the 2004 heritage assessment. These comprise twelve (12) potential cemeteries and grave sites, five (5) historical farmsteads, and seven (7) historical structures. Several of these heritage features were noted to fall within the proposed development footprints. A verification of the previously undertaken mining activities and the locations of these heritage features must be conducted in order to verify whether any of the identified heritage features have been disturbed by mining activities. An additional six (6) cemeteries and grave sites were assessed during the 2013 heritage assessment, two of which had been previously identified during the 2004 assessment.

The 2015 heritage assessment for Zandvoort in 2015 identified a total of seven heritage sites. Four of these form part of a single farmstead, namely a farm dwelling, rondavel, garage and shed. The other three sites include one cemetery, one possible informal grave and an old farm dipping structure.

At the time of the heritage study undertaken on Kwaggafontein in 2017, the majority of the Kwaggafontein site had already been exposed and opencast mining was in process, therefore, it was not possible to conduct an assessment of the heritage remains. However, satellite imagery which was observed before the site visit suggests that there were no significant buildings or stone-walls present in the area. A small cemetery is located just outside the construction area exists. It has been clearly marked and fenced off as required by SAHRA. The fenced off area is about 20x25 m and contains approximately 16 graves.

The September 2017 heritage study undertaken for this report, identified a total of 23 heritage sites. These include 5 cemeteries (ILM001, ILM002, ILM008, ILM010, and which have fencing or berms enclosing them, 3 historic grave sites (ZV02, ILM006 and ILM011 unprotected), 4 informal cemeteries (ILM 012, ILM013, ILM017 and ILM018 unprotected), 2 possible graves (ILM009 and ILM016), 9 structures ILM003, ILM004, ILM007, ILM014, ILM015, ZV04-07 and one possible site of mining infrastructure ILM005. Many of the sites have already been exposed and opencast mining is currently in process. Therefore, assessment of those sites for heritage remains was not possible. Satellite imagery which was observed before the site visit suggests that there were no significant buildings or stone-walls present in these areas. The location of these heritage sites is indicated in Figure 34 to Figure 36 below.

A full description of the identified heritage features is included in the specialist studies attached in Appendix I.

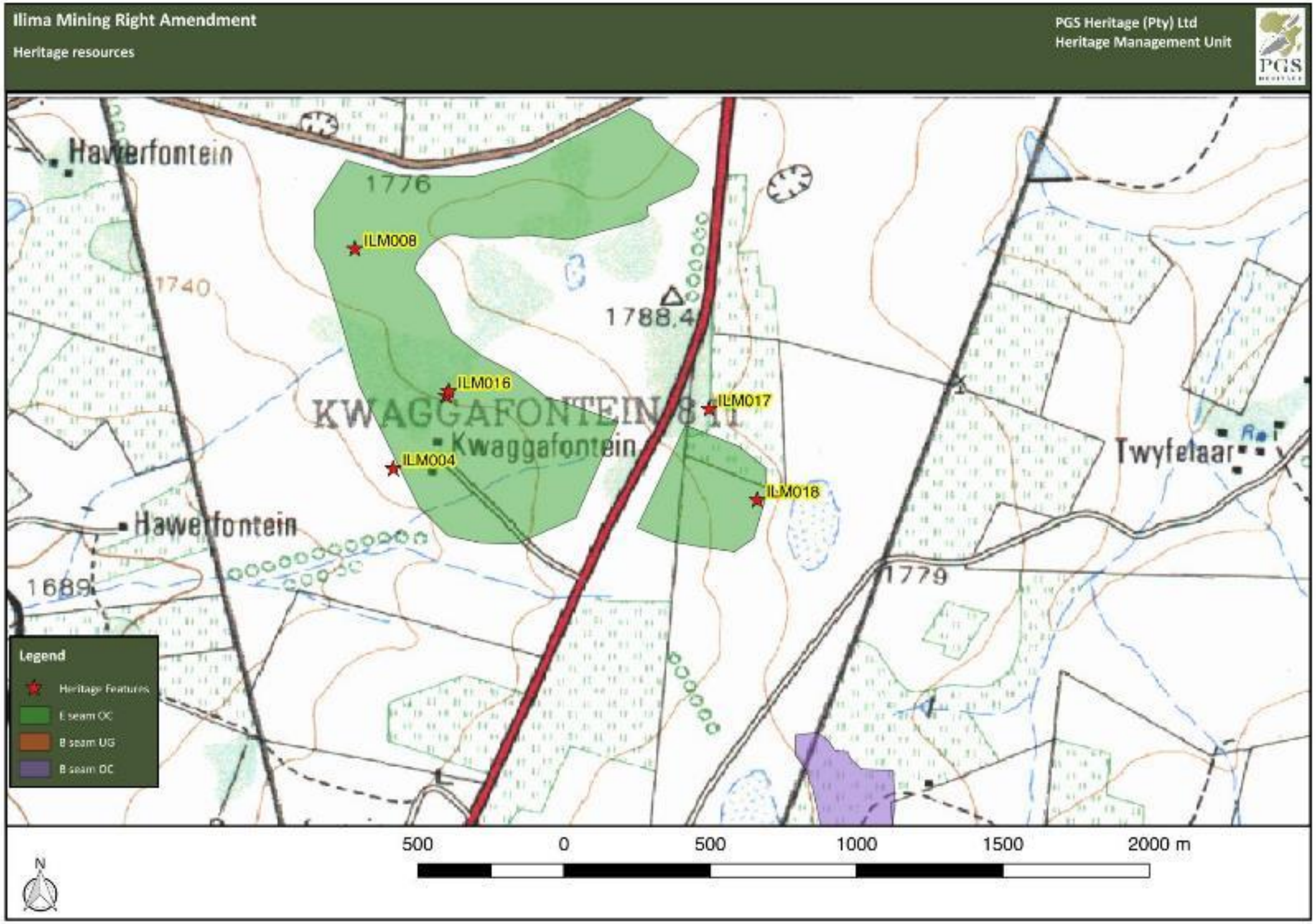



Figure 34: Located heritage features (northern section).

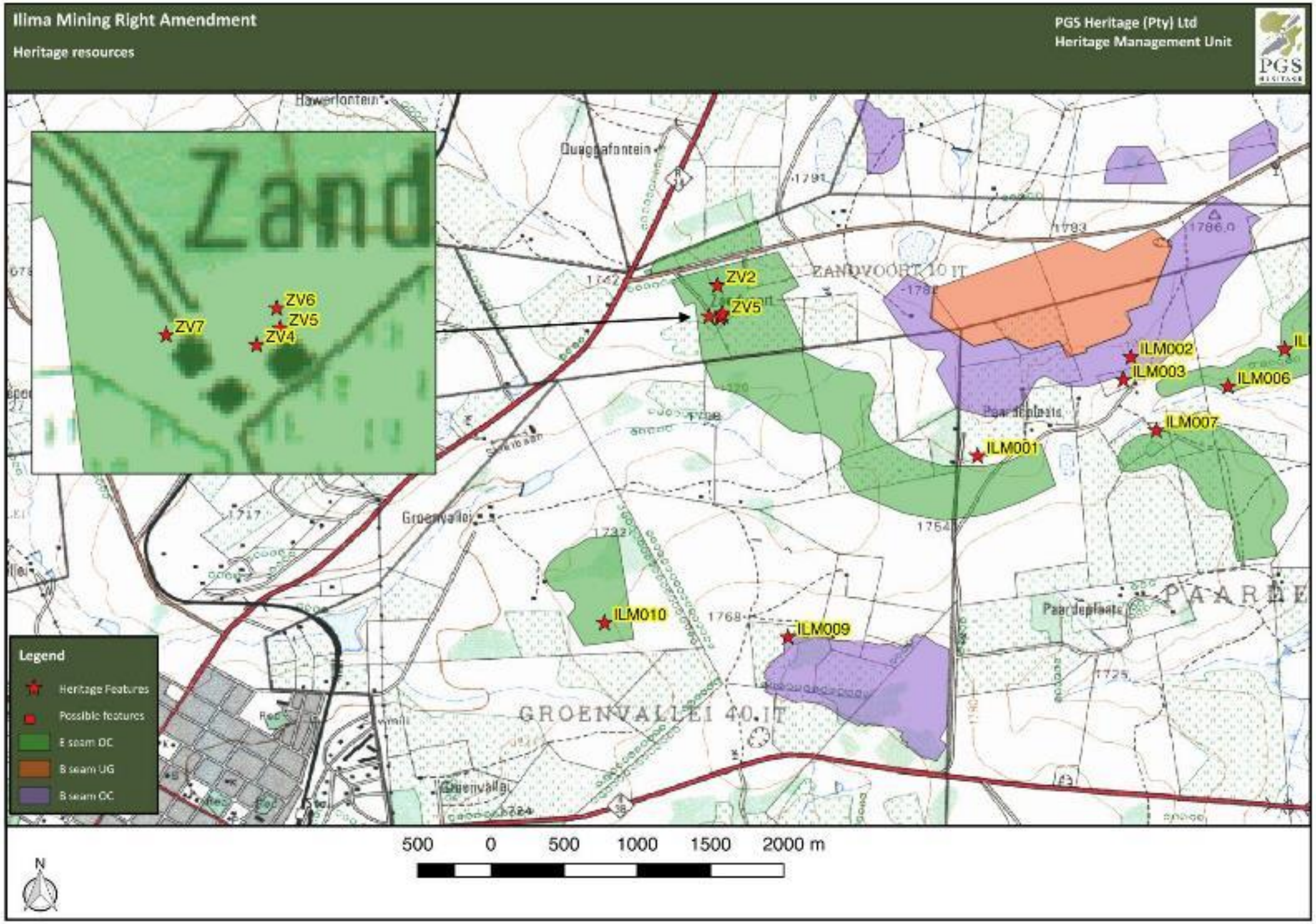



Figure 35: Located heritage features in central section of Ilima Colliery.

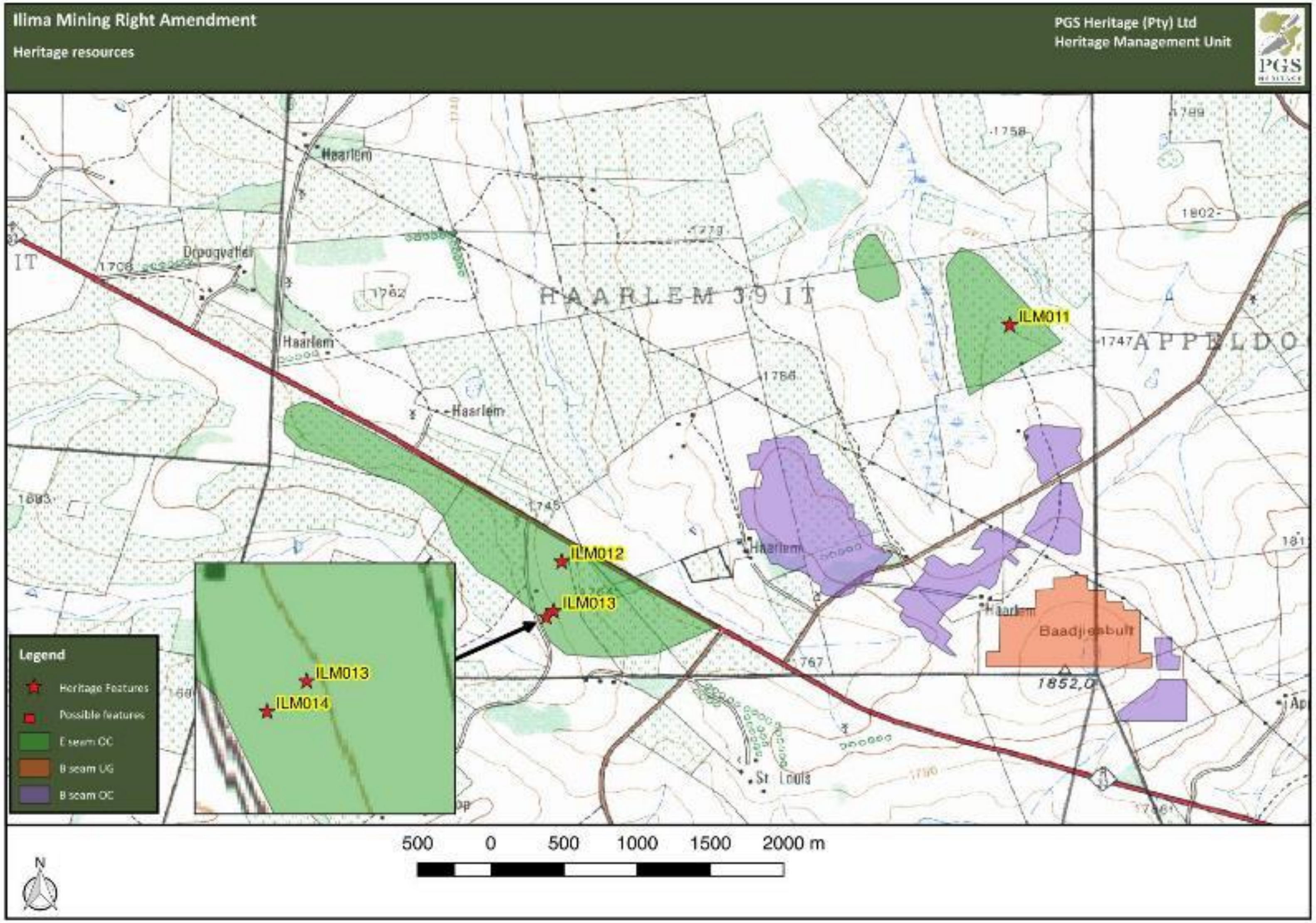



Figure 36: Heritage features in Southern Section of Ilima Colliery.

### 9.1.13 SOCIO-ECONOMIC

The Mpumalanga Province, with Nelspruit as its Capital, occupies 6.5% of South Africa and 3 million (6.9%) of the population resides in this province. Manufacturing industries, mining, power generation industries, tourism, agriculture and forestry are some of the main economic activities in the Mpumalanga area. The GGP in 1993 was around R 28 billion and comprised of 8% of the GGP of South Africa.

The mining area falls specifically within the Albert Luthuli Local Municipality which covers an area of around 5 556.29 $km^2$, and is one of seven (7) local municipalities of the Gert Sibande District Municipality in Mpumalanga. The Municipality offices are in Carolina and the main industries include agriculture and mining.

The major economic activities and sources of employment are in the mining and quarrying sector (23.9%), the services sector (23.7%), the manufacturing sector (14.3%) and the agricultural sector (13.9%). In Carolina, the main source of employment is the agricultural sector; however increased mining activities are increasing employment opportunities in this sector. Agriculture/forestry and fishing make up the largest percentage of industries in the municipality (27.05%), followed by community, social and government service industries (22.8%). Mining and quarrying only makes up 3.4%.

About 34.3% of the population falls within the elementary occupation category. Around 11.1% are technicians and 10.2% are occupations related to agriculture and fishery. Plant or machine operators make up 9% of occupations. Within the Albert Luthuli Local Municipality 20% of the population is employed, 22% are unemployed and around 58% are not economically active. About 78% of the population within the Albert Luthuli Local Municipality receive no monthly income, 7% receive between R1 – R400 and 9.3% between R401 – R800. Of the households in the area, around 30% receive no income, 15.4% receive between R1 000 – R4 800 annually, 24.6% receive between R4 801 – 9 600 annually.

The Albert Luthuli Local Municipality provides essential services such as water, sanitation and housing to the local communities, although bulk water supply is still administered largely by DWS. Communities obtain water from community standpipes (29.2%), from flowing waters (8.6%) and dam or pool water (1.7%). No municipal water supply is available within the mine boundary and the immediate surrounding areas.

Many school buildings in the Albert Luthuli Local Municipality area are reported to be in unacceptable condition and there is a shortage of classrooms. The schools also lack essential services such as water and electricity. Access to schools is poor and long distances need to be covered for pupils to get to schools. Of the population over 20 years of age, around 37% have no schooling, 23% have secondary schooling and only 5% have tertiary education.

The Albert Luthuli Local Municipality together with six other local Municipalities, contributes to the Carolina District Municipality in the Mpumalanga Province. Towns within the Municipality include Badplaas, Carolina, Eerstehoek and Lochiel. The Municipality offices are based in Carolina, the surroundings of which are predominantly rural. The Municipality is dominated by agricultural (i.e. maize, vegetables, stock farming and timber) and mining industries (coal, lime, granite, iron).

### 9.1.14 TRANSPORTATION, INFRASTRUCTURE AND TRAFFIC

Current traffic in the area consists of local farmers, motorists and trucks transporting coal from the mines, mostly for Eskom consumption. Private properties are fenced off to the public but secondary roads are accessible to the public. The main access roads to the area are the R33, R36 and R38. These all lead to Carolina and then to neighbouring towns. The roads in Carolina are currently being upgraded in order to handle the large trucks.

### 9.1.15 VISUAL

The visual aspects section was compiled based on a site assessment and the ortho photos available for the area during 2008. The initial mining plan, which was based on information obtained from the drilling program, was also used.

The surrounding area is predominantly rural in nature with farmhouses and small farm roads connecting the farms to the main roads. There are small areas of plantations and natural vegetation but predominantly fields for grazing and crops. Structures, including the existing mines in the area and associated infrastructure, are visible from neighbouring farms, but are well screened from the main roads. There are various dams and rivers in the vicinity which are aesthetically pleasing, as well as undulating hills and farmhouses. As mining activities progress, they will be visible to residents of Carolina town, and the Silobela township.

### 9.1.16 AIR QUALITY

The project is situated on the Mpumalanga Highveld, an area which has been formally declared as an air quality priority area in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEMAQA), to be known as the “the Highveld Priority Area” (Notice No. 1123 of 23 November 2007 contained in Government Gazette No. 30518).

This declaration is in recognition of the extremely stressed nature of the airshed in this region, home as it is, to much of South Africa’s coal mining activity and to many coal fired power stations. While the declaration of this hotspot does not have a direct impact on the project, it will mean that in the long term this mine will operate in a legislative environment where proper air quality management will be considered a priority and appropriate management and mitigation measures against excessive emissions will be required in keeping with the broader air quality management plan for the area.

Dust monitoring takes place on site on a monthly basis. The network comprises of thirty-seven (37) single buckets, located over nine (9) mining areas (see Figure 37). The selection of sampling sites was in accordance with the latest SANS 1137:2012 guidelines, which stipulates:

- The number of samplers that shall be sufficient to monitor dust fallout at representative locations; and
- Criteria for site selection around the dust source.

This includes monitors located at human residences and sensitive business, non-residential or agricultural locations within a maximum distance of two kilometres (km) from the source boundary. A site might sometimes be located farther to establish background away from the influence of source emissions.

Typical sources of the fugitive dust emissions are from farming activities such as ploughing, mining and transportation of coal on the dirt roads in the area. Table 30 below indicates the quarterly (2nd quarter 2017) dust fallout averages for all Ilima areas.

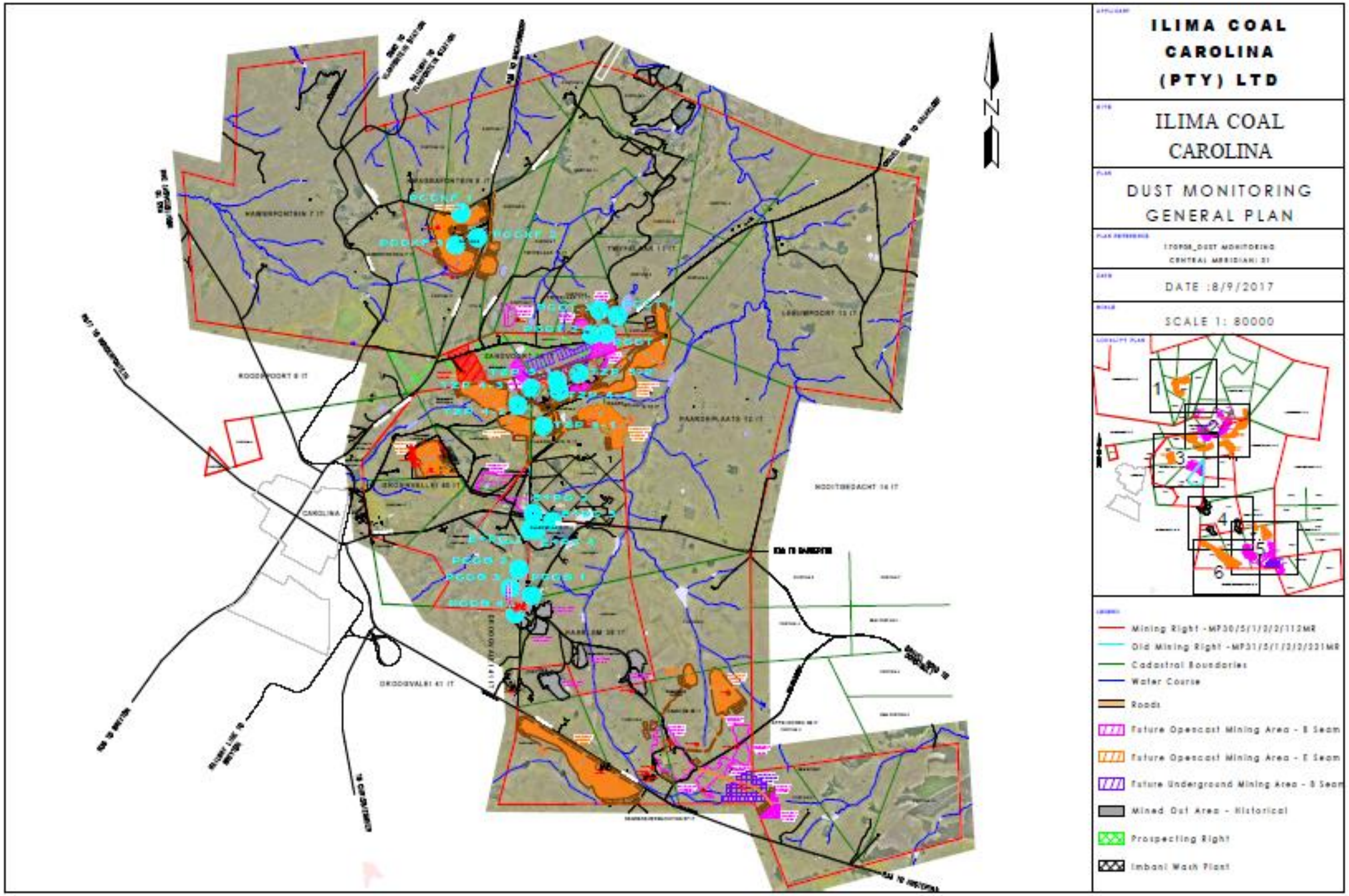



Figure 37: Ilima dust fallout monitoring programme.

Table 30: Combined quarterly averages for all Ilima areas.

| Ilima Dust Fallout Monitoring 2017<br>2nd Quarterly Average – All Ilima Areas | | | |
|---|---|---|---|
| Monitoring Area | NDCR, 2013 - Residential: 600 mg/m²/day | NDCR, 2013 - Non-residential: 1200 mg/m²/day | Dust Fallout in mg/m²/day |
| | | | All Areas |
| Groenvallei | | | Area Rehabilitated |
| Twyfelaar | | | 194.073 |
| E+PC | | | 265.457 |
| TZP4 | | | 105.096 |
| TZP5 | | | 161.558 |
| Groenvallei 7 | | | 276.637* |
| Haarlem 3 | | | 83.570 |
| Kwaggafontein | | | 108.123 |
| Haarlem 5 | | | 153.224 |
| Haarlem 5 South | | | Area Rehabilitated |
| * NDCR, 2013 - National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004). National Dust Control Regulations 2013. | | | |
| ** Values highlighted in yellow exceeded the NEMA: AQA Residential Standards | | | |
| *** Values highlighted in red exceeded the NEMA: AQA Non-residential Standards | | | |
| NR = No Results - Either because of theft or the dust sample was compromised | | | |

From the results, it is evident that dust fallout recorded at the monitoring sites fluctuated according to the time of season and the intensity of activities.

### 9.1.17 NOISE

Noise monitoring points are indicated in Figure 38 and monitoring took place over two eight-hour shifts for day and night. The results of the noise monitoring are indicated in Table 31.

Table 31: Noise monitoring in the Mining Right.

| 2016 Noise Monitoring Programme Readings (dBa) | | | | |
|---|---|---|---|---|
| Noise Monitoring Points – 25 August 2016 | | | | |
| Sample ID | Type of District | Period | SANS 10103:2013 Rating Level Guideline | Measurement results ($L_{Aeq,T}$) |
| PN1 | Rural | Day time | 45 | 44 |
| | | Night time | 35 | 42 |
| PN2 | Rural | Day time | 45 | 39 |
| | | Night time | 35 | 37 |
| PN3 | Rural | Day time | 45 | 50 |
| | | Night time | 35 | 50 |
| PN4 | Rural | Day time | 45 | 36 |
| | | Night time | 35 | 43 |
| PN5 | Rural | Day time | 45 | 37 |
| | | Night time | 35 | 42 |
| | Value exceeds SANS 10103:2013 Rating Level Guideline | | | |

During the day time PN 01, PN 02, PN 04 and PN 05 recorded ambient noise levels below the SANS10103:2013 rural daytime rating. PN 03, located at an informal settlement 1500 meters east of PCC, recorded an average ambient noise level exceeding the SANS10103:2013 rural daytime rating. The ambient noise recorded at PN 03 cannot be ascribed to Ilima's activities, but rather to the community itself as several activities from the community like speaking, laughing, shouting, music and dogs barking was audible. No activities from PCC were audible at PN 01, PN 02, PN 03 and PN 04. Although the ambient noise level at PN 05 was below the SANS10103:2013 rural daytime rating, crushing activities at the Just Coal crushing plant were slightly audible

From the results it is evident that ambient noise levels at all noise monitoring points exceeded the SANS10103:2013 rural night time rating. During night time no PCC activities at PN 01, PN 02, PN03 and PN 04 were audible. All ambient noise recorded at the monitoring points were produced by community activities.

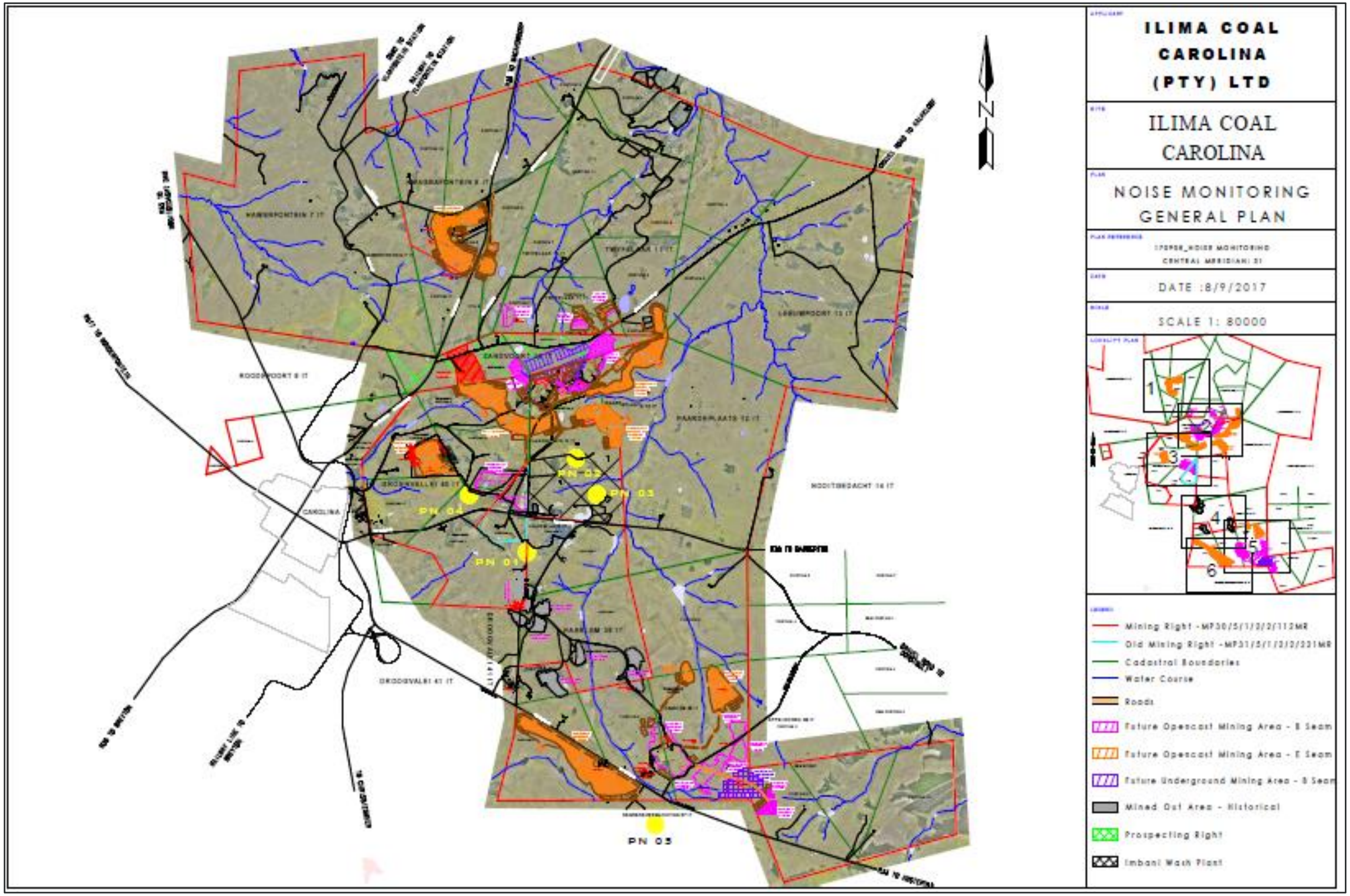



Figure 38: Noise monitoring points (Yellow)

### 9.1.18 BLASTING AND VIBRATION

The opencast blasting operations will be the main source contributing to the influences with regards to ground vibration levels, air blast levels and fly rock. These aspects contribute to damage to structures and causing nuisance to humans and animals if levels are too high and not controlled. Apart from levels that causes damage the possible influence with regards to the human perceptions of ground vibration and air blast will also be considered. Humans are sensitive to even very low level effects of ground vibration and air blast. In order to take this into consideration an area of 3500m is identified as the area that could observe influence. This is in view that people will experience ground vibration at levels as low as 0.75mm/s[3].

## 9.2 ENVIRONMENTAL ASPECTS WHICH MAY REQUIRE PROTECTION AND/OR REMEDIATION

Environmental aspects both within the application and surrounding area that may require protection or remediation are listed in Table 32 below. These aspects have been identified and based on the information contained in the description of the baseline receiving environment as well as the impact assessment. These environmental aspects that may require protection or remediation have been included in the action plan and technical management measures contained in this report.

Table 32: Environmental aspects requiring protection

| Aspect | Feature |
|---|---|
| Topography | Surface drainage lines |
| Ground water | Ground water resources (such as aquifers) |
| | Ground water quantity |
| | Ground water quality |
| Surface Water | Surface water resources (such as streams and pans) |
| | Surface water quantity |
| | Surface water quality |
| | Wetlands and pans |
| Biodiversity | Species of concern (flora and fauna) |
| | Primary vegetation units |
| | Wetlands and pans |
| Soils | Stripped and stockpiled soils |
| | Soils of moderate to high agricultural potential |
| Land Use | Livestock Grazing |
| | Agriculture |
| | Homesteads |
| Land Capability | Agricultural potential |
| | Grazing potential |
| Air Quality | Ambient air quality |
| Noise Environment | Ambient noise levels |
| Social | Livelihoods |
| Economic | Employment |
| Heritage and Cultural | Heritage Resources (cemeteries, graves, structures older than 60 years) |
| | Paleontological features |
| Visual | Sensitive viewer locations |

## 9.3 DESCRIPTION OF CURRENT LAND USES

The pre-mining landuse of the mine area was described in the original EIA for the mining right application. The predominant landuses on the properties that make up the project area prior to mining were:

- Arable land;
- Dry beans cultivation;
- Fallow land;
- Grazing;

- Informal settlement;
- Maize cultivation;
- Pastures; and
- Wetland.

The current land use for the site is a combination of opencast and underground mining. There remain areas where active mining is not underway and the pre-mining land uses continue to co-exist with mining operations. This includes the following land uses that existed prior to mining:

- Agriculture - Maize;
- Dry beans
- Pastures;
- Grazing;
- Fallow land; and
- Informal settlement.

## 9.4 DESCRIPTION OF SPECIFIC ENVIRONMENTAL FEATURES AND INFRASTRUCTURE ON SITE

The sensitive environmental features on site have been mapped together with the mine infrastructure layout and are presented in Figure 39 to Figure 44. Sections within the mining right area are identified as Critical Biodiversity Areas (CBA) and Ecologically Sensitive Areas (ESA) according the Mpumalanga Conservation Plan (CPLAN). The CPLAN is a compilation of sensitive ecological elements considered to be a high priority in terms of protection and conservation.

Further to the above, specific environmental features identified on site which may require protection, remediation, management or avoidance includes the following identified sensitive features:

- Farmhouses and associated farm buildings;
- Rural settlements;
- Infrastructure such as Eskom Transmission/Distribution lines and servitudes;
- Several heritage features, including grave sites;
- Remaining areas of natural vegetation;
- High Biodiversity areas; and
- Watercourses, wetlands and dams.

The existing surface infrastructure located within the application area is considered sensitive in terms of physical damage. Mitigation measures will stipulate total avoidance of surface infrastructure with a 100 m buffer or revised buffer stipulated by the landowner or Chief Mining officer, whichever is relevant.

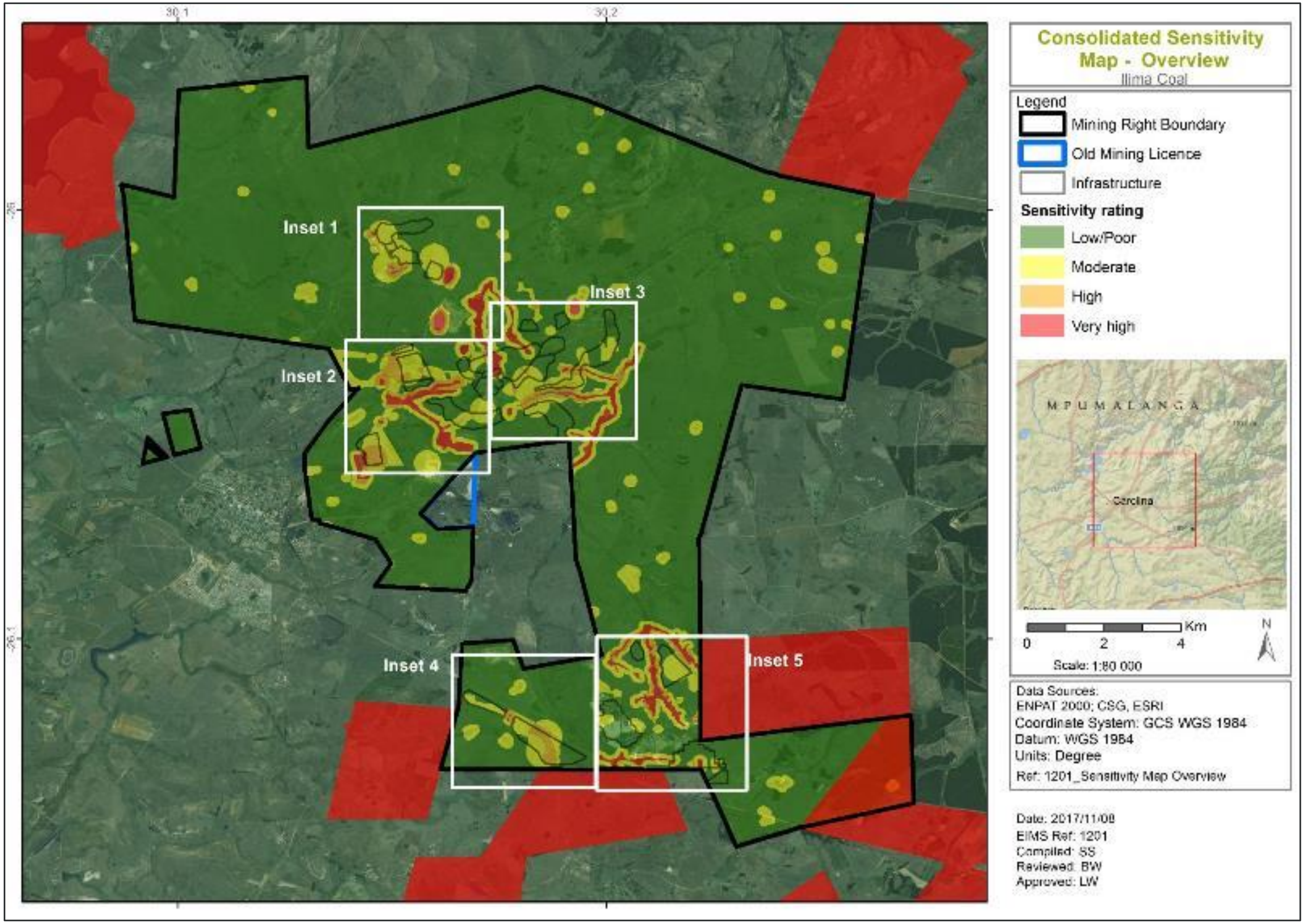



Figure 39: Sensitive environmental features and mine infrastructure map (Overview).

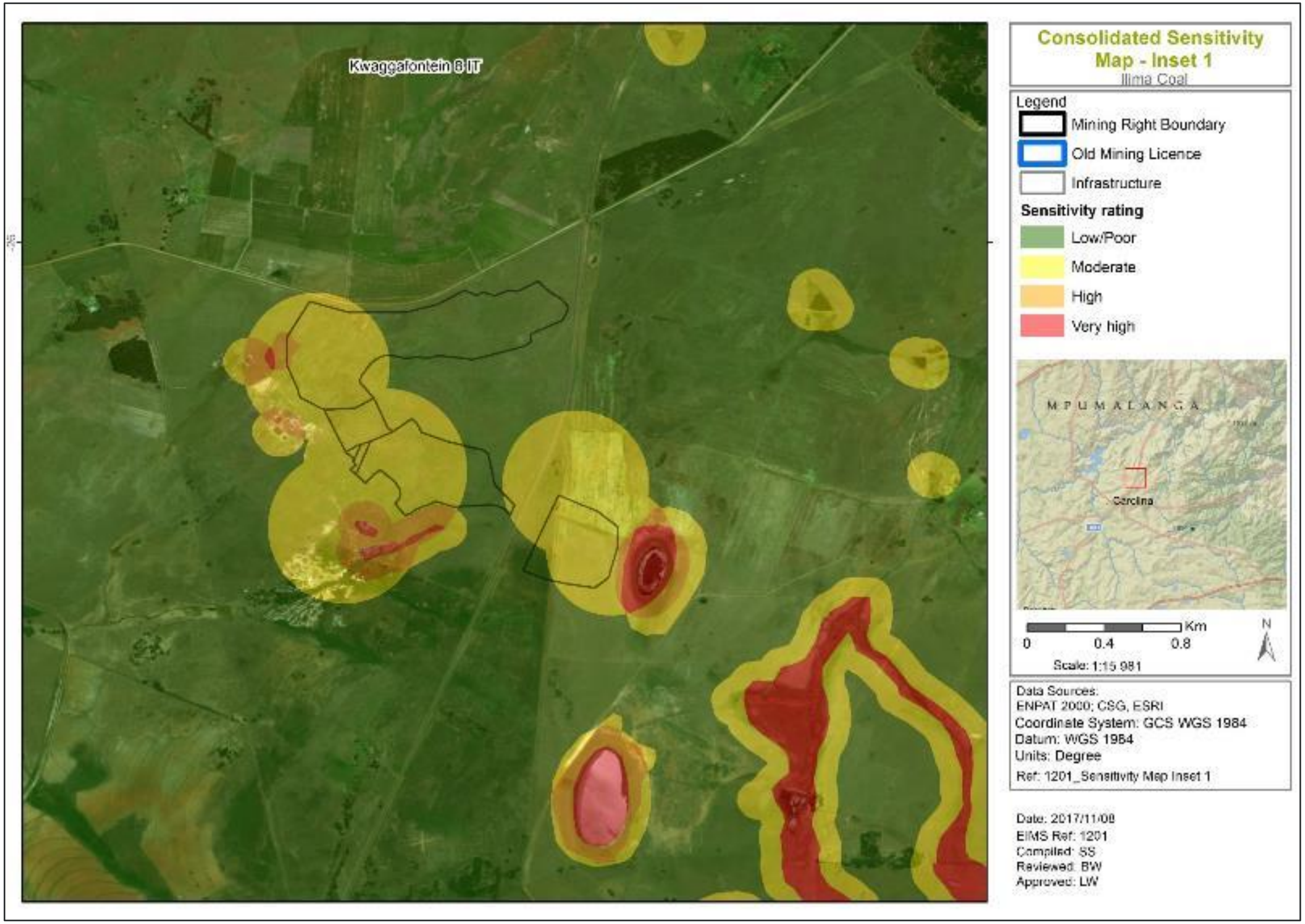



Figure 40: Sensitive environmental features and mine infrastructure map (Inset 1).

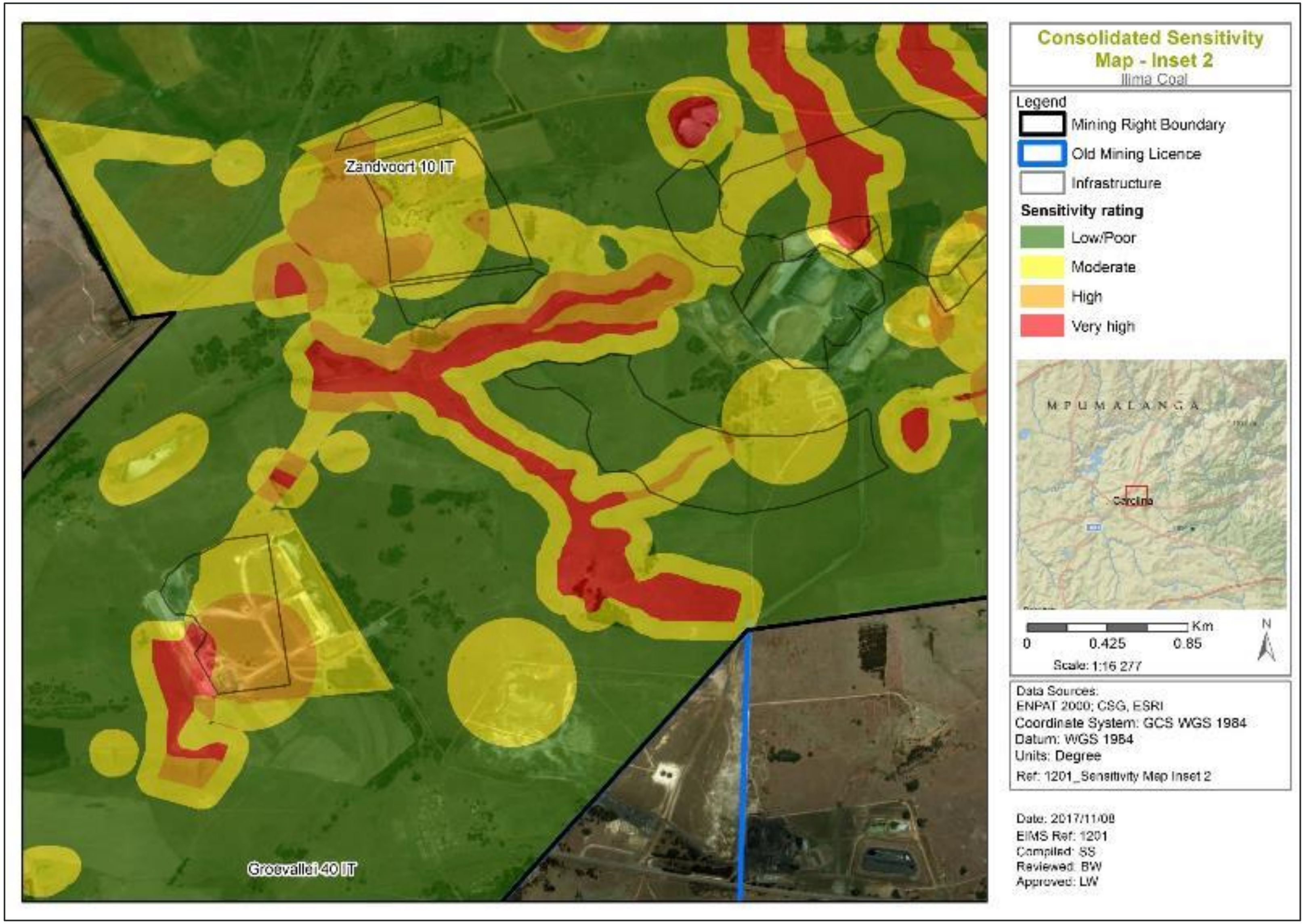



Figure 41: Sensitive environmental features and mine infrastructure map (Inset 2).

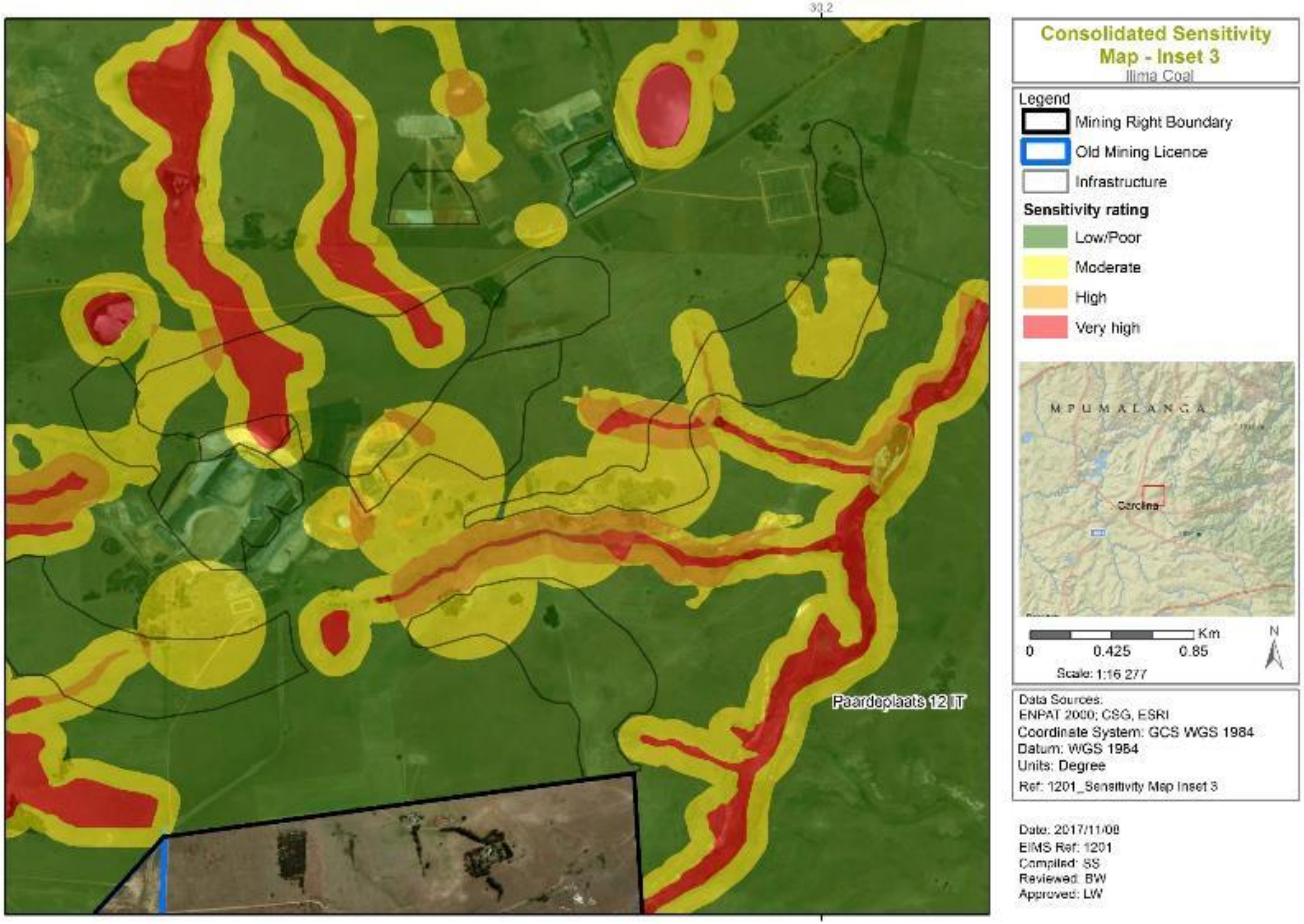



Figure 42: Sensitive environmental features and mine infrastructure map (Inset 3).

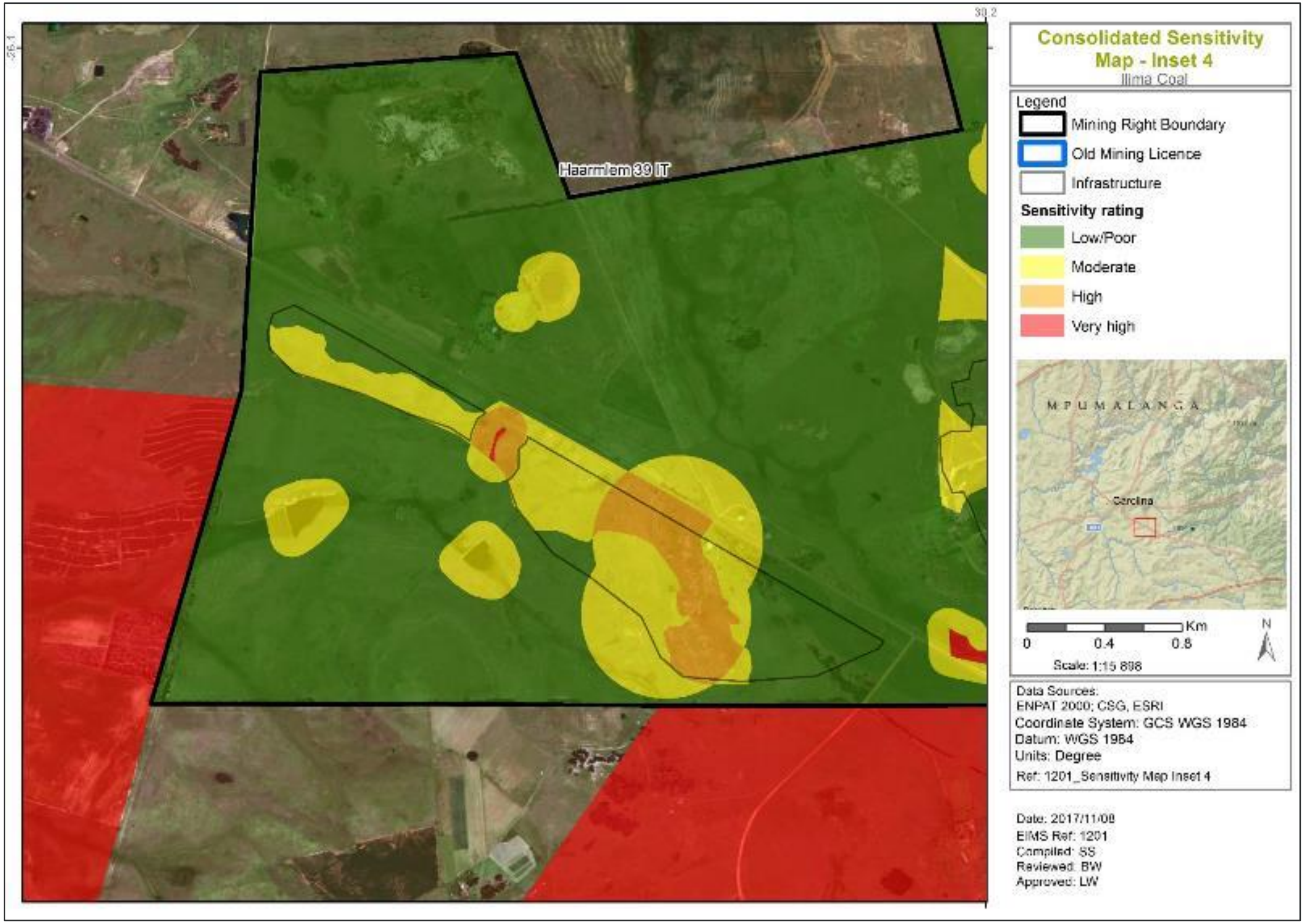



Figure 43: Sensitive environmental features and mine infrastructure map (Inset 4).


Figure 44: Sensitive environmental features and mine infrastructure map (Inset 5).

# 10 THE IMPACT ASSESSMENT METHODOLOGY

The impact significance rating methodology is guided by the requirements of the NEMA EIA Regulations. The broad approach to the significance rating methodology is to determine the environmental risk (ER) by considering the consequence (C) of each impact (comprising Nature, Extent, Duration, Magnitude, and Reversibility) and relate this to the probability/ likelihood (P) of the impact occurring. This determines the environmental risk. In addition, other factors, including cumulative impacts, public concern, and potential for irreplaceable loss of resources, are used to determine a prioritisation factor (PF) which is applied to the ER to determine the overall significance (S).

The significance (S) of an impact is determined by applying a prioritisation factor (PF) to the environmental risk (ER).

The environmental risk is dependent on the consequence (C) of the particular impact and the probability (P) of the impact occurring. Consequence is determined through the consideration of the Nature (N), Extent (E), Duration (D), Magnitude (M), and reversibility (R) applicable to the specific impact.

For the purpose of this methodology the consequence of the impact is represented by:

$$C = \frac{(E+D+M+R) \times N}{4}$$

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in Table 33:

Table 33: Criteria for determination of impact consequence

| Aspect | Score | Definition |
|---|---|---|
| Nature | - 1 | Likely to result in a negative/ detrimental impact |
| | +1 | Likely to result in a positive/ beneficial impact |
| Extent | 1 | Activity (i.e. limited to the area applicable to the specific activity) |
| | 2 | Site (i.e. within the development property boundary), |
| | 3 | Local (i.e. the area within 5 km of the site), |
| | 4 | Regional (i.e. extends between 5 and 50 km from the site |
| | 5 | Provincial / National (i.e. extends beyond 50 km from the site) |
| Duration | 1 | Immediate (<1 year) |
| | 2 | Short term (1-5 years), |
| | 3 | Medium term (6-15 years), |
| | 4 | Long term (the impact will cease after the operational life span of the project), |
| | 5 | Permanent (no mitigation measure of natural process will reduce the impact after construction). |
| Magnitude/ Intensity | 1 | Minor (where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected), |
| | 2 | Low (where the impact affects the environment in such a way that natural, cultural and social functions and processes are slightly affected), |
| | 3 | Moderate (where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way), |
| | 4 | High (where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease), or |

| | | |
|---|---|---|
| | 5 | Very high / don't know (where natural, cultural or social functions or processes are altered to the extent that it will permanently cease). |
| **Reversibility** | 1 | Impact is reversible without any time and cost. |
| | 2 | Impact is reversible without incurring significant time and cost. |
| | 3 | Impact is reversible only by incurring significant time and cost. |
| | 4 | Impact is reversible only by incurring prohibitively high time and cost. |
| | 5 | Irreversible Impact |

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per Table 34.

Table 34: Probability scoring

| | | |
|---|---|---|
| **Probability** | 1 | Improbable (the possibility of the impact materialising is very low as a result of design, historic experience, or implementation of adequate corrective actions; <25%), |
| | 2 | Low probability (there is a possibility that the impact will occur; >25% and <50%), |
| | 3 | Medium probability (the impact may occur; >50% and <75%), |
| | 4 | High probability (it is most likely that the impact will occur- > 75% probability), or |
| | 5 | Definite (the impact will occur), |

The result is a qualitative representation of relative ER associated with the impact. ER is therefore calculated as follows:

**ER= C x P**

Table 35: Determination of environmental risk

| | | | | | | |
|---|---|---|---|---|---|---|
| **Consequence** | 5 | 5 | 10 | 15 | 20 | 25 |
| | 4 | 4 | 8 | 12 | 16 | 20 |
| | 3 | 3 | 6 | 9 | 12 | 15 |
| | 2 | 2 | 4 | 6 | 8 | 10 |
| | 1 | 1 | 2 | 3 | 4 | 5 |
| | | 1 | 2 | 3 | 4 | 5 |
| | **Probability** | | | | | |

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described in **Table 36.**

Table 36: Significance classes

| **Environmental Risk Score** | |
|---|---|
| **Value** | Description |
| **< 10** | Low (i.e. where this impact is unlikely to be a significant environmental risk), |
| **≥ 10; < 20** | Medium (i.e. where the impact could have a significant environmental risk), |
| **≥ 20** | High (i.e. where the impact will have a significant environmental risk). |

The impact ER has been determined for each impact without relevant management and mitigation measures (pre-mitigation), as well as post implementation of relevant management and mitigation measures (post-mitigation). This allows for a prediction in the degree to which the impact can be managed/ mitigated.

In accordance with the requirements of Appendix 3(j) of the EIA Regulations (GNR 982), and further to the assessment criteria presented above it is necessary to assess each potentially significant impact in terms of:

- Cumulative impacts; and
- The degree to which the impact may cause irreplaceable loss of resources.

In addition, it is important that the public opinion and sentiment regarding a prospective development and consequent potential impacts is considered in the decision-making process.

In an effort to ensure that these factors are considered, an impact prioritisation factor (PF) will be applied to each impact ER (post-mitigation). This prioritisation factor does not aim to detract from the risk ratings but rather to focus the attention of the decision-making authority on the higher priority / significance issues and impacts. The PF will be applied to the ER score based on the assumption that relevant suggested management/ mitigation impacts are implemented.

Table 37: Criteria for the determination of prioritisation

| | | |
|---|---|---|
| **Public response (PR)** | Low (1) | Issue not raised in public response. |
| | Medium (2) | Issue has received a meaningful and justifiable public response. |
| | High (3) | Issue has received an intense meaningful and justifiable public response. |
| **Cumulative Impact (CI)** | Low (1) | Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. |
| | Medium (2) | Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change. |
| | High (3) | Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change. |
| **Irreplaceable loss of resources (LR)** | Low (1) | Where the impact is unlikely to result in irreplaceable loss of resources. |
| | Medium (2) | Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited. |
| | High (3) | Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions). |

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table 74. The impact priority is therefore determined as follows:

**Priority = PR + CI + LR**

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 2 (refer to Table 38).

Table 38: Determination of prioritisation factor

| Priority | Ranking | Prioritisation Factor |
|---|---|---|
| 3 | Low | 1 |
| 4 | Medium | 1.17 |
| 5 | Medium | 1.33 |
| 6 | Medium | 1.5 |
| 7 | Medium | 1.67 |
| 8 | Medium | 1.83 |

| | | |
|---|---|---|
| 9 | High | 2 |

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance).

Table 39: Environmental Significance Rating

| **Environmental Significance Rating** | |
|---|---|
| **Value** | **Description** |
| < -10 | Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area). |
| ≥ -10 < -20 | Medium negative (i.e. where the impact could influence the decision to develop in the area). |
| ≥ -20 | High negative (i.e. where the impact must have an influence on the decision process to develop in the area). |
| 0 | No impact |
| < 10 | Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area). |
| ≥ 10 < 20 | Medium positive (i.e. where the impact could influence the decision to develop in the area). |
| ≥ 20 | High positive (i.e. where the impact must have an influence on the decision process to develop in the area). |

The significance ratings and additional considerations applied to each impact will be used to provide a quantitative comparative assessment of the alternatives being considered. In addition, professional expertise and opinion of the specialists and the environmental consultants will be applied to provide a qualitative comparison of the alternatives under consideration. This process will identify the best alternative for the proposed project.

## 10.1 ASSESSMENT AND EVALUATION OF POTENTIAL PROJECT IMPACTS

Project alternatives have previously been assessed in the relevant applications. As such this report presents the risks and impacts associated with the approved mine design and layout, but also includes risks and impacts associated with the proposed extension of the mining areas within the existing Mining Right boundary.

It should be noted that this report will be made available to I&AP's for review and comment and their comments and concerns will be addressed in the final report to be submitted to the DMR for adjudication. Furthermore, it should be noted that the impact scores themselves will include the results of the aforementioned public response and comment. The results of the public consultation will be used to update the impact scores upon completion of the public review period, where after the finalised report will be submitted to the competent authority for adjudication.

The following sections provide a description and assessment of the potential impacts identified in the impact assessment process. The impact scores below are reflective of the impacts prior to the implementation of mitigation measures. Please refer to Appendix E for the full impact scoring calculations.

### 10.1.1 TOPOGRAPHY AND LANDFORM

Topography refers to the surface shape and features of an area. Opencast operations will remove surface material to access and mine an orebody and this can alter the natural topography of the site. Resultant changes to the topography can in turn impact on ground water, surface water drainage, visual character and the safety of both people and animals if not properly mitigated. If underground mining extraction techniques are not carried out correctly, lack of support from underlying layers could cause the surface soil profile to vertically subside to a greater or lesser degree. This could result in limitations to the viability of potential post mining land uses.

The following activities have been associated with potential impacts on topography and landform:

- Construction
    - Site establishment – Camp;
    - Mine area site preparation; and
    - Water management Infrastructure construction.
- Operation
    - Maintenance and operation of site infrastructure and facilities;
    - Opencast mining;
    - Underground mining; and
    - Mineral Processing.
- Decommissioning
    - Infrastructure removal;
    - Filling Opencast Voids; and
    - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
    - General Surface Rehabilitation;
    - Storm water management; and
    - Post Closure Monitoring and Maintenance.

Impacts on the topography and landform within the application area are expected to occur as follows:

- Alteration of topography;

- Altered drainage patterns; and
- Soil surface subsidence.

#### *10.1.1.1* SIGNIFICANCE OF IMPACTS

The above impacts on topography and landform will be negative but site specific. They are long term impacts and are expected to last for the duration of the life of the mine/pit and in some cases the impact will be permanent. Table 40 presents a summary of the impacts on topography and landform.

Table 40: Impacts on topography and landform.

| Impact | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| Alteration of topography | Site establishment - camp | -16,25 |
| | Mine area site preparation | -16,25 |
| | Site establishment – Permanent office infrastructure | -16.25 |
| | Water Management Infrastructure Construction | -16.25 |
| Altered Drainage Patterns | Site establishment - camp | -13.00 |
| | Mine area site preparation | -13.00 |
| | Site establishment – Permanent office infrastructure | -13.00 |
| Altered Drainage Patterns | Water Management Infrastructure Construction | -13.00 |
| Operational Phase | | |
| Alteration of Topography | Opencast Mining | -16,25 |
| | Underground Mining | -16,25 |
| Altered Drainage Patterns | Maintenance and operation of site infrastructure and facilities | -12 |
| | Mineral Processing | -12 |
| | Opencast mining | -12 |
| | Underground mining | -12 |
| Soil surface subsidence | Opencast mining | -8,25 |
| | Underground mining | -13 |
| Decommissioning Phase | | |
| Alteration of Topography | Filling Opencast Voids | -11,25 |
| Altered Drainage Patterns | Infrastructure removal | -6,75 |
| | Filling Opencast Voids | -6,75 |
| Soil surface subsidence | Filling Opencast Voids | -10 |
| | Decommissioning Underground Mine Infrastructure | -10 |
| Rehabilitation and Closure Phase | | |
| Alteration of Topography | General Surface Rehabilitation | -6,75 |

| Impact | Activity | Pre-Mitigation Score |
|---|---|---|
| Altered Drainage Patterns | General Surface Rehabilitation | -3 |
| | Storm water management | -3 |
| Soil surface subsidence | Post Closure Monitoring and Maintenance | -6,75 |

### 10.1.2 IMPACT ON GEOLOGY

Geology refers to the underlying mineral structure of an area. Alterations to the natural geology could have impacts on other aspects such as groundwater and topography. Mining operations will remove the entire ore body layer which will alter the geology of the site. Resultant changes to the geology can in turn impact on ground water, soil forms, and paleontological resources. Mining will have a permanent impact on the geology of the application area.

The following activities have been associated with potential impacts on geology:

- Operation
    - Underground mining; and
    - Opencast mining.

Impacts on the local geology are expected to occur as follows:

- Impacts on Geology

#### *10.1.2.1* SIGNIFICANCE OF IMPACT

The impact on the local geology is permanent as an entire orebody and stratigraphic unit will be removed during the mining operations (refer to Table 41).

Table 41: Impacts on geology.

| Impact | Activity | Pre-Mitigation Score |
|---|---|---|
| Operational Phase | | |
| Impacts on geology | Opencast mining | -18,75 |
| | Underground mining | -18,75 |

### 10.1.3 IMPACTS ON SOIL

Mining operations have the potential to damage soil resources through physical loss of soil and/or the contamination of soils, thereby impacting on the soils ability to sustain natural vegetation and altering land capability and land use. Due to the increased activity of trucks and heavy machinery the possibility of soil contamination by product spillage (coal and carbonaceous shales), reagent spills and/or possible leaking oils and fuels is increased. The contamination of soils may contribute to the contamination of surface and groundwater resources. Increased soil erosion can be caused by a loss in vegetative cover resulting in increased water runoff. This is especially likely to occur on sloping terrain. Impacts on soil structure can result in changes to soil drainage, increasing runoff and erosion, and may also result in further potential knock on effects impacting on surface and underground water resources. Loss of the topsoil resource reduces chances of successful rehabilitation and restoration. The underground operations, if confined to bord and pillar mining will have limited impact, with the possibility of subsidence and collapse of the surface at or close to the adit entrances to the underground operations and/or around the ventilation shafts.

The following activities have been associated with potential impacts on soil:

- Planning and Design
  - Drilling monitoring boreholes; and
  - Drilling for continued resource evaluation.
- Construction
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Site establishment – Contractors Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Maintenance and operation of site infrastructure and facilities;
  - Opencast mining.
  - Underground mining; and
  - Mineral Processing.
- Decommissioning
  - Drilling monitoring boreholes;
  - General decommissioning activities;
  - Decommissioning of Co-Disposal Dump;
  - Infrastructure removal;
  - Filling Opencast Voids; and
  - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
  - Drilling monitoring boreholes;
  - General Surface Rehabilitation;
  - Storm water management;
  - Re-vegetation;
  - Post Closure Monitoring and Maintenance; and

- Water Treatment (when required).

Impacts on soil resources are expected to occur as follows:

- Erosion and sedimentation;
- Soil compaction; and
- Soil Pollution/Contamination.

#### *10.1.3.1* SIGNIFICANCE OF IMPACTS

The above impacts on soil resources will be negative but site specific. They are long term impacts and are expected to last for the duration of the life of the mine (refer to Table 42).

Table 42: Impacts on Soils.

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| Erosion and Sedimentation | Drilling monitoring boreholes | -8.25 |
| | Drilling for continued resource evaluation | -8.25 |
| | Site establishment of Camp | -13 |
| | Mine area site preparation | -13 |
| | Water management Infrastructure construction | -13 |
| Soil Compaction | Drilling monitoring boreholes | -9 |
| | Drilling for continued resource evaluation | -9 |
| | Site establishment of Camp | -12 |
| | Mine area site preparation | -12 |
| | Water management Infrastructure construction | -12 |
| Soil Pollution/Contamination | Drilling monitoring boreholes | -8.25 |
| | Drilling for continued resource evaluation | -8.25 |
| | Site establishment of Camp | -11 |
| | Mine area site preparation | -11 |
| | Water management Infrastructure construction | -11 |
| Operational Phase | | |
| Soil compaction | Drilling for continued resource evaluation | -9 |
| | Drilling monitoring boreholes | -9 |
| | Mineral Processing | -12 |
| | Opencast mining | -12 |
| | Underground mining | -12 |
| Soil pollution/contamination | Maintenance and operation of site infrastructure and facilities | -12 |
| | Mineral Processing | -12 |
| | Opencast mining | -12 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Underground mining | -12 |
| Erosion and sedimentation | Maintenance and operation of site infrastructure and facilities | -13 |
| | Mineral Processing | -13 |
| | Opencast mining | -13 |
| | Underground mining | -13 |
| Decommissioning Phase | | |
| Soil compaction | Decommissioning of Co-Disposal Dump | -10 |
| | Drilling monitoring boreholes | -7,5 |
| | Infrastructure removal | -10 |
| Soil pollution/contamination | Decommissioning of Co-Disposal Dump | -10 |
| | General decommissioning activities | -10 |
| | Infrastructure removal | -10 |
| | Filling Opencast Voids | -10 |
| | Decommissioning Underground Mine Infrastructure | -10 |
| Erosion and sedimentation | Decommissioning of Co-Disposal Dump | -11 |
| | Infrastructure removal | -11 |
| Rehabilitation and Closure Phase | | |
| Soil compaction | Drilling monitoring boreholes | -7,5 |
| | Post Closure Monitoring and Maintenance | -10 |
| | Storm water management | -7,5 |
| | Water Treatment (when required) | -7,5 |
| Soil pollution/contamination | General Surface Rehabilitation | -10 |
| | Post Closure Monitoring and Maintenance | -10 |
| | Re-vegetation | -10 |
| | Storm water management | -10 |
| | Water Treatment (when required) | -10 |
| Erosion and sedimentation | General Surface Rehabilitation | -10 |
| | Post Closure Monitoring and Maintenance | -10 |
| | Storm water management | -10 |
| | Water Treatment (when required) | -10 |

### 10.1.4 IMPACTS ON LAND CAPABILITY

Land capability is closely linked to the soil. Mining operations have the potential to significantly transform the land capability, often irreparably. The types of impacts related to land capability involve post mining compaction, loss of fertility, impeded soil drainage and insufficient depth of the replaced soil. In many cases, mining may result in the land capability class changing from arable to grazing post closure. The loss of potentially productive agricultural land, along with a reduction in land capability may occur as a result of site sterilisation due to mining activities. A reduction of natural soil fertility can be caused by the removal, storage, and replacement of the soil profile. Underground mining does not affect the surface to the same extent as opencast mining. In this respect the impact on the land capability will be less severe and will impact only in areas which will be cleared for infrastructure. Some impacts such as acidification and loss of original soil depth and volume can be permanent and will reduce the capability post closure.

The following activities have been associated with potential impacts on land capability:

- Construction
    - Site establishment – Camp;
    - Mine area site preparation; and
    - Water management Infrastructure construction.
- Operation
    - Maintenance and operation of site infrastructure and facilities; and
    - Opencast mining.
- Decommissioning
    - Filling Opencast Voids.
- Rehabilitation and Closure
    - General Surface Rehabilitation;
    - Storm water management; and
    - Water Treatment (when required).

Impacts on land capability are expected to occur as follows:

- Loss of soil fertility (denitrification, loss of soil nutrient store and organic carbon stores) and loss of land capability; and
- Loss of soil resource and its utilisation potential.

#### *10.1.4.1* SIGNIFICANCE OF IMPACTS

The above impacts on land capability will be negative but site specific. They are long term impacts and are expected to last for the duration of the life of the mine and in some cases the disturbance will be permanent (refer to Table 43).

Table 43: Impacts on land capability.

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Construction Phase | |
| Loss of soil fertility (denitrification, loss of soil nutrient store and organic carbon stores) and loss of land capability | Site establishment – Camp | -17.5 |
| | Site establishment | -17.5 |
| | Mine area site preparation | -17.5 |
| | Water management Infrastructure construction | -17.5 |
| Loss of soil resource and its utilisation potential | Site establishment – Camp | -18.75 |
| | Site establishment | -18.75 |
| | Mine area site preparation | -18.75 |
| | Water management Infrastructure construction | -18.75 |
| Operational Phase | | |
| Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability | Maintenance and operation of site infrastructure and facilities | -16.25 |
| | Opencast mining | -16.25 |
| Loss of soil resource and its utilisation potential | Maintenance and operation of site infrastructure and facilities | -17.25 |
| | Opencast mining | -17.25 |
| Decommissioning Phase | | |
| Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability | Filling Opencast Voids | -6,75 |
| Loss of soil resource and its utilisation potential | Filling Opencast Voids | -7,5 |
| Rehabilitation and Closure Phase | | |
| Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability | General Surface Rehabilitation | -7,5 |
| | Storm water management | -7,5 |
| | Water Treatment (when required) | -6 |
| Loss of soil resource and its utilisation potential | General Surface Rehabilitation | -7,5 |
| | Storm water management | -7,5 |
| | Water Treatment (when required) | -6 |

### 10.1.5 IMPACTS ON LAND USE

The predominant land use in the surrounding area is agriculture. Mining activities have the potential to affect land uses both within the application area and in the surrounding areas. This can be caused by physical transformation of land through direct or indirect impacts. Impacts may be related to factors such as loss of soil, loss of biodiversity, pollution of water, dewatering, air pollution, noise pollution, and damage/destruction from blasting. The nature of opencast mining is such that it is unlikely that mining and other land uses can coexist. This means that any area utilised for opencast mining will be unavailable for other land uses. The extent of surface interference from underground mining is limited to areas of surface infrastructure and the underground entrance only.

The following activities have been associated with potential impacts on land use:

- Planning and Design
  - Drilling monitoring boreholes; and
  - Drilling for continued resource evaluation.
- Construction
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Site establishment – Contractors Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Opencast mining; and
  - Underground mining.
- Decommissioning
  - Drilling monitoring boreholes;
  - Infrastructure removal; and
  - Filling Opencast Voids.
- Rehabilitation and Closure
  - Drilling monitoring boreholes;
  - General Surface Rehabilitation;
  - Storm water management; and
  - Water Treatment (when required).

Impacts on land use are expected to occur as follows:

  - Damage/Disruption of services (such as water and power supply, etc.); and
  - Interference with existing land uses.

#### *10.1.5.1* SIGNIFICANCE OF IMPACTS

This change in land use will be negative and site specific. The impact will remain for the life of the mine and has an overall low significance (refer to Table 44).

Table 44: Impacts on land use.

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Construction Phase | |
| Damage/disruption to services | Site establishment of Camp | -12 |
| | Mine area site preparation | -12 |
| Interference with existing land uses | Drilling monitoring boreholes | -6,75 |
| | Drilling for continued resource evaluation; | -6,75 |
| | Site establishment of Camp | -12 |
| | Mine area site preparation | -12 |
| | Water Management Infrastructure Construction | -12 |
| Operational Phase | | |
| Impacts on services | Opencast Mining | -13 |
| | Underground Mining | -12 |
| Interference with existing land uses | Drilling for continued resource evaluation | -6,75 |
| | Drilling monitoring boreholes | -6,75 |
| | Opencast Mining | -12 |
| | Underground Mining | -12 |
| Decommissioning Phase | | |
| Impacts on services | Infrastructure removal | -9 |
| Interference with existing land uses | Drilling monitoring boreholes | -5,25 |
| | Infrastructure removal | -5,25 |
| | Filling Opencast Voids | -6 |
| Rehabilitation and Closure Phase | | |
| Impacts on services | Water treatment (when required) | -8 |
| Interference with existing land uses | Drilling monitoring boreholes | -5,25 |
| | General Surface Rehabilitation | -6 |
| | Storm water management | -6 |

### 10.1.6 IMPACTS ON FAUNA AND FLORA

The mining activities and the establishment of the supporting infrastructure have the potential to result in loss of vegetation, habitat disruption, loss of ecosystem functionality, habitat transformation, spread of alien invasive species, a reduction in overall biodiversity, increased hunting of animals, the introduction of new species to the site, and disruption of migration routes.

Mining and associated activities may result in the removal and destruction of primary vegetation communities. These communities may be in threat categories according to NEMBA or important according to the Mpumalanga C-Plan. According to the ecology specialists several species listed as threatened under NEMBA, the South African

Red Data list, and the Mpumalanga C-Plan are expected to be present on site. Should these species be present on site, mining activities may result in losses to the on-site populations of these species.

Disturbances to the site may result in an increase of invasive species on site and on downstream and adjacent properties. Increased erosion may alter the drivers that affect wetland vegetation. Several pollutants associated with mining activities including oil, concrete, coal dust, and AMD have the potential to inhibit plant growth and germination and could potentially result in plant mortality. Mining alters the movement of water through the landscape, potentially affecting the hydrological flow regime which is the main driver of natural vegetation.

Threatened animal species are affected primarily by the overall loss of habitat, as direct mining impacts on individuals can often be avoided due to movement of individuals from the area of disturbance. Direct impacts during mining activities are unlikely to have an impact on individual animals of concern, as most are highly mobile and will move out of the area. During operation, birds could potentially suffer mortality due to collisions with vertical infrastructure, especially infrastructure with low visibility, such as power lines.

The following activities have been associated with potential impacts on fauna and flora:

- Planning and Design
    - Drilling monitoring boreholes;
    - Drilling for continued resource evaluation; and
    - Site visits.
- Construction
    - Drilling monitoring boreholes;
    - Drilling for continued resource evaluation;
    - Site establishment –Camp;
    - Mine area site preparation; and
    - Water management Infrastructure construction.
- Operation
    - Drilling monitoring boreholes;
    - Drilling for continued resource evaluation;
    - Maintenance and operation of site infrastructure and facilities;
    - Opencast mining;
    - Underground mining; and
    - Mineral Processing.
- Decommissioning
    - Drilling monitoring boreholes;
    - Decommissioning of Co-Disposal Dump;

- Infrastructure removal; and
- Filling Opencast Voids.

- Rehabilitation and Closure
    - Drilling monitoring boreholes;
    - General Surface Rehabilitation;
    - Storm water management;
    - Post Closure Monitoring and Maintenance; and
    - Water Treatment (when required).

Impacts on fauna and flora are expected to occur as follows:

- Direct and indirect mortality of flora and fauna;
- Habitat fragmentation and blockage of seasonal and dispersal movements; and
- Introduction/invasion by alien (non-native) species.

#### *10.1.6.1* SIGNIFICANCE OF IMPACTS

The impacts on fauna and flora (Table 45) will be negative and will remain for the life of the mine.

Table 45: Impacts on fauna and flora.

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction | | |
| Direct and indirect mortality of flora and fauna | Site establishment of Camp; | -13,75 |
| | Mine area site preparation | -13,75 |
| | Water management Infrastructure construction | -13,75 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | Site establishment of Camp | -14 |
| | Mine area site preparation | -14 |
| | Water management Infrastructure construction | -14 |
| Operational Phase | | |
| Direct and indirect mortality of flora and fauna | Drilling for continued resource evaluation | -13,75 |
| | Drilling monitoring boreholes | -13,75 |
| | Maintenance and operation of site infrastructure and facilities | -15 |
| | Mineral Processing | -15 |
| | Opencast mining | -15 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | Opencast mining | -14 |
| | Maintenance and operation of site infrastructure and facilities | -14 |
| Introduction/invasion by alien (non-native) species | Drilling for continued resource evaluation | -4,5 |
| | Maintenance and operation of site infrastructure and facilities | -9 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Mineral Processing | -5 |
| | Opencast mining | -5 |
| | Underground mining | -5 |
| Decommissioning Phase | | |
| Direct and indirect mortality of flora and fauna | Drilling monitoring boreholes | -11,25 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | General decommissioning activities | -11 |
| Introduction/invasion by alien (non-native) species | Decommissioning of Co-Disposal Dump | -3,5 |
| | Infrastructure removal | -10 |
| | Filling Opencast Voids | -9 |
| Rehabilitation and Closure Phase | | |
| Direct and indirect mortality of flora and fauna | Drilling monitoring boreholes | -8 |
| | General Surface Rehabilitation | -9 |
| | Post Closure Monitoring and Maintenance | -9 |
| | Storm water management | -9 |
| | Water Treatment (when required) | -9 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | Storm water management | -11 |
| | Water Treatment (when required) | -11 |
| Introduction/invasion by alien (non-native) species | General Surface Rehabilitation | -10 |
| | Post Closure Monitoring and Maintenance | -10 |
| | Storm water management | -8 |
| | Water Treatment (when required) | -3,5 |

### 10.1.7 IMPACTS ON SURFACE WATER RESOURCES

Mining activities have the potential to alter surface water features through actual mining methods employed as well as the placement of infrastructure. Hydrocarbon spills from diesel machinery also pose threats to local water resources. Surface infrastructure can result in the diversion of surface runoff to storm water dams and PCD's resulting in a decrease in the quantity of water entering local resources. Should surface water become contaminated it could have impacts on downstream users, resulting in affected livelihoods and supply problems. Underground mining methods are in general, less impactful on surface water than opencast mining methods.

The following activities have been associated with potential impacts on surface water:

- Construction
  - Site establishment – Camp;

- Mine area site preparation; and
- Water management Infrastructure construction.

- Operation
  - Maintenance and operation of site infrastructure and facilities;
  - Opencast mining;
  - Underground mining; and
  - Mineral Processing.
- Decommissioning
  - Decommissioning of Co-Disposal Dump; and
  - Filling Opencast Voids.
- Rehabilitation and Closure
  - Re-vegetation; and
  - Post Closure Monitoring and Maintenance.

Impacts on surface water are expected to occur as follows:

- Pollution of surface water resources/decreased water quality; and
- Decrease in Surface Water Availability.

#### *10.1.7.1* SIGNIFICANCE OF IMPACTS

The impacts on surface water (Table 46) will be negative and will remain for the life of the mine.

Table 46: Impacts on surface water.

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| Pollution of surface water resources/decreased water quality | Site establishment – Camp | -14 |
| | Mine area site preparation | -14 |
| | Water management Infrastructure construction | -14 |
| Decrease in surface water quantity/availability | Site establishment – Camp | -15 |
| | Mine area site preparation | -15 |
| | Water management Infrastructure construction | -15 |
| Operational Phase | | |
| Decrease in surface water quantity/availability | Maintenance and operation of site infrastructure and facilities | -15 |
| Pollution of surface water resources/decreased water quality | Maintenance and operation of site infrastructure and facilities | -14 |
| | Mineral Processing | -14 |
| | Opencast mining | -14 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Underground mining | -9,75 |
| Decommissioning Phase | | |
| Pollution of surface water resources/decreased water quality | Decommissioning of Co-Disposal Dump | -11 |
| | Filling Opencast Voids | -11 |
| Rehabilitation and Closure Phase | | |
| Pollution of surface water resources/decreased water quality | Post Closure Monitoring and Maintenance | -8,25 |
| | Re-vegetation | -8,25 |

### 10.1.8 IMPACTS ON GROUNDWATER

Mining activities have the potential to impact on ground water resources through potential pollution and/or contamination as a result of activities such as the actual mining method employed and resultant geological exposure of oxidising materials, seepage, spillages and both mineralised and non-mineralised waste streams. Additional impacts related to mining activities also include dewatering cones of depression and loss of water supply to surrounding land users. The dewatering of the weathered and fractured aquifer will occur due to the removal of the material below the phreatic surface in order to reach the coal seam. This cone of depression will extend a short distance from the mine workings (Figure 45 to Figure 46). The cone of depression dewatering will remain in place until the completion of mining when the pits and void will be allowed to fill with water and flood.

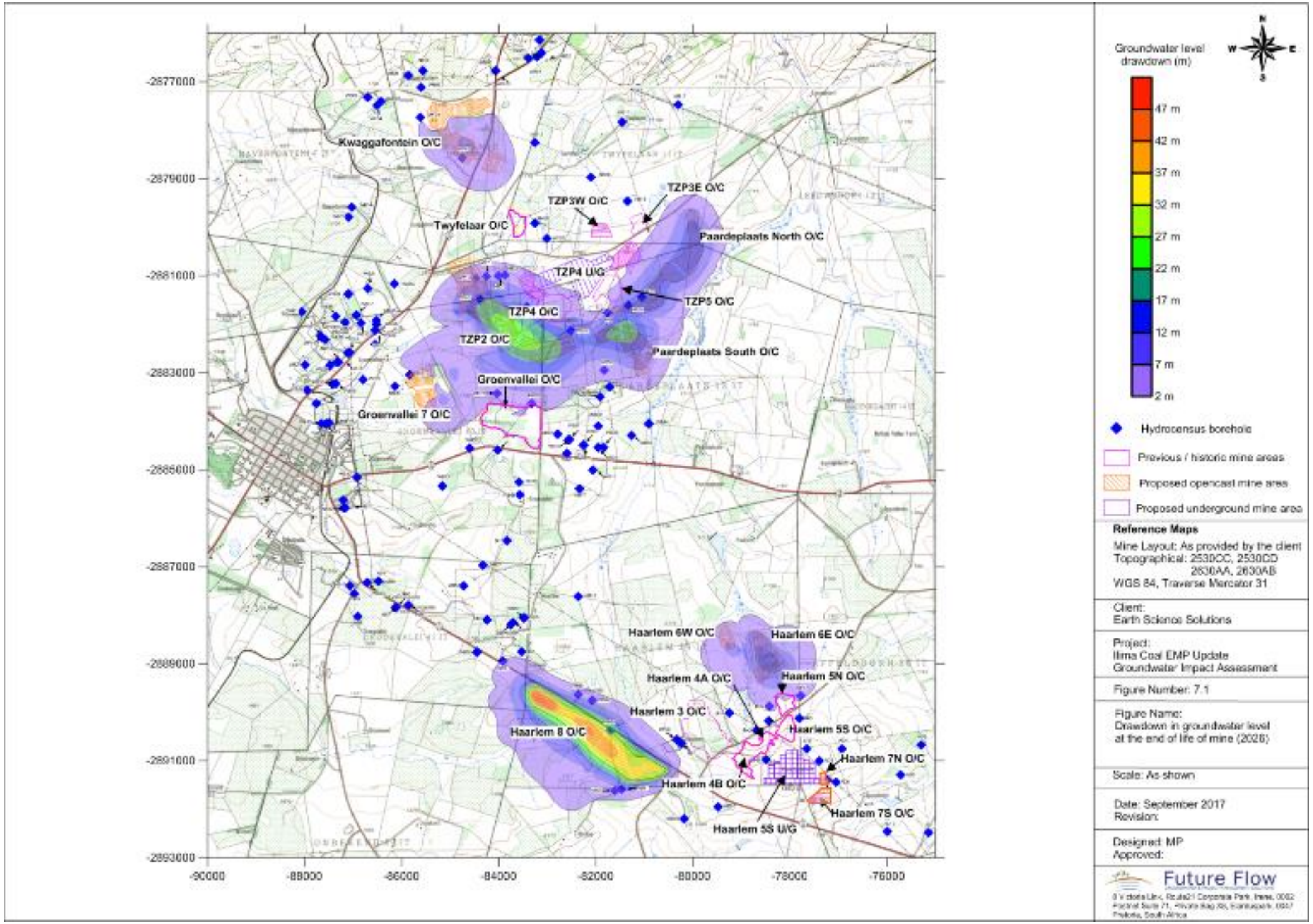



Figure 45: Fractured rock aquifer groundwater level drawdown - end of life operational phase

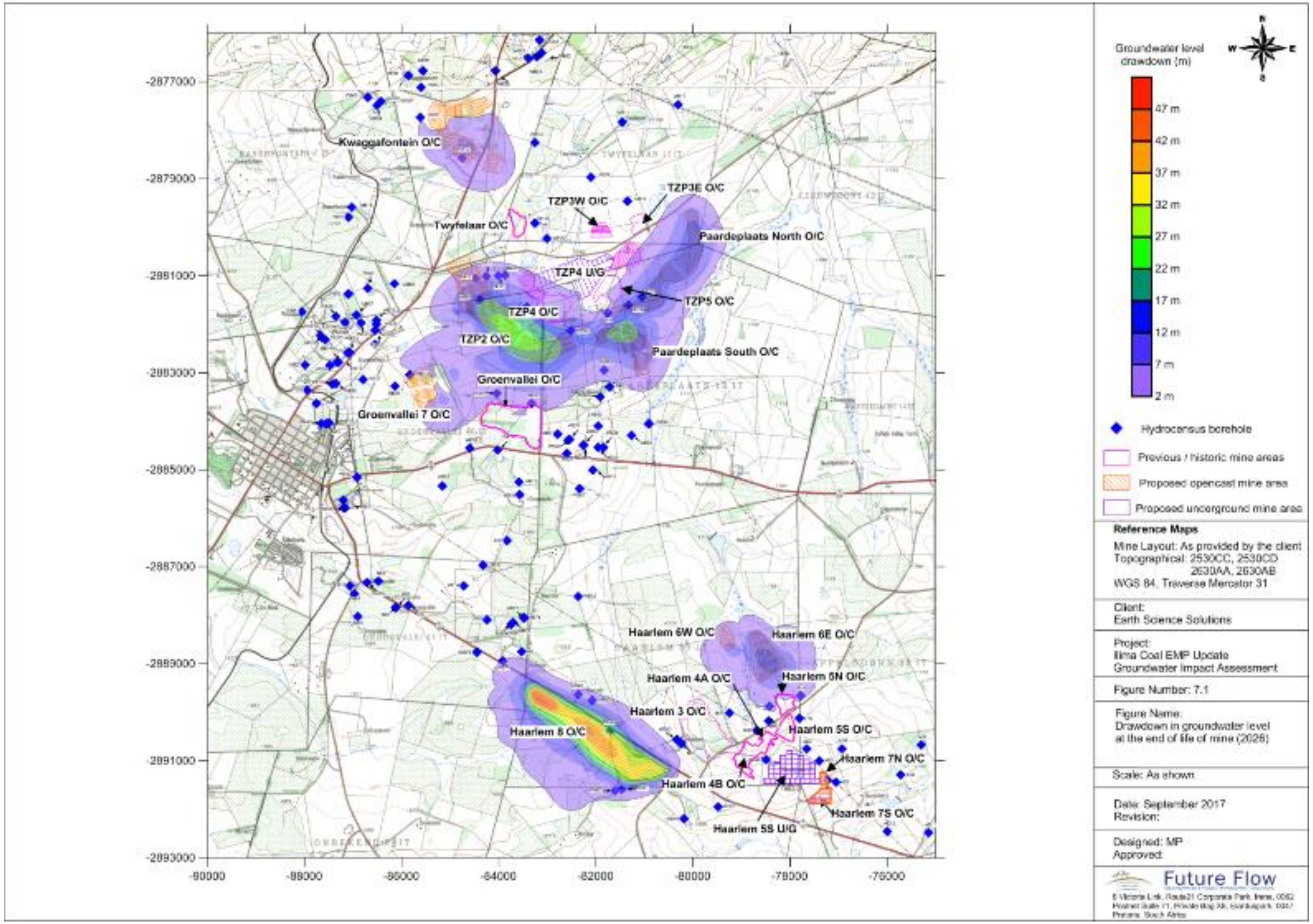



Figure 46: Drawdown in groundwater level at the end of life of mine (2026)

The access to the underground mining will be via the highwall of the opencast pits, therefore overlapping with the operational phase of the opencast mining. Accessing the underground mining areas will result in the exposure of the coal seam roof and floor which could have a potential for the generation of acid mine drainage. Once the mining has ceased, the likelihood of AMD forming is still present, however to a limited degree if suitable mitigation is implemented. Therefore, a groundwater contaminant plume is likely to migrate from the mining area once the water level in the workings have reached long term steady state conditions (i.e. each underground mine water level has reached the decant level). The migration of pollution in the groundwater could lead to the plume crossing the property boundary, albeit unlikely. Groundwater contamination plumes after mine closure are indicated in Figure 47 and Figure 48. The potential decant points are indicated in Figure 49.

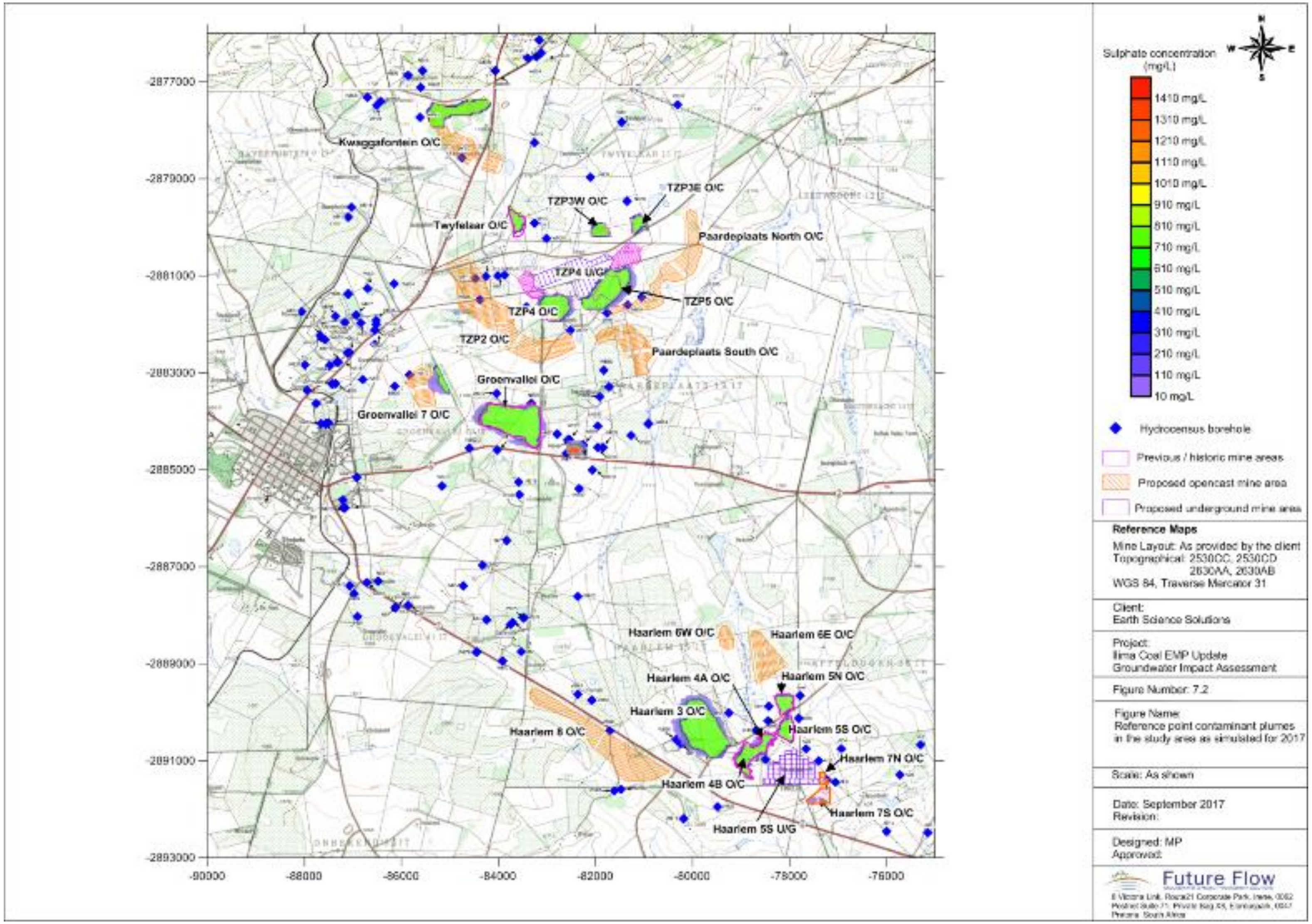



Figure 47: Reference point contaminant plumes in the study area as simulated for 2017

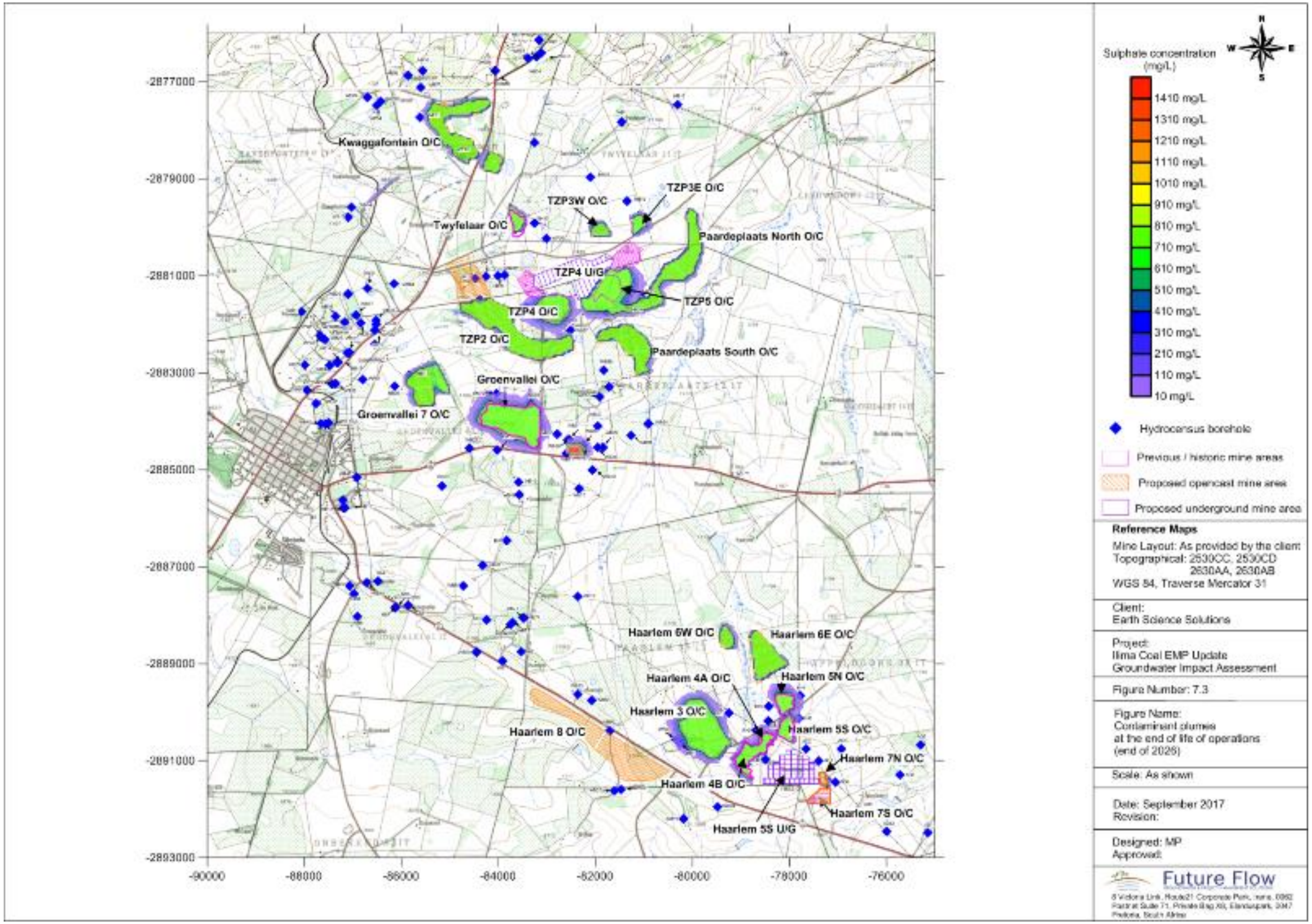



Figure 48: Contaminant plumes at the end of life of operations (end of 2026)

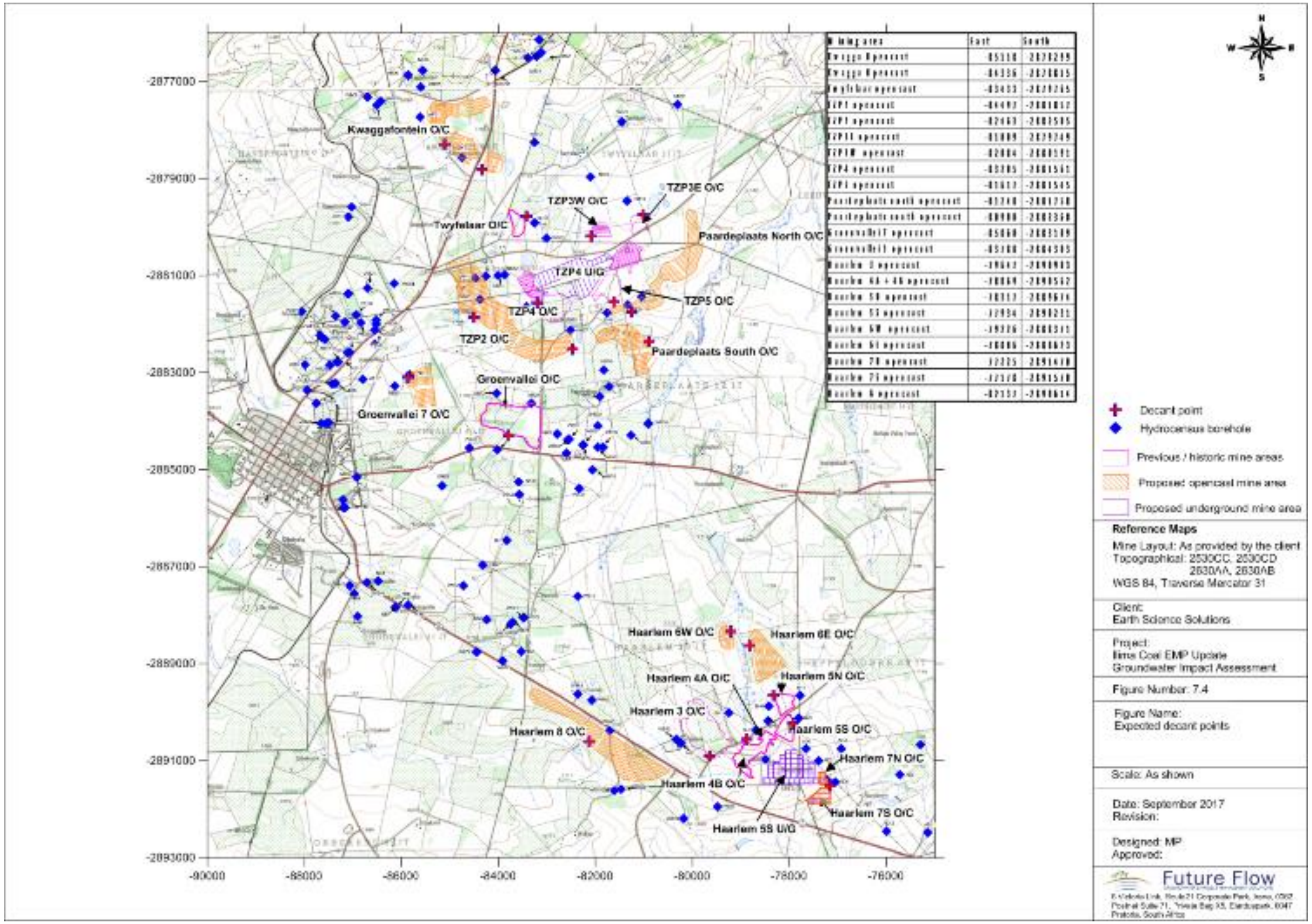



Figure 49: Potential decant points

The bord and pillar mining technique prevents the dewatering of the overlying aquifers due to the low vertical permeability of the Karoo strata. Small areas may be dewatered where the vertical conductivity is higher e.g. dyke contacts of geological faults.

The following activities have been associated with potential impacts on groundwater:

- Construction
  - Site establishment – Contractors Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Maintenance and operation of site infrastructure and facilities;
  - Opencast mining;
  - Underground mining; and
  - Mineral Processing.
- Decommissioning
  - General decommissioning activities;
  - Filling Opencast Voids; and
  - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
  - General Surface Rehabilitation;
  - Storm water management;
  - Re-vegetation; and
  - Post Closure Monitoring and Maintenance.

Impacts on groundwater are expected to occur as follows:

- Acid Mine Drainage;
- Decrease in water quantity/availability;
- Dewatering of groundwater aquifers; and
- Pollution of groundwater/decreased water quality.

#### *10.1.8.1* SIGNIFICANCE OF IMPACTS

The impacts to groundwater (Table 47) will be negative. They are long term impacts and are expected to last for the duration of the life of the mine and in some cases the impact will be permanent.

Table 47: Impacts on groundwater.

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Construction Phase | |
| Decrease in water quantity/availability | Site establishment of Camp | -15 |
| | Mine area site preparation | -15 |
| | Water management Infrastructure construction | -15 |
| Pollution of groundwater/decreased water quality | Site establishment of Camp | -11,25 |
| | Mine area site preparation | -11,25 |
| | Water management Infrastructure construction | -11,25 |
| | Operational Phase | |
| Decrease in water quantity/availability | Mineral Processing | -15 |
| | Mineral Processing | -15 |
| | Opencast mining | -15 |
| | Underground mining | -15 |
| Dewatering of groundwater aquifers | Opencast mining | -15 |
| | Underground mining | -15 |
| Pollution of groundwater/decreased water quality | Maintenance and operation of site infrastructure and facilities | -11,25 |
| | Opencast mining | -21.5 |
| | Underground mining | -21.5 |
| | Decommissioning Phase | |
| Decrease in water quantity/availability | General decommissioning activities | -11 |
| Dewatering of groundwater aquifers | Decommissioning Underground Mine Infrastructure | -9,75 |
| Pollution of groundwater/decreased water quality | Filling Opencast Voids | -8,25 |
| | Decommissioning Underground Mine Infrastructure | -12 |
| | Rehabilitation and Closure Phase | |
| Acid Mine Drainage | Post Closure Monitoring and Maintenance | -22,5 |
| Decrease in water quantity/availability | Re-vegetation | -8,25 |
| Dewatering of groundwater aquifers | General Surface Rehabilitation | -6,5 |
| | Storm water management | -6,5 |
| Pollution of groundwater/decreased water quality | Post Closure Monitoring and Maintenance | -9 |
| | Re-vegetation | -5,5 |

### 10.1.9 IMPACTS ON WETLANDS

Mining activities have the potential to damage and/or disturb wetland habitat, and result in deterioration of water quality, increased surface run-off, erosion, increased transport and sedimentation in wetlands, and increased alien vegetation. Erosion of wetlands and watercourses may occur at storm water discharge points due to point source discharges of high velocity flows. The erosion of channels through wetlands results in the local lowering of the water table with resultant partial desiccation and changes in vegetation structure and composition. Erosion of topsoil could result in silt deposition in wetlands and this could have severe impacts on wetland flow systems and therefore inhibit their functioning. Silt also changes the water quality which will adversely affect the habitat and biodiversity associated with wetlands. Increased sediment movement off the site may occur during mining operations. Increased sediment deposition within wetlands and watercourses can result in alteration to benthic habitats and the establishment of reed beds in areas of sediment deposition. With increased activity of heavy machinery and vehicles, there exists the increased potential of spillages. If hydrocarbons and/or product get into the wetland areas, then impacts on the habitat and biodiversity will increase.

The following activities have been associated with potential impacts on wetlands:

- Construction
    - Site establishment – Camp; and
    - Water management Infrastructure construction.
- Operation
    - Maintenance and operation of site infrastructure and facilities;
    - Opencast mining; and
    - Underground mining.
- Decommissioning
    - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
    - Water Treatment (when required).

Impacts on wetlands are expected to occur as follows:

- Decreased water make to adjacent wetlands;
- Loss and disturbance of wetland habitat; and
- Undermining of wetlands - surface subsidence.

#### *10.1.9.1* SIGNIFICANCE OF IMPACTS

The impacts to wetlands (Table 48) will be negative and site specific. They are long term impacts and are expected to last for the duration of the life of the mine and in some cases the impact will be permanent.

Table 48: Impacts on wetlands (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Construction Phase | |
| | Site establishment – Camp | -12 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Decreased water to adjacent wetlands | Water management Infrastructure construction | -12 |
| Loss and disturbance of wetland habitat | Site establishment – Camp | -15 |
| | Water management Infrastructure construction | -15 |
| Operational Phase | | |
| Decreased water to adjacent wetlands | Maintenance and operation of site infrastructure and facilities | -12 |
| | Opencast mining | -12 |
| | Underground mining | -12 |
| Loss and disturbance of wetland habitat | Maintenance and operation of site infrastructure and facilities | -15 |
| | Opencast mining | -18,75 |
| | Underground mining | -15 |
| Undermining of wetlands - surface subsidence | Underground mining | -14 |
| Decommissioning Phase | | |
| Decreased water to adjacent wetlands | Decommissioning Underground Mine Infrastructure | -7,5 |
| Rehabilitation and Closure Phase | | |
| Loss and disturbance of wetland habitat | Water Treatment (when required) | -15 |

### 10.1.10 IMPACT OF ENVIRONMENTAL POLLUTION

Environmental pollution refers to any contamination of the environment resulting from mining activities. The types of impacts related to environmental pollution include hydrocarbon spills, sewage spills, and decant from underground workings. Environmental pollution can affect surface water, groundwater, wetlands, soil resources, and air quality. Poorly designed wash bays, accidental spillages, related water facilities on site, hydrocarbon spills from heavy machinery and vehicles onsite, the intentional washing and rinsing of equipment, storage and use of hydrocarbons and other hazardous materials including cement, and improper waste handling, storage and disposal can all be sources of environmental pollution. Activities that involve the removal of infrastructure within the dirty water areas or associated with dirty water management systems such as PCD's could potentially result in the mobilisation of pollutants potentially trapped in the soils underlying these areas. Negative air quality effects can occur from processing plants, crushers and chemical/hydrocarbon by-product release into the air. Due to the recovery of ground water levels in the post-mining environment, contaminated groundwater will be able to migrate away from the mining area. This can lead to the contamination of surrounding aquifers and streams.

The following activities have been associated with potential impacts of environmental pollution:

- Planning and Design
    - Drilling monitoring boreholes; and
    - Drilling for continued resource evaluation.

- Construction
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Site establishment – Contractors Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Maintenance and operation of site infrastructure and facilities;
  - Opencast mining;
  - Underground mining; and
  - Mineral Processing.
- Decommissioning
  - Drilling monitoring boreholes;
  - General decommissioning activities;
  - Decommissioning of Co-Disposal Dump;
  - Infrastructure removal;
  - Filling Opencast Voids; and
  - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
  - Drilling monitoring boreholes;
  - General Surface Rehabilitation;
  - Storm water management;
  - Re-vegetation;
  - Post Closure Monitoring and Maintenance; and
  - Water Treatment (when required).

Impacts of environmental pollution are expected to occur as follows:

- Decant from underground workings;
- General Environmental Pollution;
- Hydrocarbon spills/contamination; and
- Sewage spills/contamination.

#### 10.1.10.1 SIGNIFICANCE OF IMPACTS

The above impacts of environmental pollution (Table 49) will be negative. They are long term impacts and are expected to last for the duration of the life of the mine and in some cases the disturbance can be permanent.

Table 49: Impacts on environmental pollution (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| General Environmental Pollution | Drilling monitoring boreholes | -10 |
| | Drilling for continued resource evaluation | -10 |
| | Site establishment of Camp | -10 |
| | Mine area site preparation | -10 |
| | Water management Infrastructure construction | -10 |
| Operational Phase | | |
| General Environmental Pollution | Mineral Processing | -14 |
| | Opencast mining | -14 |
| | Underground mining | -14 |
| Hydrocarbon spills/contamination | Drilling for continued resource evaluation | -11 |
| | Drilling monitoring boreholes | -11 |
| | Maintenance and operation of site infrastructure and facilities | -12 |
| | Mineral Processing | -12 |
| | Opencast mining | -12 |
| | Underground mining | -12 |
| Sewage spills/contamination | Maintenance and operation of site infra structure and facilities | -12 |
| | Opencast mining | -11 |
| | Underground mining | -11 |
| Decommissioning Phase | | |
| General Environmental Pollution | General decommissioning activities | -12 |
| | Infrastructure removal | -12 |
| Hydrocarbon spills/contamination | Decommissioning of Co-Disposal Dump | -10 |
| | Drilling monitoring boreholes | -9 |
| | General decommissioning activities | -10 |
| | Infrastructure removal | -10 |
| | Filling Opencast Voids | -10 |
| | Decommissioning Underground Mine Infrastructure | -10 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Sewage spills/contamination | General decommissioning activities | -9 |
| Rehabilitation and Closure Phase | | |
| Decant from underground workings | Post Closure Monitoring and Maintenance | -22,5 |
| General Environmental Pollution | Water Treatment (when required) | -12 |
| Hydrocarbon spills/contamination | Drilling monitoring boreholes | -9 |
| | General Surface Rehabilitation | -10 |
| | Post Closure Monitoring and Maintenance | -10 |
| | Re-vegetation | -10 |
| | Storm water management | -10 |
| | Water Treatment (when required) | -10 |
| Sewage spills/contamination | Water Treatment (when required) | -9 |

### 10.1.11 IMPACTS ON HERITAGE RESOURCES

An evaluation of the study area and the surroundings has shown that various heritage resources occur within the mining area, including historical structures as well as graves and cemeteries. Mining activities such as blasting may result in damage to heritage features present on the site. The disturbance, destruction or damage of such sites requires a permit from the responsible heritage authority. If graves are to be relocated, the community will need to be engaged in a consultation process. The relocation of graves and the associated consultation process will need to be conducted by a reputable organisation. Unexpected discovery of any unidentified graves and cemeteries during the operations may also delay mining activities due to the legal processes involved.

The following activities have been associated with potential impacts on heritage resources:

- Construction
  - Site establishment –Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Opencast mining; and
  - Underground mining.
- Rehab and Closure
  - General Surface Rehabilitation;
  - Storm water management; and
  - Water Treatment (when required).

Impacts on heritage resources are expected to occur as follows:

- Discovery and preservation of fossils;
- Destruction/damage of palaeontological resources; and
- Destruction/damage of heritage resources.

#### *10.1.11.1* SIGNIFICANCE OF IMPACTS

If the provided mitigation measures are implemented any disturbance to heritage features can be minimised. Any destruction of heritage features is considered permanent. The pre-mitigation impact assessment on heritage features is presented in Table 50.

Table 50: Impacts on heritage resources (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction | | |
| Destruction/damage of heritage resources | Site establishment –Camp | -17 |
| | Mine area site preparation | -17 |
| | Water management Infrastructure construction | -17 |
| Destruction/damage of palaeontological resources | Site establishment –Camp | -9 |
| | Mine area site preparation | -9 |
| | Water management Infrastructure construction | -9 |
| Operational Phase | | |
| Destruction/damage of heritage resources | Opencast mining | -17 |
| | Underground mining | -17 |
| Destruction/damage of palaeontological resources | Opencast Mining | -15 |
| | Underground Mining | -15 |
| Discovery and preservation of fossils | Opencast Mining | 4,5 |
| | Underground Mining | 4,5 |
| Decommissioning Phase | | |
| Destruction/damage of heritage resources | General decommissioning activities | -12 |
| Rehabilitation and Closure Phase | | |
| Destruction/damage of heritage resources | General Surface Rehabilitation | -12 |
| | Storm water management | -12 |
| | Water Treatment (as required by conditions of WUL) | -12 |
| Destruction/damage of palaeontological resources | Water Treatment (as required by conditions of WUL) | -12 |

### 10.1.12 SOCIAL IMPACTS

It is important to understand the difference between a social change process and a social impact. Social change processes are set in motion by project activities or policies. Social change processes can be measured objectively, independent of the local context. Examples of a social change process are increase in the population, relocation or presence of temporary workers. Under certain circumstances these processes may result in social impacts, but if managed properly these changes may not create impacts. Whether impacts are caused will depend on the characteristics and history of the host community, and the extent of mitigation measures that are put in place (Vanclay, 2003). A social impact is something that is experienced or felt by humans. It can be positive or negative. Social impacts can be experienced in a physical or perceptual sense. Social impacts can be either objective or subjective. Objective social impacts can be quantified and verified by independent observers in the local context, such as changes in employment patterns, in standard of living or in health and safety. Subjective social impacts occur "in the heads" or emotions of people, such as negative public attitudes, psychological stress or reduced quality of life. It is very likely that a number of social changes processes will be set in motion by the project. Whether these processes result in social impacts will depend on the successful implementation of the suggested mitigation measures.

The following activities have been associated with potential impacts on the social environment:

- Planning and Design
    - General Mine Management.
- Construction
    - General Mine Management;
    - General Construction Management; and
    - Mine area site preparation.
- Operation
    - General Mine Management;
    - Maintenance and operation of site infrastructure and facilities;
    - Opencast mining;
    - Underground mining; and
    - Mineral Processing.
- Decommissioning
    - General Mine Management.
- Rehabilitation and Closure
    - General Mine Management; and
    - Water Treatment (when required).

Impacts on the social environment are expected to occur as follows:

- Crime and violence;
- Influx of migrant workers;
- Loss of sense of place;
- Relocation; and
- Social vices.

#### *10.1.12.1* SIGNIFICANCE OF IMPACTS

Social impacts will be negative and site specific (Table 51). The impacts will remain for the life of the mine and have an overall to moderate significance.

Table 51: Impacts on social aspects (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| Crime and violence | General mine management | -13 |
| Influx of migrant workers | General mine management | -14 |
| | General Construction management | -14 |
| Loss of sense of place | General mine management | -9.75 |
| | General Construction management | -9.75 |
| | Mine area site preparation | -9.75 |
| Relocation | General mine management | -17 |
| Social Vices | General mine management | -9.75 |
| | General Construction Management | -9.75 |
| Operational Phase | | |
| Crime and violence | General mine management | -13 |
| Influx of migrant workers | General mine management | -14 |
| | Opencast mining | -14 |
| Loss of sense of place | General mine management | -9,75 |
| | Mineral processing | -13 |
| | Opencast mining | -13 |
| | Underground mining | -9,75 |
| Relocation | General mine management | -17 |
| Social vices | General mine management | -9,75 |
| | Maintenance and operation of site infrastructure and facilities | -9,75 |
| | Opencast mining | -9,75 |

| | | |
|---|---|---|
| | Underground mining | -9,75 |
| Decommissioning Phase | | |
| Crime and violence | General mine management | -8,25 |
| Influx of migrant workers | General mine management | -8,25 |
| Loss of sense of place | General mine management | -6,75 |
| Relocation | General mine management | -17 |
| Social vices | General mine management | -8,25 |
| Rehabilitation and Closure Phase | | |
| Crime and violence | General mine management | -8,25 |
| Influx of migrant workers | General mine management | -7,5 |
| Loss of sense of place | General mine management | -6,75 |
| | Water treatment (when required) | -6,75 |
| Relocation | General mine management | -17 |
| Social vices | General mine management | -8,25 |

### 10.1.13 SOCIO-ECONOMIC IMPACTS

The study of economic development, which is generally broad in its scope, refers to the standard of living of citizens; most often measured by GDP per capita, literacy rate, and life expectancy. Economic development incorporates many elements of pure macro-economics, such as price stability, high employment, and sustainable growth. However, this is underpinned by the study of infrastructure and social development programs, such as education, housing, and road networks. Mine operations have the potential to positively or negatively influence/affect the economic environment of the area. Mines contribute directly towards employment, procurement, skills development and taxes on a local, regional and national scale. In addition, mines indirectly contribute to economic growth in the local and regional economies because the increase in the number of income earning people has a multiplying effect on the trade of other goods and services in other sectors. However, the introduction of a mine into an area can have undesirable implications in the surrounding environment. This is because changes occur not only to the pre-existing land uses but also to the existing associated social structures and general way of life. The closure phase of the mine can have highly negative impacts because the surrounding environment loses the economic support that it receives during the operation of the mine. To ensure the economic safety of the communities which are affected by the mining operations, mitigation measures post closure of the mine will need to consider the economic environment of the communities and address these impacts effectively.

The following activities have been associated with potential impacts on the socio-economic environment:

- Planning
  - General Mine Management; and
  - Drilling for continued resource evaluation.

- Construction
    - General Mine Management;
    - Drilling for continued resource evaluation;
    - General Construction Management;
    - Site establishment –Camp; and
    - Water management Infrastructure construction.
- Operation
    - General Mine Management;
    - Drilling for continued resource evaluation;
    - Maintenance and operation of site infrastructure and facilities;
    - Opencast mining; and
    - Underground mining.
- Decommissioning
    - General Mine Management; and
    - General decommissioning activities.
- Rehabilitation and Closure
    - General Mine Management.

Impacts on the socio-economic environment are expected to occur as follows:

- Coal supply for energy security;
- Economic growth;
- Education, Skills Development and Training;
- Employment Opportunities;
- Impacts on local farm labour;
- Loss of jobs and economic opportunities;
- Perceptions and Expectations; and
- Re-instatement of livelihoods.

#### *10.1.13.1* SIGNIFICANCE OF IMPACTS

The socio-economic impact will be positive in nature to a large degree and of short-term duration over the region (Table 52). Considering the levels of unemployment in the area, the significance is moderate.

Table 52: Impacts on socio-economic aspects (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction | | |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Economic growth | General Mine Management | 9 |
| | Drilling for continued resource evaluation | 9,75 |
| Education, Skills Development and Training | Drilling for continued resource evaluation | 6 |
| | General Mine Management | 6 |
| | Site establishment of camp | 6 |
| | Water management Infrastructure construction | 6 |
| Employment opportunities | Drilling for continued resource evaluation | 9,75 |
| | General Mine Management | 9,75 |
| | General Construction Management | 9,75 |
| | Site establishment of camp | 9,75 |
| | Water management Infrastructure construction | 9,75 |
| Impact on local farm labour | General Mine Management | -9 |
| Perceptions and Expectations | Drilling for continued resource evaluation | -13 |
| Operational Phase | | |
| Coal supply for energy security | Opencast mining | 14 |
| | Underground Mining | 14 |
| Economic growth | General Mine Management | 9 |
| | Opencast mining | 9 |
| | Underground mining | 9 |
| Education, Skills Development and Training | Drilling for continued resource evaluation | 6 |
| | General Mine Management | 6 |
| | Opencast mining | 6 |
| | Underground mining | 6 |
| Employment Opportunities | Drilling for continued resource evaluation | 9,75 |
| | General Mine Management | 9,75 |
| | Maintenance and operation of site infrastructure and facilities | 9,75 |
| | Opencast mining | 9,75 |
| | Underground mining | 9,75 |
| Impacts on local farm labour | General Mine Management | -9 |
| | Underground mining | -9 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Perceptions and Expectations | Drilling for continued resource evaluation | -13 |
| Impact on livelihoods | General Mine Management | -9,75 |
| Decommissioning Phase | | |
| Economic growth | General Mine Management | 6 |
| Education, Skills Development and Training | General Mine Management | 4 |
| Employment Opportunities | General decommissioning activities | 5 |
| | General Mine Management | 5 |
| Impacts on local farm labour | General Mine Management | -6,75 |
| Loss of jobs and economic opportunities | General Mine Management | -17,5 |
| Impact on livelihoods | General Mine Management | -8,25 |
| Rehabilitation and Closure Phase | | |
| Economic Growth | General Mine Management | 3,5 |
| Education, Skills Development and Training | General Mine Management | 3,5 |
| Employment Opportunities | General Mine Management | 5 |
| Impacts on local farm labour | General Mine Management | -4 |
| Loss of jobs and economic opportunities | General Mine Management | -17,5 |
| Impact on livelihoods | General Mine Management | -7,5 |

### 10.1.14 IMPACTS ON HEALTH AND SAFETY

It is important to recognize that mining activities, equipment, and infrastructure can increase community exposure to risks and impacts. The mining activities can result in a possible increase in crime due to increased number of strangers in the community. Hazardous structures and excavations may pose a threat to community safety if not correctly located, properly designed and correctly managed. By way of example, excavations may pose a risk to animals and people if not properly managed to prevent unauthorised access. The use of hazardous materials on the mine may result in a community health and safety risk if these materials are not stored, handled and disposed of in an appropriate manner. For example, the storage and use of explosives may represent a safety risk if appropriate controls and procedures are not followed. Fly rock in particular may pose a risk to people, animals and infrastructure within close proximity to the mine. The use of public roads for hauling coal will result in increased safety risks for members of the community and public utilising these roads. Mining activities have the potential to increase the risk of accidental fires. Impacts on ecosystem services can impact on communities, particularly where these communities rely on these ecosystem services (e.g. water from watercourses) for their livelihoods. The contamination or degradation of natural resources, such as adverse impacts on the quality, quantity, and availability of freshwater, may result in health-related risks and impacts. Land use changes may result in the loss of natural buffer areas such as wetlands, and impacts to natural vegetation areas that mitigate the effects of natural hazards such as flooding, landslides, and fire, may result in increased vulnerability and community safety-related risks and impacts. An influx of people to the mining area seeking employment may the increase the risk for community exposure to waterborne, water based, water-related, and vector borne and communicable diseases.

The following activities have been associated with potential impacts on health and safety:

- Planning and Design
    - General Mine Management.
- Construction
    - General Mine Management;
    - General Construction Management;
    - Site establishment - Camp;
    - Mine area site preparation; and
    - Water management Infrastructure construction.
- Operation
    - General Mine Management;
    - Maintenance and operation of site infrastructure and facilities;
    - Opencast mining;
    - Underground mining; and
    - Mineral Processing.
- Decommissioning
    - General Mine Management;
    - General decommissioning activities;
    - Decommissioning of Co-Disposal Dump;
    - Filling Opencast Voids; and
    - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
    - General Mine Management; and
    - Re-vegetation.

Impacts on health and safety are expected to occur as follows:

- Community health and safety;
- Fire and explosion hazard;
- Fly Rock; and
- Health impacts.

### *10.1.14.1* SIGNIFICANCE OF IMPACTS

Health and safety impacts will be negative and site specific (Table 53). The impact will remain for the life of the mine and has an overall low to moderate significance.

Table 53: Impacts on health and safety (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction | | |
| Community health and safety | General Mine Management | -13 |
| | General Construction Management | -13 |
| | Site establishment of camp | -13 |
| | Mine area site preparation | -13 |
| | Water management infrastructure construction | -13 |
| Health impacts | General Mine Management | -9,75 |
| | Mine area site preparation | -9,75 |
| Operational Phase | | |
| Community health and safety | General Mine Management | -13 |
| | Maintenance and operation of site infrastructure and facilities | -13 |
| | Opencast mining | -13 |
| Fire and explosion hazard | Maintenance and operation of site infrastructure and facilities | -8,25 |
| | Mineral Processing | -8,25 |
| | Opencast mining | -8,25 |
| | Underground mining | -8,25 |
| Fly Rock | Opencast mining | -8,25 |
| | Underground mining | -8,25 |
| Health impacts | General Mine Management | -9,75 |
| | Maintenance and operation of site infrastructure and facilities | -9,75 |
| | Mineral Processing | -9,75 |
| | Opencast mining | -9,75 |
| | Underground mining | -9,75 |
| Decommissioning Phase | | |
| | Decommissioning of Co-Disposal Dump | -6 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Community health and safety | General decommissioning activities | -6 |
| | General Mine Management | -6 |
| | Filling Opencast Voids | -6 |
| | Decommissioning Underground Mine Infrastructure | -6 |
| Health Impacts | General decommissioning activities | -8,25 |
| | General Mine Management | -8,25 |
| Rehabilitation and Closure Phase | | |
| Community health and safety | General Mine Management | -4,5 |
| | Re-vegetation | -4,5 |
| Health Impacts | General Mine Management | -5 |
| | Re-vegetation | -5 |

### 10.1.15 IMPACTS ON TRANSPORTATION, INFRASTRUCTURE AND TRAFFIC

In terms of potential impacts, the mine will result in increased use of the local road network which may result in the deterioration of road surfacing, damage to bridges and culverts in the area, and safety risks to surrounding communities. The R33, R36 and R38 are expected to experience increased traffic usage due to mining activities. This will be predominantly due to the increase in transport of heavy machinery, and vehicles carrying coal and labour for mining activities. Some of the roads are already in a state of disrepair and further traffic is expected to have negative impacts on road quality. Increased traffic will have repercussions on safety for other road users, predominantly by increasing the potential for road accidents. There are no large communities along the R38 and therefore increased traffic along this route should not create major safety concerns for residents, such as concern for children playing near the road. The R33, however, is close to the Silobela settlement which could pose a safety hazard to residents walking home and to town. The R36 is in close proximity to Carolina and increased traffic on this road will also be a safety issue with residents in this town.

The following activities have been associated with potential impacts on transportation, infrastructure, and traffic:

- Construction
  - Site establishment – Camp;
  - Mine area site preparation; and
  - Water management infrastructure construction.
- Operation
  - Opencast mining; and
  - Underground mining.

- Decommissioning
  - Decommissioning of Co-Disposal Dump.

Impacts on transportation, infrastructure, and traffic are expected to occur as follows:

- Damage to road infrastructure; and
- Increased traffic.

#### *10.1.15.1* SIGNIFICANCE OF IMPACTS

The impacts on transportation, infrastructure, and traffic will be negative and will remain for the life of the mine (Table 54).

Table 54: Impacts on transportation, infrastructure and traffic (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction | | |
| Increased traffic | Site establishment of Camp | -14 |
| | Mine area site preparation | -14 |
| | Water management Infrastructure construction | -14 |
| Damage to road infrastructure | Site establishment of Camp | -9,75 |
| | Mine area site preparation | -9,75 |
| | Water management Infrastructure construction | -9,75 |
| Operational Phase | | |
| Increased traffic | Opencast mining | -14 |
| | Underground mining | -14 |
| Damage to road infrastructure | Opencast mining | -9,75 |
| | Underground mining | -9,75 |
| Decommissioning Phase | | |
| Damage to road infrastructure | Decommissioning of Co-Disposal Dump | -8,25 |

### 10.1.16 VISUAL IMPACTS

Considering the rural setting of the mining area, it is anticipated that the introduction of additional mining structures and related activities would create further contrast with the existing landscape characteristics. During mining, it is expected that there will be coal trucks and other mine vehicles on the public roads. This, along with the removal of vegetation, dust generation and preparation of opencast mining areas will result in a negative impact on the visual aspect. Operational areas may require lighting at night for safety reasons.

The following activities have been associated with potential visual impacts:

- Construction
  - Site establishment – Camp;

- Mine area site preparation; and
- Water management Infrastructure construction.

- Operation
  - Opencast mining;
  - Underground mining; and
  - Mineral Processing.
- Decommissioning
  - Decommissioning of Co-Disposal Dump.
- Rehab and Closure
  - General Surface Rehabilitation;
  - Storm water management; and
  - Water Treatment (when required).

Visual impacts are expected to occur as follows:

- Visual impact of light at night; and
- Visual impact of mine infrastructure, stockpiles and dust.

#### *10.1.16.1* SIGNIFICANCE OF IMPACTS

Visual impacts will be negative and site specific (Table 55). The impact will remain for the life of the mine and has an overall low significance.

Table 55: Visual impacts (pre-mitigation).

<table>
<tr><th>Impacts</th><th>Activity</th><th>Pre-Mitigation Score</th></tr>
<tr><td colspan="3">Construction Phase</td></tr>
<tr><td rowspan="3">Visual impact of mine infrastructure, stockpiles and dust</td><td>Site establishment – Camp</td><td>-9,75</td></tr>
<tr><td>Mine area site preparation</td><td>-9,75</td></tr>
<tr><td>Water management Infrastructure construction</td><td>-9,75</td></tr>
<tr><td colspan="3">Operational Phase</td></tr>
<tr><td rowspan="3">Visual impact of light at night</td><td>Mineral Processing</td><td>-9,75</td></tr>
<tr><td>Opencast mining</td><td>-9,75</td></tr>
<tr><td>Underground mining</td><td>-7,5</td></tr>
<tr><td rowspan="3">Visual impact of mine infrastructure, stockpiles and dust</td><td>Mineral Processing</td><td>-9,75</td></tr>
<tr><td>Opencast mining</td><td>-9,75</td></tr>
<tr><td>Underground mining</td><td>-6,75</td></tr>
<tr><td colspan="3">Decommissioning Phase</td></tr>
</table>

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Visual impact of mine infrastructure, stockpiles and dust | Decommissioning of Co-Disposal Dump | -9 |
| Rehabilitation and Closure Phase | | |
| Visual impact of mine infrastructure, stockpiles and dust | General Surface Rehabilitation | -6 |
| | Storm water management | -6 |
| | Water Treatment (when required) | -6,75 |

### 10.1.17 IMPACTS ON AIR QUALITY

Existing sources of emissions in the region and the characterisation of existing ambient pollution concentrations is fundamental to the assessment of cumulative air impacts. A change in the ambient air quality can result in a variety of impacts which in turn may cause a disturbance to and/or health impacts on nearby receptors. Sensitive receptor sites include residential areas, communities, and the natural environments. Mining activities have the potential to result in increased levels of atmospheric dust, increased concentrations of $PM_{10}$ (Particulate Matter with an aerodynamic diameter of less than 10µm) and increased concentrations of $PM_{2.5}$ (Particulate Matter with an aerodynamic diameter of less than 2.5µm). Historical evidence indicates that the pollutant of concern associated with open-cast mining operations is particulate matter creating a nuisance dust source and resulting in human health concerns and nuisance.

The following activities have been associated with potential impacts on air quality:

- Planning and Design
  - Drilling monitoring boreholes; and
  - Drilling for continued resource evaluation.
- Construction
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Site establishment – Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Maintenance and operation of site infrastructure and facilities;
  - Opencast mining;
  - Underground mining; and
  - Mineral Processing.

- Decommissioning
    - Drilling monitoring boreholes;
    - General decommissioning activities;
    - Decommissioning of Co-Disposal Dump;
    - Infrastructure removal;
    - Filling Opencast Voids; and
    - Decommissioning of Underground Mine Infrastructure.
- Rehabilitation and Closure
    - Drilling monitoring boreholes;
    - General Surface Rehabilitation;
    - Storm water management;
    - Re-vegetation;
    - Post Closure Monitoring and Maintenance; and
    - Water Treatment (when required).

Impacts on air quality are expected to occur as follows:

- Greenhouse gas emissions; and
- Fugitive emissions (Dust).

#### *10.1.17.1* SIGNIFICANCE OF IMPACTS

Impacts on air quality will be negative and will remain for the life of the mine (Table 56).

Table 56: Impacts on air quality (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| Fugitive emissions (Dust) | Drilling monitoring boreholes | -11 |
| | Drilling for continued resource evaluation | -11 |
| | Site establishment of Camp | -11 |
| | Mine area site preparation | -11 |
| | Water management Infrastructure construction | -11 |
| Greenhouse gas emissions | Drilling monitoring boreholes | -13,75 |
| | Drilling for continued resource evaluation | -13,75 |
| | Site establishment of Camp | -13,75 |
| | Mine area site preparation | -13,75 |
| | Water management Infrastructure construction | -13,75 |
| Operational Phase | | |
| Fugitive emissions (Dust) | Drilling for continued resource evaluation | -11 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Drilling monitoring boreholes | -11 |
| | Mineral Processing | -18,75 |
| | Opencast mining | -16,25 |
| | Underground mining | -16,25 |
| Greenhouse gas emissions | Maintenance and operation of site infrastructure and infrastructure and facilities | -16,25 |
| | Mineral Processing | -16,25 |
| | Opencast mining | -16,25 |
| | Underground mining | -16,25 |
| Decommissioning Phase | | |
| Fugitive emissions (Dust) | Decommissioning of Co-Disposal Dump | -11 |
| | Drilling monitoring boreholes | -9 |
| | General decommissioning activities | -11 |
| | Infrastructure removal | -11 |
| | Filling Opencast Voids | -11 |
| Greenhouse gas emissions | Decommissioning of Co-Disposal Dump | -13,75 |
| | General decommissioning activities | -13,75 |
| | Infrastructure removal | -13,75 |
| | Filling Opencast Voids | -13,75 |
| | Decommissioning Underground Mine Infrastructure | -13,75 |
| Rehabilitation and Closure Phase | | |
| Fugitive emissions (Dust) | Drilling monitoring boreholes | -9 |
| | General Surface Rehabilitation | -9 |
| | Post Closure Monitoring and Maintenance | -9 |
| | Re-vegetation | -9 |
| | Storm water management | -9 |
| | Water Treatment (when required) | -9 |
| Greenhouse gas emissions | Re-vegetation | -13,75 |
| | General Surface Rehabilitation | -13,75 |
| | Storm water management | -12,5 |
| | Water Treatment (when required) | -13,75 |

### 10.1.18 NOISE IMPACTS

Certain noise generating activities associated with mining operations can cause an increase in ambient noise levels in and around the site. Significant noise is associated with opencast and the processing plant (including workshops) activities. The only noisy activities relating to the underground mining activities are associated with the plant activities. A source of noise during the operational phase will be traffic to and from the site, traffic around the facility, RoM and product transport and activities associated with waste management. In some cases, mining and related activities may result in an increase in noise levels above the allowable thresholds. Whilst studies show that the response differs greatly between species, noise typically disturbs animals and results in them moving away from the source of noise or becoming adapted to the noise. Some of the typical effects that disturbing noise may have on sensitive receptors include interference with daily activities (work, leisure and sleeping), hindered speech communication, impeded thinking process, and interference with concentration. Mine workers in very close proximity to noisy activities would be at risk to hearing damage if the proper precautions (e.g. use of personal protective equipment) are not taken.

The following activities have been associated with potential impacts of noise:

- Planning and Design
  - Drilling monitoring boreholes; and
  - Drilling for continued resource evaluation.
- Construction
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Site establishment – Camp;
  - Mine area site preparation; and
  - Water management Infrastructure construction.
- Operation
  - Drilling monitoring boreholes;
  - Drilling for continued resource evaluation;
  - Maintenance and operation of site infrastructure and facilities;
  - Opencast mining;
  - Underground mining; and
  - Mineral Processing.
- Decommissioning
  - Drilling monitoring boreholes;
  - General decommissioning activities;
  - Decommissioning of Co-Disposal Dump;

- Infrastructure removal;
- Filling Opencast Voids; and
- Decommissioning of Underground Mine Infrastructure.

- Rehabilitation and Closure
  - Drilling monitoring boreholes;
  - General Surface Rehabilitation;
  - Storm water management;
  - Re-vegetation; and
  - Water Treatment (when required).

The impact of noise is expected to occur as follows:

- Disturbing and/or nuisance noise

#### *10.1.18.1* SIGNIFICANCE OF IMPACT

The impact of noise will be negative and will remain for the life of the mine (Table 57).

Table 57: Noise impacts (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Construction Phase | | |
| Disturbing and/or nuisance noise | Drilling monitoring boreholes | -7,5 |
| | Drilling for continued resource evaluation | -7,5 |
| | Site establishment of Camp | -8.5 |
| | Mine area site preparation | -8.5 |
| | Water management Infrastructure construction | -8.5 |
| Operational Phase | | |
| Disturbing and/or nuisance noise | Drilling for continued resource evaluation | -7,5 |
| | Drilling monitoring boreholes | -7,5 |
| | Maintenance and operation of site infrastructure and facilities | -12 |
| | Mineral Processing | -13 |
| | Opencast mining | -13 |
| | Underground mining | -7,5 |
| Decommissioning Phase | | |
| Disturbing and/or nuisance noise | Decommissioning of Co-Disposal Dump | -7,5 |
| | Drilling monitoring boreholes | -7,5 |
| | General decommissioning activities | -12 |
| | Infrastructure removal | -13 |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| | Filling Opencast Voids | -13 |
| | Decommissioning Underground Mine Infrastructure | -7,5 |
| Rehabilitation and Closure Phase | | |
| Disturbing and/or nuisance noise | Drilling monitoring boreholes | -6 |
| | General Surface Rehabilitation | -6 |
| | Re-vegetation | -5,25 |
| | Storm water management | -6 |
| | Water Treatment (as required by conditions of WUL) | -5,25 |

### 10.1.19 BLASTING AND VIBRATION

The application of explosives for breaking rock will always have an effect on the surrounding environment. These effects can manifest in the form of ground vibration, air blast, fumes, fly rock and noxious fumes. These short duration events may be noticeable by communities and individuals living in the immediate environment. These events tend to cause nuisance and elicit an emotive response because of resonance because they are easily recognized as being related to blasting.

The following activities have been associated with potential impacts of blasting and vibration:

- Operation
    - Opencast mining; and
    - Underground mining.

Impacts of blasting and vibration are expected to occur as follows:

- Air Blast;
- Ground Vibration and human perception;
- Ground Vibration Impacts on productivity of farm animals (cattle, chickens, pigs, etc.);
- Impacts on Infrastructure (roads, communications infrastructure, services, houses, boreholes); and
- Noxious fumes.

#### *10.1.19.1* SIGNIFICANCE OF IMPACTS

The above impacts of blasting and vibration will be negative (Table 58). They are long term impacts and are expected to last for the duration of the operational life of the mine.

Table 58: Blasting and vibration impacts (pre-mitigation).

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Operational Phase | | |

| Impacts | Activity | Pre-Mitigation Score |
|---|---|---|
| Air Blast | Opencast mining | -11 |
| | Underground mining | -11 |
| Ground Vibration and human perception | Opencast mining | -13 |
| | Underground mining | -13 |
| Ground Vibration Impacts on productivity of farm animals (cattle, chickens, pigs, etc.) | Opencast mining | -13 |
| Impacts on Infrastructure (roads, communications infrastructure, services, houses, boreholes) | Opencast mining | -13 |
| | Underground mining | -13 |
| Noxious fumes | Opencast mining | -12 |
| | Underground mining | -12 |

## 10.2 POTENTIAL MITIGATION MEASURES AND RESIDUAL RISK

The following sections provide a description and assessment of the mitigation measures for each potential impact identified in the impact assessment process. The impact scores below are reflective of the impacts post the implementation of mitigation measures. A second score indicating the final significance of each potential impact is also reflected below. This score indicates the degree of potential loss of irreplaceable resources, the cumulative nature of the impact, as well as the degree of public concern regarding the impact. It should be noted that this report will be made available to I&AP's for review and comment and their comments and concerns will be addressed in the final report to be submitted to the DMR for adjudication. Furthermore, it should be noted that the impact scores themselves will include the results of the aforementioned public response and comment. The results of the public consultation will be used to update the impact scores upon completion of the public review period, where after the finalised report will be submitted to the DMR for adjudication. Please refer to Appendix E for the full impact scoring calculations.

### 10.2.1 TOPOGRAPHY AND LANDFORM

The following mitigation types have been associated with potential impacts on topography and landform:

- Control through site planning and design;
- Control through proper soil management procedures; and
- Avoidance through mine design and planning (depth of mining, safety factors, overburden and rock qualities).

#### *10.2.1.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain low to moderate in significance (Table 59).

Table 59: Impact on topography and landform (post mitigation).

| Impact | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Alteration of topography | Site establishment - camp | -10 | -10.00 |
| | Mine area site preparation | -10 | -10.00 |
| | Site establishment – Permanent office infrastructure | -10 | -10.00 |
| | Water Management Infrastructure Construction | -10 | -10.00 |
| Altered Drainage Patterns | Site establishment - camp | -9 | -11.97 |
| | Mine area site preparation | -9 | -11.97 |
| | Site establishment – Permanent office infrastructure | -9 | -11.97 |
| | Water Management Infrastructure Construction | -9 | -11.97 |
| Operational Phase | | | |
| Alteration of Topography | Opencast Mining | -15 | -15,00 |
| | Underground Mining | -15 | -15,00 |
| Altered Drainage Patterns | Maintenance and operation of site infrastructure and facilities | -8,25 | -11,00 |
| | Mineral Processing | -8,25 | -11,00 |
| | Opencast mining | -8,25 | -11,00 |
| | Underground mining | -8,25 | -11,00 |
| Soil surface subsidence | Opencast mining | -4,5 | -4,5 |
| | Underground mining | -9 | -9 |
| Decommissioning Phase | | | |
| Alteration of Topography | Filling Opencast Voids | -8 | -8,00 |
| Altered Drainage Patterns | Infrastructure removal | -6 | -8,00 |
| | Filling Opencast Voids | -6 | -8,00 |
| Soil surface subsidence | Filling Opencast Voids | -6 | -6 |
| | Decommissioning Underground Mine Infrastructure | -6,75 | -6,75 |
| Rehabilitation and Closure Phase | | | |
| Alteration of Topography | General Surface Rehabilitation | -6 | -6,00 |
| Altered Drainage Patterns | General Surface Rehabilitation | -3 | -4,00 |
| | Storm water management | -3 | -4,00 |

| | | | |
|---|---|---|---|
| Soil surface subsidence | Post Closure Monitoring and Maintenance | -3,5 | -3,5 |

### 10.2.2 IMPACT ON GEOLOGY

Mining operations will remove the entire ore body layer which will alter the geology of the site. Mining will have a permanent impact on the geology of the application area.

The following mitigation types have been associated with potential impacts on geology:

- Modify through mine planning, design and rehabilitation.

#### *10.2.2.1* SIGNIFICANCE OF IMPACT MITIGATION

There are no mitigation measures to reduce the impact on geology as the removal of a geological unit is the goal of the activity (Table 60). The impact will remain high.

Table 60: Impacts on geology (post mitigation).

| Impact | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Operational Phase | | | |
| Impacts on geology | Opencast mining | -17,5 | -23,33 |
| | Underground mining | -17,5 | -23,33 |

### 10.2.3 IMPACTS ON SOIL

The following mitigation types have been associated with potential impacts on soil:

- Avoid and control through preventative measures (Soil placement, storm water infrastructure, erosion control structures);
- Avoid through implementation of EMP mitigation measures;
- Remedy through application of treatment measures (e.g. ripping);
- Avoid through preventative measures (e.g. bunding, spill kits);
- Use of the roll over method of mining and the consideration of concurrent rehabilitation wherever possible;
- Limiting of the area of impact to as small a footprint as possible, inclusive of resource stockpiles and the length of servitudes (access and haulage ways);
- Mining of the commodity and construction of support infrastructure over the less sensitive sites (minimise impact on wetlands and sensitive sites);
- An awareness of the length of time that the resource will need to be stored and managed.
- Implement concurrent rehabilitation wherever practical;
- The development and inclusion of soil management as part of the general housekeeping operations. Use independent auditing of this management;
- Concurrent rehabilitation of all affected sites that are not required for the operation – rehabilitation of temporary structures and footprint areas used during the feasibility investigation (geotechnical pits, trenching etc.) and the construction phase (access roads etc.);

- Effective soil stripping during the less windy months when the soils are less susceptible to erosion;
- Separation of the utilisable soils and ferricrete base materials from each other and from the soft overburden;
- Effective cladding of the berms and soil with vegetation or large rock fragments, and the minimising of the height of storage facilities to 15m and soil berms to 1,5m wherever possible;
- Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction;
- Soil amelioration (cultivation) to enhance the oxygenation and growing capability (germination) of natural regeneration and/or seed within the stockpiled soils (maintain the soils viability during storage) and areas of concurrent rehabilitation Remedy through clean-up and waste disposal;
- Soil replacement and the preparation of a seed bed to facilitate and accelerate the revegetation program and to limit potential erosion on all areas that become available for rehabilitation (temporary servitudes and
- Modify through soil treatment if required.

#### *10.2.3.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain low to moderate in significance.

Table 61: Impact on soil (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Erosion and Sedimentation | Drilling monitoring boreholes | -8.25 | -9.63 |
| | Drilling for continued resource evaluation | -8.25 | -9.63 |
| | Site establishment of Camp | -8.25 | -9.63 |
| | Mine area site preparation | -8.25 | -9.63 |
| | Water management Infrastructure construction | -8.25 | -9.63 |
| Soil Compaction | Drilling monitoring boreholes | -5 | -6.67 |
| | Drilling for continued resource evaluation | -5 | -6.67 |
| | Site establishment of Camp | -5 | -6.67 |
| | Mine area site preparation | -5 | -6.67 |
| | Water management Infrastructure construction | -5 | -6.67 |
| Soil Pollution/Contamination | Drilling monitoring boreholes | -9 | -12.00 |
| | Drilling for continued resource evaluation | -9 | -12.00 |
| | Site establishment of Camp | -9 | -12.00 |
| | Mine area site preparation | -9 | -12.00 |
| | Water management Infrastructure construction | -9 | -12.00 |
| Operational Phase | | | |
| Soil compaction | Drilling for continued resource evaluation | -5 | -6,67 |
| | Drilling monitoring boreholes | -5 | -6,67 |
| | Mineral Processing | -8,25 | -11,00 |
| | Opencast mining | -9 | -12,00 |
| | Underground mining | -8,25 | -11,00 |
| Soil pollution/contamination | Maintenance and operation of site infrastructure and facilities | -9 | -12,00 |
| | Mineral Processing | -9 | -12,00 |
| | Opencast mining | -9 | -12,00 |
| | Underground mining | -6,75 | -9,00 |
| Erosion and sedimentation | Maintenance and operation of site infrastructure and facilities | -8,25 | -9,63 |
| | Mineral Processing | -8,25 | -9,63 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Erosion and Sedimentation | Drilling monitoring boreholes | -8.25 | -9.63 |
| | Drilling for continued resource evaluation | -8.25 | -9.63 |
| | Site establishment of Camp | -8.25 | -9.63 |
| | Mine area site preparation | -8.25 | -9.63 |
| | Water management Infrastructure construction | -8.25 | -9.63 |
| Soil Compaction | Drilling monitoring boreholes | -5 | -6.67 |
| | Drilling for continued resource evaluation | -5 | -6.67 |
| | Site establishment of Camp | -5 | -6.67 |
| | Mine area site preparation | -5 | -6.67 |
| | Water management Infrastructure construction | -5 | -6.67 |
| Soil Pollution/Contamination | Drilling monitoring boreholes | -9 | -12.00 |
| | Drilling for continued resource evaluation | -9 | -12.00 |
| | Site establishment of Camp | -9 | -12.00 |
| | Mine area site preparation | -9 | -12.00 |
| | Water management Infrastructure construction | -9 | -12.00 |
| | Opencast mining | -8,25 | -9,63 |
| | Underground mining | -8,25 | -9,63 |
| Decommissioning Phase | | | |
| Soil compaction | Decommissioning of Co-Disposal Dump | -6,75 | -9,00 |
| | Drilling monitoring boreholes | -4 | -5,33 |
| | Infrastructure removal | -7,5 | -10,00 |
| Soil pollution/contamination | Decommissioning of Co-Disposal Dump | -5,25 | -7,00 |
| | General decommissioning activities | -7,5 | -10,00 |
| | Infrastructure removal | -7,5 | -10,00 |
| | Filling Opencast Voids | -5,25 | -7,00 |
| | Decommissioning Underground Mine Infrastructure | -5,25 | -7,00 |
| Erosion and sedimentation | Decommissioning of Co-Disposal Dump | -6,75 | -7,88 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Erosion and Sedimentation | Drilling monitoring boreholes | -8.25 | -9.63 |
| | Drilling for continued resource evaluation | -8.25 | -9.63 |
| | Site establishment of Camp | -8.25 | -9.63 |
| | Mine area site preparation | -8.25 | -9.63 |
| | Water management Infrastructure construction | -8.25 | -9.63 |
| Soil Compaction | Drilling monitoring boreholes | -5 | -6.67 |
| | Drilling for continued resource evaluation | -5 | -6.67 |
| | Site establishment of Camp | -5 | -6.67 |
| | Mine area site preparation | -5 | -6.67 |
| | Water management Infrastructure construction | -5 | -6.67 |
| Soil Pollution/Contamination | Drilling monitoring boreholes | -9 | -12.00 |
| | Drilling for continued resource evaluation | -9 | -12.00 |
| | Site establishment of Camp | -9 | -12.00 |
| | Mine area site preparation | -9 | -12.00 |
| | Water management Infrastructure construction | -9 | -12.00 |
| | Infrastructure removal | -6,75 | -7,88 |
| Rehabilitation and Closure Phase | | | |
| Soil compaction | Drilling monitoring boreholes | -4 | -5,33 |
| | Post Closure Monitoring and Maintenance | -7,5 | -10,00 |
| | Storm water management | -4 | -5,33 |
| | Water Treatment (as required by conditions of WUL) | -4 | -5,33 |
| Soil pollution/contamination | General Surface Rehabilitation | -7,5 | -10,00 |
| | Post Closure Monitoring and Maintenance | -7,5 | -10,00 |
| | Re-vegetation | -7,5 | -10,00 |
| | Storm water management | -5,25 | -7,00 |
| | Water Treatment (as required by conditions of WUL) | -5,25 | -7,00 |
| Erosion and sedimentation | General Surface Rehabilitation | -6 | -7,00 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Erosion and Sedimentation | Drilling monitoring boreholes | -8.25 | -9.63 |
| | Drilling for continued resource evaluation | -8.25 | -9.63 |
| | Site establishment of Camp | -8.25 | -9.63 |
| | Mine area site preparation | -8.25 | -9.63 |
| | Water management Infrastructure construction | -8.25 | -9.63 |
| Soil Compaction | Drilling monitoring boreholes | -5 | -6.67 |
| | Drilling for continued resource evaluation | -5 | -6.67 |
| | Site establishment of Camp | -5 | -6.67 |
| | Mine area site preparation | -5 | -6.67 |
| | Water management Infrastructure construction | -5 | -6.67 |
| Soil Pollution/Contamination | Drilling monitoring boreholes | -9 | -12.00 |
| | Drilling for continued resource evaluation | -9 | -12.00 |
| | Site establishment of Camp | -9 | -12.00 |
| | Mine area site preparation | -9 | -12.00 |
| | Water management Infrastructure construction | -9 | -12.00 |
| | Post Closure Monitoring and Maintenance | -6 | -7,00 |
| | Storm water management | -6 | -7,00 |
| | Water Treatment (as required by conditions of WUL) | -6 | -7,00 |

### 10.2.4 IMPACTS ON LAND CAPABILITY

The following mitigation types have been associated with potential impacts on land capability:

- Avoid through preventative measures (e.g. limit area of disturbance); and
- Remedy through soil remediation if required (e.g. fertilizer and Organic Matter applications);

#### *10.2.4.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and some impacts will be permanent (Table 62).

Table 62: Impact on land capability (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Loss of soil fertility (denitrification, loss of soil nutrient store and organic carbon stores) and loss of land capability | Site establishment – Camp | -12 | -16.00 |
| | Site establishment | -12 | -16.00 |
| | Mine area site preparation | -12 | -16.00 |
| | Water management Infrastructure construction | -12 | -16.00 |
| Loss of soil resource and its utilisation potential | Site establishment – Camp | -9 | -13.50 |
| | Site establishment | -9 | -13.50 |
| | Mine area site preparation | -9 | -13.50 |
| | Water management Infrastructure construction | -9 | -13.50 |
| Operational Phase | | | |
| Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability | Maintenance and operation of site infrastructure and facilities | -9 | -12,00 |
| | Opencast mining | -12 | -16,00 |
| Loss of soil resource and its utilisation potential | Maintenance and operation of site infrastructure and facilities | -9 | -13,50 |
| | Opencast mining | -9 | -13,50 |
| Decommissioning Phase | | | |
| Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability | Filling Opencast Voids | -6,75 | -9,00 |
| Loss of soil resource and its utilisation potential | Filling Opencast Voids | -4,5 | -6,75 |
| Rehabilitation and Closure Phase | | | |
| Loss of soil fertility (denitrification, Loss of soil nutrient store and organic carbon stores) and loss of land capability | General Surface Rehabilitation | -7,5 | -10,00 |
| | Storm water management | -7,5 | -10,00 |
| | Water Treatment (as required by conditions of WUL) | -5,25 | -7,00 |
| Loss of soil resource and its utilisation potential | General Surface Rehabilitation | -4,5 | -6,75 |
| | Storm water management | -4,5 | -6,75 |
| | Water Treatment (as required by conditions of WUL) | -4 | -6,00 |

### 10.2.5 IMPACTS ON LAND USE

The following mitigation types have been associated with potential impacts on land use:

- Avoid through implementation of EMP mitigation measures (e.g. service detection and communication with landowners);

- Remedy through repair or reinstatement of services if required; and
- Control through implementation of ESMS.

#### *10.2.5.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain low in significance (Table 63).

Table 63: Impact on land use (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Damage/disruption to services | Site establishment of Camp | -12 | -12.00 |
| | Mine area site preparation | -12 | -12.00 |
| Interference with existing land uses | Drilling monitoring boreholes | -6 | -8.00 |
| | Drilling for continued resource evaluation; | -6 | -8.00 |
| | Site establishment of Camp | -6 | -8.00 |
| | Mine area site preparation; | -6 | -8.00 |
| | Water Management Infrastructure Construction | -6 | -8.00 |
| Operational Phase | | | |
| Impacts on services | Opencast Mining | -12 | -12,00 |
| | Underground Mining | -8,25 | -8,25 |
| Interference with existing land uses | Drilling for continued resource evaluation | -6 | -8,00 |
| | Drilling monitoring boreholes | -6 | -8,00 |
| | Opencast Mining | -12 | -16,00 |
| | Underground Mining | -7,5 | -10,00 |
| Decommissioning Phase | | | |
| Impacts on services | Infrastructure removal | -6,75 | -6,75 |
| Interference with existing land uses | Drilling monitoring boreholes | -4,5 | -6,00 |
| | Infrastructure removal | -4,5 | -6,00 |
| | Filling Opencast Voids | -5,25 | -7,00 |
| Rehabilitation and Closure Phase | | | |
| Impacts on services | Water treatment (as required by conditions of WUL) | -3,5 | -3,50 |
| Interference with existing land uses | Drilling monitoring boreholes | -4,5 | -6,00 |
| | General Surface Rehabilitation | -5,25 | -7,00 |
| | Storm water management | -5,25 | -7,00 |

### 10.2.6 IMPACTS ON FAUNA AND FLORA

The following mitigation types have been associated with potential impacts fauna and flora:

- Control through implementation of EMP mitigation measures (e.g. limit area of disturbance, training);
- Avoid/Stop through relocation of threatened or protected species;
- Control through implementation of ESMS;
- Avoid and control through implementation of EMP mitigation measures (e.g. shape of disturbed areas, maintaining corridors);
- Control through implementation of EMP mitigation measures (e.g. alien vegetation management plan); and
- Avoid/Stop through preventative measures (e.g. limit extent of disturbance).

#### *10.2.6.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain low to moderate in significance (Table 64).

Table 64: Impact on fauna and flora (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Direct and indirect mortality of flora and fauna | Site establishment of Camp; | -8.25 | -9.63 |
| | Mine area site preparation | -8.25 | -9.63 |
| | Water management Infrastructure construction | -8.25 | -9.63 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | Site establishment of Camp; | -9.75 | -11.38 |
| | Mine area site preparation | -9.75 | -11.38 |
| | Water management Infrastructure construction | -9.75 | -11.38 |
| Operational Phase | | | |
| Direct and indirect mortality of flora and fauna | Drilling for continued resource evaluation | -8,25 | -9,63 |
| | Drilling monitoring boreholes | -8,25 | -9,63 |
| | Maintenance and operation of site infrastructure and facilities | -9 | -10,50 |
| | Mineral Processing | -9 | -10,50 |
| | Opencast mining | -9 | -10,50 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | Opencast mining | -9,75 | -11,38 |
| | Maintenance and operation of site infrastructure and facilities | -9,75 | -11,38 |
| Introduction/invasion by alien (non-native) species | Drilling for continued resource evaluation | -4,5 | -6,00 |

| | | | |
|---|---|---|---|
| | Maintenance and operation of site infrastructure and facilities | -8,25 | -11,00 |
| | Mineral Processing | -5 | -6,67 |
| | Opencast mining | -5 | -6,67 |
| | Underground mining | -5 | -6,67 |
| Decommissioning Phase | | | |
| Direct and indirect mortality of flora and fauna | Drilling monitoring boreholes | -6 | -7,00 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | General decommissioning activities | -8,25 | -9,63 |
| Introduction/invasion by alien (non-native) species | Decommissioning of Co-Disposal Dump | -3,5 | -4,67 |
| | Infrastructure removal | -7,5 | -10,00 |
| | Filling Opencast Voids | -6,75 | -9,00 |
| Rehabilitation and Closure Phase | | | |
| Direct and indirect mortality of flora and fauna | Drilling monitoring boreholes | -4 | -4,67 |
| | General Surface Rehabilitation | -4,5 | -5,25 |
| | Post Closure Monitoring and Maintenance | -4,5 | -5,25 |
| | Storm water management | -4,5 | -5,25 |
| | Water Treatment (as required by conditions of WUL) | -4,5 | -5,25 |
| Habitat fragmentation and blockage of seasonal and dispersal movements | Storm water management | -6,75 | -7,88 |
| | Water Treatment (as required by conditions of WUL) | -6,75 | -7,88 |
| Introduction/invasion by alien (non-native) species | General Surface Rehabilitation | -7,5 | -10,00 |
| | Post Closure Monitoring and Maintenance | -7,5 | -10,00 |
| | Storm water management | -6 | -8,00 |
| | Water Treatment (as required by conditions of WUL) | -3,5 | -4,67 |

### 10.2.7 IMPACTS ON SURFACE WATER RESOURCES

The following mitigation types have been associated with potential impacts on surface water resources:

- Avoid through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management);
- Control through implementation of mitigation measures (water treatment when required); and
- Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling).

#### *10.2.7.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented (Table 65).

Table 65: Impacts on surface water resources (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Pollution of surface water resources/decreased water quality | Site establishment – Camp | -9.75 | -16.25 |
| | Mine area site preparation | -9.75 | -16.25 |
| | Water management Infrastructure construction | -9.75 | -16.25 |
| Decrease in surface water quantity/availability | Site establishment of camp | -9.75 | -16.25 |
| | Mine area site preparation | -9.75 | -16.25 |
| | Water Management Infrastructure Construction | -9.75 | -16.25 |
| Operational Phase | | | |
| Decrease in surface water quantity/availability | Maintenance and operation of site infrastructure and facilities | -9,75 | -16,25 |
| Pollution of surface water resources/decreased water quality | Maintenance and operation of site infrastructure and facilities | -9,75 | -16,25 |
| | Mineral Processing | -13 | -21,67 |
| | Opencast mining | -13 | -21,67 |
| | Underground mining | -6,5 | -10,83 |
| Decommissioning Phase | | | |
| Pollution of surface water resources/decreased water quality | Decommissioning of Co-Disposal Dump | -7,5 | -12,50 |
| | Filling Opencast Voids | -7,5 | -12,50 |
| Rehabilitation and Closure Phase | | | |
| Pollution of surface water resources/decreased water quality | Post Closure Monitoring and Maintenance | -5 | -8,33 |
| | Re-vegetation | -5 | -8,33 |

### 10.2.8 IMPACTS ON GROUNDWATER

The following mitigation types have been associated with potential impacts on groundwater:

- Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling);
- Implement a surface water management plan to minimise the volume of dirty water produced thereby reducing the probability of contamination of groundwater from infiltration of dirty surface water;
- Treatment of the pumped groundwater will be required for human consumption and construction activities. The potential acid generating discard facility should be lined or buffered with acid neutralising material. If contamination is observed within the groundwater monitoring boreholes, then scavenger boreholes might be required to intercept the contaminated water before it reaches a sensitive receptor;

- If groundwater resources are selected as one of the water supply options, production boreholes should be spread across the mining area and on adjacent farms to minimise impacts from the construction phase cone of dewatering.
- Should it be found that the dewatering activities do impact on private boreholes then it is recommended that the mine should supply equal/better quality water to affected parties.
- Recovery of rain water is recommended;
- Avoid constructing below the water table as far as possible. Where deep excavations are required the surface can be built up to avoid excavation into the saturated zone or the area can be temporarily dewatered until construction is finished;
- Avoid and control through implementation of preventative measures (e.g. AMD mitigation strategy, mine design and progressive rehabilitation);
- Remedy through water treatment when required;
- Install out-of-pit dewatering boreholes. The advantage of out-of-pit dewatering boreholes is that the abstracted borehole water is theoretically clean and potentially in a state where it can be applied elsewhere. This mitigation option would also reduce the volume of dirty water generated on site and thereby the volume of water that needs to be stored and treated.
- The drawdown in groundwater level within the mined out open pits areas will be mitigated by the on-going rehabilitation that forms part of the rollover mining technique and which will allow for recovery of the groundwater levels in areas where rehabilitation is completed;
- Always keep the dewatering level close to the coal seam floor, not deeper;
- Avoid and control through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures);
- If a considerable amount of fluid is accidentally spilled, the contaminated soil should be removed and disposed at a licenced dumping facility. The excavation should be backfilled with soil of good quality; and
- Control through implementation of mitigation measures (AMD mitigation strategy, progressive rehabilitation).

#### *10.2.8.1* SIGNIFICANCE OF IMPACT MITIGATION

Mitigation is possible and is effective if implemented correctly (Table 66).

Table 66: Impacts on groundwater (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Decrease in water quantity/availability | Site establishment of Camp | -9.75 | -14.63 |
| | Mine area site preparation | -9.75 | -14.63 |
| | Water management Infrastructure construction | -9.75 | -14.63 |
| Pollution of groundwater/decreased water quality | Site establishment of Camp | -10.5 | -17.50 |
| | Mine area site preparation | -10.5 | -17.50 |
| | Water management Infrastructure construction | -10.5 | -17.50 |
| Operational Phase | | | |
| Decrease in water quantity/availability | Mineral Processing | -9,75 | -14,63 |
| | Mineral Processing | -9,75 | -14,63 |
| | Opencast mining | -9,75 | -14,63 |
| | Underground mining | -9,75 | -14,63 |
| Dewatering of groundwater aquifers | Opencast mining | -14 | -23,33 |
| | Underground mining | -14 | -23,33 |
| Pollution of groundwater/decreased water quality | Maintenance and operation of site infrastructure and facilities | -10,5 | -17,50 |
| | Opencast mining | -15 | -25,00 |
| | Underground mining | -16 | -26,67 |
| Decommissioning Phase | | | |
| Decrease in water quantity/availability | General decommissioning activities | -7,5 | -11,25 |
| Dewatering of groundwater aquifers | Decommissioning Underground Mine Infrastructure | -6 | -10,00 |
| Pollution of groundwater/decreased water quality | Filling Opencast Voids | -7,5 | -12,50 |
| | Decommissioning Underground Mine Infrastructure | -11 | -18,33 |
| Rehabilitation and Closure Phase | | | |
| Acid Mine Drainage | Post Closure Monitoring and Maintenance | -15 | -27,50 |
| Decrease in water quantity/availability | Re-vegetation | -4,5 | -6,75 |
| Dewatering of groundwater aquifers | General Surface Rehabilitation | -6 | -10,00 |
| | Storm water management | -6 | -10,00 |
| Pollution of groundwater/decreased water quality | Post Closure Monitoring and Maintenance | -8,25 | -13,75 |
| | Re-vegetation | -5 | -8,33 |

### 10.2.9 IMPACTS ON WETLANDS

The following mitigation types have been associated with potential impacts on wetlands:

- Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance as well as wetland buffer disturbance – "No-Go" area);
- Remedy/modify through wetland rehabilitation; and
- Avoid through implementation of preventative measures (e.g. adequate safety factors).

#### *10.2.9.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain moderate to high in significance (Table 67).

Table 67: Impacts on wetlands (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Decreased watermake to adjacent wetlands | Site establishment – Camp | -9 | -15.03 |
| | Water management Infrastructure construction | -9 | -15.03 |
| Loss and disturbance of wetland habitat | Site establishment – Camp | -11.25 | -20.59 |
| | Water management Infrastructure construction | -11.25 | -20.59 |
| Operational Phase | | | |
| Decreased water to adjacent wetlands | Maintenance and operation of site infrastructure and facilities | -9 | -13,50 |
| | Opencast mining | -9 | -13,50 |
| | Underground mining | -9 | -13,50 |
| Loss and disturbance of wetland habitat | Maintenance and operation of site infrastructure and facilities | -11,25 | -20,63 |
| | Opencast mining | -15 | -27,50 |
| | Underground mining | -11,25 | -20,63 |
| Undermining of wetlands - surface subsidence | Underground mining | -9,75 | -17,88 |
| Decommissioning Phase | | | |
| Decreased water to adjacent wetlands | Decommissioning Underground Mine Infrastructure | -6,75 | -9,00 |
| Rehabilitation and Closure Phase | | | |
| Loss and disturbance of wetland habitat | Water Treatment (as required by conditions of WUL) | -11,25 | -20,63 |

### 10.2.10 IMPACT OF ENVIRONMENTAL POLLUTION

The following mitigation types have been associated with potential impacts on environmental pollution:

- Avoid through implementation of suitable progressive rehabilitation and soil management;
- Control/Remedy through interception of decant and treatment of polluted water where required;
- Avoid and control through implementation of EMP mitigation measures (e.g. Spill prevention, Hydrocarbon Storage);
- Avoid through preventative measures (e.g. bunding, spill kits);
- Remedy through clean-up and waste disposal;
- Modify through soil treatment if required; and
- Avoid and control through implementation of preventative measures (e.g. location of toilets, spill prevention, waste management).

#### *10.2.10.1* SIGNIFICANCE OF IMPACT MITIGATION

Mitigation is possible and is effective in most cases (Table 68).

Table 68: Impacts on environmental pollution (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| General Environmental Pollution | Drilling monitoring boreholes | -9 | -13.50 |
| | Drilling for continued resource evaluation | -9 | -13.50 |
| | Site establishment of Camp | -9 | -13.50 |
| | Mine area site preparation | -9 | -13.50 |
| | Water management Infrastructure construction | -9 | -13.50 |
| Operational Phase | | | |
| General Environmental Pollution | Mineral Processing | -9 | -13,50 |
| | Opencast mining | -9 | -13,50 |
| | Underground mining | -9 | -13,50 |
| Hydrocarbon spills/contamination | Drilling for continued resource evaluation | -8,25 | -11,00 |
| | Drilling monitoring boreholes | -8,25 | -11,00 |
| | Maintenance and operation of site infrastructure and facilities | -9 | -12,00 |
| | Mineral Processing | -9 | -12,00 |
| | Opencast mining | -9 | -12,00 |
| | Underground mining | -9 | -12,00 |
| Sewage spills/contamination | Maintenance and operation of site infra structure and facilities | -5 | -5,00 |
| | Opencast mining | -4,5 | -4,50 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| General Environmental Pollution | Drilling monitoring boreholes | -9 | -13.50 |
| | Drilling for continued resource evaluation | -9 | -13.50 |
| | Site establishment of Camp | -9 | -13.50 |
| | Mine area site preparation | -9 | -13.50 |
| | Water management Infrastructure construction | -9 | -13.50 |
| | Underground mining | -4,5 | -4,50 |
| Decommissioning Phase | | | |
| General Environmental Pollution | General decommissioning activities | -7,5 | -11,25 |
| | Infrastructure removal | -7,5 | -11,25 |
| Hydrocarbon spills/contamination | Decommissioning of Co-Disposal Dump | -6,75 | -9,00 |
| | Drilling monitoring boreholes | -6 | -8,00 |
| | General decommissioning activities | -6,75 | -9,00 |
| | Infrastructure removal | -6,75 | -9,00 |
| | Filling Opencast Voids | -6,75 | -9,00 |
| | Decommissioning Underground Mine Infrastructure | -6,75 | -9,00 |
| Sewage spills/contamination | General decommissioning activities | -3,5 | -3,50 |
| Rehabilitation and Closure Phase | | | |
| Decant from underground workings | Post Closure Monitoring and Maintenance | -15 | -25,00 |
| General Environmental Pollution | Water Treatment (as required by conditions of WUL) | -6,75 | -10,13 |
| Hydrocarbon spills/contamination | Drilling monitoring boreholes | -5,25 | -7,00 |
| | General Surface Rehabilitation | -6 | -8,00 |
| | Post Closure Monitoring and Maintenance | -6 | -8,00 |
| | Re-vegetation | -6 | -8,00 |
| | Storm water management | -6 | -8,00 |
| | Water Treatment (as required by conditions of WUL) | -6 | -8,00 |
| Sewage spills/contamination | Water Treatment (as required by conditions of WUL) | -3,5 | -3,50 |

## 10.2.11 IMPACTS ON HERITAGE RESOURCES

The following mitigation types have been associated with potential impacts on heritage resources:

- Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief);
- Modify through removal and curation of fossils if found during construction and operation;
- Avoid and control through implementation of preventative measures (e.g. fencing of graveyards, watching brief, chance finds procedure);
- In the case of ZV04-07, ILM003, ILM004 and ILM007 the sites will need to be documented before a destruction permit can be applied for at the provincial heritage authority (Mpumalanga). ILM014 will need to be fully mitigated with excavations and documentation of the site. No mitigation is required for ILM015. In the event of any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on mitigation;
- Demarcate sites with a 50-meter buffer and avoid them. If the sites cannot be avoided a grave relocation process will need to take place. Stakeholder engagement will need to be implemented to determine the possibility of infant burials at ILM014 and 015; and
- Stop through relocation of graves if required.

### *10.2.11.1* SIGNIFICANCE OF IMPACT MITIGATION

If the provided mitigation measures are implemented any disturbance to heritage features can be minimised (Table 69).

Table 69: Impacts on heritage resources (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Destruction/damage of heritage resources | Site establishment –Camp | -12.75 | -23.33 |
| | Mine area site preparation | -12.75 | -23.33 |
| | Water management Infrastructure construction | -12.75 | -23.33 |
| Destruction/damage of palaeontological resources | Site establishment of Camp | 9 | 12.00 |
| | Mine area site preparation | 9 | 12.00 |
| | Water management Infrastructure construction | 9 | 12.00 |
| Operational Phase | | | |
| Destruction/damage of heritage resources | Opencast mining | -12,75 | -23,38 |
| | Underground mining | -12,75 | -23,38 |
| Destruction/damage of palaeontological resources | Opencast Mining | -12 | -14,00 |
| | Underground Mining | -12 | -14,00 |
| | Opencast Mining | 9 | 12,00 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Destruction/damage of heritage resources | Site establishment –Camp | -12.75 | -23.33 |
| | Mine area site preparation | -12.75 | -23.33 |
| | Water management Infrastructure construction | -12.75 | -23.33 |
| Destruction/damage of palaeontological resources<br><br>Discovery and preservation of fossils | Site establishment of Camp | 9 | 12.00 |
| | Mine area site preparation | 9 | 12.00 |
| | Water management Infrastructure construction | 9 | 12.00 |
| | Underground Mining | 9 | 12,00 |
| Decommissioning Phase | | | |
| Destruction/damage of heritage resources | General decommissioning activities | -8 | -14,67 |
| Rehabilitation and Closure Phase | | | |
| Destruction/damage of heritage resources | General Surface Rehabilitation | -8 | -14,67 |
| | Storm water management | -8 | -14,67 |
| | Water Treatment (as required by conditions of WUL) | -8 | -14,67 |
| Destruction/damage of palaeontological resources | Water Treatment (as required by conditions of WUL) | -8 | -14,67 |

## 10.2.12 SOCIAL IMPACTS

The following mitigation types have been associated with potential social impacts:

- Avoidance and control through preventative measures (e.g. site security, code of conduct);
- Avoidance and control through mitigation measures (e.g. recruitment procedure, grievance mechanism, code of conduct);
- Control through implementation of ESMS and stakeholder engagement plan;
- Modify through reduction of visual impact; and
- Modify and control through mitigation measures (e.g. grievance mechanism, Relocation plan).

### *10.2.12.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impacts can be controlled but not prevented (Table 70).

Table 70: Social impacts (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |

| | | | |
|---|---|---|---|
| Crime and violence | General mine management | -5.25 | -5.50 |
| Influx of migrant workers | General mine management | -13 | -13 |
| | General Construction management | -13 | -13 |
| Loss of sense of place | General mine management | -6 | -6 |
| | General Construction management | -6 | -6 |
| | Mine area site preparation | -6 | -6 |
| Relocation | General mine management | -11.25 | -13 |
| Social Vices | General mine management | -9 | -9 |
| | General Construction Management | -9 | -9 |
| Operational Phase | | | |
| Crime and violence | General mine management | -5,5 | -5,50 |
| Influx of migrant workers | General mine management | -13 | -13,00 |
| | Opencast mining | -13 | -13,00 |
| Loss of sense of place | General mine management | -6 | -6,00 |
| | Mineral processing | -9 | -9,00 |
| | Opencast mining | -12 | -12,00 |
| | Underground mining | -6 | -6,00 |
| Relocation | General mine management | -11,25 | -13,13 |
| Social vices | General mine management | -9 | -9,00 |
| | Maintenance and operation of site infrastructure and facilities | -9 | -9,00 |
| | Opencast mining | -9 | -9,00 |
| | Underground mining | -9 | -9,00 |
| Decommissioning Phase | | | |
| Crime and violence | General mine management | -4,5 | -4,50 |
| Influx of migrant workers | General mine management | -7,5 | -7,50 |
| Loss of sense of place | General mine management | -4 | -4,00 |
| Relocation | General mine management | -11,25 | -13,13 |
| Social vices | General mine management | -7,5 | -7,50 |

| Rehabilitation and Closure Phase | | | |
|---|---|---|---|
| Crime and violence | General mine management | -4,5 | -4,50 |
| Influx of migrant workers | General mine management | -5 | -5,00 |
| Loss of sense of place | General mine management | -4 | -4,00 |
| | Water treatment (as required by conditions of WUL) | -4 | -4,00 |
| Relocation | General mine management | -11,25 | -13,13 |
| Social vices | General mine management | -7,5 | -7,50 |

## 10.2.13 SOCIO-ECONOMIC IMPACTS

The following mitigation types have been associated with potential socio-economic:

- Maximise through optimisation of economic growth opportunities;
- Maximise skills development and training through implementation of SLP;
- Maximise employment opportunities through implementation of SLP;
- Minimise impacts on local farm labour through compensation, skills development and livelihood restoration;
- Minimise impacts of job loss through skills development and livelihood restoration;
- Avoid through implementation of preventative measures (e.g. consultation and communication);
- Control through ESMS procedures such as recruitment procedure;
- Minimise impacts of job loss through skills development and livelihood restoration; and
- Maximise security of coal supply through sound and responsible mine management.

### *10.2.13.1* SIGNIFICANCE OF IMPACT MITIGATION

Implementation of mitigation measures will help maximise the positive impact of the mining operation (Table 71).

Table 71: Socio-economic impacts (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Economic growth | General Mine Management | 13 | 13 |
| | Drilling for continued resource evaluation | 13 | 13 |
| Education, Skills Development and Training | Drilling for continued resource evaluation | 9 | 9 |
| | General Mine Management | 9 | 9 |
| | Site establishment of camp | 9 | 9 |
| | Water management Infrastructure construction | 9 | 9 |
| Employment opportunities | Drilling for continued resource evaluation | 13 | 13 |
| | General Mine Management | 13 | 13 |
| | General Construction Management | 13 | 13 |
| | Site establishment of camp | 13 | 13 |
| | Water management Infrastructure construction | 13 | 13 |
| Impact on local farm labour | General Mine Management | -9 | -8.25 |
| Perceptions and Expectations | Drilling for continued resource evaluation | -8.25 | -8.25 |
| Operational Phase | | | |
| Coal supply for energy security | Opencast mining | 20 | 23,33 |
| | Underground Mining | 20 | 23,33 |
| Economic growth | General Mine Management | 13 | 13,00 |
| | Opencast mining | 13 | 13,00 |
| | Underground mining | 13 | 13,00 |
| Education, Skills Development and Training | Drilling for continued resource evaluation | 9 | 9,00 |
| | General Mine Management | 9 | 9,00 |
| | Opencast mining | 9 | 9,00 |
| | Underground mining | 9 | 9,00 |
| Employment Opportunities | Drilling for continued resource evaluation | 13 | 13,00 |
| | General Mine Management | 13 | 13,00 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Economic growth | General Mine Management | 13 | 13 |
| | Drilling for continued resource evaluation | 13 | 13 |
| Education, Skills Development and Training | Drilling for continued resource evaluation | 9 | 9 |
| | General Mine Management | 9 | 9 |
| | Site establishment of camp | 9 | 9 |
| | Water management Infrastructure construction | 9 | 9 |
| Employment opportunities | Drilling for continued resource evaluation | 13 | 13 |
| | General Mine Management | 13 | 13 |
| | General Construction Management | 13 | 13 |
| | Site establishment of camp | 13 | 13 |
| | Water management Infrastructure construction | 13 | 13 |
| Impact on local farm labour | General Mine Management | -9 | -8.25 |
| Perceptions and Expectations | Drilling for continued resource evaluation | -8.25 | -8.25 |
| | Maintenance and operation of site infrastructure and facilities | 13 | 13,00 |
| | Opencast mining | 13 | 13,00 |
| | Underground mining | 13 | 13,00 |
| Impacts on local farm labour | General Mine Management | -8,25 | -8,25 |
| | Underground mining | -8,25 | -8,25 |
| Perceptions and Expectations | Drilling for continued resource evaluation | -8,25 | -8,25 |
| Impact on livelihoods | General Mine Management | -9 | -9,00 |
| Decommissioning Phase | | | |
| Economic growth | General Mine Management | 8 | 8 |
| Education, Skills Development and Training | General Mine Management | 6 | 6 |
| Employment Opportunities | General decommissioning activities | 7,5 | 7,50 |
| | General Mine Management | 7,5 | 7,50 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Economic growth | General Mine Management | 13 | 13 |
| | Drilling for continued resource evaluation | 13 | 13 |
| Education, Skills Development and Training | Drilling for continued resource evaluation | 9 | 9 |
| | General Mine Management | 9 | 9 |
| | Site establishment of camp | 9 | 9 |
| | Water management Infrastructure construction | 9 | 9 |
| Employment opportunities | Drilling for continued resource evaluation | 13 | 13 |
| | General Mine Management | 13 | 13 |
| | General Construction Management | 13 | 13 |
| | Site establishment of camp | 13 | 13 |
| | Water management Infrastructure construction | 13 | 13 |
| Impact on local farm labour | General Mine Management | -9 | -8.25 |
| Perceptions and Expectations | Drilling for continued resource evaluation | -8.25 | -8.25 |
| Impacts on local farm labour | General Mine Management | -4 | -4,00 |
| Loss of jobs and economic opportunities | General Mine Management | -16,25 | -16,25 |
| Impact on livelihoods | General Mine Management | -5 | -5,00 |
| Rehabilitation and Closure Phase | | | |
| Economic Growth | General Mine Management | 5,25 | 5,25 |
| Education, Skills Development and Training | General Mine Management | 5,25 | 5,25 |
| Employment Opportunities | General Mine Management | 7,5 | 7,50 |
| Impacts on local farm labour | General Mine Management | -3,5 | -3,50 |
| Loss of jobs and economic opportunities | General Mine Management | -16,25 | -16,25 |
| Impact on livelihoods | General Mine Management | -5 | -5,00 |

### 10.2.14 IMPACTS ON HEALTH AND SAFETY

The following mitigation types have been associated with potential impacts on health and safety:

- Avoidance and control through preventative measures (e.g. HIV/AIDS awareness);
- Remedy through application of mitigation measures in EMP;
- Avoid and control through implementation of preventative measures (e.g. Fire breaks, Blasting procedures, hazardous substances management, adequate ventilation underground); and
- Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures).

#### *10.2.14.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented (Table 72).

Table 72: Impacts on health and safety (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Community health and safety | General Mine Management | -9.75 | -11.38 |
| | General Construction Management | -9.75 | -11.38 |
| | Site establishment of camp | -9.75 | -11.38 |
| | Mine area site preparation | -9.75 | -11.38 |
| | Water management infrastructure construction | -9.75 | -11.38 |
| Health impacts | General Mine Management | -9 | -10.50 |
| | Mine area site preparation | -9 | -10.50 |
| Operational Phase | | | |
| Community health and safety | General Mine Management | -9,75 | -11,38 |
| | Maintenance and operation of site infrastructure and facilities | -9,75 | -11,38 |
| | Opencast mining | -9,75 | -11,38 |
| Fire and explosion hazard | Maintenance and operation of site infrastructure and facilities | -5 | -5,00 |
| | Mineral Processing | -5 | -5,00 |
| | Opencast mining | -5 | -5,00 |
| | Underground mining | -5 | -5,00 |
| Fly Rock | Opencast mining | -4,5 | -4,50 |
| | Underground mining | -4,5 | -4,50 |
| Health impacts | General Mine Management | -9 | -10,50 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Community health and safety | General Mine Management | -9.75 | -11.38 |
| | General Construction Management | -9.75 | -11.38 |
| | Site establishment of camp | -9.75 | -11.38 |
| | Mine area site preparation | -9.75 | -11.38 |
| | Water management infrastructure construction | -9.75 | -11.38 |
| Health impacts | General Mine Management | -9 | -10.50 |
| | Mine area site preparation | -9 | -10.50 |
| | Maintenance and operation of site infrastructure and facilities | -9 | -10,50 |
| | Mineral Processing | -9 | -10,50 |
| | Opencast mining | -9 | -10,50 |
| | Underground mining | -9 | -10,50 |
| Decommissioning Phase | | | |
| Community health and safety | Decommissioning of Co-Disposal Dump | -4 | -4,00 |
| | General decommissioning activities | -4 | -4,00 |
| | General Mine Management | -4 | -4,00 |
| | Filling Opencast Voids | -4 | -4,00 |
| | Decommissioning Underground Mine Infrastructure | -4 | -4,00 |
| Health Impacts | General decommissioning activities | -7,5 | -8,75 |
| | General Mine Management | -7,5 | -8,75 |
| Rehabilitation and Closure Phase | | | |
| Community health and safety | General Mine Management | -3 | -3,00 |
| | Re-vegetation | -3 | -3,00 |
| Health Impacts | General Mine Management | -6,75 | -7,88 |
| | Re-vegetation | -6,75 | -7,88 |

### 10.2.15 IMPACTS ON TRANSPORTATION, INFRASTRUCTURE AND TRAFFIC

The following mitigation types have been associated with potential impacts on transportation, infrastructure and traffic:

- Avoid and control through implementation of EMP mitigation measures (e.g. speed limit enforcement, vehicle maintenance).

#### *10.2.15.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain low to moderate in significance (Table 73).

Table 73: Impacts on transportation, infrastructure and traffic (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Increased traffic | Site establishment of Camp | -13 | -13 |
| | Mine area site preparation | -13 | -13 |
| | Water management Infrastructure construction | -13 | -13 |
| Damage to road infrastructure | Site establishment of Camp | -9 | -9.00 |
| | Mine area site preparation | -9 | -9.00 |
| | Water management Infrastructure construction | -9 | -9.00 |
| Operational Phase | | | |
| Increased traffic | Opencast mining | -13 | -13,00 |
| | Underground mining | -13 | -13,00 |
| Damage to road infrastructure | Opencast mining | -9 | -9,00 |
| | Underground mining | -9 | -9,00 |
| Decommissioning Phase | | | |
| Damage to road infrastructure | Decommissioning of Co-Disposal Dump | -7,5 | -7,50 |

### 10.2.16 VISUAL IMPACTS

The following mitigation types have been associated with potential visual impacts:

- Avoid and control through implementation of EMP mitigation measures (e.g. directional down lighting, dust suppression, mine planning and progressive rehabilitation).

#### *10.2.16.1* SIGNIFICANCE OF IMPACT MITIGATION

Mitigation is possible and is effective if implemented correctly (Table 74).

Table 74: Visual impacts (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Visual impact of mine infrastructure, stockpiles and dust | Site establishment – Camp | -9 | -10.50 |
| | Mine area site preparation | -9 | -10.50 |
| | Water management Infrastructure construction | -9 | -10.50 |
| Operational Phase | | | |
| Visual impact of light at night | Mineral Processing | -8,25 | -9,63 |
| | Opencast mining | -8,25 | -9,63 |
| | Underground mining | -6 | -7,00 |
| Visual impact of mine infrastructure, stockpiles and dust | Mineral Processing | -9 | -10,50 |
| | Opencast mining | -9 | -10,50 |
| | Underground mining | -6,75 | -7,88 |
| Decommissioning Phase | | | |
| Visual impact of mine infrastructure, stockpiles and dust | Decommissioning of Co-Disposal Dump | -7,5 | -8,75 |
| Rehabilitation and Closure Phase | | | |
| Visual impact of mine infrastructure, stockpiles and dust | General Surface Rehabilitation | -6 | -7,00 |
| | Storm water management | -6 | -7,00 |
| | Water Treatment (when required) | -6,75 | -7,88 |

### 10.2.17 IMPACTS ON AIR QUALITY

The following mitigation types have been associated with potential impacts on air quality:

- Avoid and control through implementation of EMP mitigation measures (e.g. vehicle maintenance, progressive rehabilitation);
- Avoid through preventative measures (e.g. speed limit enforcement); and
- Control through implementation of EMP mitigation measures (e.g. dust suppression).

#### *10.2.17.1* SIGNIFICANCE OF IMPACTS

With mitigation, the impact can be controlled but not prevented and will remain low in significance (Table 75).

Table 75: Impacts on air quality (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Fugitive emissions (Dust) | Drilling monitoring boreholes | -4 | -4.67 |
| | Drilling for continued resource evaluation | -4 | -4.67 |
| | Site establishment of Camp | -4 | -4.67 |
| | Mine area site preparation | -4 | -4.67 |
| | Water management Infrastructure construction | -4 | -4.67 |
| Greenhouse gas emissions | Drilling monitoring boreholes | -6.75 | -10.13 |
| | Drilling for continued resource evaluation | -6.75 | -10.13 |
| | Site establishment of Camp | -6.75 | -10.13 |
| | Mine area site preparation | -6.75 | -10.13 |
| | Water management Infrastructure construction | -6.75 | -10.13 |
| Operational Phase | | | |
| Fugitive emissions (Dust) | Drilling for continued resource evaluation | -4 | -4,67 |
| | Drilling monitoring boreholes | -4 | -4,67 |
| | Mineral Processing | -12 | -14 |
| | Opencast mining | -8,25 | -9,63 |
| | Underground mining | -8,25 | -9,63 |
| Greenhouse gas emissions | Maintenance and operation of site infrastructure and infrastructure and facilities | -6,75 | -10,13 |
| | Mineral Processing | -6,75 | -10,13 |
| | Opencast mining | -6,75 | -10,13 |
| | Underground mining | -6,75 | -10,13 |
| Decommissioning Phase | | | |
| Fugitive emissions (Dust) | Decommissioning of Co-Disposal Dump | -6,75 | -7,88 |
| | Drilling monitoring boreholes | -3 | -3,50 |
| | General decommissioning activities | -6,75 | -7,88 |
| | Infrastructure removal | -6,75 | -7,88 |
| | Filling Opencast Voids | -6,75 | -7,88 |
| Greenhouse gas emissions | Decommissioning of Co-Disposal Dump | -5,25 | -7,88 |

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Fugitive emissions (Dust) | Drilling monitoring boreholes | -4 | -4.67 |
| | Drilling for continued resource evaluation | -4 | -4.67 |
| | Site establishment of Camp | -4 | -4.67 |
| | Mine area site preparation | -4 | -4.67 |
| | Water management Infrastructure construction | -4 | -4.67 |
| Greenhouse gas emissions | Drilling monitoring boreholes | -6.75 | -10.13 |
| | Drilling for continued resource evaluation | -6.75 | -10.13 |
| | Site establishment of Camp | -6.75 | -10.13 |
| | Mine area site preparation | -6.75 | -10.13 |
| | Water management Infrastructure construction | -6.75 | -10.13 |
| | General decommissioning activities | -5,25 | -7,88 |
| | Infrastructure removal | -5,25 | -7,88 |
| | Filling Opencast Voids | -5,25 | -7,88 |
| | Decommissioning Underground Mine Infrastructure | -5,25 | -7,88 |
| Rehabilitation and Closure Phase | | | |
| Fugitive emissions (Dust) | Drilling monitoring boreholes | -5,25 | -6,13 |
| | General Surface Rehabilitation | -5,25 | -6,13 |
| | Post Closure Monitoring and Maintenance | -5,25 | -6,13 |
| | Re-vegetation | -5,25 | -6,13 |
| | Storm water management | -5,25 | -6,13 |
| | Water Treatment (as required by conditions of WUL) | -5,25 | -6,13 |
| Greenhouse gas emissions | Re-vegetation | -5,25 | -7,88 |
| | General Surface Rehabilitation | -5,25 | -7,88 |
| | Storm water management | -5,25 | -7,88 |
| | Water Treatment (as required by conditions of WUL) | -5,25 | -7,88 |

### 10.2.18 NOISE IMPACTS

The following mitigation types have been associated with potential noise impacts:

- Avoid through preventative measures (e.g. communication with landowners, timing of activities); and

- Control through implementation of EMP mitigation measures (e.g. Noise abatement measures).

#### *10.2.18.1* SIGNIFICANCE OF IMPACT MITIGATION

With mitigation, the impact can be controlled but not prevented and will remain low in significance (Table 76).

Table 76: Noise impacts (post mitigation).

| Impacts | Activity | Post-Mitigation Score | Final Significance |
|---|---|---|---|
| Construction Phase | | | |
| Disturbing and/or nuisance noise | Drilling monitoring boreholes | -6.75 | -7.88 |
| | Drilling for continued resource evaluation | -6.75 | -7.88 |
| | Site establishment of Camp | -6.75 | -7.88 |
| | Mine area site preparation | -6.75 | -7.88 |
| | Water management Infrastructure construction | -6.75 | -7.88 |
| Operational Phase | | | |
| Disturbing and/or nuisance noise | Drilling for continued resource evaluation | -6,75 | -7,88 |
| | Drilling monitoring boreholes | -6,75 | -7,88 |
| | Maintenance and operation of site infrastructure and facilities | -9 | -10,50 |
| | Mineral Processing | -9 | -10,50 |
| | Opencast mining | -9 | -10,50 |
| | Underground mining | -7,5 | -8,75 |
| Decommissioning Phase | | | |
| Disturbing and/or nuisance noise | Decommissioning of Co-Disposal Dump | -6,75 | -7,88 |
| | Drilling monitoring boreholes | -6,75 | -7,88 |
| | General decommissioning activities | -9 | -10,50 |
| | Infrastructure removal | -9 | -10,50 |
| | Filling Opencast Voids | -9 | -10,50 |
| | Decommissioning Underground Mine Infrastructure | -7,5 | -8,75 |
| Rehabilitation and Closure Phase | | | |
| Disturbing and/or nuisance noise | Drilling monitoring boreholes | -5,25 | -6,13 |
| | General Surface Rehabilitation | -6 | -7,00 |
| | Re-vegetation | -5,25 | -6,13 |
| | Storm water management | -6 | -7,00 |
| | Water Treatment (as required by conditions of WUL) | -5,25 | -6,13 |

### 10.2.19 BLASTING AND VIBRATION

The following mitigation types have been associated with potential blasting and vibration impacts:

- Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures).

#### *10.2.19.1* SIGNIFICANCE OF IMPACT MITIGATION

Mitigation is possible and is effective in most cases (Table 77).

Table 77: Blasting and vibration impacts (post mitigation).

| Impacts | Activity | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| Operational Phase | | | | |
| Air Blast | Opencast mining | -11 | -6,75 | -7,88 |
| | Underground mining | -11 | -6,75 | -7,88 |
| Ground Vibration and human perception | Opencast mining | -13 | -7,5 | -7,50 |
| | Underground mining | -13 | -7,5 | -7,50 |
| Ground Vibration Impacts on productivity of farm animals (cattle, chickens, pigs, etc.) | Opencast mining | -13 | -8,25 | -9,63 |
| Impacts on Infrastructure (roads, communications infrastructure, services, houses, boreholes) | Opencast mining | -13 | -8,25 | -9,63 |
| | Underground mining | -13 | -9 | -9,00 |
| Noxious fumes | Opencast mining | -12 | -9 | -9,00 |
| | Underground mining | -12 | -9 | -9,00 |

# 11 ADEQUACY OF PREDICTIVE METHODS, UNDERLYING ASSUMPTIONS, AND UNCERTAINTIES

The following assumptions, limitations, gaps in knowledge and uncertainties are applicable to this assessment:

## 11.1 ENVIRONMENTAL IMPACT ASSESSMENT

In determining the significance of impacts, with mitigation, it is assumed that mitigation measures proposed in the report are correctly and effectively implemented and managed by the applicant throughout the life of the project.

## 11.2 ENVIRONMENTAL ASSESSMENT LIMITS

The health and safety of communities has been assessed in the EIA Amendment as this relates to potential social impacts that may arise from the project. The EIA Amendment did not, however, assess the health and safety of workers as this is regulated separately under the Mine Health and Safety Act and the Occupational Health and Safety Act.

## 11.3 PREDICTIVE MODELS

Predictive models are only as accurate as the data provided, therefore, if the input data becomes inaccurate or inapplicable due to project design changes or alterations to other variables, the predictive models will decrease in accuracy. Despite these shortcomings of predictive models in general, it should be noted that the models which are crucial for ongoing impact and risk identification (such as the geohydrological model) will be refined (as much as is practically possible) on an ongoing basis with real world data collected from the monitoring programmes. As such the models will be periodically refined and will improve in accuracy over time.

## 11.4 HERITAGE AND CULTURAL RESOURCES

Due to the nature of cultural remains that occur, in most cases, below surface, the possibility remains that some cultural remains may not have been discovered during the survey. It is incumbent upon the applicant to inform the relevant heritage agency should further as yet unknown cultural remains be unearthed or laid open during the process of development.

Notwithstanding the comprehensiveness of the fieldwork undertaken in the various heritage assessments, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and vegetation cover. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must be contacted immediately. Such observed or located heritage features and/or objects may not be disturbed or removed in any way, until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well.

Old fossil databases have not been kept up-to-date or are not computerised. These databases do not always include relevant locality or geological information. South Africa has a limited number of professional palaeontologists and most development study areas have never been surveyed by a palaeontologist.

The correctness of geological maps where data may be based merely on aerial photographs and small areas of important geology have been ignored. The sheet explanations for geological maps are insufficient and little to no attention is paid to the palaeontology.

Impact assessments and other reports - is not readily available for desktop studies. Large areas of South Africa have not been studied palaeontologically. Fossil data assembled from similar Assemblage Zones but in different areas, might provide insight on the possible presence of fossils in an unfamiliar area. Desktop studies thus assume the presence of unexposed fossil heritage within study areas of similar geological formations. When significant exposures of bedrocks or potentially fossiliferous superficial sediments are present in the development area, the trustworthiness of a Palaeontological Impact Assessment may be enhanced through a field-survey by a professional palaeontologist.

## 11.5 SOCIAL

The social environment constantly changes and adapts to change, and external factors outside the scope of the project can offset social changes, for example changes in local political leadership. It is therefore difficult to predict all impacts to a high level of accuracy, although care has been taken to identify and address the most likely impacts in the most appropriate way for the current local context within the limitations.

Social impacts can be felt on an actual or perceptual level, and therefore it is not always straightforward to measure the impacts in a quantitative manner. There are different groups with different interests in the community, and what one group may experience as a positive social impact, another group may experience as a negative impact.

## 11.6 FAUNA AND FLORA

Red List species are, by their nature, are usually very rare and difficult to locate. Compiling the list of species that could potentially occur in an area is limited by the paucity of collection records that make it difficult to predict whether a species may occur in an area or not. The methodology used in this assessment is designed to reduce the risks of omitting any species, but it is always possible that a species that does not occur on a list may be located in an area where it was not previously known to exist.

Animal species are mostly highly mobile and often migrate seasonally. Any field assessment of relatively short duration is, therefore, unlikely to record anything more than the most common species that happen to be on site at the time of the survey. This is a poor reflection of the overall diversity of species that could potentially occur on site.

Due to the time of sampling (July and August 2017), not all plant species on site could be identified as features such as seeds, flowers and fruit were absent. Migratory bird species were not present during the winter months and amphibian and reptile behavior was extremely low due to the cold temperatures and time of the year.

## 11.7 SOIL, LAND USE AND LAND CAPABILITY

It has been assumed that the total area of possible disturbance was included in the area of study, that the mining plan as tabled is the most recent information, that the plan caters for all actions and activities that could potentially have an impact on the soils, land use and land capability, and that the recommendations made, and impact ratings tabled will be re-assessed if the development plan changes.

Limitations to the accuracy of the pedological mapping (as recognised within the pedological industry) are accepted at between 50% (reconnaissance mapping) and 80% (detailed mapping), while the degree of certainty for the soils physical and chemical (analytical data) results has been based on “composite” samples taken from the dominant soil types mapped in the study area.

The area in question has been mapped on a comprehensive reconnaissance base, the degree and intensity of mapping and geochemical sampling being considered and measured based on the complexity of the soils noted in field during the field mapping, and the interplay of geomorphological aspects (ground roughness, slope, aspect and geology etc.).

A more intensive study of the particular crop varieties and livestock ventures has not been undertaken, with the socio economic study having better access to these information and data sets.

## 11.8 WATER BALANCE

No predictive water balance (model) has been undertaken for the future mining areas.

## 11.9 GROUND WATER

The sub-catchments within which the proposed mining activities lie span an area of approximately 470 km$^2$. This is a relatively large area, and even though there are 113 boreholes and 34 springs that were identified in the study area during the 2012 hydrocensus there is still a shortage of information on the baseline groundwater conditions that occur in the area. In addition, the geological information database is restricted to the proposed mining area and there is little information available on the regional geological conditions. Some assumptions had to be made during the model set-up and calibration:

- Aquifer homogeneity: It is assumed that the aquifers that occur in the area are relatively homogenous and non-compartmentalised. This assumption is supported by the fact that the depth to groundwater level, as well as the groundwater chemical characteristics are relatively evenly distributed through the area with no indication of compartmentalisation. In addition, the geological map indicates that the geology is relatively homogenous.
- Mine floor elevations: The mine floor elevations data is concentrated within the various pit and underground mining areas. There is no information on the coal seam elevations available outside the pit area. The numerical modelling software requires that each individual layer extends through the entire model area. Layers cannot pinch out. Since coal seam elevations for the B-seam and E-seam are only available in localised areas of the total model area the seam elevations must be interpolated throughout the entire model area. This caused some problems in areas and it was necessary to simulate the weathered zone and the overburden as a single layer to prevent pinching out of the weathered material aquifer in places. This assumption is supported by the fact that the depth to groundwater level data does not show a clear distinction between groundwater levels in the shallow weathered

material aquifer and that of the underlying fractured rock aquifer. Therefore, it can be concluded that the weathered material aquifer and the underlying fractured rock aquifer has a good hydraulic connectivity and although it is not optimal, the weathered material aquifer and the fractured rock aquifer in the overburden can be simulated as a single layer.

- It is assumed that recharge from rainfall range between 1 and 3% of the mean annual rainfall. The groundwater maps of South Africa support this assumption.
- It is assumed that the mining pits that were recently rehabilitated could still have an impact on the groundwater flow patterns, and therefore also the contaminant migration through the study area. These recently rehabilitated pit areas, or areas where mining will stop by the end of 2017 and rehabilitation will start, are included in the numerical model. After calibration, a scenario was run where the impacts of the current and recent mining activities on the groundwater levels were simulated. The outputs from this scenario provides an indication of the current groundwater levels in the area and takes into consideration the effect of historic and current mine dewatering.
- Geochemical assessment of the rock material excavated and stored on site has been done during previous studies. In addition, water qualities from individual decant points and waste water facilities are available. Where applicable reference is made to the actual measured waste water or decant qualities to obtain an indication of the source concentrations rather than theoretical values obtained from the leach testing

In addition to the existing monitoring program it is recommended that some gaps be addressed:

- There are no monitoring boreholes near the TZP2 opencast area. It is recommended that additional boreholes be installed to monitor this pit area.
- There are no monitoring boreholes near the Paardeplaats South opencast area. It is recommended that additional boreholes be installed to monitor this pit area.
- There are no monitoring boreholes near Haarlem 6E and 6W opencast areas. It is recommended that additional boreholes be installed to monitor these pit areas.
- There are no monitoring boreholes near Haarlem 7N and 7S opencast areas. It is recommended that additional boreholes be installed to monitor these pit areas.
- There are no monitoring boreholes near Haarlem 8 opencast area. It is recommended that additional boreholes be installed to monitor this pit area.

## 11.10 SURFACE WATER

No specific surface water specialist impact assessment report was undertaken for the future mining areas in support this amendment report. The impacts on surface water have been calculated based on the previous surface water studies undertaken and the monthly water monitoring for the mine which provided an adequate understanding of the possible impacts on surface water features.

## 11.11 WETLANDS

Although a specific wetland study was not undertaken, the two elements required for the delineation of wetlands was:

- The soil/land capability study delineates the wetlands, and
- The ecological study (fauna and flora) took cognisance of wetland vegetation and animal life.

In addition, the wetlands were refined and delineated as part of the mine planning, wherein site-specific delineation was undertaken prior to the planning of any pit outlines or infrastructural positioning. The impacts on wetlands have been calculated based on the previous wetland studies undertaken for the mine which provided a limited understanding of the possible impacts on wetland features. As a risk averse approach, wetlands and associated buffers have been excluded from the initial proposed future mining areas.

## 11.12 AIR QUALITY

No specific specialist air quality impact assessment study was undertaken for the future mining areas in support this amendment report. The on-going air quality monitoring information and reports were utilized to inform the impact assessment and proposed mitigation measures contained in this amendment report.

## 11.13 VISUAL

No specific specialist visual impact assessment study was undertaken for the future mining areas in support this amendment report.

## 11.14 NOISE

No specific specialist noise impact assessment report was undertaken for the future mining areas in support this amendment report. The existing and on-going noise monitoring reports were utilized to inform the impact assessment and proposed mitigation measures contained in this amendment report.

## 11.15 FINANCIAL PROVISION

The updated closure costing for the mine was calculated by Digby Wells in 2016 according to the following limitations and assumptions:

- The survey information provided by Thembani Technical Services, used by Digby Wells for measurements of infrastructure and areas requiring rehabilitation are deemed accurate and up to date.
- Volume not calculated by Digby Wells but received from Ilima were assumed to be correct for the purposes of this report.
- No due diligence was undertaken to determine whether Ilima is responsible for any other areas not specified in the report.
- It is assumed that all surface infrastructure will be demolished at mine closure.
- The calculations do not account for any value recovered from the sale of plant, steel or other material.
- There is sufficient backfill material to rehabilitate all open pits on site.
- All open pits will be backfilled with their associated dumps located close to the pit.
- All stockpiled product will be removed prior to rehabilitation and allowance was made to rehabilitate the respective footprints.
- The cost assessment did not include fertilizing of soil.
- Allowance was made to topsoil and level all the pit and disturbed areas, after they have been backfilled. The recommended rehabilitation approach to ensure full vegetation growth is as follows. The recommended approach was not however costed in the assessment:

- Lime and superphosphate should be applied to the surface;
- These ameliorants are then incorporated by deep ripping, which penetrated 100mm through the soil into the underlying overburden material;
- Compound (NPK + Zn) fertilizer is applied, and disced in as part of seedbed preparation;
- A grass seed mix is then planted, usually with first rains, or after rains have commenced; and
- The site is then mulched using locally obtained grass (usually *Hyparrhenia hirta*); this is to stimulate the long-term establishment of indigenous vegetation and to reduce erosion during early plant growth.

- The financial provision estimate is exclusive of VAT;
- A contingency of 10% was included to allow for unforeseen costs associated with contractors or rate increases;
- It was assumed that 3 years is adequate for the monitoring and maintenance of vegetation after rehabilitation;
- For post-closure monitoring, costs of ground and surface water have been assumed to take place for a period of five years with sampling taking place on a quarterly basis; and
- The rate to move soil and overburden material was derived from contractor rates.

The financial provision will need to be updated in 2017 to include all relevant future mining areas and amended mining operations. Annual updates to the financial provisioning must take into consideration the future mining areas which may become active within the subsequent year of assessment.

# 12 REASONED OPINION AS TO WHETHER THE PROPOSED ACTIVITY SHOULD OR SHOULD NOT BE AUTHORISED

## 12.1 REASONS WHY THE ACTIVITY SHOULD BE AUTHORISED OR NOT

The Ilima Colliery is an existing mine and the proposed extensions to the mining areas, are located within the existing Mining Right (extend the life of mine) and therefore, allow for further and continued economic benefits associated with the mining operation. This report has assessed the potential impacts associated with the additional activities and mitigation measures have been developed to address the impacts identified. This EIR and EMPR Amendment will provide a framework for the effective management of the mining operations going forward with the aim of minimising the potential harmful impacts and promoting the positive impacts where relevant. This EIR and EMPR Amendment will also be made available to I&APs and appropriate measures will be included wherever possible to ensure their concerns are addressed. As such, the EAP is of the opinion that the activity should be authorised.

## 12.2 CONDITIONS THAT MUST BE INCLUDED IN THE AUTHORISATION

The subsections below contain the specific conditions that should be considered for inclusion in the authorisation based on the findings of the assessment that has been undertaken.

### 12.2.1 SPECIFIC CONDITIONS TO BE INCLUDED INTO THE COMPILATION AND APPROVAL OF THE EIR AND EMPR AMENDMENT

In addition to the standard conditions typically included in an authorisation, the following key commitments should be included in the conditions to be made legally binding on the Applicant should this EIR and EMPR Amendment be approved. These include:

- The Applicant shall develop an effective Environmental and Social Management System (ESMS) as described in the EMPR that is appropriate to the nature and scale of the project.
- The Applicant shall develop and implement social and environmental plans and procedures to support the successful implementation of the ESMS. The ESMS shall dictate which plans and procedures are required.
- The Integrated Rehabilitation and Closure Plan must be developed by a specialist for implementation within one year of the approval of the EMPR. The Plan shall be viewed as a dynamic document and shall be subjected to independent review on an annual basis along with the quantum for financial provision.
- The Applicant shall appoint a suitably qualified and competent Independent ECO who shall be tasked with auditing the mines environmental compliance. The ECO shall undertake site inspections during the construction phase and prepare audit reports to be submitted to the mines management. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO should have appropriate qualification and experience in the implementation of environmental management specifications. Following the construction phase, the mine's appointed environmental officer will take over and ensure compliance.
- The EMPR must be made binding on all contractors, sub-contractors or agents operating on behalf of the Mining Right Holder.
- The Applicant must appoint suitably qualified palaeontology and archaeology specialists to develop a Heritage Management Plan for the mine. This should include the relevant measures to protect and monitor all known heritage resources on site. Furthermore, the plan should include a chance finds procedure to protect any heritage or fossil resources which may be discovered during the operations.
- Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist.
- In the event that graves or cemeteries must be relocated, a full grave relocation process must be undertaken that complies with legal requirements and includes comprehensive social consultation.
- The mine needs to initiate a social consultation process before any graveyards are fenced as per Chapter IX of the 2000 NHRA Regulations and section 36 (3) of the NHRA.
- As per the requirements of SAHRA, a palaeontologist must be appointed to review the geotechnical report and submit a letter concluding whether or not any monitoring should be carried out by a palaeontologist;
- The Applicant shall take the necessary precautions to avoid any impacts to wetlands outside of the required construction and/or mining footprint. These areas should be considered as no-go areas, and the restriction should be enforced. Should the Applicant not be able to comply with these conditions, the relevant authorisations, exemptions or licences will be obtained and complied with.

- The Applicant shall include additional groundwater/surface water monitoring points to include the additional mining areas.
- The Applicant shall include additional noise monitoring points to include the additional mining areas.
- The Applicant shall include additional dust monitoring points to include the additional mining areas.
- A socio-economic study should be undertaken in order to determine the particular crop varieties and livestock ventures within the area in order to determine the impacts of these additional mining areas and to provide suitable mitigation measures.
- The applicant must update their closure planning and associated financial provisions for all mining areas on an annual basis as required by NEMA.
- Any infrastructure and all storm water controls and mining related facilities or activities should be constructed outside of the wetland environment.
- Sensitive landscapes such as wetland areas and pan systems should be avoided completely.
- All future monitoring boreholes, as well as private boreholes must be surveyed with a differential GPS system to ensure accurate reporting of the groundwater levels. Hand-held GPS systems have a coordinate accuracy of approximately 5 m whereas the differential GPS systems record the coordinates, and more importantly the elevation with accuracy better than five centimetres.

### 12.2.2 REHABILITATION REQUIREMENTS

The following commitments are considered to be extremely important to ensure negative impacts are effectively mitigated and should be specifically included as conditions in the Authorisation.

- A specialist must be appointed to develop a detailed, site specific AMD management plan to be implemented for the remaining life of mine. Where acid mine drainage is anticipated, or detected, mitigation measures must be investigated and implemented (such as impermeable linings for the coal stockpiles and treatment of mine water).
- Provision must be made for the long-term treatment and/or management of water collecting in mined out voids. The extent of treatment required, as well as the duration of treatment needs to be determined by water quality assessments and in consultation with the competent authority. Polluted mine water and/or decant needs to be treated to the required level before discharge into natural watercourses.
- An Integrated Rehabilitation and Closure Plan that complies with the framework, guidelines and principles presented in this EMPR must be developed and implemented within one year of this EMPR being approved. Furthermore, the Mine shall investigate water treatment options to address decant where this occurs as a result of the mining activities. The mine should implement appropriate treatment options as agreed with the competent authority.

# 13 PERIOD FOR WHICH THE ENVIRONMENTAL AUTHORISATION IS REQUIRED

The EA should be valid for the duration of the mining right.

# 14 UNDERTAKING

It is hereby confirmed that the undertaking required to meet the requirements of this section is provided at the end of the EMPR.

# 15 FINANCIAL PROVISION

An annual Financial Provision Assessment was conducted in 2016. As Ilima Colliery is an existing mine, the financial provisioning was not determined as required by the NEMA, as amended and associated regulations. Section 24 P of NEMA provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. Ilima will be required to address and align its financial provisioning according to the GNR 1147 by February 2019. Ilima will manage environmental impacts throughout the LoM. The mine will put in place mitigation measures to achieve the objectives and goals of impact management and rehabilitation as identified in this report. The direct operational budget for the financial year following approval will be determined in consultation with the DMR and a capital budget for the project provided for. Estimated costs for the implementation of specific mitigation measures where available are provided in the specialist reports.

## 15.1 EXPLAIN HOW THE AFORESAID AMOUNT WAS DERIVED

Estimated costs for the implementation of specific mitigation measures, where available, are based on previous costs for similar measures on previous projects and taking into account an inflation factor. It is, however, important to note that the mines operational budget for environmental management is reviewed on an annual basis and the mine is committed in terms of the EMPR, which is a legally binding document, to ensure that adequate operational budget is set aside for operational environmental management.

The financial provision associated with the Ilima Operation was assessed as at December 2016, and a revised closure costing submitted to the DMR in March 2017. New mining activities were observed on site whilst a portion of TZP4 and the entire TZP5 have been backfilled since the last assessment in 2015. The new activities include the Kwaggafontein 5 boxcut and hard stand.

Allowance was made for the sealing of the shafts at TZP 4, demolition and management of physical infrastructure, replacement of soil and re-vegetation, and for the general surface rehabilitation of all the disturbed areas at Ilima Operation.

The Financial Provisioning Regulations, 2015 (Government Notice No. 1147 published in GG 39425) pertaining to the financial provision for prospecting, exploration, mining or production operations were promulgated on 20 November 2015 under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), as amended. The report did not address any of the requirements of the Financial Provisioning Regulations. The report and associated review of the financial provision is based on the Regulations applicable as at 1 December 2014. In terms of the new Regulations, a holder will have 39 months to assess, review and adjust the sum of the financial provision in accordance with Regulation 9. Therefore, the new Regulation will need to be addressed and aligned by February 2019.

It is recommended the financial provision be updated on an annual basis as a requirement by NEMA. This will ensure that all costs become more accurate over time and will reflect current market conditions.

## 15.2 CONFIRM THAT THIS AMOUNT CAN BE PROVIDED FOR FROM OPERATING EXPENDITURE

The amount provided for to manage and rehabilitate the environment will be provided by the direct operational budget for the proposed mine and in consultation with the DMR.

# 16 DEVIATIONS FROM THE APPROVED SCOPING REPORT AND PLAN OF STUDY

This document is prepared and submitted in terms of NEMA GNR 982, Regulation 31 as Part 2 amendment EIR and EMPR report and, therefore, was not required to undergo a scoping phase.

## 16.1 DEVIATIONS FROM THE METHODOLOGY USED IN DETERMINING THE SIGNIFICANCE OF POTENTIAL ENVIRONMENTAL IMPACTS AND RISKS

The previously submitted and approved EIA's were undertaken under legislation which has since been repealed and updated by new legislation. The impacts identified in this assessment have been assessed in accordance with the latest environmental regulations (NEMA 2017 EIA Regulations) and, therefore, include additional criteria such as the irreplaceable loss of resources, degree to which impacts can be reversed and the results of public consultation.

## 16.2 MOTIVATION FOR THE DEVIATION

The impacts identified in this assessment have been assessed in accordance with the latest environmental regulations (NEMA 2017 EIA Regulations), which includes additional criteria, thus rendering the impact assessment more robust than those undertaken previously.

# 17 OTHER INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No additional information has been requested from the competent authority to date.

## 17.1 COMPLIANCE WITH THE PROVISIONS OF SECTIONS 24(4)(A) AND (B) READ WITH SECTION 24(3)(A) AND (7) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT 107 OF 1998) THE EIA REPORT MUST INCLUDE THE:

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

The potential impacts on the socio-economic conditions include:

- Education, Skills Development and Training:
    - The implementation of skills development and training programmes will have a direct positive effect on a number of individuals. The commitments in this regard are stipulated in the SLP and Ilima is legally bound to implement these programmes.

- Employment Opportunities:
    - The operation of the mine will result in both direct and indirect employment opportunities.
- Impacts on local farm labour:
    - There is potential for impact on farm labour as farm labourers are recruited by the mine and consequently there is a loss of skills and knowledge in the farm labour community. This in turn can have an impact on the socio-economic conditions for landowners and farmers.
- Influx of migrant workers:
    - The mining operations can result in the influx of migrant workers seeking jobs and thereby reducing the number of jobs available to local labour. This is addressed through the recruitment procedure which focuses on employment of local labour.
- Loss of jobs and economic opportunities:
    - Upon closure and downscaling of mining operations, there will be a loss of jobs and income for a large number of individuals. The SLP aims through skills development and training to equip to employees with portable skills, thereby opening up other employment opportunities post mining.
- Perceptions and Expectations:
    - When a new mine comes into an area there is often false perceptions and expectations, particularly surrounding potential employment. There are inevitably more people seeking jobs than the number of jobs available at the mine, especially for unskilled labour. The manner in which false perceptions and expectations is addressed is through extensive consultation and communication to ensure people are fully aware of the potential employment opportunities and recruitment process.
- Relocation:
    - In some cases, there is a requirement to relocate homesteads where opencast mining takes place in previously inhabited areas. This can result in socio-economic impacts including loss of income. This is addressed through livelihood restoration which typically includes replacement of infrastructure, property and services and may also include compensation.

Numerous EIA studies have been undertaken for the Ilima Colliery and extensive public consultation has taken place to determine the specific impacts on specific individuals or communities. The consultation process has allowed directly affected parties to raise their concerns.

Further to the above, it must be noted that I&AP's, including directly affected parties such as landowners, will have the opportunity to review and comment on this report. The results of the public consultation will be included in the final report to be submitted to the department for adjudication.

## 17.3 IMPACT ON ANY NATIONAL ESTATE REFERRED TO IN SECTION 3(2) OF THE NATIONAL HERITAGE RESOURCES ACT

A number of heritage impact assessment studies have been undertaken to identify potential impacts on heritage and palaeontological resources. Please refer to section 9.1.12 of the report for a summary of the findings. For further detailed information, please refer to the full specialist reports which are provided Appendix I.

The overall finding from the specialist studies is that a number of heritage resources exist on the properties within the mining right area. Furthermore, it was determined that there was a high probability of impacts to these features due to the proposed proximity of opencast mining areas to some of these sites. As discussed in the description of the baseline environment, it is now apparent that some of the heritage features may have already been destroyed or impacted upon by mining activities in the past. As such a key mitigation measure included in this amendment report is for the mine to develop a heritage management plan which will first and foremost focus on the protection and monitoring of all known heritage sites. Should relocation of any graves be required, the mine will be required to appoint a suitably qualified specialist to under the necessary consultation and relocation process in accordance with legal requirements and as advised by the competent authority. Furthermore, a social consultation process will need to be undertaken before any graveyard fencing is done. Further to the protection of heritage resources, the desktop palaeontological study has described the possible presence of significant fossils, occurring in adjacent strata to the coal. No fossils were discovered during the study. Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist. As such, a condition has been included in the EMPR to ensure that the potential for significant fossil finds is confirmed during a site visit by a professional palaeontologist. Should there be a discovery of significant fossils, the mine will be required to develop a long-term strategy aimed towards to the retrieval and preservation of significant fossils. SAHRA has also requested that a palaeontologist be appointed to review the geotechnical report and to then submit a letter concluding whether or not monitoring should be carried out by the palaeontologist.

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

Due to the various EIA's undertaken in the past, no alternatives are assessed in this report. Project alternatives have been previously assessed in the relevant applications. The reader is directed to the original assessments for a full description of the alternative assessments previously undertaken. This report is based on the final approved alternatives and project description and provides the necessary mitigation measures to ensure the advantages associated with the chosen alternatives, layout and design are optimised.

# 19 TECHNICAL SUPPORTING INFORMATION

The following specialist reports have been included as Appendices to this report:

- Appendix H: Social Study Report (2005)
- Appendix I: Heritage and Cultural Resources
  - Appendix I1: Heritage study (2004)
  - Appendix I2: Heritage study (2013)

- Appendix I3: Heritage Study for proposed underground mining on Zandvoort 10 IT (2015)
- Appendix I4: Heritage Study for mining on Kwaggafontein 8IT (2017)
- Appendix I5: Palaeontological Studies for Zandvoort 10IT and Kwaggafontein 8IT (2017)
- Appendix I6: Heritage and Palaeontology study for proposed extension of Ilima mining operations (2017)

- Appendix J: Ecology
  - Appendix J1: Fauna and Flora Report (2004)
  - Appendix J2: Ecology (Flora & Fauna) study for Zandvoort underground mining expansion (2015)
  - Appendix J3: Biodiversity Study for Kwaggafontein (2017)
  - Appendix J4: Biodiversity study for the proposed Ilima coal mining operations (2017)
- Appendix K: Geohydrology
  - Appendix K1: Groundwater study (2012)
  - Appendix K2: Groundwater study (2015)
  - Appendix K3: Groundwater study (2017)
- Appendix L: Surface Water Study Report (2005)
- Appendix M: Wetland Biodiversity Assessment (2011)
- Appendix N: Soils
  - Appendix N1: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 1 and 4 of the Farm Haarlem 39 IT (2004)
  - Appendix N2: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 5 of the Farm Haarlem 39 IT (2004)
  - Appendix N3: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 4 and R/E of the Farm Haarlem 39 IT and Portion 3 and 9 of The Farm Appeldoorn 38 IT (2004)
  - Appendix N4: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 2 and RE of the Farm Paardeplaats 12 IT (2004)
  - Appendix N5: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 8 of the Farm Twyfelaar 11 IT (2004)
  - Appendix N6: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 9 and 10 of the Farm Twyfelaar 11 IT (2004)
  - Appendix N7: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 6, 7, 8 and 17 of the Farm Groenvallei 40 IT (2004)
  - Appendix N8: Pre-mining Soil Assessment of the Proposed Opencast Area on Portion LG of the Farm Groenvallei 40 IT (2004)
  - Appendix N9: Zandvoort Soil Assessment (2015)
  - Appendix N10: Specialist Soils, Land Use and Land Capability Studies (2017)
- Appendix P: Closure Cost Report (2016)

# 20 ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

## 20.1 DETAILS OF THE EAP

The details and expertise of the EAP are detailed in Section 2.3 above as required.

## 20.2 DESCRIPTION OF THE ASPECTS OF THE ACTIVITY

A description of the aspects of the activity covered by the EMPR Amendment below is included in Section 3 above.

## 20.3 COMPOSITE MAP / LIFE OF MINE

Figure 50 to Figure 55 below indicate the composite maps for the Ilima Colliery showing the Life of Mine planning as well as wetland sensitivities which have been excluded from the proposed future mining areas due to their inherent sensitivities. Higher resolution composite maps are contained in Appendix Q and for ease of reference, Appendix R contains high resolution maps for the majority of the maps included in this report.

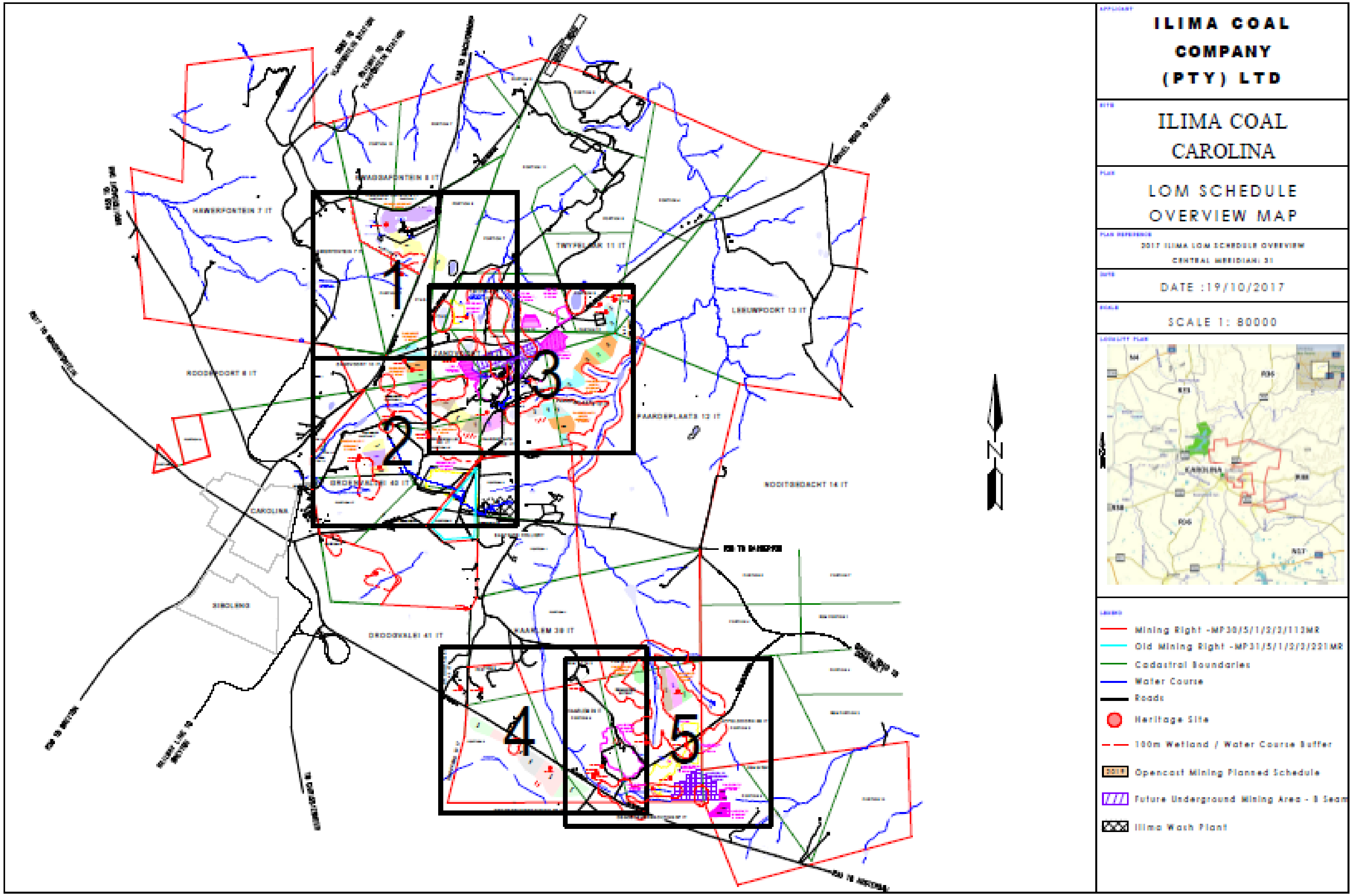



Figure 50: LOM Schedule Overview Map.

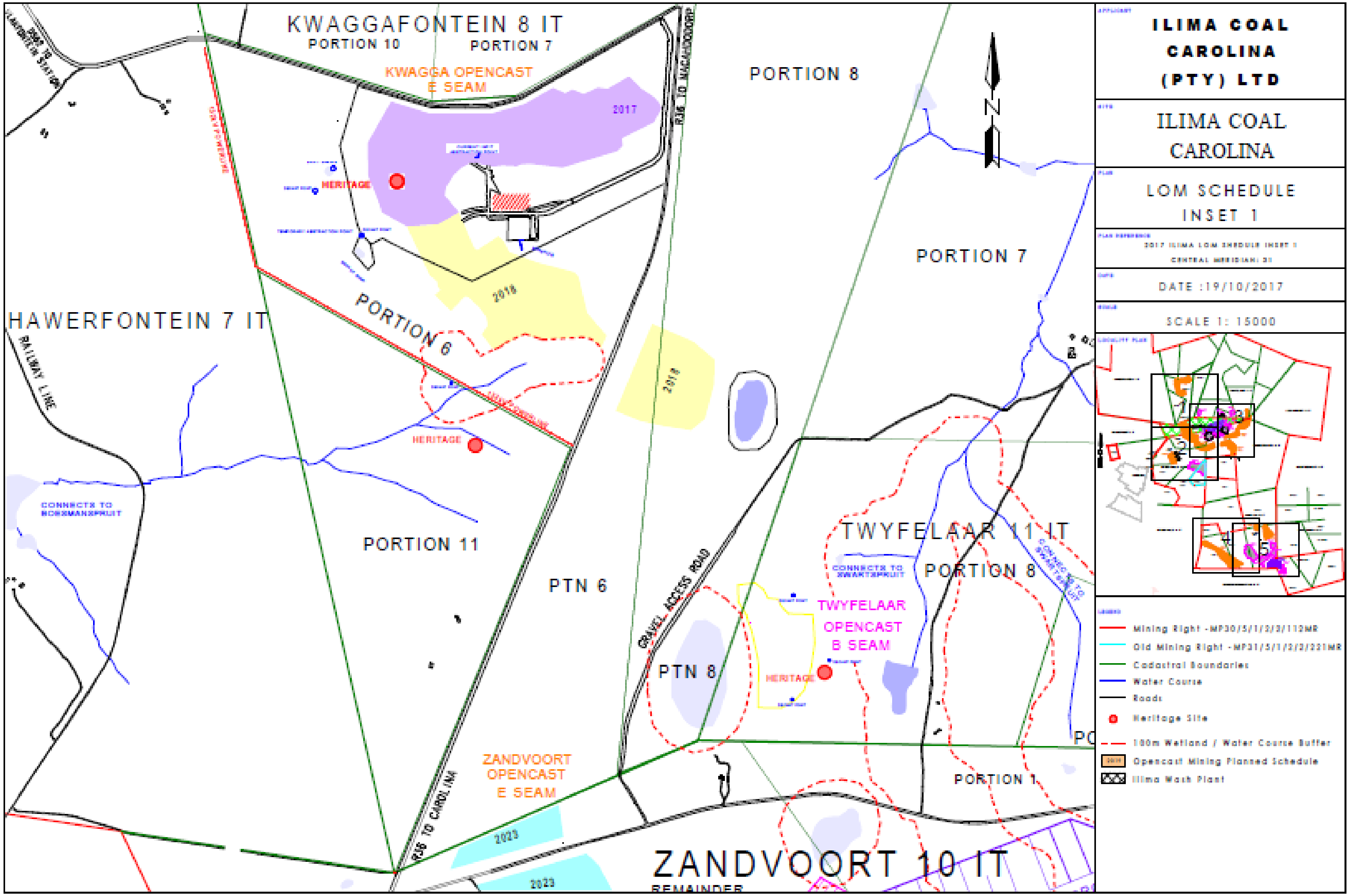


Figure 51: LOM Schedule Inset Map 1.

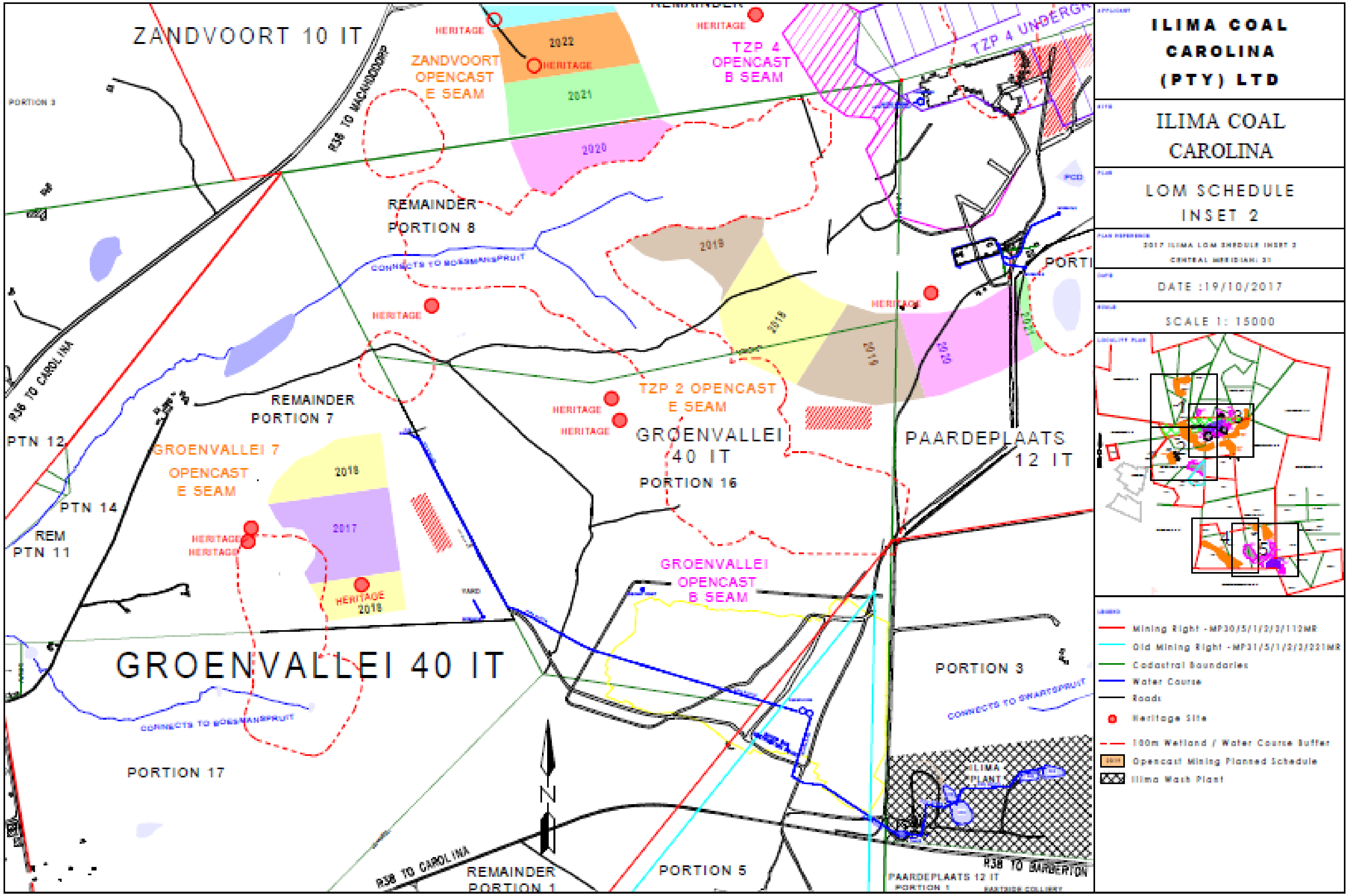



Figure 52: LOM Schedule Inset Map 2.

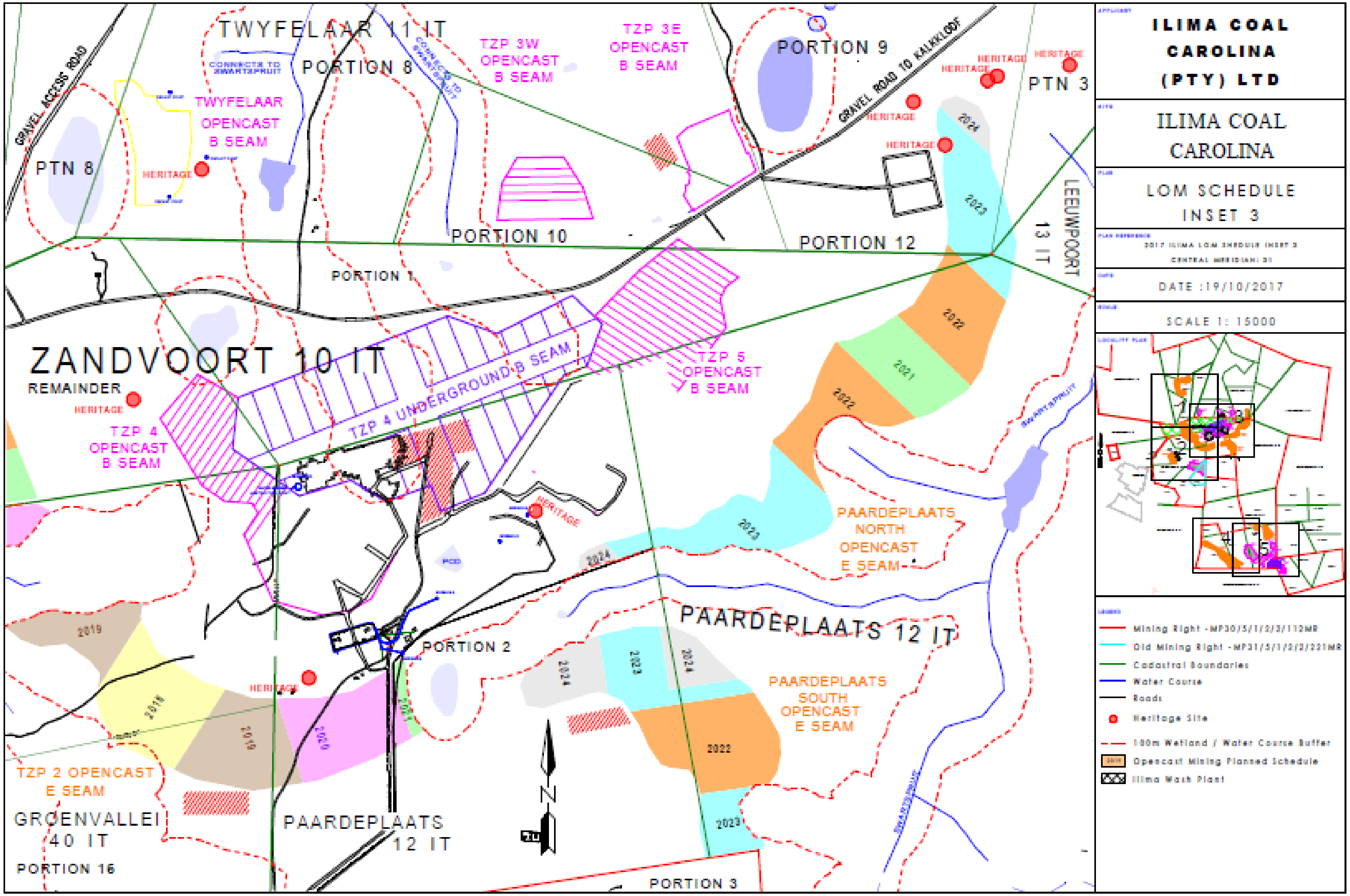



Figure 53: LOM Schedule Inset Map 3.

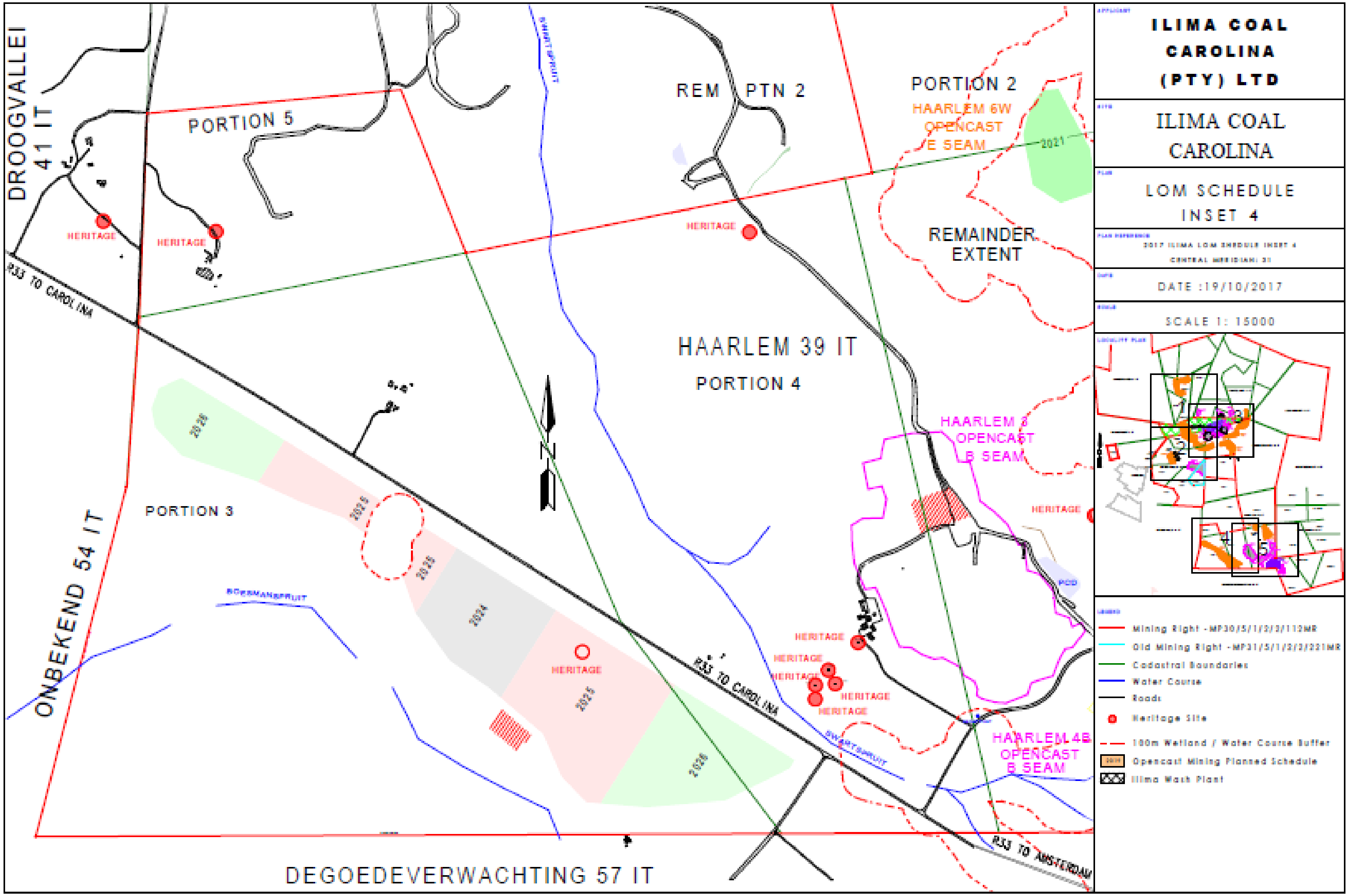



Figure 54: LOM Schedule Inset Map 4.

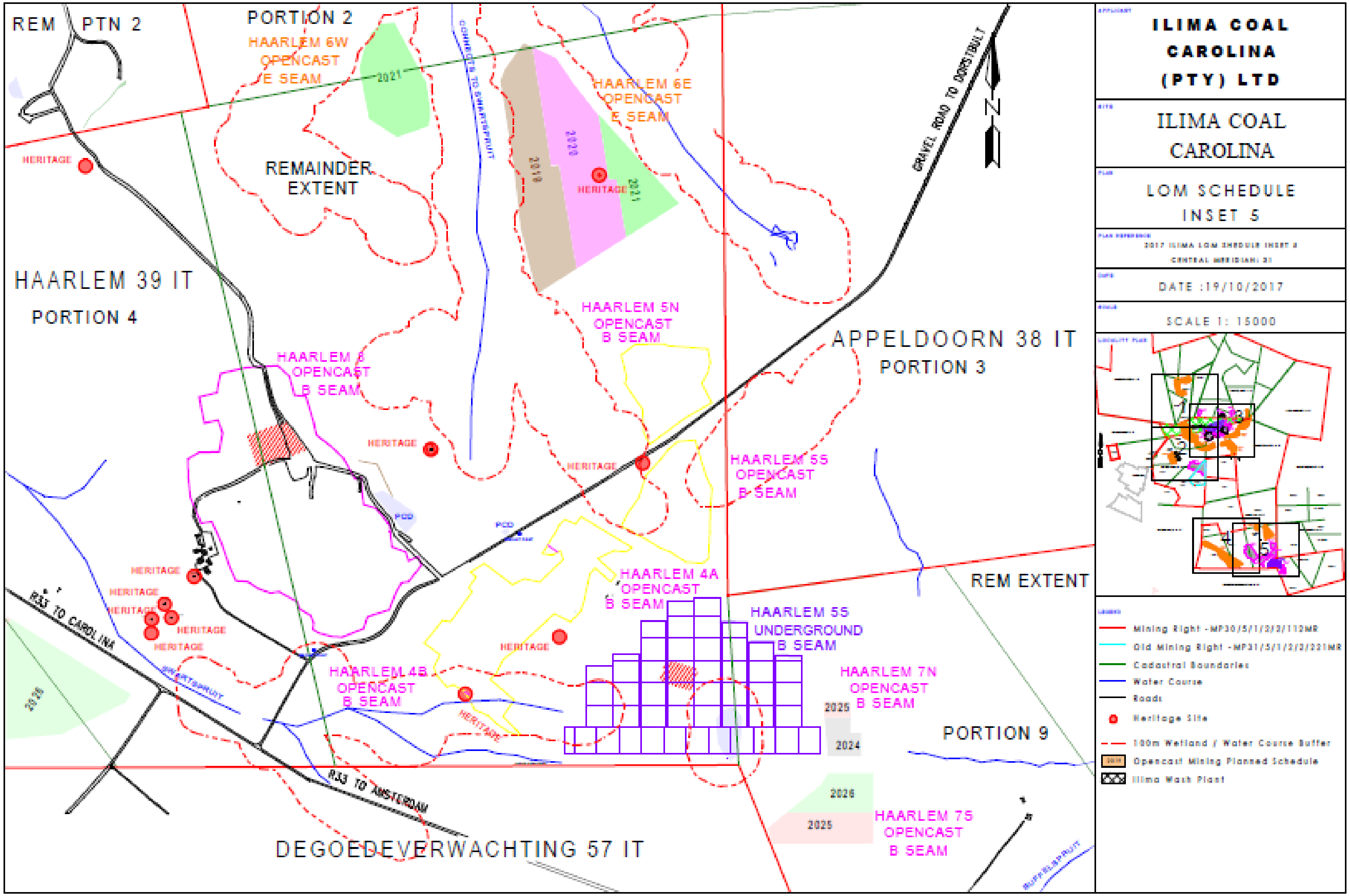



Figure 55: LOM Schedule Inset Map 5.

# 21 ENVIRONMENTAL MANAGEMENT PRINCIPLES

It is extremely important for effective environmental management that the mine be aware of the general principles upon which sound environmental management is based and that these principles are considered in all aspects of the mines operation. NEMA establishes a general framework for environmental law, in part by prescribing national environmental management principles that must be applied when making decisions that may have a significant impact on the environment. These principles are briefly summarised in the sections that follow.

## 21.1 HOLISTIC PRINCIPLE

The Holistic principle, as defined by NEMA (Section 2(4)(b)) requires that environmental management must be integrated, acknowledging that all elements of the environment are linked and inter-related and it must take into account the effect of decisions on all aspects of the environment and all people in the environment by pursuing the selection of the best practicable environmental option (defined below). Holistic evaluation does not mean that a project must be looked at as a whole. It rather means that it must be accepted that there is a whole into which a project is introduced. If the indications are that the project could have major adverse effects, the project must be reconsidered and where appropriate re-planned or relocated to avoid an adverse impact or to ensure a beneficial impact.

## 21.2 BEST PRACTICABLE ENVIRONMENTAL OPTION

When it is necessary to undertake any action with environmental impacts, the different options that could be considered for the purpose must be identified and defined. The Best Practicable Environmental Option (BPEO) is defined in NEMA as *"the option that provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term."* Other guidelines typically used for environmental management in terms of other legislation include: BPM which is the Best Practicable Means and BAT which is the Best Available Technology.

## 21.3 SUSTAINABLE DEVELOPMENT

The concept of sustainable development was introduced in the 1980's with the aim to ensure that the use of natural resources is such that our present needs are provided without compromising the ability of future generations to meet their own needs. The constitution of South Africa is built around the fact that everyone has the right to have the environment protected through reasonable legislative and other measures that secure ecologically sustainable development. The National Environmental Principles included in the NEMA require development to be socially, environmentally and economically sustainable.

## 21.4 PREVENTATIVE PRINCIPLES

The preventative principle is fundamental to sustainable development and requires that the disturbance to ecosystems and the pollution, degradation of the environment and negative impacts on the environment be avoided, or, where they cannot be altogether avoided, are minimised and remedied.

## 21.5 THE PRECAUTIONARY PRINCIPLES

The precautionary principle requires that where there is uncertainty, based on available information, that an impact will be harmful to the environment, it is assumed, as a matter of precaution, that said impact will be harmful to the environment until such time that it can be proven otherwise. The precautionary principle requires that decisions by the private sector, governments, institutions and individuals need to allow for and recognise conditions of uncertainty, particularly with respect to the possible environmental consequences of those decisions. In South Africa, the DWA (then DWAF, now DWS) adopted a BPEO guideline in 1991 for water quality management and in 1994 in the Minimum Requirements document for waste management.

In terms of DWAF Minimum Requirements for the Handling and Disposal of Hazardous Waste, 1994, the precautionary principle is defined as, *"Where a risk is unknown; the assumption of the worst-case situation and the making of provision for such a situation."* Here the precautionary principle assumes that a waste or an identified contaminant of a waste is *"both highly hazardous and toxic until proven otherwise."*

In the context of the EIA process in South Africa, the precautionary principle also translates to a requirement to provide sound, scientifically based, information that is sufficient to provide the decision-making authority with reasonable grounds to understand the potential impacts on the environment, the extent thereof and how impacts could be mitigated. If such information is not adequate for this purpose, the relevant authority cannot be satisfied as is required and then the authority should require that further information be collected and provided.

## 21.6 DUTY OF CARE AND CRADLE TO GRAVE PRINCIPLE

In terms of the NEMA Section 28, *"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment."*

By way of example, the principle of *"duty of care"* in terms of waste management emphasises the responsibility to make sure that waste is correctly stored and correctly transported, as it passes through the chain of custody to final point of disposal. This means that waste must always be stored safely and securely. The company removing and disposing of waste also holds the responsibility to hold the relevant licenses, and that waste is transported alongside the necessary paperwork.

"Cradle to Grave" refers to the responsibility a company takes for the entire life cycle of a product, service or program, from design to disposal or termination. In terms of the DWAF Minimum Requirements for the Handling and Disposal of Hazardous Waste, 1994, *"any person who generates, transports, treats or disposes of waste must ensure that there is no unauthorised transfer or escape of waste from his control. Such a person must retain documentation describing both the waste and any related transactions. In this way, he retains responsibility for the waste generated or handled."* This places responsibility for a waste on the Generator, and is supported by the "Cradle to Grave" principle, according to which a "manifest" accompanies each load of Hazardous Waste until it is responsibly and legally disposed. This manifest is transferred from one transporter to the next along with the load, should more than one transporter be involved. Once the waste is properly disposed of at a suitable, permitted facility, a copy of the manifest must be returned to the point of origin." Duty of Care offers one strategy to implement sustainable development.

## 21.7 POLLUTER PAYS PRINCIPLE

The "polluter pays principle" holds that the person or organisation causing pollution is liable for any costs involved in cleaning it up or rehabilitating its effects. It is noted that the polluter will not always necessarily be the generator, as it is possible for responsibility for the safe handling, treatment or disposal of waste to pass from one competent contracting party to another. The polluter may therefore not be the generator, but could be a disposal site operator or a transporter. Through the 'duty of care' principle, however, the generator will always be one of the parties held accountable for the pollution caused by the waste. Accordingly, the generator must be able to prove that the transferral of management of the waste was a responsible action. The polluter pays principle acceding to NEMA dictates that *"the cost of remedying pollution, environmental degradation and consequent adverse effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects must be paid for by those responsible for harming the environment."*

## 21.8 DUTY OF CARE RESPONSIBILITIES

The principle of duty of care is especially important to understand when it comes to pollution that arises as a result of mining. Notwithstanding any licences or permits that may exist, the mine still has a responsibility to take suitable measures should pollution arise as a result of the mining activities.

Training and awareness should be fostered in all staff working to ensure that they can perform their duties. Failure to comply with the provisions in the EMPR and NEMA would be a contravention of the Act. The relevant sections of NEMA are provided below, to outline the duty of care and responsibility that the applicant and all employees have towards the environment. The National Environmental Management Act (Act 107 of 1998) (NEMA) Section 28 makes provision for Duty of care and remediation of environmental damage. The binding principals are described below:

1. Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.
2. Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures, include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which-
    a) any activity or process is or was performed or undertaken; or
    b) any other situation exists, which causes, has caused or is likely to cause significant pollution or degradation of the environment.
3. The measures required in terms of subsection (1) may include measures to-
    a) investigate, assess and evaluate the impact on the environment;

b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment;

c) cease, modify or control any act, activity or process causing the pollution or degradation;

d) contain or prevent the movement of pollutants or the cause of degradation;

e) eliminate any source of the pollution or degradation; or

f) remedy the effects of the pollution or degradation.

4. No person may-

   a) unlawfully and intentionally or negligently commit any act or omission which causes significant or is likely to cause significant pollution or degradation of the environment;

   b) unlawfully and intentionally or negligently commit any act or omission which detrimentally affects or is likely to affect the environment in such manner; or

   c) refuse to comply with a directive issued under this section.

Any person who contravenes or fails to comply with subsection (14) is guilty of an offence and liable on conviction to a fine not exceeding R10 million or to imprisonment for a period not exceeding 10 years or to both such a fine and such imprisonment.

# 22 FAILURE TO COMPLY WITH ENVIRONMENTAL CONSIDERATIONS

Within the provisions of the relevant environmental legislation, there are a number of penalties for non-compliance or offences. Below a few extracts are presented for information purposes, however these must not be read in isolation and the reader is reminded that there are other acts that may be applicable to the relevant project:

- NEMA Section 24F(2): It is an offence for any person to fail to comply with or to contravene the conditions applicable to any environmental authorization granted for that listed activity. 24F(4) A person convicted for an offence under subsection 2 is liable to a fine not exceeding 5 million rand or to imprisonment not exceeding 10 years or to both such a fine and imprisonment;
- NEMA Section 34(6): Whenever any manager, agent or employee does or omits to do an act which it had been his or her task to do, or to refrain from doing on behalf of the employer and which would be an offence under any provision listed in Schedule 3 (relates to all environmental related acts) for the employer to do or omit to do, he or she shall be liable to be convicted and sentenced in respect thereof as if he or she were the employer;
- NWA Section 151 (1): “No person may fail to comply with any condition attached to a permitted water use (Water Use License)”;
- NWA Section 151 (2): “Any person who contravenes any provision of subsection 1 is guilty of an offence and liable, on the first conviction, to a fine or imprisonment for a period not exceeding 5 years or to both a fine and such imprisonment (10 years for second conviction)”;
- In addition, if anyone is convicted of an offence under the act which has resulted in harm, loss or damage to any other person, the court may award damages to be paid by the accused or convicted;

- NWA Section 154: Makes provision that it's not only the applicant that may be liable but also an employee or agent acting on their behalf;
- In terms of the MPRDA, Section 98, any person is guilty of an offence if he or she fails to comply with the requirements of the issued mining permit; and
- MPRDA Section 99 (1a): any person convicted of an offence in terms of the MPRDA is liable to a fine not exceeding R100, 000 or to imprisonment to a period not exceeding 2 years or to both such fine and imprisonment.

It is recommended that a procedure for non-compliances (i.e. incentives or disincentives for conformance and non-conformance with the EMP requirements) must be employed to ensure that the EMP is adequately implemented. The system to be used must be determined before mining commences, included in the tender documents and contracts, and made clear to all project workers. The system may include that the independent ECO can be authorized to impose spot fines on the Mine and/or subcontractors (if utilised by the mine) for any of the transgressions detailed below:

- Littering on site;
- Lighting of illegal fires on site;
- Persistent or un-repaired oil leaks;
- Any persons, vehicles or equipment related to the Mine's operations found within the designated "no – go" areas;
- Any vehicles being driven in excess of designated speed limits;
- Removal and/or damage to fauna, flora or heritage objects on site; and
- Legal contraventions.

Such fines should be issued in addition to any remedial costs incurred as a result of non-compliance with the Environmental Specifications and or legal obligations.

# 23 IMPACT MANAGEMENT OBJECTIVES

## 23.1 DETERMINATION OF CLOSURE OBJECTIVES

The goals and objectives for closure were determined based on the baseline environment and the land uses that will be established post mining. Please refer to section 24.1 of this report for the determined closure and rehabilitation objectives.

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

The EIR Amendment includes preventative measures to firstly avoid potential risks and impacts. Where avoidance is not possible, the EIR Amendment provides mitigation measures to control, remedy or modify risks and impacts such as pollution. The response to risks, impacts and incidents which are identified is managed through implementation of the ESMS which provides the mechanisms (such as procedures) for responding to risks and impacts. The process for managing risks and impacts is summarised in Table 78 below. Table 79 provides an example of the process for responding to some of the main pollution related risks.

Table 78: Process for responding to risks and impacts.

| Aspect of the Environment | Aspect | Nature of risk or impact | Detection Mechanism | Response Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| Geophysical | Topography<br>Landform<br>Geology<br>Soils | Pollute<br>Contaminate<br>Disturbance<br>Destruction<br>Damage | Site Inspections and Audits<br><br>Environmental Monitoring Programmes (water monitoring, biomonitoring, noise, air quality etc)<br><br>Periodic Impacts and Aspects Risk Assessment as per ESMS<br><br>Topographical Surveys<br><br>Public Complaints | Incident reporting procedure<br><br>Preventative and Corrective Action Procedure<br><br>Grievance Mechanism | Avoid/Stop through implementation of preventative measures<br><br>Control/Modify through implementation of EMP mitigation measures (e.g. mine design and layout)<br><br>Control through implementation of ESMS | Damage Limitation<br>Intervention<br>Incident Notification<br>Rehabilitation<br>Remediation<br>Protective measures<br>Monitoring<br>Inspections<br>Modification |
| Biophysical Environment | Fauna and Flora<br>Surface Water<br>Wetlands<br>Air Quality<br>Groundwater | Pollute<br>Contaminate<br>Disturbance<br>Destruction<br>Damage | Site Inspections and Audits<br><br>Environmental Monitoring Programmes (water monitoring, biomonitoring, noise, air quality etc)<br><br>Periodic Impacts and Aspects Risk Assessment as per ESMS<br>Public Complaints | Incident reporting procedure<br><br>Preventative and Corrective Action Procedure<br><br>Grievance Mechanism | Avoid/Stop through implementation of preventative measures<br><br>Control/Modify through implementation of EMP mitigation measures (e.g. | Damage Limitation<br>Intervention<br>Incident Notification<br>Rehabilitation<br>Remediation<br>Relocation<br>Protective measures<br>Monitoring<br>Inspections<br>Treatment<br>Modification |

| Aspect of the Environment | Aspect | Nature of risk or impact | Detection Mechanism | Response Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| | | | | | alien vegetation control)<br><br>Control through implementation of ESMS | |
| Cultural and Heritage | Heritage<br>Palaeontology | Disturbance<br>Destruction<br>Damage | Site Inspections and Audits<br><br>Watching Brief<br><br>Chance Finds Procedure<br><br>Periodic Impacts and Aspects Risk Assessment as per ESMS<br><br>Public Complaints | Incident reporting procedure<br><br>Preventative and Corrective Action Procedure<br><br>Grievance Mechanism | Avoid/Stop through implementation of preventative measures<br><br>Control/Modify through implementation of EMP mitigation measures (e.g. grave relocation)<br><br>Control through implementation of ESMS. | Intervention<br>Protective measures<br>Monitoring<br>Inspections<br>Damage Limitation<br>Relocation |
| Built Environment | Transportation, Infrastructure<br>Traffic | Disturbance<br>Destruction<br>Damage | Site Inspections and Audits | Incident reporting procedure | Avoid/Stop through implementation of | Damage Limitation<br>Intervention<br>Incident Notification |

| Aspect of the Environment | Aspect | Nature of risk or impact | Detection Mechanism | Response Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| | | | Environmental Monitoring Programmes (water monitoring, biomonitoring, noise, air quality etc)<br><br>Periodic Impacts and Aspects Risk Assessment as per ESMS<br><br>Public Complaints | Preventative and Corrective Action Procedure<br><br>Grievance Mechanism | preventative measures<br><br>Control/Modify through implementation of EMP mitigation measures (e.g. traffic control)<br><br>Control through implementation of ESMS | Repair<br>Rebuilt<br>Monitoring<br>Inspections |
| Social Environment | Health<br>Safety<br>Visual<br>Noise<br>Blasting<br>Vibration<br>Landuse<br>Socio-Economic | Pollute<br>Injury<br>Death<br>Disturbance<br>Perception<br>Displacement | Periodic Impacts and Aspects Risk Assessment as per ESMS<br><br>Public Complaints | Preventative and Corrective Action Procedure<br><br>Grievance Mechanism<br><br>Emergency Response | Avoid/Stop through implementation of preventative measures<br><br>Control/Modify through implementation of EMP mitigation measures (e.g. communication)<br><br>Control through implementation of ESMS | Intervention<br>Compensate<br>Replace<br>Mediate<br>Negotiate<br>Communicate<br>Monitoring<br>Inspections |
| Socio-biogeophysical | Land Capability | Pollute<br>Modify | Site Inspections and Audits | Incident reporting procedure | Avoid/Stop through | Ameliorate<br>Replace |

| Aspect of the Environment | Aspect | Nature of risk or impact | Detection Mechanism | Response Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| Environment | | | Environmental Monitoring Programmes (water monitoring, biomonitoring, noise, air quality etc)<br><br>Periodic Impacts and Aspects Risk Assessment as per ESMS<br><br>Public Complaints | Preventative and Corrective Action Procedure<br><br>Grievance Mechanism | implementation of preventative measures<br><br>Control/Modify through implementation of EMP mitigation measures (e.g. fertilization)<br><br>Control through implementation of ESMS | Rehabilitate<br>Remediate<br>Compensate<br>Mediate<br>Negotiate<br>Intervention<br>Communicate<br>Monitoring<br>Inspections |

Table 79: Examples of process to manage potential pollution risks

| Potential source of pollution | Pollutant | Spatial scale | Temporal scale | Detection Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| Decant from opencast and underground workings | AMD and other water pollutants (e.g. high salt loads) | Site | Long Term | Ground water monitoring<br><br>Bio-monitoring<br><br>Public Complaints | Avoid through soil management practises and progressive rehabilitation<br><br>Control through intervention measures (intercept decant and direct to treatment plant/artificial wetland or other suitable methods) | Damage Limitation<br>Intervention – Intercept decant and direct to treatment facility or other suitable method<br>Rehabilitation – Rehabilitate any impacted areas<br>Monitoring – Ongoing monitoring to determine effectiveness of treatment and to act as early warning for any further impacts or risks<br>Treatment - Treatment of polluted water with RO plant where required.<br>Utilise artificial wetlands as |

| Potential source of pollution | Pollutant | Spatial scale | Temporal scale | Detection Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| | | | | | Modify through water treatment (water treatment plant/artificial wetland or other suitable method) | sustainable, long term treatment options once more acceptable water quality is achieved. Alternatively enlist specialist assistance with developing treatment options for implementation. |
| Spills of hazardous substances at workshop | Hazardous chemicals | Activity | Short Term | Site Inspections and Audits | Avoid through preventative measures included in hazardous substance management procedure<br><br>Control through intervention measures (Stop leak, clean up spill, dispose of contaminated soil)<br><br>Prevent reoccurrence through implementation of preventive and corrective actions procedure | Damage Limitation<br>Intervention – stop leak and clean up spill<br>Rehabilitation – Dispose of contaminated soil<br>For large spills may need to rehabilitate contaminated area |
| Hydrocarbon spills from fuel storage area | Diesel<br>Hydraulic oil | Activity | Short Term | Site Inspections and Audits | Avoid through preventative measures included in hazardous substance management procedure<br><br>Control through intervention measures | Damage Limitation<br>Intervention – stop leak and clean up spill<br>Rehabilitation – Dispose of contaminated soil<br>For large spills may need to rehabilitate contaminated area |

| Potential source of pollution | Pollutant | Spatial scale | Temporal scale | Detection Mechanism | Mitigation Type | Nature of Corrective Action |
|---|---|---|---|---|---|---|
| | | | | | (Stop leak, clean up spill, dispose of contaminated soil)<br><br>Prevent reoccurrence through implementation of preventive and corrective actions procedure | |
| Sewage spills from overflow of septic tank | Sewage | Activity | Short Term | Site Inspections and Audits | Avoid through preventative measures included in waste management plan<br><br>Control through intervention measures (Stop leak, clean up spill, dispose of contaminated soil)<br><br>Prevent reoccurrence through implementation of preventive and corrective actions procedure | Damage Limitation<br><br>Intervention – stop leak and clean up spill<br><br>Rehabilitation – Dispose of contaminated soil<br><br>For large spills may need to rehabilitate contaminated area |

## 23.3 POTENTIAL RISK OF ACID MINE DRAINAGE

### 23.3.1 BACKGROUND TO ACID GENERATION AND METAL MOBILISATION

Acid Mine Drainage (AMD) can be defined as the outflow or seepage of acidic water from old metal or coal mine areas. AMD is comprised of a low pH, iron and sulphate water and it usually occurs when water is exposed to the atmosphere via outflow or seepage, thus oxidising. The creation of acid or ferric hydroxide within the system is as a direct result of iron sulphide or pyrite oxidation. Pyrite is one of the most important sulphides found in the waste rock of mines. Coal-bearing rocks in particular have the potential to generate AMD, because of the low modal distribution of sulphide minerals, i.e. mainly pyrite. It is important to note that exposure to air is a crucial step in AMD formation. Iron sulphides in geologic materials that are located below the water table will remain essentially stable, since the potential for oxidation is limited. However, where sulphidic materials are exposed to oxidising conditions (air) the iron sulphides will react and water can move the reaction products (e.g. iron and sulphate) into surface water and groundwater. As the acid water migrates, it further reacts with other minerals and dissolves a broader range of metals. Once sulphides have been oxidised, it is extremely difficult to avoid ferric hydroxide precipitation.

### 23.3.2 AMD FORMATION IN THE HIGHVELD, WITBANK, AND ERMELO COALFIELDS

Samples were collected during previous research projects for the Water Research Commission from the coal seams, as well as their roof and floor lithologies in the Eastern Transvaal Highveld, Witbank, and Ermelo coalfields. Acid-base accounting (ABA) results for the collected samples show that the lithological units in the coalfields have the ability to contribute to deterioration in ground and surface water quality. A positive correlation was also recognized between the types of minerals, (modal proportion of sulphide, carbonate, and clay minerals) present in the coal and the associated water quality, i.e. the severity of the AMD problem.

### 23.3.3 POTENTIAL IMPACTS AND CONSEQUENCES OF AMD

If AMD is incorrectly managed, it has the potential to result in social and environmental impacts as well as long term liability for mine operators, regulators, and the community. The costs of managing AMD after it has occurred can incur large management costs. Some of the main social and environmental impacts associated with AMD include:

- Mobilise (bring into solution) metals to levels that may seriously compromise aquatic ecosystems, riparian communities and possibly human health (e.g. zinc, cadmium, aluminium, copper);
- Limit the downstream beneficial uses of the receiving water (e.g. stock, recreation, fishing, aquaculture, irrigation);
- Alter important life supporting balances in water chemistry (e.g. bicarbonate buffering system);
- AMD can cause rehabilitation and re-vegetation difficulties;
- Released chemicals that can result in the smothering of aquatic habitat and reduce light penetration; and
- Limit the reuse of mine site water and exacerbate the corrosion of site infrastructure and equipment.
- The above impacts can result in severe consequences which primarily include:

- Long term environmental liabilities for mine operators, regulators and communities; and
- Treatment of AMD requires the installation of expensive control, treatment and rehabilitation programs.

#### 23.3.4 POTENTIAL FOR AMD AT ILIMA

The ABA analysis results (2012 and 2015) yielded the following results and comments:

**Net Neutralising Potential (NNP):**

- The discard material and the sampled sulphur reducing algae bloom indicated a potential to be acid generating – this is for the material found in the Groenvallei area and the sulphur reducing algal bloom;
- Nine samples (from coal to discard to overburden) indicated a level of uncertainty around the potential to produce acid; and
- Some coal and roof material indicated no potential to generate acid.

**Neutralising Potential Ration (NPR):**

- The discard material in the discard and Haarlem areas is likely to be acid generating;
- The sulphur reducing algae bloom is likely to be acid generating;
- It is possible that the roof, rehabilitation material, discard and coal material can be acid generating; and
- Four samples also indicated that it is unlikely for the sampled coal, roof and discard material to be acid generating.

**Sulphide - S and NAG pH:**

- The Sulphide-S for all the 2012 and 2015 samples is above 0.3 %, indicating the potential for long-term sustained acid generation in the co-disposal material; and
- The NAG pH confirmed that the coal seam, rehabilitated material, and discard material are likely to generate ARD.

It was concluded that AMD conditions are likely to form from the sampled waste rock and co-disposal material that will be handled in the area. The high Total–S percentage and the acidic pH values of the coal and rehabilitation material show that acid conditions will be sustained in the mining areas. The material in the sulphur reducing algal bloom and the discard material may be acid producing, but the acidity will not be sustained in the long term.

From the leach testing it was concluded that elements that are expected in high concentrations in the project area are:

**pH:**

- At a low pH water may taste sour. The danger to health results primarily from the presence of metal ions. The potential toxicity of metal ions and chemicals which can be protonated increases with decreasing pH value.

**Manganese:**

- All 2015 co-disposal material samples indicate a total manganese concentration exceeding that of the SANS 241:2015 guideline values. Seven of the 2012 waste rock dump samples indicated a potential to leach Manganese above the SANS 241 guideline value.

- Manganese is a relatively abundant element, constituting approximately 0.1% of the earth's crust. The aquatic chemistry of manganese is closely associated with that of iron and the ions tend to behave synergistically in their dissolution.

**Nickel:**

- Elevated nickel concentrations were identified in two of the 2012 waste rock samples and in one co-disposal sample. The United States of America's Environmental Protection Agency (USEPA) shows that nickel is an essential element in some animal species, and it has been suggested it may be essential for human nutrition.

- Nickel dermatitis, consisting of itching of the fingers, hands and forearms, is the most common effect in humans from chronic (long-term) skin contact with nickel. Respiratory effects have also been reported in humans from inhalation exposure to nickel.

**Arsenic:**

- One discard sample exceeded the SANS241:2015 guideline value of 0.01 mg/L. Soluble arsenic compounds are readily taken up by living organisms and at elevated concentrations can exert toxic effects. Once absorbed by living organisms, arsenic is excreted slowly, therefore allowing accumulation to occur easily. Ingestion of arsenic in drinking water is most likely to lead to chronic effects, principally different types of skin lesions.

**Selenium:**

- Two 2015 co-disposal samples showed concentrations exceeding the SANS 241 guideline value of 0.01 mg/L. No adverse health effects are expected with short to medium-term use at concentrations below 0.05 mg/L.

**Sodium:**

- The sodium concentrations in all nine waste rock samples (2012) exceed the SANS241:2015 guideline value of 200 mg/L. Sodium is ubiquitous in the environment and usually occurs as sodium-chloride, but sometimes as sodium-sulphate, bicarbonate or even nitrate. Sodium is highly soluble in water and does not precipitate when water evaporates, unless saturation occurs.

**Iron:**

- Elevated iron concentrations are present in four 2012 waste rock samples, exceeding the SANS 241:2015 guideline concentration of 0.3 mg/L.

- High concentrations of iron are predominantly an aesthetic concern since ferrous salts are unstable under the pH conditions prevailing in drinking water and precipitate as insoluble ferric hydroxide, which settles out as rust-coloured silt. Health effects occur at extremely high concentrations.

**Chloride:**

- A high chloride concentration was observed for one waste rock sample (2012), exceeding the SANS 241:2015 guideline of 100 mg/L. Human health effects such as nausea are observed at very high concentrations, exceeding 2,000 mg/L.

Chloride is a common constituent in groundwater and is highly soluble. The guideline for chloride is based principally on aesthetic effects and on the influence of corrosion rates in domestic appliances.

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

Acid Base Accounting (ABA) tests have been performed on nine rock samples, representing all lithologies which occur in the mined out underground areas, the operational opencast areas, the rehabilitated opencast areas, as well as any surface stockpiles that could potentially be acid producing, namely carbonaceous shale from the roof and floor material. A sample was also collected from the developing sulphur reducing blooms as seen at the old Kwaggafontein underground area.

ABA involves a combined measurement of sulphur contents (total sulphur, sulphuric acid, sulphur, and organic sulphur), neutralisation capacity (NP), paste pH and the calculation of acid potential (AP), net neutralisation potential (NNP) and NP/AP ratio (NPR). The assessment obtained by ABA techniques can be refined and calibrated with detailed mineralogical characterisation, site-specific observation and kinetic testing.

Leach testing performed on the rock samples described above provides an indication of the expected quality of seepage from the mined-out area in the long term. The measured qualities are compared to the SANS241 domestic use quality guidelines as an indicator of compliance.

Based on the results of these tests, the potential impact of AMD at the Ilima Colliery was assessed according to the Impact Assessment Methodology provided in Section 8. The results of the impact assessment are provided in Section 10.1 and Section 10.2.

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

If accounted for at the beginning of a project together with an immediate action plan to be put into effect should oxidization begin, AMD can be managed correctly, therefore minimizing the affects to the surrounding environment. Currently, best practice environmental management of sulphidic mine wastes involves integration of acid drainage prevention, as well as minimisation and control within the mining process. It can be summarised as the early characterisation and classification of the acid generating potential of these materials, development of strategies to minimise the oxidation of sulphides, and where acid drainage formation is unavoidable, the implementation of suitable long-term control and treatment technologies.

The following best practice management of AMD principles is considered applicable as an avoidance and management strategy for AMD at Ilima Colliery:

- Understanding the site mechanisms for acid generation, predicting the acid generating potential and incorporating this information into mine design and management (e.g. location of waste dumps, blending of wastes, dump design and management procedures, water management plans, etc.);
- Ensure that the detailed management plan for decant and seepage is drafted (i.e.: development of suitable minimisation and control strategies);
- Monitoring to seek warning signs of the early development of acid drainage, and later to quantify the effectiveness of minimisation and control strategies; and

- Treatment where minimisation and control strategies are not totally effective or where costs of treatment are less than the costs of minimisation and control.

In almost all circumstances, resources spent on prevention and minimisations of acid drainage are returned many fold through lower control and treatment costs.

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

The management options that should be considered for the treatment of decant expected post mining is as follows:

- A pump-and-treat system can be established to continuously pump the water from the rehabilitated workings. This will keep the water concentrations below decant level. All the pumped, contaminated water can be sent to active or passive water treatment facilities. This option will have the benefit of reducing plume migration, preventing decant and reducing seepage to the Swartspruit tributary by ensuring water concentrations are kept low enough to prevent this water from reaching nearby water bodies. The only negative aspect would be the long-term drying up of the same springs. In addition, this method would have to be employed indefinitely.
- Pollution control facilities such as interception trenches (which must be excavated until the hard rock is exposed) and associated PCDs can be established to intercept any seepage/decant. Any water arising from the rehabilitated area will then decant into the trench and lead to the PCDs. The consideration of the area required to establish this will need to be properly evaluated.
- Passive treatment can also be investigated, and the mine can establish passive water ponds/wetlands. The other option is to set up the successive treatment ponds nearby and pump the decant water to these. This would require some sort of containment dam to be erected to be able to pump the decant water.
- Specific trees could be planted over the opencast workings to keep water concentrations low and to take up contaminants.

## 23.7 VOLUMES AND RATE OF WATER USE REQUIRED FOR THE MINING, TRENCHING OR BULK SAMPLING OPERATION

The Ilima has a WUL and the volumes and rates of water required for the mining process are detailed in this and in the associated IWWMP. However, the WUL will need to be updated to include any additional Water Uses that need to be licenced in terms of the amendment to include the additional mining areas.

## 23.8 HAS A WATER USE LICENCE BEEN APPLIED FOR?

The Ilima Colliery has an existing IWUL (IWUL #: 05/X11D/AGJ/466) issued on 1st April 2011 by the DWA, now known as the DWS.

The approved water uses included in the IWUL include the following:

- Section 21(a) of the Act: Taking of water from a water resource;
- Section 21(g) of the Act: Disposing of waste in a manner which may detrimentally impact on a water resource; and
- Section 21(j) of the Act: Removing, discharging or disposing of water found underground.

Further to the issued IWUL, additional water uses have been identified and an Integrated Water Use License Application (IWULA) was compiled and submitted to the DWS. This IWUL was granted on 07 July 2016 (Licence No. 05/X11B/ACGIJ/4704). The following water uses are additionally included in the new IWUL:

- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse; and
- Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource.

However, Ilima will need to apply for a WUL amendment to include the additional mining areas within the existing Mining Right, as new water uses in terms of Section 21 of the NWA will be triggered by the future mining areas, which are currently not licensed (i.e.: location of authorised water uses will need to be amended).

## 23.9 IMPACTS TO BE MITIGATED IN THEIR RESPECTIVE PHASES

Table 80 below provides measure for rehabilitation of the environmental aspects that are impacted on during the different phases of the project.

**Table 80: Measures to rehabilitate the environment affected by the activity**

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | **Environmental Management System** | | |
| General Mine Management | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall develop an effective Environmental and Social Management System (ESMS) that is appropriate to the nature and scale of the project. The ESMS should include and provide for the following as a minimum:<br>• Environmental Policy;<br>• Ongoing Identification of risks and impacts;<br>• Social and Environmental Management programs;<br>• Organisational capacity and competency;<br>• Emergency preparedness;<br>• Stakeholder engagement; and<br>• Monitoring and review. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| General Mine Management | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall ensure that Social and Environmental human resources have the knowledge, skills, and experience necessary to perform their work with competence and efficiency. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| General Mine Management | Planning and Design<br>Construction<br>Operation<br>Decommissioning | No direct physical disturbance | The mine shall appoint a suitably qualified and competent ECO who shall preferably be independent from the Applicant. The ECO must preferably have a tertiary qualification in an Environmental Management or appropriate field. The ECO should have appropriate | Shall adhere to the ESMS developed to ensure compliance with | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Rehabilitation and Closure | | qualification and experience in the implementation of environmental management specifications. The ECO shall be tasked with auditing the mines environmental compliance on a regular basis (at least monthly). The Applicant shall provide the ECO with the necessary support to ensure that the environmental aspects relating to the development is adhered to. | the regulatory framework | |
| General Mine Management | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | All Mine must have a copy of this EMPR Amendment at the point of use and should be briefed by the Mine EO or ECO with regards to the use and implementation of the EMPR. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| General Mine Management | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The EMPR Amendment must be made binding on all sub-contractors (if utilised) operating on behalf of the Mining Right Holder. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| General Mine Management | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall ensure that all sub-contractors (if utilised) abide by the requirements of the EMPR Amendment through the inclusion of the EMPR Amendment and applicable environmental requirements in contractual agreements for all sub-contractors. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| **Emergency Response** | | | | | |
| General Mine Management | Construction<br>Operation | Emergencies have the potential for large scale and high significance impacts | The Applicant shall develop and implement an Emergency Preparedness and Response Plan which shall include and provide for the following as a minimum:<br>• Risk assessment; | Shall adhere to the ESMS developed to ensure | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Decommissioning Rehabilitation and Closure | | • Response procedures;<br>• Provision of equipment and resources;<br>• Designation of responsibilities;<br>• Communication and reporting (including that with potentially affected communities)<br>• Periodic training to ensure effective response; and<br>• Periodic review and revision, as necessary, to reflect changing conditions. | compliance with the regulatory framework | |
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | No direct physical disturbance | The necessary provisions (financial, resources, materials) shall be made in order to ensure compliance with the Emergency Preparedness and Response Plan. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| **Health and Safety** | | | | | |
| General Mine Management | Planning and Design Construction Operation Decommissioning Rehabilitation and Closure | Health and safety risks are classified as high significance due to the value of human life | The mine shall ensure that reasonable measures are taken to ensure the safety of all site staff, including induction training for all employees and visitors. | OHS and MHSA | Throughout LoM |
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | Health and safety risks are classified as high significance due to the value of human life | The mine shall provide appropriate Personal Protective Equipment (PPE) to employees wherever required and in accordance with the risks associated with their activities. | OHS and MHSA | Throughout LoM |
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | Health and safety risks are classified as high significance due to the value of human life | The mine shall undertake safety audits to ensure compliance with the;<br>• Occupational Health and Safety Act (Act No. 85 of 1993) and associated regulations; and | OHS and MHSA | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | • Mine Health and Safety Act (Act 29 of 1996) as amended and associated regulations. | | |
| General Mine Management | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Health and safety risks are classified as high significance due to the value of human life | The mine shall implement a safety reporting procedure to ensure that all accidents and incidents (safety and environmental) are recorded and reported to the Mine manager and EO. | OHS and MHSA | Throughout LoM |
| General Mine Management | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Health risks are classified as high significance due to the value of human life | The mine shall develop and implement an infectious diseases management plan to address health issues with the workforce. The mine shall align the strategy with a community HIV strategy. This strategy should include but not be limited to:<br>• The formation of an AIDS Task Force for the project with representatives from unions, management, local community members and people living with HIV.<br>• The extension of the workplace programme for HIV beyond the company's operations, and include all subcontractors, suppliers, transportation companies and local communities. The spread of HIV along transportation routes (roads and railways) is well documented, so this component of the project (transportation of all goods and services to and from the project site) needs special attention.<br>• Select suppliers who have in-house HIV programmes and policies in place;<br>• Develop tailored behaviour change communication (BCC) materials such as mirror hanger messages and bumper stickers;<br>• Include condoms in the road safety kit;<br>• Work with truck company managers to ensure that their drivers receive adequate HIV training. | OHS | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | Health and safety risks are classified as high significance due to the value of human life | Any containers in which hazardous substances (e.g. fuel, paints, solvents) are stored shall be clearly marked as to the contents therein (in accordance with OHSA regulations). | OHS and MHSA | Throughout LoM |
| **Site Access and Security** | | | | | |
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | Security risks can have a highly significant impact although localized | On-site vehicles must be limited to approved access routes and areas (including turning circles and parking) on the site so as to minimise excessive environmental disturbance to the soil and vegetation off site, and to minimise disruption of traffic. | OHS and MHSA | Throughout LoM |
| General Mine Management | Construction Operation | The creation of roads can have a significant and relatively widespread impact, especially as roads create corridors | Any new access (if required) shall first be approved by the Mine Manager and ECO (method statement may be required) and should be provided with erosion and silt pollution prevention measures where required. | OHS and MHSA | Throughout LoM |
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | Security risks can have a highly significant impact although localized | No person will be allowed to keep or use alcohol, recreational drugs, traditional or modern weapons, snares or otherwise dangerous objects on-site, or to enter the site while under the influence of alcohol or drugs. | OHS and MHSA | Throughout LoM |
| **Environmental Awareness** | | | | | |
| General Mine Management | Construction Operation Decommissioning Rehabilitation and Closure | No direct physical disturbance | All employees and visitors to the site must undergo a site induction which shall include basic environmental awareness and site specific environmental requirements (e.g. site sensitivities and relevant protocols/procedures). This induction should be presented or otherwise facilitated by the Mine EO wherever possible. | NEMA | Throughout LoM |
| **Social and Socio-Economic** | | | | | |
| General Mine Management | Planning Construction | No direct physical disturbance | The mine shall develop and implement a recruitment policy that allows equal opportunity to all people | Adherence to corporate | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Operation<br>Decommissioning<br>Rehabilitation and Closure | | (woman, disabled) and give preference to local labour from the local Municipality where possible. | policies (e.g.: SLP) and compliance with legislation including Labour Act and Employment Act | |
| General Mine Management | Planning | No direct physical disturbance | Skilling and training of local community members should take place before the mining operations so as to equip people to become eligible for positions at the mine. | SLP commitments | Prior to construction |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The procurement policy for the mine should focus on utilising service providers from the local area so as to encourage the growth of businesses. | Adherence to corporate policies and compliance with legislation including Labour Act and Employment Act<br><br>SLP Commitments | Throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall attempt, where possible, to recruit local service providers and subcontractors to assist with construction activities. | Adherence to corporate policies and compliance with legislation including Labour Act and Employment Act<br><br>SLP Commitments | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall comply with the conditions of the SLP developed for the mine to ensure the socio-economic benefits of the mine are maximised. | SLP commitments | Throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall comply with all relevant legislation pertaining to labour recruitment and employment. | Compliance with legislation including Labour Act and Employment Act | Throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall develop and implement a Stakeholder Engagement Plan in consultation with a suitably qualified specialist. This plan shall include a strategy to actively manage expectations. This includes the sharing of relevant information in a way that is accessible to all members of the community. Frequent communication is a key aspect in the management of expectations. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Developed as early as possible and implemented throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall appoint a community liaison officer that deals specifically with the surrounding communities. The Mine shall communicate frequently with the affected stakeholders to ensure that they understand the processes and do not develop more unrealistic expectations. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Appointment as early as possible and implemented throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall establish a detailed grievance mechanism for communities to lodge concerns, suggestions and grievances which can be dealt with by the Project in a timely manner. The grievance mechanism shall aim to accomplish the following objectives;<br>• Receive and register external communications from the public; | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Developed as early as possible and implemented throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | • Screen and assess the issues raised and determine how to address them;<br>• Identify roles and responsibilities relating to the reporting, recording and addressing of grievances;<br>• Maintenance of a grievance register to record and track, and document responses and actions taken to address grievances;<br>• Reporting of grievances to DMR; and<br>• Adjust the management program, as appropriate. | | |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | A grievance register must be maintained by the mine to log grievances from landowners, communities, occupants and other Interested and Affected Parties, and response to such grievances. The grievance register should be provided to authorities at any point in time if so requested. The grievance register shall contain, at a minimum, the following information;<br>• Date of the grievance being lodged,<br>• Location relating to the grievance,<br>• Contact details of the complainant,<br>• Grievance description (detailed as possible),<br>• Person receiving grievance,<br>• Agreed corrective action,<br>• Responsible party for corrective action,<br>• Summary of actions taken (and date action was taken),<br>• Status of grievance (open, closed-out, awaiting feedback etc.).<br>The grievance mechanism must be communicated to all stakeholders and communities. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Developed as early as possible and implemented throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation | No direct physical disturbance | Open channels of communication between the Mine and surrounding landowners/communities are essential. The mine shall establish a community liaison forum (CLF) that | Shall adhere to the ESMS developed to | As early as possible in the process and |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Decommissioning<br>Rehabilitation and Closure | | meet on a regular basis (at least quarterly) – at this forum the mine can give feedback on its activities and keep the communities informed about matters that concern them in a transparent and honest manner. The relevant authorities shall also be invited to attend CLF meetings. This forum is an important mechanism to manage expectations and build relationships. Meeting minutes must be captured and forwarded to all attendees. | ensure compliance with the regulatory framework | implemented throughout LoM |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | Employees should be sourced from the local area where possible. | Adherence to corporate policies and compliance with legislation including Labour Act and Employment Act<br><br>SLP Commitments | Throughout LoM |
| General Mine Management | Construction<br>Operation | No direct physical disturbance | The mine shall comply with the SLP and where possible, conduct agricultural training programmes with community members and employees to encourage the continuation of agricultural activities in the area. | SLP | During operation |
| General Mine Management | Construction<br>Operation | No direct physical disturbance | The mine shall encourage the continuation of agricultural activities in the area surrounding the mining activities that are not affected by mining. | SLP | During operation |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | The mine shall provide training, where necessary to the local work force as per the Environmental Awareness Plan. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| General Mine Management | Operation | No direct physical disturbance | The workforce should undergo multi-skilling during the operation of the mine so that they may be productively absorbed into the local economy after mine closure. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | During operation |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | Should relocation become necessary the Applicant must appoint a relocation specialist to compile a relocation action plan. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | As required when scaling down operations and prior to closure |
| General Mine Management | Planning<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | No direct physical disturbance | Stakeholder Engagement will continue throughout the life of the mine to ensure local communities are kept informed and allowed to raise issues. These issues will then be addressed through the grievance mechanism. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| General Mine Management | Operation | No direct physical disturbance | Where retrenchments are unavoidable, they should be managed humanely according to legislative requirements. | | When retrenchments are required |
| General Mine Management | Operation | No direct physical disturbance | Upon closure, the contracting company for the mining operations should attempt to redeploy employees to its other operations. | | As required when scaling down operations and prior to closure |
| **Camp – Site Establishment** | | | | | |
| Construction camp sewage management | Construction | Construction impacts are temporary in nature and have a | The physical footprint of any construction or site camp shall be minimised and vegetation clearance should be kept to the minimum required area. Topsoil shall be handled in accordance with the soil management | Shall adhere to the ESMS developed to ensure | Throughout construction |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Dust suppression<br><br>Earthworks<br><br>Fencing<br><br>Fuel Storage and refueling<br><br>Hazardous substances management<br><br>Site security<br><br>Soil Management<br><br>Truck and heavy machinery operation<br><br>Utilization of portable toilets and generation of sewage<br><br>Vegetation clearance | | limited extent but may include significant impacts | principles presented in this EMPR and the soil management guide developed for the Mine. | compliance with the regulatory framework<br><br>OHSA<br><br>MHSA<br><br>NEMA<br><br>MPRDA | |
| | | | All construction and/or site camps shall be enclosed with a fence. The mesh size should be small enough for the fence to act as a catch net for blown debris and as a demarcation of the site. The fence shall be maintained as required to ensure access control remains effective. All temporary fences erected by the Mine shall be removed and the site restored on completion of construction, unless otherwise agreed in writing with the Applicant. | | |
| | | | Site and construction camps must be kept in a clean, neat and tidy condition at all times. The Mine shall maintain good housekeeping practices and shall comply with the relevant HSE regulations in terms of materials storage. Stockpiles of construction materials may only be placed within demarcated areas within the construction camp. Laydown areas must be kept neat and tidy and free of litter or waste at all times. | | |
| | | | A waste storage area must be established within the site camp/construction camp that provides for appropriate and adequate waste storage and waste separation for recycling. All waste must be adequately contained to prevent ground and/or water pollution. The total volume of general waste stored shall not exceed 100$m^3$. In the case that a storage capacity exceeding this amount is required or planned for, the necessary waste permits must be obtained in accordance with the NEMWA beforehand (GN718). | | |
| | | | The site camp/construction camp shall have adequate provision for the storage of hazardous waste (e.g. old oil filters, soil from spills etc.) and the waste shall be contained within closed containers to prevent the possibility of spillages. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | All fuel storage areas shall be bunded to contain at least 110 % of the volume stored and will comply with the relevant safety regulations. Fuel storage areas may not be located within 100m of the watercourse and the total volume of fuel stored on site may not exceed 30 cubic metres (30 000l) without the necessary authorisation in terms of the NEMA. Fuel storage areas must be provided with an impervious surface with the provision to contain any potential fuel spillages during refueling (e.g. a bunded, sealed concrete slab which drains to a sump/oil separator). No person smoke or take part in any activity that may results in sparks near fuels and other flammable substances to prevent ignition. | | |
| | | | All hazardous substances shall be stored within designated areas that comply with the relevant HSE standards (e.g. access control, HSE signage, firefighting equipment etc.) and that provide for spill prevention and containment. It is recommended that a dedicated, bunded and fenced Hazardous Storage Area is provided within the construction camp for this purpose. | | |
| | | | Site camps/construction camps shall be provided with portable fire extinguishing equipment, in accordance with all relevant legislation and this equipment must be readily accessible. | | |
| | | | No open fires shall be permitted within the site camp/construction camp, except where approved by the responsible safety officer and ECO and within a designated structure designed for that purpose. In such cases firefighting equipment must be readily available near the fire place and an appropriate safety representative should be present at all times during burning of the fire. All fires shall be fully extinguished after use. | | |
| **Flora** | | | | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Decommissioning of Co-Disposal Dump<br><br>Drilling for continued resource evaluation<br><br>Drilling monitoring boreholes<br><br>General Surface Rehabilitation<br><br>Infrastructure removal<br><br>Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Filling Opencast Voids | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | The mine, in consultation with the ECO, shall develop an appropriate weed management plan and alien invasive management plan, to be implemented throughout the lifespan of the project. The weed management plan shall aim to eradicate and control alien vegetation in accordance with NEMBA. Control involves killing the plants present, killing the seedlings which emerge, and establishing and managing an alternative plant cover to limit re-growth and re-invasion.<br>Specialist input shall be sought in developing the plan to ensure the potential for residual or latent impacts resulting from alien vegetation removal are minimised and mitigated. The weed management plan and alien management plan shall include appropriate measures for removal/control of alien vegetation across the entire site. The weed management plan and alien management plan shall include the following measures as a minimum;<br>• Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act or in terms of Working for Water guidelines,<br>• Alien invasive tree species such as black wattle and blue gum should be eradicated,<br>• Institute an eradication/control programme for early intervention if invasive species are detected, so that their spread to surrounding natural ecosystems can be prevented,<br>• Institute a monitoring programme to detect alien invasive species early, before they become established and, in the case of weeds, before the release of seeds (including closure and post closure monitoring), | NEMA<br><br>NEMBA<br><br>CARA<br><br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Development of plan as soon as possible and implementation throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Post Closure Monitoring and Maintenance<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Site visits<br><br>Storm water management<br><br>Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | | | The Plan must clearly define the areas from which alien vegetation must be removed as well as the plant, equipment, materials and methodology to be used (including safe disposal) | | |
| | Planning and Design<br>Construction<br>Operation | Impacts on red data species has a very high significance | It is recommended to conduct a biodiversity walk through to locate protected species prior to commencement and relocate species where possible or required.<br>All Red Data Plants within the proposed opencast areas, roads and all other infrastructure areas should be transplanted and relocated within either a nursery or any neighbouring piece of land where it can be conserved until rehabilitation can take place. These species can either be replanted during the rehabilitation process of the opencast mining areas as rehabilitation of mined out areas progresses, or left in their new location if this is not to be disturbed in future. | NEMBA<br>Threatened or Protected Species (TOPS) regulations<br>National Forests Act<br>DAFF permitting requirements | Prior to commencement of activities or disturbance |
| | Planning and Design<br>Construction<br>Operation | Impacts on red data species has a very high significance | The mine shall ensure that the relevant permits are obtained to remove and relocate protected species. Plan activities carefully so that only vegetation that needs to be impacted is impacted. Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. | NEMBA<br>TOPS regulations<br>National Forests Act<br>DAFF permitting requirements | Prior to commencement of activities or disturbance |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | Limit the vegetation disturbance to the designated areas only and the legal minimum requirement width for road and powerline servitudes is strictly adhered to.<br>No unnecessary clearing of vegetation will take place, to enable seeds from undisturbed areas to move into disturbed area through natural processes of succession. | NEMA | Throughout LoM |
| | Planning and Design | Impacts on flora may occur over a | The mine shall plan activities carefully so that only vegetation that needs to be impacted is impacted. | NEMA<br>CARA | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | large area (active mine areas) and has the potential to be a relatively high significance | Incorporate herbaceous vegetation into soil stockpiles to maintain a seed bank. Limit activity to area of disturbance and revegetate impacted areas as soon as possible. Allow pioneer species to establish in disturbed areas. Erosion prevention measures will be implemented along infrastructure areas. | | |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | The harvesting of plants by construction and mine workers is prohibited on site. This includes the harvesting of plants for firewood, construction material, the making of crafts and medicinal purposes. | NEMA | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | Damage or harm to threatened plant species is illegal in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004). Threatened species are defined in terms of the most recent Red Data list of Southern African Plants. Employees and workers shall be educated with regards to any potential threatened species that may be encountered on site, and shall take the necessary actions to prevent of harm to any such species found on site. | NEMBA<br>TOPS regulations<br>National Forests Act<br>DAFF permitting requirements | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | All alien vegetation occurring on the site must be controlled in accordance with NEMBA. The area should be assessed, and the alien invasive species controlled prior to the commencement of the construction activities. The area should be monitored for the establishment and spread of alien invasive species throughout the LoM. The weed management plan and principles for weed management presented in this EMPR must be implemented throughout the lifespan of the project. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Construction<br>Operation | Impacts on flora may occur over a | All soil stockpiles shall be kept free of any weeds or alien invader plant species. | Shall adhere to the ESMS | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | large area (active mine areas) and has the potential to be a relatively high significance | | developed to ensure compliance with the regulatory framework | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | Alien species removal must take place in an appropriate manner, which includes:<br>• Avoid disturbance to the soil.<br>• Use an appropriate control for each species. Some species may require manual and herbicide control. Where appropriate, use biological control.<br>• Where herbicide control is used, ensure that the correct herbicide as registered for the species is used.<br>• Use only herbicides that are registered for use near water close to the wetland areas.<br>• In most cases herbicide control is only successful in the growing season. All herbicides must be applied appropriately. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | Where large clumps of invasive trees are to be controlled, do not clear all invasive species at once, since this will lead to large areas bare of vegetation and may lead to erosion and a large sediment load in the adjacent water resources. Aliens must be removed gradually over a long period and the trees replaced with grassland. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has | The mine should consider the use of excess vegetation (tree stumps etc.) to create 'safe sites' for seedling recruitment as well as animal habitats in rehabilitated areas. | Shall adhere to the ESMS developed to ensure | During Rehabilitation |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
| --- | --- | --- | --- | --- | --- |
| | | the potential to be a relatively high significance | | compliance with the regulatory framework | |
| | Rehabilitation and Closure | Impacts on flora may occur over a large area (active mine areas) and has the potential to be a relatively high significance | Disturbed surfaces will be re-vegetated as soon as they become available, by seeding with an appropriate seed mix as per direction by a vegetation specialist. The following seed mix shall be considered and utilised if approved by the specialist:<br>*Chloris gayana* (Rhodes grass – 4 kg/ha), *Digitaria eriantha* (finger grass – 4 kg/ha), *Cynodon dactylon* (Couch grass – 3 kg/ha) and *Eragrostis teff* (Teff – 1 kg/ha). | Adherence to Rehabilitation and Closure Plan | During rehabilitation |
| **Fauna** | | | | | |
| Decommissioning of Co-Disposal Dump<br><br>Drilling for continued resource evaluation<br><br>Drilling monitoring boreholes<br><br>General Surface Rehabilitation<br><br>Infrastructure removal<br><br>Maintenance and operation | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | Visitors and workers will be informed that the killing of fauna is prohibited within the boundaries of the mining area, as well as neighbouring areas. | Induction training shall comply with ESMS Framework | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | The mine shall educate and inform all workers, subcontractors and visitors about any rare and endangered species through an environmental awareness plan and the distribution of posters, containing pictures of any potential rare and endangered species. Ensure that environmental awareness training takes place at regular intervals. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Planning and Design<br>Construction | Impacts on fauna has the potential to be a relatively high | The sighting of any rare or endangered species needs to be reported to management which will keep record of all such species. Should there be a risk of an impact to such | NEMBA<br>TOPS | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Filling Opencast Voids<br><br>Post Closure Monitoring and Maintenance<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office<br>Infrastructure<br><br>Site visits<br><br>Storm water management | Operation<br>Decommissioning<br>Rehabilitation and Closure | significance especially where threatened or protected species are impacted upon | a species, the mine shall notify a specialist who shall advise on the best course of action. Should relocation or destruction of any species be required, the necessary permits shall be obtained. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | Ensure that there are waste disposal and littering prevention procedures in place to ensure decreased contact with humans. A waste management plan must be generated and implemented. The system must be monitored to ensure that the environment is not polluted and that fauna do not consume the waste. Ensure that there are spillage procedures in place so that any exposure to biophysical environment is limited. Ensure that the appropriate training is given to staff and management. | NEMA,1998<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | During LoM |
| | Construction<br>Operation | Impacts on sensitive landscapes have the potential to be a relatively high significance with widespread effects. | The destruction of sensitive landscape features shall be avoided where possible and otherwise minimised through effective planning. In areas where the destruction cannot be avoided, these features should be re-introduced in the post mining landscape. | In accordance with Rehabilitation and closure plan | During construction and operation |
| | Construction<br>Operation | Impacts on sensitive landscapes have the potential to be a relatively high significance with widespread effects. | Infrastructure should be designed to rather follow the edge of natural areas than crossing it. If crossing it is the only option, then the area should be transected so that one large area remains rather than two equally sized areas. Infrastructure should be condensed to prevent unnecessary sprawl into sensitive areas. | In accordance with Rehabilitation and closure plan | During construction and operation |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | No construction workers or mine employees may disturb, hunt, set traps/snares, utilise dead or alive fauna/livestock/wildlife/fish. This includes the killing of any animal caught in construction works. No construction workers or mine employees may collect or remove firewood or medicinal plants or other plants/crops/fruits from the site or areas adjacent to the site. Disciplinary action must be taken if any flora or fauna is willfully disturbed or killed. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | Ensure that noise control measures are implemented by reducing speed, ensure that exhaust systems are functioning according to manufacturer's specifications. Ensure that heavy vehicle traffic is limited to daylight hours only. Ensure that speed limits are enforced | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | Any animals found within excavations should be carefully returned without harm to an adjacent area away from potential harm, but preferably not further than 200m away from where it was found unless otherwise agreed to by the ECO. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation | Impacts on fauna has the potential to be a relatively high significance | The Mine shall ensure that any snakes discovered in excavated areas, on or near the construction site are not killed or otherwise harassed. The Mine EO must be notified should a snake be found on or near the site. The | NEMA<br>NEMBA<br>CARA | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Decommissioning<br>Rehabilitation and Closure | especially where threatened or protected species are impacted upon | Mine EO will be responsible to ensure that an appropriately skilled person is summoned to remove the snake from the site for relocation to a suitable nearby location. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | The mine shall take the necessary measures to limit the speed of trucks and vehicles on the roads on site and enforce these speed limits. | Internal speed limits for haul roads and declared legal speed limits for public roads. | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | Any red data species such as the South African Hedgehog, recorded within the areas that will be cleared for the newly opencast mining areas should be relocated within re- vegetated areas where a good vegetation cover has been established. The mine must ensure relevant permits are in place if any threatened or protected species are relocated. Conduct a protected fauna species survey prior to commencement and relocate species where possible or required. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on fauna has the potential to be a relatively high significance especially where threatened or protected species are impacted upon | No person should willfully disturb the movement of any mammals, birds, amphibians, insects or reptiles on the mine site. | NEMA<br>NEMBA<br>CARA<br>Shall adhere to the ESMS developed to ensure compliance with | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | | the regulatory framework | |
| **Soils** | | | | | |
| Decommissioning of Co-Disposal Dump<br><br>Decommissioning Underground Mine Infrastructure<br><br>Drilling for continued resource evaluation<br><br>Drilling monitoring boreholes<br><br>Filling Opencast Voids<br><br>General decommissioning activities<br><br>General Surface Rehabilitation Infrastructure removal | Construction<br>Operation<br>Decommissioning | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Topsoil shall be removed from all areas where physical disturbance of the surface will occur (up to a maximum of 30 cm depth). Topsoil must be stockpiled for re-use in subsequent rehabilitation activities outside of areas prone to erosion and 1:100-year floodplain demarcation. | CARA<br>NEMA<br>GN704<br>In accordance with Rehabilitation and closure plan | As required |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Soils must be stripped from the area of activity. Topsoils and subsoils should be stripped separately. The stripped soils should be utilised to create a berm up-slope of the proposed development area to divert runoff water around the site. Re-vegetate any bare soil immediately. Activity should be limited to area of disturbance. Where required the compacted soils should be ripped to an adequate depth and re- vegetated with indigenous plants. | CARA<br>NEMA<br>In accordance with Rehabilitation and closure plan | As required |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | To the greatest extent possible topsoil shall only be handled twice, only-once during the initial stripping of topsoil and a second time to replace it. | CARA<br>NEMA<br>In accordance with Rehabilitation and closure plan | Throughout LoM |
| | Construction<br>Operation | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn | It must be ensured that the topsoil is separated from the subsoil and that the topsoil is stockpiled separately from the subsoil and construction materials.<br>Soils will be handled in dry weather conditions so as to cause as little compaction as possible. Utilisable soil (Topsoil and upper portion of subsoil B2/1) must be | CARA<br>NEMA<br>In accordance with Rehabilitation and closure plan | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Opencast mining<br><br>Post Closure Monitoring and Maintenance<br><br>Re-vegetation<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management | | affect land use and land capability. | removed and stockpiled separately from the lower "B" horizon, with the ferricrete layer being separated from the soft/decomposed rock, and wet based soils separated from the dry soils if they are to be impacted. The "Utilisable" soil will be stripped to a depth of 750mm or until hard rock/ferricrete is encountered. These soils will be stockpiled together with any vegetation cover present (only large vegetation to be removed prior to stripping). The total stripped depth should be 750mm, wherever possible. | | |
| | Construction<br>Operation | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Areas for stripping need to be delineated and stripping will only occur where soils are to be disturbed by activities that are described in the design report, and where a clearly defined end rehabilitation use for the stripped soil has been identified. | CARA<br>NEMA<br>In accordance with Rehabilitation and closure plan | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Topsoil and sub-soil stockpiles must be located such that the potential for erosion is minimised. Areas with existing erosion and stability issues must be avoided. Topsoil stockpiles will not be placed within the 1:100-year floodline of a water course, and will not be placed within the path of a stormwater channel, and if necessary, will be provided with a silt fence around the perimeter of the foot of the stockpile (as directed by ECO). Stockpiles will be established/engineered with storm water diversion berms in place to prevent run off erosion. Stockpiles are to be stabilised if signs of erosion are visible. Any evidence of erosion, scouring, sedimentation, and/or undercutting must be rectified and rehabilitated immediately. Enhanced growth of vegetation on the Soil Stockpiles and berms will be promoted (e.g. by means of watering and/or fertilisation), or a system of rock | CARA<br>NEMA<br>GN704<br>In accordance with Rehabilitation and closure plan | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | | | cladding will be employed. The purpose of this exercise will be to protect the soils and combat erosion by water and wind. Soil stockpile and berm heights will be restricted where possible to <1.5m so as to avoid compaction and damage to the soil seed pool. Where stockpiles higher than 1.5m cannot be avoided, these will be benched to a maximum height of 15m. Each bench should ideally be 1.5m high and 2m wide. For storage periods greater than 3 years, vegetative (vetiver hedges and native grass species) or rock cover will be essential, and should be encouraged using fertilization and induced seeding with water and/or the placement of waste rock. The stockpile side slopes should be stabilized at a slope of 1 in 6. This will promote vegetation growth and reduce run-off related erosion. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | There must be no contamination of topsoil. The biological, chemical and physical properties of the topsoil must not be changed by introducing detrimental foreign material, gravel, rock, rubble or mine residue to such soil (MPRDA Regulation 70(7)). This also includes littering, waste disposal, fuel or chemical contamination, plant matter dumping, or other activity occurs that may introduce pollutants or foreign plant species into stockpiled soils. Material laydown areas and stockpiles of construction materials must be clearly separated from topsoil stockpiles to limit any contamination of the topsoil. | MPRDA<br>CARA | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn | Care must be taken to protect topsoil resources on site and thereby avoid the need to obtain additional topsoil from outside the site for rehabilitation. However, if additional topsoil needs to be sourced from outside the site, this shall be done with extreme caution not to introduce any alien or invasive species to the site. The | NEMBA<br>NEMA | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | affect land use and land capability. | topsoil shall be sourced from a location approved by, and a standard, acceptable to the ECO. | | |
| | Construction<br>Operation | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | It is recommended that all vegetation is stripped and stored as part of the utilisable soil. However, the requirements for moving and preserving fauna and flora according to the biodiversity action plan should be consulted. | NEMBA<br>NEMA | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Compacting of soil must be avoided as far as possible. The Mine should restrict the use of heavy machinery, particularly in areas outside of the physical mining footprint area to reduce the compaction of soils. No vehicles or machines will be allowed to drive over or be parked on the topsoil stockpiles. Equipment, human and animal movement on the soil stockpiles will, therefore, be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank. | MPRDA<br>CARA | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Stockpiles and berms should be vegetated with a suitable seed-mix to be approved by the ECO. A typical seed mix would consist of *Chloris gayana* (Rhodes grass – 4 kg/ha), *Digitaria eriantha* (finger grass – 4 kg/ha), *Cynodon dactylon* (Couch grass – 3 kg/ha) and *Eragrostis teff* (Teff – 1 kg/ha). | MPRDA<br>CARA | As required |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn | A monitoring system shall be implemented which will include inspecting soil stockpiles and berms for any degradation or erosion, and ensure immediate action if these are noted. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Ongoing throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | affect land use and land capability. | | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Regular inspections shall aim to identify negative effects such as acidification and erosion of cover-soil, poor quality leachate seeping from the residue deposits and deterioration of vegetation cover. The mine shall take measures to re-vegetate any bare soil immediately. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Ongoing throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Trucks, machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks. All leaks will be cleaned up immediately using spill kits or as per the emergency response plan. For large spills a hazardous materials specialist shall be utilised. | NEMA<br>NWA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Ongoing throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Accidental hydrocarbon spillages should be reported immediately, and then the affected soil should be removed, and rehabilitated or if this is not possible, disposed of at a waste sites designated to accept such waste.<br>If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by the local water authority on a case by case basis, before it is implemented. If *in situ* treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification | NEMWA<br><br>DWAF minimum requirement for waste disposal | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | and Disposal of Hazardous Waste (Local DWS) and disposed of at an appropriate, permitted, off-site waste facility. | | |
| | Construction Operation Decommissioning Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | Activity should be limited to area of disturbance. This can be encouraged by pegging out the area of activity. Where required the compacted soils should be disked/ripped to an adequate depth and re- vegetated with indigenous plants. | In accordance with Rehabilitation and closure plan | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | All vehicles will be regularly serviced to ensure they are in proper working condition and to reduce risk of leaks. All leaks will be cleaned up immediately using spill kits or as per the emergency response plan. | NEMWA<br><br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | During rehabilitation, soil samples shall be taken to determine soil fertility, depth compaction, acidity and mine related pollution. Treatment methods will then be put forward for soils according to recommendations made from the results obtained. A representative sampling of the stripped and stockpiled soils will be analysed to determine the nutrient status and chemistry of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil. based on the analysis, fertilisers will be applied if necessary. | In accordance with Rehabilitation and closure plan | During rehabilitation |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Rehabilitation and Closure | Impacts on soils can have significant impact both in terms of severity and scale. Impacts on soil can in turn affect land use and land capability. | The mine shall reinstate the soil over the open cast mining areas to the following standards<br>• the soils should be replaced to their original soil depth prior to stripping;<br>• in the correct soil profile order;<br>• add mulching;<br>• and soil stabilisation measures; and<br>• ensure that the vegetation cover is as evenly spaced as possible with an initial basal cover of at least 15% with pioneer species | In accordance with Rehabilitation and closure plan | During rehabilitation |
| **Land use** | | | | | |
| Drilling for continued resource evaluation<br><br>Drilling monitoring boreholes<br><br>General Surface Rehabilitation<br><br>Infrastructure removal<br><br>Mine area site preparation<br><br>Opencast mining | Planning<br>Construction<br>Operation | Impacts on alternative land uses are considered highly significant and can occur over a large area. | Leasing options should be evaluated so that unmined land (surface areas above underground mining) can be used for other uses such as grazing or cropping. Adequate fencing will be required to separate the land from miming areas for safety reasons. | MHSA | Throughout LoM |
| | Construction<br>Operation | Impacts on alternative land uses are considered highly significant and can occur over a large area. | Soil stockpiles shall be designed to have free drainage of water with minimal soil erosion potential. | MPRDA | Throughout LoM |
| | Operation | Impacts on alternative land uses are considered highly significant and can occur over a large area. | The ongoing rehabilitation should occur soon after the area has been mined out so that alternative land use can commence. | In accordance with Rehabilitation and closure plan | During rehabilitation |
| | Rehabilitation and Closure | Impacts on alternative land uses are considered highly significant | Rehabilitation should follow procedures with regard to seed bed preparation and fertilising, and advice on seed mixtures to seed with. | In accordance with Rehabilitation and closure plan | During rehabilitation |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Filling Opencast Voids<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management<br><br>Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | | and can occur over a large area. | | | |
| | Operation Decommissioning Rehabilitation and Closure | Impacts on alternative land uses are considered highly significant and can occur over a large area. | Rehabilitated areas should be mowed or grazed (where appropriate) as soon as they are considered stable and become available. | In accordance with Rehabilitation and closure plan | During rehabilitation |
| | Operation Decommissioning Rehabilitation and Closure | Impacts on alternative land uses are considered highly significant and can occur over a large area. | Areas that have been rehabilitated and are suitable for grazing must be fenced off from the adjacent mining areas and made available to landowners. | In accordance with Rehabilitation and closure plan | During rehabilitation |
| | Operation Decommissioning Rehabilitation and Closure | Impacts on alternative land uses are considered highly significant and can occur over a large area. | The post mining land use must be predetermined in order to ensure it is rehabilitated to suit the use of the land. | In accordance with Rehabilitation and closure plan | Established early during operations and implemented during rehabilitation |
| **Pollution Prevention** | | | | | |
| Decommissioning of Co-Disposal Dump | Construction Operation Decommissioning Rehabilitation and Closure | Small scale and localised | Vehicles/machinery will be regularly serviced to reduce risk of leaks. Drip trays will be placed under potential leak sites. Any leakages should be reported and treated as per the emergency response plan. For large spills a hazardous | NEMA Polluter Pays Principle<br><br>NEMA Duty of Care | Throughout operations |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Drilling for continued resource evaluation<br><br>Drilling monitoring boreholes<br><br>General decommissioning activities<br><br>General Surface Rehabilitation<br><br>Infrastructure removal<br><br>Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Opencast mining | | | materials company (specialist spill cleanup company) will be appointed. | NWA<br>OHSA<br>MHSA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Any equipment that may leak, and does not have to be transported regularly, shall be placed on watertight drips trays to catch any potential spillages of pollutants. The drip trays shall be of a size that the equipment can be placed inside it. Daily inspections shall be carried out to ensure such spill prevention measures are in place and remain effective. Drip trays shall be cleaned regularly and shall not be allowed to overflow. All spilled hazardous substances must be collected and adequately disposed of at a suitably licensed facility. | | |
| | Construction<br>Operation<br>Decommissioning | | Appropriate measures must be implemented to ensure that rainwater does not run into areas containing cement, oil, diesel etc. as this could result in a pollution threat. Storage areas for these substances should be placed on high-lying ground, and surrounded by erosion control measures e.g. rows of filled hessian bags, silt fences etc. During operation, the storm water management system shall ensure that water from dirty areas reports to the PCD's. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Servicing and maintenance of vehicles may only take place in the workshop area (subject to suitable spill prevention and containment measures). If emergency repairs are required elsewhere on site, this shall be undertaken with the necessary spill prevention measures in place. | | |
| | Construction<br>Operation | | Cement and liquid concrete are hazardous to the natural environment on account of the very high pH of the material, and the chemicals contained therein. As a result, the Mine shall ensure that:<br>• Concrete shall only be mixed on mortar boards, and not directly on the ground, | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Filling Opencast Voids<br><br>Post Closure Monitoring and Maintenance<br><br>Re-vegetation<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management<br><br>Decommissioning Underground Mine Infrastructure<br><br>Underground mining<br><br>Water management | | | • The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste, (Washing of visible signs into the ground is not acceptable).<br>• All excess aggregate shall also be removed. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Small scale and localised | All hazardous substances (e.g. fuel, grease, oil, brake fluid, hydraulic fluid) must be handled, stored and disposed of in a safe and responsible manner so as to prevent pollution of the environment or harm to people or animals. Appropriate measures must be implemented to prevent spillage and appropriate steps must be taken to prevent pollution in the event of a spill. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | High significance and potentially a moderate scale disturbance | Hazardous substances shall be confined to specific and secured areas, and in such a way that does not pose any danger of pollution even during times of high rainfall. Hazardous storage areas shall be bunded (impermeable) with adequate containment (at least 110% the largest volume stored) for potential spills or leaks. Bunded storage areas shall be either be provided with an oil separator or sump. Waste from spillages will then be removed and recycled or disposed of responsibly. | NEMA Polluter Pays Principle<br><br>NEMA Duty of Care<br><br>NEMA<br>NWA<br>OHSA<br>MHSA<br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout operations |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | High significance and potentially a moderate scale disturbance | All fuel storage areas shall be bunded to contain at least 110 % of the volume stored and will comply with the relevant environmental and safety regulations. Fuel storage areas must be provided with an impervious surface with the provision to contain any potential fuel spillages during refueling (e.g. a sealed concrete slab which drains to a sump/oil separator). The applicant must ensure that employees and labourers do not smoke or take part in any activity that may results in sparks in the vicinity of fuels and other flammable substances to prevent ignition. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Infrastructure construction<br><br>Water Treatment (as required by WUL) | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | High significance and potentially a moderate scale disturbance | Refueling may only take place within a dedicated area inside the mine that is subject to appropriate spill prevention and containment measures Refueling and transfer of hazardous chemicals and other potentially hazardous substances must be carried out so as to minimise the potential for leakage and to prevent spillage onto the soil. Drip trays should be utilised in relevant locations (inlets, outlets, points of leakage, etc.) during transfer to prevent such spillage or leakage. Any accidental spillages shall be contained and cleaned up promptly. | | |
| | Construction<br>Operation<br>Decommissioning | High significance and potentially a moderate scale disturbance | Any excess or waste material or chemicals should be removed from the site and should preferably be recycled (e.g. oil and other hydrocarbon waste products). Any waste materials or chemicals that cannot be recycled shall be disposed of at a suitably licensed waste facility. | NEMWA<br><br>DWAF minimum requirement for waste disposal | Throughout operations |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | High significance and potentially a moderate scale disturbance | Hazardous waste may only be disposed of at a licensed hazardous waste disposal facility. A specialist waste contractor shall dispose of such waste and shall be required to provide waste manifests and safe disposal certificates. The 'cradle-to-grave' principle must be complied with. | NEMA Polluter Pays Principle<br>NEMA Duty of Care<br>NEMWA<br>DWAF minimum requirement for waste disposal | Throughout operations |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Potential health risks are considered high significance | All relevant personnel on site must be properly trained concerning the proper use, handling and disposal of hazardous substances applicable to their line of work. If required, advice shall be obtained from the manufacturer with regard to the safe handling and storage of hazardous materials. | MSDS specifications<br><br>OHSA<br>MHSA | Throughout operations |
| | Construction<br>Operation<br>Decommissioning | Small scale and localised | The Mine EO shall maintain a list of all hazardous materials that would be present on site during the construction period. The Mine EO shall develop and | OHSA<br>MHSA | Throughout operations |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | maintain a hazardous substance register for all hazardous materials that shall be kept on site during all phases of the project. The register shall be provided to the ECO upon request. Material Safety Data Sheets (MSDS) must be available on site at the point of use and readily accessible for all hazardous substances stored. | | |
| **Waste Management** | | | | | |
| Maintenance and operation of site infrastructure and facilities<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Drilling for continued resource evaluation<br><br>Water management Infrastructure construction | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from localized to large scale impacts. | The mine shall develop and implement a waste management plan for the Mine which complies with the principles of the NEMWA and provides a mechanism for the effective management of waste throughout the LoM. This plan shall ensure the appropriate management of all solid waste, including construction debris (cement bags, wrapping material, timber, cans, wire, nails, etc.), waste and surplus food, food packaging, organic waste etc. | NEMWA<br>NEMA cradle to grave<br>DWAF minimum requirement for waste disposal<br><br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout operations |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from localized to large scale impacts. | The waste management system shall provide for adequate waste storage (in the form of waste skips and bins with lids), waste separation for recycling, and frequent removal of non-recyclable waste for permanent disposal at an appropriately licensed waste disposal facility. No waste material is to be disposed of on site. Under no circumstances may there be any burial of waste underground or on the site. | NEMWA<br>NEMA cradle to grave<br>DWAF minimum requirement for waste disposal | Throughout operations |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from | Waste generated on site should be recycled as far as possible and sold/given to interested contractors. Recyclable waste should not be stored on site for excessive periods to reduce risk of environmental contamination | NEMWA<br>NEMA cradle to grave | Throughout operations |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| General Construction Mine area site preparation<br><br>Drilling monitoring boreholes<br><br>General Mine Management<br><br>Opencast mining<br><br>Underground mining<br><br>Mineral Processing<br><br>Maintenance and operation of site infrastructure and facilities<br><br>General decommissioning activities<br><br>Infrastructure removal | | localized to large scale impacts. | | DWAF minimum requirement for waste disposal | |
| | Construction Operation Decommissioning Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from localized to large scale impacts. | The Mine shall implement a waste removal regime that ensures waste skips do not exceed their capacity before being removed from site for disposal. | NEMWA NEMA cradle to grave | Throughout operations |
| | Construction Operation Decommissioning Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from localized to large scale impacts. | Littering shall be strictly prohibited. The site shall remain in a neat and tidy condition at all times. If required, the mine shall make use of regular litter patrols to remove litter and ensure the site remains clean, neat and tidy. | NEMWA NEMA cradle to grave | Throughout operations |
| | Construction Operation Decommissioning Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from localized to large scale impacts. | The mine shall maintain a waste register which shall be used to track all waste removed from site. Proof of appropriate waste disposal shall be kept on file at the site for auditing purposes. | NEMA cradle to grave | Throughout operations |
| | Construction Operation Decommissioning Rehabilitation and Closure | Waste has the potential to pollute the environment and can vary from localized to large scale impacts. | The mine will adopt a cradle-to-grave approach to ensure that the waste is removed and disposed of in the prescribed and correct manner. | NEMA cradle to grave | Throughout operations |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Decommissioning Underground Mine Sections | | | | | |
| **Sewage and Sanitation** | | | | | |
| Drilling for continued resource evaluation<br><br>Site establishment – Permanent site office Infrastructure<br><br>Site establishment – Camp<br><br>Water management Infrastructure construction<br><br>General Construction<br><br>Mine area site preparation<br><br>Drilling monitoring boreholes | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Sewage has the potential to result in localized impacts of low to medium significance | There must be adequate provision for safe and effective sanitation (i.e. ablution facilities) at the mine and work sites and these shall conform to all relevant health and safety standards and codes. The Mine shall ensure compliance with the OHSA and MHSA in terms of sewage and sanitation (managed by safety department). Under no circumstances will pit latrines, french drain systems or soak away systems be allowed. Septic tanks are permitted on condition that they are closed units and are serviced regularly to prevent overflows.<br><br>Portable toilets will be managed by reputable contractors and inspected daily for any potential leaks. The Contractor (or reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. Chemical toilets shall be emptied/serviced frequently to avoid offensive odours (at least weekly). Toilets must be kept in a clean, neat and hygienic condition. Chemical toilets shall be cleaned and emptied before long weekends or public holidays.<br><br>Toilets must be easily accessible. Toilets shall be placed outside areas susceptible to potential flooding and shall not be placed within 50m of any wetland or watercourse. Ablution facilities shall be located a sufficient distance from any offices or eating areas to prevent nuisance from offensive odours. Sanitary arrangements shall also be to the satisfaction of the ECO.<br><br>Disposal of sewage from chemical toilets shall be in a safe and responsible manner and at an approved facility specifically for that purpose. Proof of sewage removal and disposal shall be kept on file for auditing purposes. | NEMWA<br>NWA<br>NEMA cradle to grave | Throughout operations |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| General Mine Management<br><br>Opencast mining<br><br>Underground mining<br><br>Maintenance and operation of site infrastructure and facilities<br><br>General decommissioning activities<br><br>Infrastructure removal | | | | | |
| **Noise** | | | | | |
| Decommissioning of Co-Disposal Dump<br><br>Drilling for continued resource evaluation | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Noise has the potential to result in significant impacts to sensitive receptors at a small to medium scale | The mine shall take reasonable measures to limit exceedingly noisy activities. Where noise is generated which may impact on sensitive receptors, the mine shall apply measures to control the noise cannot be avoided, mitigation measures to be applied shall include but is not limited to;<br>• Using the smallest/quietest equipment for the particular purpose;<br>• Ensuring that equipment is well-maintained and fitted with the correct and appropriate noise abatement measures; | SANS10103<br><br>ECA Noise Regulations<br><br>World Bank EHS guidelines<br><br>OHSA<br><br>MHSA | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Drilling monitoring boreholes<br><br>General decommissioning activities<br><br>General Surface Rehabilitation<br><br>Infrastructure removal<br><br>Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Opencast mining<br><br>Filling Opencast Voids | | | • Where possible, stationary noisy equipment (for example compressors, pumps, pneumatic breakers,) should be encapsulated in acoustic covers, screens or sheds. Proper sound insulation can reduce noise by up to 20dBA. All construction vehicles and equipment are to be kept in good repair;<br>• Machines in intermittent use should be shut down in the intervening periods between work or throttled down to a minimum;<br>• The Mine must attempt to restrict noisy activities as far as is possible to times and locations whereby the potential for noise nuisance is reduced;<br>• When working near (within 800 meters) to a potential sensitive receptor(s), the Mine shall limit the number of simultaneous activities to the minimum;<br>• All machines should be equipped with appropriate noise reduction equipment;<br>• All machines should be roadworthy (including meeting maximum noise specifications);<br>• The vehicles exhaust and baffle systems must be maintained regularly to ensure that the noise from these vehicles is within the required noise specification;<br>• All plant and equipment must be operated in accordance with the specifications provided by the manufacturer; and<br>• Safety measures that generate noise, including reverse gear alarms, should be adjusted to minimise noise where possible. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Re-vegetation<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management<br><br>Underground Mine Infrastructure<br><br>Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | | | A maintenance programme will be investigated for the ventilation machinery and shall be implemented should feasible options exist. | | |
| | | | Community involvement needs to continue throughout the project. Good public relations are essential. At all stages surrounding receptors should be educated with respect to the potential increase of noise from the mine (i.e.: when the potential increase is considered of concern to surrounding receptors). The information presented to stakeholders should be factual and should not set unrealistic expectations. | | |
| | | | Trucks, machinery and equipment will be regularly serviced to ensure acceptable noise levels are not exceeded. Quieter equipment will be sought where possible when purchasing new equipment. Silencers will be utilised where possible. Point sources will be enclosed where possible. Acoustic screens will be considered if I&AP complaints are received. | | |
| | | | Local residents within 3km of the mine should be notified of any potentially significant noisy activities or work (e.g.: blasting) and these activities should be undertaken at reasonable times of the day. These works should not take place at night or on weekends. | | |
| | | | A channel of communication should be established and promoted between the mine and surrounding stakeholders. All noise complaints must be recorded and investigated. If required, the complaints should be investigated by an acoustical consultant. | | |
| | | | As a general rule, construction operations should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993). The Applicant shall obtain a copy of the relevant noise regulations and take all reasonable measures to abide by these regulations. Sound pressure levels should not exceed the | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | specified threshold level for the relevant area in accordance with SANS10103, as experienced by the nearest noise sensitive receivers (i.e. local residents). In the event that noise levels exceed the specified thresholds in terms of the noise regulations, the Applicant shall appoint a suitably qualified acoustic engineer to identify sources of the elevated noise levels and to suggest suitable and reasonable mitigation measures. | | |
| **Air Quality** | | | | | |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Localised and low significance | Areas of high risk for spontaneous combustion will be inspected regularly for signs of possible combustion. An emergency procedure will be set up in the case of spontaneous combustion. | NEMAQA<br><br>Dust regulations | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Localised and low significance | Every effort should be made to avoid the tracking of coal from the site onto the road as this can have the impact of increasing the dust impact of the roads and changing the profile of the dust to one of black coal dust. The ECO shall evaluate the condition of the roads and in the event that coal dust is being tracked off site to an unacceptable degree, the Applicant shall implement measures as necessary to avoid and reduce this impact. | NEMAQA<br><br>Dust regulations | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Wide scale of disturbance and low to medium significance. Some localized high significant impacts. | It is important to note that dust could be a major disturbance, especially during the dry winter periods to people residing around the site. All reasonable measures must be utilised to minimise the generation of dust as a result of activities on site. Such measures shall include, but shall not be limited to;<br>• Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds;<br>• Regular and effective measures aimed at binding the surface material or enhancing | NEMAQA<br><br>Dust regulations | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management<br>Infrastructure construction<br>Water Treatment (as required by WUL) | | | moisture retention, such as wet suppression and chemical stabilisation;<br>• Application of chemical dust palliatives and the optimal selection of wearing course materials (where possible environmentally friendly products should be utilised);<br>• Appropriate scheduling of dust-generating activities (e.g. the clearing of parking areas should be postponed until the construction programme requires the clearing of that specific area).<br>• Avoid excavation and stockpiling activities during periods of strong winds.<br>• Increase dust suppression efforts during conditions conducive to excessive dust creation (e.g. dry and windy conditions).<br>• Limit the height of soil stockpiles where possible; and<br>• Areas where excessive or difficult to manage fallout dust and erosion occur remain may be treated with chemical dust suppressant or paved as opposed to using water. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Wide scale of disturbance and low to medium significance. Some localized high significant impacts. | The mine shall comply with the National Dust Control Regulations, Promulgated under the National Environmental Management: Air Quality Act (Act 39 of 2004). If dust levels exceed the specified thresholds in terms of the dust control regulations, the Applicant shall appoint a suitably qualified specialist to identify sources of the excessive dust levels and to suggest suitable and reasonable mitigation measures. | NEMAQA<br><br>Dust regulations | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning | Localised and low significance | The mine must ensure that no transported materials escape from the construction and mine vehicles (no spillage on roads or dust clouds). If necessary, the load | NEMAQA<br><br>Dust regulation | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | bin of the vehicle shall be covered with a tarpaulin to prevent dust. | | |
| | Construction Operation Decommissioning Rehabilitation and Closure | No direct Impacts | The Mine shall maintain open and transparent communication with the community and surrounding landowners regarding air quality and shall supply monitoring records to the public upon request. | NEMAQA<br><br>Dust regulation | Throughout LoM |
| | Construction Operation | Localised and low significance | A skirt (dust barrier) shall be placed around the base of dry drills to minimise the generation of airborne dust. | NEMAQA<br><br>Dust regulation | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | Health impacts have a localized but high significance | Employees will receive training on the use of personal dust respirators, whenever high dust levels are experienced. | NEMAQA<br><br>Dust regulation | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | Wide scale of disturbance and low to medium significance. Some localized high significant impacts. | Speed limits will be established and enforced on the mine to minimise dust generation. | NEMAQA<br><br>Dust regulation | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | Localised and low significance | Machinery and equipment will be regularly serviced to ensure they are in proper working condition and to reduce risk of excessive emissions. | NEMAQA<br><br>Dust regulation | Throughout LoM |
| | Construction Operation | Localised and low significance | Coal will not be left lying around as this increases the risk of spontaneous combustion. | NEMAQA<br><br>Dust regulation | Throughout LoM |
| **Heritage** | | | | | |
| Decommissioning of Co-Disposal Dump | Construction Operation | Impacts on heritage affect a limit extent but have a very high significance due to | Following the palaeontological study conducted the specialist determined that although no fossils were found during the site visit. The EAP and ECO for the Ilima Colliery ought to be informed that the sediments of the | NHRA<br><br>Development Facilitation Act | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance | | the value of heritage resources which are protected by law. | Vryheid Formation, Ecca Group contains important fossil remains, although they are mostly trace fossil and plant fossil assemblages. Should fossil remains be discovered during any phase of construction, either on the surface or exposed by fresh excavations, the ECO responsible for these developments should be alerted immediately. Such discoveries ought to be protected (preferably *in situ*) and the ECO should alert SAHRA (South African Heritage Research Agency) so that appropriate mitigation (*e.g.* recording, sampling or collection) can be taken by a professional palaeontologist. The appointed palaeontologist, in consultation with the mining company, must then develop a long-term strategy and budget for the recovery of significant fossils during the mining operation. This strategy may include site visits to monitor the spoil heaps, the collection of representative samples as well as the curation of fossil material. All fieldwork and reports should meet the minimum standards for palaeontological impact studies developed by SAHRA.<br>In areas that are allocated a Very High and High Palaeontological sensitivity and specifically where deep excavation into bedrock is expected, a qualified palaeontologist must be employed to evaluate and record fossils at the development footprint. The fossils may be placed on a stock pile where a professional palaeontologist may inspect them at regular intervals (determined by the mine and palaeontologist). | | |
| Re-vegetation<br>Site establishment – Camp | Construction<br>Operation<br>Decommissioning | Impacts on heritage affect a limit extent but have a very high significance due to the value of | Monitoring of the grave sites on the various farms should take place. The archaeologist must define a suitable number of fixed points around each identified heritage site and photographically record each site using pre-defined fixed points. This recording must be conducted in | NHRA<br><br>Development Facilitation Act | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Site establishment – Permanent site office Infrastructure Storm water management Underground Mine Infrastructure Underground mining Water management Infrastructure construction Water Treatment (as required by WUL) | | heritage resources which are protected by law. | conjunction with the ECO. The archaeologist must familiarise the ECO with the principles and aims of the monitoring process and the use of fixed-point photography.<br>Fixed photo points for the Status Quo report must be presented on the building plans to make it visually clear where follow up monitoring photos must be taken. This must be done before construction commences. | | |
| | Construction Operation Decommissioning Rehabilitation and Closure | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law. | Should artefacts or archaeological items be observed, then all activity should cease immediately, the area marked off and a specialist consulted prior to any further activity. | NHRA<br><br>Development Facilitation Act | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law. | Should graves be observed on site during activity progress then all activity should cease, and the area demarcated as a no-go zone. A specialist will need to be consulted and responsible action considered, whether grave relocation or ceasing activity completely within the area and a 50m buffer zone. | NHRA<br><br>Development Facilitation Act | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law. | The mine must develop a heritage management plan. This should include the relevant measures to protect and monitor all known heritage resources on site. Furthermore, the plan should include a chance finds procedure. | NHRA<br><br>Development Facilitation Act | As soon as possible and implemented throughout LoM |
| | Construction Operation | Impacts on heritage affect a limit extent | The ECO and Mine EO must be trained on potential heritage features which may be found on site and the | NHRA | As required |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Decommissioning Rehabilitation and Closure | but have a very high significance due to the value of heritage resources which are protected by law. | implementation of the chance finds procedure. Should any potential heritage features be identified the relevant specialist must be notified and shall advise on the way forward. | Development Facilitation Act | |
| | Construction Operation Decommissioning Rehabilitation and Closure | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law. | All identified gravesites will be fenced off, or relocated. Access to gravesites will be arranged for family members/friends of the deceased if requested. Grave sites that remain in situ shall be inspected on a regular basis as per the heritage management plan to ensure no damage has occurred. | NHRA<br><br>Development Facilitation Act | As soon as possible and implemented throughout LoM |
| | Construction | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law. | For known structures such as **ZV04-07**, **ILM003**, **ILM004** and **ILM007** the sites will need to be documented before a destruction permit can be applied for at the provincial heritage authority (Mpumalanga); **ILM014** will need to be fully mitigated with excavations and documentation of the site, while no mitigation is required for **ILM015**.<br>In the event of any other heritage resources are uncovered SAHRA should be contacted and a qualified archaeologist appointed to evaluate the finds and make appropriate recommendation on mitigation. | Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA | As soon as possible and implemented throughout LoM |
| | Construction | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law | For the burial grounds, the site must be demarcated with a 50-meter buffer and avoid them. Stakeholder engagement will need to be implemented to determine the possibility of infant burials at **ILM014** and **015**. If this is not possible a detailed grave relocation process must be implemented as required under the NHRA and National Health Act regulations. | Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA | As soon as possible and implemented throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on heritage affect a limit extent but have a very high significance due to the value of heritage resources which are protected by law. | In the event that graves or cemeteries need to be relocated, a full grave relocation process must be undertaken that includes comprehensive social consultation. The grave relocation process must include:<br>• A detailed social consultation process, that will trace the next-of-kin and obtain their consent for the relocation of the graves, which will be at least 60 days in length;<br>• Site notices indicating the intent of the relocation<br>• Newspaper Notice indicating the intent of the relocation<br>• A permit from the local authority;<br>• A permit from the Provincial Department of Health;<br>• A permit from the South African Heritage Resources Agency, if the graves are older than 60 years, or unidentified and thus presumed older than 60 years;<br>• An exhumation process that keeps the dignity of the remains and family intact;<br>• The whole process must be done by a reputable company that is well versed in relocations; and<br>• The exhumation process must be conducted in such a manner as to safeguard the legal rights of the families as well as that of the development company. | NHRA<br><br>Development Facilitation Act<br><br>Human Tissue Act | Throughout LoM |
| **Land Capability** | | | | | |
| General Surface Rehabilitation<br><br>Maintenance and operation of site | Construction<br>Operation<br>Decommissioning | Impacts on land capability have long term effects and can be of a high significance | The mine will ensure that overburden stockpiles are located in accordance with the rehabilitation plan to allow for minimal handling when returning soils during rehabilitation. | In accordance with Rehabilitation and closure plan | Throughout LoM |
| | Construction<br>Operation | | The mine shall preserve soil potential as far as possible, thus conserving land capability. | In accordance with | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| infrastructure and facilities | Decommissioning<br>Rehabilitation and Closure | | | Rehabilitation and closure plan | |
| Mine area site preparation<br><br>Opencast mining<br><br>Filling Opencast Voids<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | Construction<br>Operation<br>Decommissioning<br>Rehabilitation | | Soil stockpiles should be vegetated with prescribed seed mixtures to prevent soil erosion. | In accordance with Rehabilitation and closure plan | Throughout LoM |
| | Rehabilitation | | The mined-out areas undergoing rehabilitation should be topographically similar to the pre-mining topography, and should allow for free water drainage to prevent the ponding of water and reduce soil erosion. | In accordance with Rehabilitation and closure plan | During Rehabilitation |
| | Rehabilitation | | During rehabilitation care must be taken to return the correct soil types and depths to specific sections of rehabilitated land to ensure land capability potential is restored to as close as possible the original land capability rating for the area. | In accordance with Rehabilitation and closure plan | During Rehabilitation |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Re-vegetate rehabilitated areas as soon as possible to prevent soil erosion. | In accordance with Rehabilitation and closure plan | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| **Surface Water** | | | | | |
| Decommissioning of Co-Disposal Dump<br><br>Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Opencast mining<br><br>Opencast Voids<br><br>Post Closure Monitoring and Maintenance<br><br>Re-vegetation<br><br>Site establishment – Camp | Construction<br>Operation<br>Decommissioning | Impacts on surface water can have a high significance and extent | The mine shall ensure that a detailed storm water management plan is approved and implemented for the mining area. Clean and dirty water system infrastructure must be installed as per the detailed storm water management plan which must take into consideration the design capacities and locations restrictions stipulated in GN 704 of the NWA. | NWA<br><br>GN704<br><br>DWAF best Practice Guidelines<br><br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | As soon as possible and implemented throughout LoM |
| | Construction<br>Operation<br>Decommissioning | | Where clean water is diverted away from construction and/or mining areas, its point of re-entry into the natural watercourse should be well protected against erosion. In addition, sediments should be effectively trapped before re-entry. | | |
| | Construction<br>Operation<br>Decommissioning | | No wastewater may run freely into any of the surrounding environment or neighbouring properties. The Mine shall implement the storm water design in accordance with the approved Storm Water Management Plan. The Applicant shall ensure compliance with the requirements of the National Water Act and GN704 | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | All areas susceptible to erosion shall be protected by ensuring that there is no undue soil erosion resultant from construction and/or mining activities. Berms shall be constructed where necessary to direct all runoff into the stormwater system. Care must be taken to avoid scouring and erosion and suitable measures should be placed in areas where runoff concentrates, in order to reduce the sediment load and slow down the runoff. All erosion damage shall be repaired as soon as possible as directed by the ECO. | | |
| | Construction<br>Operation<br>Decommissioning | | All storm water and erosion control mechanisms must be inspected frequently and shall be maintained on a regular basis to ensure they remain effective. Appropriate | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Site establishment – Permanent site office Infrastructure<br><br>Underground mining<br><br>Water management Infrastructure construction | Rehabilitation and Closure | | remedial action, including the rehabilitation of eroded areas, shall be undertaken under direction from the ECO. | | |
| | Construction | | Materials capable of resulting in poor quality leachate will not be used for the construction of haul roads. This will entail testing for acid generation potential. | | |
| | Construction | | Where possible, the disturbance of land during the construction phase will be confined to areas which are planned to be disturbed during the operation of the mine. | | |
| | Construction<br>Operation | | Soil stockpiles must be stabilised with vegetation to reduce erosion and siltation into streams and dams. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Hydrocarbon spills will require immediate attention and should be disposed of at a licensed facility. All used hydrocarbons will be collected and recycled. | | |
| | Construction<br>Operation | | Storm water drainage and pollution control facilities will be constructed to manage the flow of water and separate clean and dirty water on site. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | All licenses and permits required as per the National Water Act will be applied for as per the relevant water uses. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | The mine shall ensure soil erosion control measures are established in all high-risk areas to reduce silt-loading in storm water runoff. Construct a down-stream drain and silt traps at the outlet of water diversion areas. Clean out silt build up in trenches and silt traps over dry season or more frequently if needed. Conduct construction activities in the dry winter months as far as possible. | | |
| | Construction<br>Operation<br>Decommissioning | | Runoff from freshly rehabilitated areas should be channeled to pollution control structures so that eroded soil does not leave the property. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
| --- | --- | --- | --- | --- | --- |
| | Rehabilitation and Closure | | | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Excess water will only be discharged if it meets statutory requirements. | | |
| | Construction<br>Operation | | Storm water runoff will be diverted around opencast pits on the upslope side but the area enclosed within these boundaries will be kept as small as possible. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Mining will adhere to regulations stipulated in the water license. | | |
| | Construction<br>Operation | | The mine shall ensure that water management facilities are operating adequately and will remain operational during a 50 year 24 hr storm event until such time that all disturbed areas are stabilised. | | |
| | Rehabilitation and Closure | | On gentle slopes, water will be encouraged to flow off the rehabilitated surface, as surface flow, as quickly as possible without causing erosion. This will ensure that water does not infiltrate too deeply and come into contact with carbonaceous material. On steeper slopes, water will be encouraged to infiltrate slightly to help prevent soil erosion. | | |
| **Wetlands** | | | | | |
| Maintenance and operation of site infrastructure and facilities | Construction | Impacts on wetlands are considered to be highly significant due to the | The mine shall limit the extent of the development footprint to exclude aquatic resources as far as possible. Any infrastructure and all stormwater controls and mining related facilities or activities should be constructed outside of the wetland environment. | NWA<br>GN704<br><br>Shall adhere to the ESMS | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Opencast mining<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Underground Mine Infrastructure<br><br>Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | sensitivity of these areas. Impacts can range from localized to impacts which are large in extent | The mine shall take the necessary precautions to avoid any impacts to wetlands outside of the required construction and/or mining footprint. These areas should be considered as no-go areas, and the restriction should be enforced. | developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Construction<br>Operation | | The Highly Sensitive and "No Go" areas (wetlands) should not be impacted unless absolutely necessary, and then only if the necessary permissions have been obtained (licenses etc.). | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | The mine shall set up a 100m buffer zone around sensitive areas, such as pans, wetlands and streams. These areas should be considered as no-go areas, and the restriction should be enforced. | | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Any wetlands impacted during the construction or mining process on site should be rehabilitated in accordance with the principles and guidelines presented in this EMPR. | | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Re-vegetate all bare wetland areas not directly within the footprint of the developments as soon as possible. The extent of the disturbance should be limited to a minimum. | | Throughout LoM |
| | Rehabilitation and Closure | | Regular monitoring of the success of wetland rehabilitation measures must be undertaken. Where required, the necessary adjustments should be made to ensure the complete re-establishment of the natural vegetation. | | Throughout LoM |
| | Construction<br>Operation | | Construction of a low berm, approximately 1m high by 2-3m wide between the stockpiles and any wetlands. These berms would serve to intercept flows containing suspended sediments and create a depositional environment. They should be located outside the | | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | wetland boundaries and should be created prior to construction and vegetation clearing on the stockpile footprint commencing. | | |
| | Construction Operation Decommissioning Rehabilitation and Closure | | Inform all construction personnel to not disturb the fauna and flora in wetland areas and not to wash or bath in local streams. | | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | | Control dust emissions to prevent dust from settling in the wetland areas. | | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | | The mine shall implement an aquatic bio-monitoring and water quality monitoring programme. Where target endpoints are not met, recommendations should translate directly into follow-up action that is recorded and auditable. | | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | | No dirty water may be discharged into any wetland or water resource on site unless treated to the required standards. | | Throughout LoM |
| | Construction Operation Decommissioning Rehabilitation and Closure | | No stockpiling of material may take place within the wetland areas and temporary construction camps and infrastructure should also be located away from these areas, with a minimum buffer of 100m maintained from delineated wetland boundaries.<br>In cases where historical mining activities have encroached within 100m of wetlands, exemption must be obtained for the provisions of GN704 and the necessary protection measures shall be implemented to minimise the impact on wetlands as far as is possible. | | Throughout LoM |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | No abstraction of water from the wetlands or dams should be allowed unless expressly authorized in the IWULA. | | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Where storm water and/or diverted clean water is discharged into wetlands, appropriate measures such as gabions should be constructed to reduce the entry flow rates and contain erosion. | | Throughout LoM |
| **Topography and Landform** | | | | | |
| General Surface Rehabilitation<br><br>Infrastructure removal<br><br>Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Opencast mining | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on topography tend to be large in extent and can have a significant effect on the environment | Levelling out of the mine site area will be supervised by a qualified mine surveyor, the mine planning department and in conjunction with an environmental consultant. | In accordance with Rehabilitation and closure plan<br><br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | | | Where possible, the original topographic landscape and drainage/flow lines will be recreated so as to reduce loss of water in the natural catchments. | | |
| | | | Berms and diversion trenches will be constructed as part of the stormwater management facility to help separate clean and dirty water on site. | | |
| | | | A post mining topographical plan should be developed during the start of the project in order to ensure compliance during and after mining. This plan must be adhered to at all stages of the project. | | |
| | | | Monitor, especially after first heavy rain falls to ensure adequate surface water drainage. | | |
| | | | Monitor, especially after first heavy rain falls to ensure adequate surface water drainage, surface water flow and erosion. | | |
| | | | Overburden will be temporarily stockpiled and will be placed back into the pit once the coal has been mined out (roll over mining method), this will assist in obtaining as close as possible the original natural topography. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Filling Opencast Voids<br><br>Post Closure Monitoring and Maintenance<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management<br><br>Underground Mine Infrastructure<br><br>Underground mining<br><br>Water management Infrastructure construction | | | The overburden should be replaced in a manner that replicates the previous topography, and ensures that the final topography has a surface that is free-draining. | | |
| | | | There will be survey checks included as part of the rehabilitation planning to ensure that the planned post mining topography is being followed. | | |
| | | | All vehicles must be limited to approved access routes and areas (including turning circles and parking) on the site so as to minimise excessive environmental disturbance to the soil and vegetation on site, and to minimise disruption of traffic. | | |
| | | | Soils should be stockpiled separately according to the soil utilisation plan. | | |
| | | | During rehabilitation, the soil utilisation plan should be followed in terms of reinstatement depths, order etc. Soil horizons should be replaced in the same order as they occur in nature to prevent mixing of soil horizons. | | |
| | | | Topsoil depth should be related to the proposed post-mining land capability plans. | | |
| | | | Rehabilitated areas should not be compacted more than is necessary, and activity, particularly that of heavy machinery and vehicles, on these areas should be limited. | | |
| | | | Rehabilitated areas should be landscaped to prevent water logging and vegetated to prevent soil erosion. | | |
| | | | Erosion control measures such as contour banks and cut off berms should be constructed and soil vegetated in rehabilitated areas. | | |
| | | | Accidental hydrocarbon spillages should have sawdust applied immediately, and rehabilitated or if this is not possible then the affected soil should be removed to a licensed waste disposal site and the area rehabilitated. | | |
| | | | Final profiling of the last cut will take place to ensure the area is rehabilitated to as close as possible its natural state as possible. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | Former DTM's will be used to establish what contours were present prior to mining taking place and these will be used to help shape the area to the final topographic landform. | | |
| | | | Regular surveys will be undertaken to ensure the rehabilitation conforms to the final topographical plan and that no final void will be left. | | |
| **Transportation, Infrastructure and Traffic** | | | | | |
| Decommissioning of Co-Disposal Dump<br><br>Mine area site preparation<br><br>Opencast mining<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Underground mining<br><br>Water management | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Impacts on transportation infrastructure and traffic can have a significant extent although typically low in significance | The mine shall ensure that the internal haul roads are adequately maintained, including monthly scraping where required. Together with road maintenance, the storm water system to direct storm water that falls within the roads shall be kept maintained and settlement ponds shall be cleared of silt on a regular basis. Any/all spillage of mine product or by product will be cleared and added back onto the RoM stockpile | Road Traffic Act<br><br>OHSA<br><br>MHSA | Throughout LoM |
| | | | On-site vehicles must be limited to approved access routes and areas (including turning circles and parking) on the site so as to minimise excessive environmental disturbance to the soil and vegetation on site, and to minimise disruption of traffic. | | |
| | | | In the case of dual or multiple use of access roads by other users, arrangements for multiple responsibility must be made with the other users. If not, the maintenance of access roads will be the responsibility of the Applicant. Road condition must be assessed regularly for signs of damage. | | |
| | | | All intersections with main tarred roads will be clearly signposted. | | |
| | | | Road signs and safety features such as rumble strips will be maintained to ensure the writing is legible and the haul road crossings are visible to motorists. | | |
| | | | All construction and mining vehicles using public roads shall be in a roadworthy condition and their loads | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Infrastructure construction | | | secured. They must adhere to the speed limits and all local, provincial and national regulations with regards to road safety and transport. | | |
| **Visual** | | | | | |
| Decommissioning of Co-Disposal Dump<br><br>General Surface Rehabilitation<br><br>Mine area site preparation<br><br>Mineral Processing<br><br>Opencast mining<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management | Rehabilitation and Closure | Visual impacts have an impact on the perception and sense of place in the area and although hard to quantify can have a significant impact over a large extent of the area. | Final shaping will be implemented, such that, the final profile of the rehabilitated mining areas is formed to emulate natural contours of the area. | In accordance with Rehabilitation and closure plan<br><br>Closure and final land use objectives | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning | | Directional lighting and soft lighting will be utilised to ensure that only areas required to be lit are lit. Screens will be considered if I&AP complaints are received. | | |
| | Construction<br>Operation<br>Decommissioning | | Where possible, and in consideration of the rehabilitation plan and objectives, the mine shall create screening using soil stockpiles, berms and natural vegetation to reduce the visual impact of the mining operations and infrastructure. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Dust suppression methods must be applied when necessary to restrict the visual impact of dust emissions. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Underground mining<br><br>Water management Infrastructure construction<br><br>Water Treatment (as required by WUL) | | | | | |
| **Blasting and Vibration** | | | | | |
| Opencast Mining<br><br>Underground Mining | Operation | Blasting and Vibration can have a significant impact which increases in significance with proximity to the blast | Prior to blasting commencing, infrastructure within 1km of the mining area/blast area should be inspected to determine and document the extent of existing damage (Crack Analysis). These properties will be periodically evaluated to determine any damage. Records of blasting times and distance to properties will also be used to determine likelihood of damage.<br><br>All blast designs shall comply with current legislation and shall be designed to minimise ground vibrations and air blast.<br><br>All monitoring shall comply with USBM (United States Bureau of Mines) standards. | MHSA<br><br>Explosives Act No. 26 of 1956 and amended No. 15 of 2003<br><br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast | Throughout Operation |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | The reduction of air blast is fundamental in different ways and shall include the following measures:<br>• Detailed blast design for each blast with consideration the effects from blasting i.e. ground vibration and air blast.<br>• Use of proper stemming lengths (i.e.: where practical 25 times the blast hole diameters).<br>• Use of chippings from the drilled hole as stemming material.<br>• Record stemming lengths for each blast and correct if necessary prior to every blast blasted.<br>• Monitor each blast done. | | |
| **Groundwater** | | | | | |
| General decommissioning activities<br><br>General Surface Rehabilitation<br><br>Maintenance and operation of site infrastructure and facilities<br><br>Mine area site preparation<br><br>Mineral Processing | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | The underground mining impact on groundwater potentially affected a very large area and has a potentially high significance impact | The mine must take all reasonable measures to avoid and limit pollution of ground water resources as a result of site activities. Pollution could result from the release, accidental or otherwise, of chemicals, oils, fuels, sewage, waste water containing organic waste, detergents, solid waste and litter etc. The Applicant shall comply with the requirements relating to hazardous materials and spill management presented in this EMPR. | NEMA Duty of care<br><br>NWA<br><br>GN704<br><br>DWAF best practice guidelines<br><br>Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | Throughout LoM |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | In the event of pollution caused as a result of construction or mining activities, the responsible party, according to section 20 of the National Water Act (Act No. 36 of 1998) shall be responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Discard dumps and overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater zone. Mitigation that should be considered includes the management of the stockpile shape to control the ease with which water can run off from the facility. | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| Opencast mining<br><br>Filling Opencast Voids<br><br>Post Closure Monitoring and Maintenance<br><br>Re-vegetation<br><br>Site establishment – Camp<br><br>Site establishment – Permanent site office Infrastructure<br><br>Storm water management<br>Underground Mine Infrastructure<br><br>Water management Infrastructure construction | Construction<br>Operation | | Materials capable of resulting in poor quality leachate will not be used for the construction of haul roads. | IWUL Conditions | |
| | Operation | | Water accumulating within the opencast workings will be pumped to a lined pollution control facility from where it will be re-used in the operation. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | The mine shall ensure that the ground water monitoring program is implemented. All boreholes shall be monitoring throughout the LoM for ground water level and water quality. It is recommended that an independent specialist be contracted to indicate additional monitoring points for all new mining areas. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Local ambient groundwater quality contains various elevated element concentrations such as sodium, chloride and sulphate that already exceed the maximum allowable safe drinking water standards. Regular groundwater monitoring must be implemented to assess status versus baseline qualities. | | |
| | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | | Boreholes identified during the impact assessment as potentially being dewatered need to be monitored and if required replaced by newly drilled boreholes abstracting from below the mined workings or outside the area of influence of the boreholes. | | |
| | Construction<br>Operation<br>Decommissioning | | The mine shall utilize water on site responsibly. Ensure all pipelines and water containment facilities are adequately sealed to prevent leaks. Record water usage by attaching meters to all pumps. | | |
| | Operation<br>Decommissioning<br>Rehabilitation and Closure | | The flooding of mine workings needs to be maximized at closure, this can be achieved by the closure of access points between the opencast and underground workings by a hydraulic seal. | | |
| | Construction<br>Operation<br>Decommissioning | | Boreholes overlying the underground mine workings will be surveyed and the total depths measured where not available. The layout of mine pillars will be adjusted to allow the preservation of existing boreholes where | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Rehabilitation and Closure | | possible, or alternatively the boreholes will be sealed and replaced with alternative water sources. | | |
| | Operation Decommissioning Rehabilitation and Closure | | Water decanting from the opencast workings that cannot be sealed, and where the floor cannot be flooded will be channeled to the PCD and collected and treated prior to release, unless monitoring indicates that the water quality meets the water management objectives for release. | | |
| | Operation Decommissioning Rehabilitation and Closure | | | | |
| | Rehabilitation and Closure | | All access to the underground workings will be sealed by a seal capable of withstanding the hydraulic pressures prior to the backfilling of the opencast workings. Where this is not possible decant from the area will be collected and treated prior to release to a standard meeting the water quality management objectives. | | |
| **Acid Mine Drainage** | | | | | |
| Open cast Mining<br><br>Underground Mining | Construction Operation Decommissioning Rehabilitation and Closure | Acid Mine drainage is a highly significant impact in terms of its severity as well as potential extent. | The mine shall appoint specialist to develop detailed, site specific AMD management plan | NWA<br><br>NEMA duty of care<br><br>IWUL conditions<br><br>GN704<br><br>DWAF best practice guidelines<br><br>Shall adhere to the ESMS developed to ensure | As soon as possible during operation. AMD mitigation plan to be implemented as soon as possible. |
| | Operation Decommissioning Rehabilitation and Closure | | Where acid mine drainage is anticipated or detected, an Acid-Base Accounting Technique and Evaluation (ABATE) should be initiated. Where the expected water quality is acidic or highly alkaline, mitigation measures will need to be investigated and implemented (such as impermeable linings for the coal stockpiles and treatment of mine water.) | | As required and ongoing until closure certificate s received |
| | Operation Decommissioning | | Acid drainage control and treatment techniques can be broadly classified into physical, chemical and biological, and those using combinations of these. | | As soon as possible during operation. AMD |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | Rehabilitation and Closure | | The mine must investigate further the best options for site specific treatment of AMD. Treatment techniques are usually reactive rather than pro-active, and are generally designed to:<br>1. raise pH,<br>2. lower toxic metal concentrations (e.g. precipitation, adsorption)<br>3. lower aqueous sulphate concentrations,<br>4. lower the toxicity / bioavailability of metals in solution (e.g. oxidation, reduction)<br>5. oxidise the solution (e.g. Fe(II)-Fe(III), Mn(II)-Mn(IV), As(III)-As(V)),<br>6. reduce the solution (e.g. $SO_4^{2-}$, $H_2S$)<br>7. collect / dispose / isolate the metallic sludge generated. | compliance with the regulatory framework | mitigation plan to be implemented as soon as possible. |
| | Rehabilitation and Closure | | Provision must be made for the long-term treatment and/or management of water collecting in mined out voids. Water that decants or is pumped from mined out areas will need to comply with target water quality variables and flow requirements of downstream watercourses (as advised by DWS). | | As required and ongoing until closure certificate s received |
| | Rehabilitation and Closure | | After closure, mine water and/or decant needs to be treated to the required level before discharge into natural watercourses. The extent of treatment required, as well as the duration of treatment needs to be determined by water quality assessments. | | As required and ongoing until closure certificate s received |
| **Decommissioning** | | | | | |
| Decommissionin g of Co-Disposal Dump<br><br>Drilling monitoring boreholes | Decommissioning | Decommissioning of infrastructure can result in negative impacts. The extent is localized to the extent of the | All infrastructure, equipment, plant, temporary housing and other items used during the mining period will be removed from the site (Section 44 of the MPRDA). Infrastructure should be removed down to foundations to prevent loss of soil productivity.<br>All vehicles, equipment and other assets belonging to the Applicant must be removed from the property upon | MPRDA<br><br>In accordance with Rehabilitation and closure plan | During decommissioning activities |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| General decommissioning activities<br><br>General Mine Management<br><br>Decommissioning Underground Mine Infrastructure<br><br>Infrastructure removal<br><br>Filling Opencast Voids | | infrastructure and mining footprint. | completion of the mining operation, including any excess aggregate, gravel, stone, concrete, temporary fencing and the like. | Shall adhere to the ESMS developed to ensure compliance with the regulatory framework | |
| | | | No discard materials of whatsoever nature shall be buried on the site, or on any vacant or open land in the area. Waste material of any description, including receptacles, scrap, rubble and tyres, will be removed entirely from the mining area and disposed of at a recognised and licensed landfill facility. It will not be permitted to be buried or burned on the site. | | |
| | | | During decommissioning, all boreholes which will not be required for later monitoring or other useful purposes should be grouted to prevent possible cross flow and contamination between aquifers. | | |
| | | | In the event that the landowner requests the retention and use of any boreholes, the Department of Water Affairs must be consulted with regards to the necessary legal requirements and transfer of liability (e.g. water use licenses and/or borehole registration). | | |
| **Rehabilitation** | | | | | |
| General Surface Rehabilitation<br><br>Re-vegetation<br>Storm water management | Rehabilitation and Closure | Rehabilitation has limited negative impacts. The scale of the impact is limited to the disturbance footprint. | An Integrated Rehabilitation and Closure Plan shall be developed by the mine early in the life of the operations (preferably prior to operation). The Plan must be viewed as a dynamic document and shall be subjected to independent review on an annual basis (together with the quantum for financial provision).<br>As a minimum, the Integrated Rehabilitation and Closure Plan shall include the following;<br>• Desired end land use objectives,<br>• Methodology and proposed schedule for progressive rehabilitation to be undertaken concurrently with mining operations, | MPRDA<br><br>In accordance with Rehabilitation and closure plan<br><br>Shall adhere to the ESMS developed to ensure compliance with | As soon as possible in operational phase and implemented throughout LoM<br><br>Annually Updated |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | • Details of soil preparation procedures including proposed measures to improve soil fertility (if so required) and the sustainability thereof,<br>• A list of the plant species that will be used in the rehabilitation process. Only indigenous species may be utilised and these species should be representative of the relevant vegetation unit/landscape type of the area,<br>• Procedures for ensuring vegetation growth and survival (watering, fertilisation etc.),<br>• Details of proposed storm water and erosion control measures to ensure re-vegetation is successful and not hampered by scouring and erosion,<br>• Monitoring procedures that will be implemented to assess re-vegetation efforts (duration and frequency of monitoring, criteria for determining success of rehabilitation),<br>• Procedures for preventing the establishment of alien invasive vegetation in rehabilitated areas. | the regulatory framework | |
| | | | Upon completion of the mining operation and closure of the facility, the Applicant shall ensure that all cleared and/or disturbed areas (as a result of the activity) shall be rehabilitated in accordance with the Integrated Rehabilitation and Closure Plan. | | |
| | | | Rehabilitation will include returning the slope to the minimum possible gradient (preferably less than 1:6), the topsoil will be replaced for vegetation re-establishment and contour drains will be built to prevent erosion if necessary. | | |
| | | | The area must be rehabilitated using indigenous vegetation from the area in such a way that it will return as close as possible to the original production potential. Rehabilitation shall be overseen by a suitably qualified | | |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | | specialist who shall approve the indigenous seed mix to be used. The rehabilitated area must be returned to a self-sustaining ecosystem that is consistent with the original natural vegetation type. | | |
| | | | Any access road or portions thereof, constructed by the mine which will no longer be required by the landowner/tenant, shall be removed and/or rehabilitated to the satisfaction of the ECO and Regional Manager (DMR). | | |
| | | | Erosion control measures shall be implemented where necessary (such as berms, brush packing, silt fences etc.). Erosion control and silt prevention measures shall be inspected regularly and shall be maintained whenever required to ensure they remain effective. | | |
| | | | No alien or invader plant species should be introduced on site during rehabilitation. The weed management plan shall be implemented throughout the rehabilitation and closure phase. Regular monitoring of the rehabilitated area shall be undertaken, and all alien vegetation shall be eradicated and/or controlled prior to it setting seed. Weed management shall be to the satisfaction of the ECO and Regional Manager (DMR). Where required, the necessary adjustments should be made to ensure the complete re-establishment of the natural vegetation. | | |
| **Mine Closure** | | | | | |
| Post Closure Monitoring and Maintenance<br>Storm water management<br>Water Treatment (as required by WUL) | Rehabilitation and Closure | Very limited potential for impacts during closure. The Mine remains responsible for the mining right area until such time as a closure | Should the activity ever cease or become redundant the applicant shall undertake the required closure process in accordance with Section 43 of the MPRDA. | MPRDA and regulations | In accordance with legislated timeframes in force at the time of closure. |

| Activities | Phase | Size and Scale of Disturbance | Mitigation Measures | Compliance with Standards | Time Period for Implementation |
|---|---|---|---|---|---|
| | | certificate is obtained. | | | |
| **Post-Closure Monitoring** | | | | | |
| Post Closure Monitoring and Maintenance Water Treatment (as required by WUL) | Rehabilitation and Closure | Very limited potential for impacts during closure. The Mine remains responsible for the mining right area until such time as a closure certificate is obtained. | The post-closure monitoring and management period following cessation of mining activities will be implemented by a suitable qualified independent party for a minimum of ten (10) years unless otherwise specified by the competent authority. The monitoring activities during this period will include but not be limited to:<br>• Biodiversity monitoring;<br>• Ground and surface water;<br>• Air quality monitoring;<br>• Bio-monitoring;<br>• Re-vegetation of disturbed areas where required;<br>• Wetlands; and<br>• Maintenance on installed access control or fencing.<br>Provision must be made to monitor any unforeseen impact that may arise as a result of the proposed mining activities and incorporated into post closure monitoring and management. | MPRDA and regulations | Minimum of ten (10) years post closure or as agreed upon with DMR |

## 23.10 IMPACT MANAGEMENT OUTCOMES

The impact management objectives are summarised in Table 81 below.

Table 81: Impact Management Objectives

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| General Surface Rehabilitation<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Alteration of topography | Topography and Landform | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Control through site planning and design | Original topography and landform serve as a reference for rehabilitation |
| General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction | Altered drainage patterns | Topography and Landform | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Control through proper soil management procedures | Rehabilitation and closure plan<br>DWAF best practice Guidelines |
| Underground Mine Infrastructure<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Underground mining<br>Water management Infrastructure construction | Soil surface change | Topography and Landform | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoidance through mine design and planning (depth of mining, safety factors, overburden and rock qualities) | Appropriate safety factors (Salomon and Monroe) as calculated by engineers and in consultation with DWS/DMR |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | | |
| Opencast mining<br>Underground mining | Impacts on Geology | Geology | Operation | Modify through mine planning, design and rehabilitation | MPRDA<br>Rehabilitation and Closure Plan |
| | | | | | |
| Decommissioning of Co-Disposal Dump<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Erosion and sedimentation | Soils | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through preventative measures (Soil placement, storm water infrastructure, erosion control structures) | CARA |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>Infrastructure removal<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management | Soil compaction | Soils | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through implementation of EMP mitigation measures<br>Remedy through application of treatment measures (e.g. ripping) | Principles of CARA<br>Rehabilitation and Closure Plan<br>Ripping to 30cm where soil depth permits |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | | | |
| Decommissioning of Co-Disposal Dump<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Soil Pollution/Contamination | Soils | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through preventative measures (e.g. bunding, spill kits)<br>Remedy through cleanup and waste disposal<br>Modify through soil treatment if required | Hazardous Substances Act<br>NWA<br>NEMA Duty of Care<br>NEMWA<br>Incident reporting procedures<br>DWAF minimum standards for waste disposal |
| | | | | | |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| General Surface Rehabilitation<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Loss of soil fertility (denitrification, loss of soil nutrient store and organic carbon stores) and loss of land capability | Land Capability | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through preventative measures (e.g. limit area of disturbance)<br>Remedy through soil remediation if required (e.g. fertilizer and Organic Matter applications) | CARA<br>Rehabilitation and Closure Plan |
| General Surface Rehabilitation<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Loss of soil resource and its utilisation potential | Land Capability | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through preventative measures (e.g. limit area of disturbance)<br>Remedy through soil remediation if required (e.g. fertilizer and Organic Matter applications) | CARA<br>Rehabilitation and Closure Plan |
| | | | | | |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Infrastructure removal<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Damage/Disruption of Ecosystem Services | Land Use | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through implementation of EMP mitigation measures (e.g. service detection and communication with landowners)<br>Remedy through repair or reinstatement of services if required<br>Control through implementation of ESMS | Stakeholder Engagement Plan<br>Rehabilitation and Closure Plan<br>Grievance Mechanism |
| Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General Surface Rehabilitation<br>Infrastructure removal<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction | Interference with existing land uses | Land Use | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through implementation of EMP mitigation measures (e.g. communication with landowners)<br>Control through implementation of ESMS | Stakeholder Engagement Plan<br>Rehabilitation and Closure Plan<br>Grievance Mechanism |
| | | | | | |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General Surface Rehabilitation<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Site visits<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Direct and indirect mortality of flora and fauna | Fauna and Flora | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Control through implementation of EMP mitigation measures (e.g. limit area of disturbance, training)<br>Avoid/Stop through relocation of threatened or protected species<br>Control through implementation of ESMS | NEMBA<br>TOPS |
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Habitat fragmentation and blockage of seasonal and dispersal movements | Fauna and Flora | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of EMP mitigation measures (e.g. shape of disturbed areas, maintaining corridors) | NEMBA<br>Island Biogeography Principles |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities | Introduction/invasion by alien (non-native) species | Fauna and Flora | Planning and Design<br>Construction<br>Operation<br>Decommissioning | Control through implementation of EMP mitigation measures (e.g. alien vegetation management plan) | NEMBA<br>TOPS<br>Alien vegetation management plan<br>Hazardous Substances Act<br>SANS 10206 |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Site visits<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | Rehabilitation and Closure | Avoid/Stop through preventative measures (e.g. limit extent of disturbance) | |
| | | | | | |
| Decommissioning of Co-Disposal Dump<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Pollution of surface water resources/decreased water quality | Surface Water | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management)<br>Control through implementation of mitigation measures (water treatment when required) | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines, including the consideration of BPG:G2 in the annual updating of the water balance process. |
| Maintenance and operation of site infrastructure and facilities<br>Water management Infrastructure construction | Decrease in Surface Water Availability | Surface Water | Construction<br>Operation | Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | conservation strategies, optimization of water usage and recycling) | DWF best practice guidelines, including the consideration of BPG:G2 in the annual updating of the water balance process. |
| | | | | | |
| General Surface Rehabilitation<br>Opencast mining<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining | Dewatering of groundwater aquifers | Groundwater | Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling) | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines, including the consideration of BPG:G2 in the annual updating of the water balance process. |
| General decommissioning activities<br>Mineral Processing<br>Opencast mining<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Decrease in groundwater quantity/availability | Groundwater | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling) | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines, including the consideration of BPG:G2 in the annual updating of the water balance process. |
| Post Closure Monitoring and Maintenance | Acid Mine Drainage | Groundwater | Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. AMD mitigation strategy, mine design and progressive rehabilitation) | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | Remedy through water treatment when required | AMD mitigation Strategy |
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Opencast Voids<br>Underground Mine Infrastructure | Pollution of groundwater/decreased water quality | Groundwater | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures)<br>Control through implementation of mitigation measures (AMD mitigation strategy, progressive rehabilitation) | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan<br>AMD mitigation Strategy |
| | | | | | |
| Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Decreased water to adjacent wetlands | Wetlands | Construction<br>Operation<br>Decommissioning | Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas)<br>Remedy/modify through wetland rehabilitation | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan |
| Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure | Loss and disturbance of wetland habitat | Wetlands | Construction<br>Operation<br>Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | | of wetland disturbance – i.e.: avoid wetlands and wetland buffer areas)<br>Remedy/modify through wetland rehabilitation | Rehabilitation and closure plan |
| Underground mining | Undermining of wetlands - surface subsidence | Wetlands | Operation | Avoid through implementation of preventative measures (e.g. adequate safety factors)<br>Remedy/modify through wetland rehabilitation | MPRDA<br>NWA<br>GN704<br>DWF best practice guidelines<br>Rehabilitation and closure plan |
| | | | | | |
| Post Closure Monitoring and Maintenance | Decant from underground workings | Environmental Pollution | Rehabilitation and Closure | Avoid through implementation of suitable progressive rehabilitation and soil management<br><br>Control/Remedy through interception of decant and treatment of polluted water where required | MPRDA<br>NWA<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>NEMWA<br>GN704<br>DWF best practice guidelines<br>Rehabilitation and closure plan |
| General decommissioning activities<br>Infrastructure removal<br>Mineral Processing<br>Underground mining<br>Water Treatment as required by conditions of IWUL | General Environmental Pollution | Environmental Pollution | Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of EMP mitigation measures (e.g. Spill prevention, Hydrocarbon Storage) | Hazardous Substances Act<br>NWA<br>MSDS<br>OHSA<br>MHSA<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>NEMWA<br>Incident reporting procedures |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | | DWAF minimum standards for waste disposal |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment –Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Hydrocarbon spills/contamination | Environmental Pollution | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through preventative measures (e.g. bunding, spill kits)<br>Remedy through cleanup and waste disposal<br>Modify through soil treatment if required | Hazardous Substances Act<br>NWA<br>MSDS<br>OHSA<br>MHSA<br>NEMA Duty of Care<br>NEMWA<br>Incident reporting procedures<br>DWAF minimum standards for waste disposal |
| General decommissioning activities<br>Maintenance and operation of site infrastructure and facilities | Sewage spills/contamination | Environmental Pollution | Construction<br>Operation | Avoid and control through implementation of preventative | NWA<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water Treatment as required by conditions of IWUL | | | Decommissioning<br>Rehabilitation and Closure | measures (e.g. location of toilets, spill prevention, waste management) | OHSA<br>MHSA |
| | | | | | |
| Opencast mining<br>Underground mining | Discovery and preservation of fossils | Heritage | Operation | Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief)<br>Modify through removal and curation of fossils | NEMA<br>MPRDA<br>NHRA<br>SAHRA permitting requirements<br>Human Tissue Act |
| Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Destruction/damage of palaeontological resources | Heritage | Construction<br>Operation<br>Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief)<br>Modify through removal and curation of fossils | NEMA<br>MPRDA<br>NHRA<br>SAHRA permitting requirements<br>Human Tissue Act |
| General Surface Rehabilitation<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Water management Infrastructure construction | Destruction/damage of heritage resources | Heritage | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of preventative measures (e.g. fencing of graveyards, watching brief, chance finds procedure) | NEMA<br>MPRDA<br>NHRA<br>SAHRA permitting requirements<br>Human Tissue Act |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Water Treatment (as required by WUL) | | | | Stop through relocation of graves if required | |
| | | | | | |
| General Construction Management<br>General Mine Management | Crime and violence | Social | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoidance and control through preventative measures (e.g. site security, code of conduct) | Health and Safety Plan<br>ESMS<br>MHSA<br>OHSA<br>Code of Conduct |
| General Construction Management<br>General Mine Management<br>Mine area site preparation<br>Opencast mining | Influx of migrant workers | Social | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoidance and control through mitigation measures (e.g. recruitment procedure, grievance mechanism)<br>Control through implementation of ESMS and stakeholder engagement plan | Labour Act<br>Basic Conditions of Employment Act<br>SLP Commitments |
| General Construction Management<br>General Mine Management<br>Mineral Processing<br>Opencast mining<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water Treatment as required by conditions of IWUL | Loss of sense of place | Social | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Modify through reduction of visual impact | Rehabilitation and Closure Plan<br>ESMS |
| General Construction Management<br>General Mine Management | Relocation | Social | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Modify and control through mitigation measures (e.g. grievance mechanism, Relocation plan) | Constitution of South Africa<br>SLP Commitments |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| General Construction Management<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Underground mining | Social vices | Social | Construction<br>Operation<br>Decommissionin g<br>Rehabilitation and Closure | Avoidance and control through mitigation measures (e.g. recruitment procedure, grievance mechanism, code of conduct)<br>Control through implementation of ESMS and stakeholder engagement plan | Labour Act<br>Basic Conditions of Employment Act<br>SLP Commitments<br>Code of Conduct<br>Livelihood restoration plan |
| | | | | | |
| General Construction Management<br>General Mine Management<br>Opencast mining<br>Underground mining | Economic growth | Socio-Economic | Construction<br>Operation<br>Decommissionin g<br>Rehabilitation and Closure | Maximise through optimisation of economic growth opportunities | SLP Commitments |
| Drilling for continued resource evaluation<br>General Construction Management<br>General Mine Management<br>Opencast mining<br>Underground mining | Education, Skills Development and Training | Socio-Economic | Planning and Design<br>Construction<br>Operation<br>Decommissionin g<br>Rehabilitation and Closure | Maximise skills development and training through implementation of SLP | SLP Commitments |
| Drilling for continued resource evaluation<br>General Construction Management<br>General decommissioning activities<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Site establishment – Camp | Employment Opportunities | Socio-Economic | Planning and Design<br>Construction<br>Operation<br>Decommissionin g<br>Rehabilitation and Closure | Maximise employment opportunities through implementation of SLP | SLP Commitments |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction | | | | | |
| General Construction Management<br>General Mine Management<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining | Impacts on local farm labour | Socio-Economic | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Minimise impacts on local farm labour through compensation, skills development and livelihood restoration | SLP Commitments |
| General Construction Management<br>General Mine Management<br>Opencast mining | Loss of jobs and economic opportunities | Socio-Economic | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Minimise impacts of job loss through skills development and livelihood restoration | SLP Commitments |
| Drilling for continued resource evaluation | Perceptions and Expectations | Socio-Economic | Planning and Design<br>Construction<br>Operation | Avoid through implementation of preventative measures (e.g. consultation and communication)<br><br>Control through ESMS procedures such as recruitment procedure | Stakeholder Engagement Plan<br>SLP Commitments<br>Grievance Mechanism |
| General Mine Management | Re-instatement of livelihoods | Socio-Economic | Operation<br>Decommissioning<br>Rehabilitation and Closure | Minimise impacts of job loss through skills development and livelihood restoration | SLP Commitments |
| Opencast mining<br>Underground mining | Coal supply for energy security | Socio-Economic | Operation | Maximise security of coal supply through sound and responsible mine management | Legal register<br>SLP Commitments<br>ESMS |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | | |
| Decommissioning of Co-Disposal Dump<br>General Construction Management<br>General decommissioning activities<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground Mine Infrastructure<br>Water management Infrastructure construction | Community health and safety | Health and Safety | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoidance and control through preventative measures (e.g. HIV/AIDS awareness)<br>Remedy through application of mitigation measures in EMP | OHSA<br>MHSA<br>SLP Commitments<br>Grievance Mechanism |
| General Construction Management<br>General decommissioning activities<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Health impacts | Health and Safety | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoidance and control through preventative measures (e.g. HIV/AIDS awareness)<br>Remedy through application of mitigation measures in EMP | OHSA<br>MHSA<br>SLP Commitments<br>Grievance Mechanism |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining | Fire and explosion hazard | Health and Safety | Construction<br>Operation | Avoid and control through implementation of preventative measures (e.g. Fire breaks, Blasting procedures, hazardous substances management, adequate ventilation underground) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast |
| Opencast mining<br>Underground mining | Fly Rock | Health and Safety | Operation | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| | | | | | |
| Decommissioning of Co-Disposal Dump<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Damage to road infrastructure | Transportation, Infrastructure and Traffic | Construction<br>Operation<br>Decommissionin<br>g | Avoid and control through implementation of EMP mitigation measures (e.g. speed limit enforcement, vehicle maintenance) | National Road Traffic Act<br>OHSA<br>MHSA |
| Mine area site preparation<br>Opencast mining<br>Site establishment – Camp | Increased traffic | Transportation, Infrastructure and Traffic | Construction<br>Operation | Avoid and control through implementation of EMP mitigation measures (e.g. speed | National Road Traffic Act<br>OHSA<br>MHSA |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | | | | limit enforcement, vehicle maintenance) | |
| | | | | | |
| Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Underground mining | Visual impact of light at night | Visual | Construction<br>Operation | Avoid and control through implementation of EMP mitigation measures (e.g. directional down lighting) | Security specifications |
| Decommissioning of Co-Disposal Dump<br>General Surface Rehabilitation<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Site establishment –Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Visual impact of mine infrastructure, stockpiles and dust | Visual | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of EMP mitigation measures (e.g. dust suppression, mine planning and progressive rehabilitation) | Rehabilitation and Closure Plan<br>Final landuse objectives |
| | | | | | |
| Decommissioning of Co-Disposal Dump<br>General decommissioning activities<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Re-vegetation | Greenhouse gas emissions | Air Quality | Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid and control through implementation of EMP mitigation measures (e.g. vehicle maintenance, progressive rehabilitation) | NEMAQA |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>General Surface Rehabilitation<br>Opencast Voids<br>Storm water management<br>Underground Mine Infrastructure<br>Water Treatment as required by conditions of IWUL | | | | | |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Fugitive emissions (Dust) | Air Quality | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through preventative measures (e.g. speed limit enforcement)<br>Control through implementation of EMP mitigation measures (e.g. dust suppression) | Road Traffic Act<br>NEMAQA<br>Dust regulations |
| | | | | | |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Disturbing and/or nuisance noise | Noise | Planning and Design<br>Construction<br>Operation<br>Decommissioning<br>Rehabilitation and Closure | Avoid through preventative measures (e.g. communication with landowners, timing of activities)<br>Control through implementation of EMP mitigation measures (e.g. Noise abatement measures) | ECA noise regulations<br>SANS 10103<br>OHSA<br>MHSA |
| | | | | | |
| Opencast mining<br>Underground mining | Air Blast | Blasting and Vibration | Operation | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | | Emergency response procedure |
| Opencast mining<br>Underground mining | Ground Vibration and human perception | Blasting and Vibration | Operation | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Ground Vibration Impacts on productivity of farm animals (cattle, chickens, pigs, etc.) | Blasting and Vibration | Operation | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Impacts on Infrastructure (roads, communications infrastructure, services, houses, boreholes) | Blasting and Vibration | Operation | Avoid and control through implementation of preventative measures (e.g. structural surveys, blast procedures, monitoring, communication with landowners) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration |

| Activity | Potential Impact | Aspects Affected | Phase | Mitigation Type | Standard to be Achieved |
|---|---|---|---|---|---|
| | | | | | and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Noxious fumes | Blasting and Vibration | Operation | Avoid and control through implementation of preventative measures (e.g. structural surveys, blast procedures, monitoring, communication with landowners) | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |

## 23.11 IMPACT MANAGEMENT ACTIONS

The impact management actions associated with the prevention and mitigation of identified risks and impacts are provided below in Table 82.

Table 82: Impact Management Actions

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| General Surface Rehabilitation<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Alteration of topography | Control through site planning and design | During construction | Original topography and landform serve as a reference for rehabilitation |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction | Altered drainage patterns | Control through proper soil management procedures | During construction and rehabilitation | Rehabilitation and closure plan<br>DWAF best practice Guidelines |
| Underground Mine Infrastructure<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Underground mining<br>Water management Infrastructure construction | Soil surface subsidence | Avoidance through mine design and planning (depth of mining, safety factors, overburden and rock qualities) | During mining | Appropriate safety factors (Salomon and Monroe) as calculated by engineers and in consultation with DWA/DMR |
| | | | | |
| Opencast mining<br>Underground mining | Impacts on Geology | Modify through mine planning, design and rehabilitation | During Blasting | MPRDA<br>Rehabilitation and Closure Plan |
| | | | | |
| Decommissioning of Co-Disposal Dump<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance | Erosion and sedimentation | Avoid and control through preventative measures (Soil placement, storm water infrastructure, erosion control structures) | As required throughout LoM | CARA |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
| --- | --- | --- | --- | --- |
| Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | | |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>Infrastructure removal<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Soil compaction | Avoid through implementation of EMP mitigation measures<br>Remedy through application of treatment measures (e.g. ripping) | As required and during final rehabilitation | Principles of CARA<br>Rehabilitation and Closure Plan<br>Ripping to 30cm where soil depth permits |
| Decommissioning of Co-Disposal Dump<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids | Soil Pollution/Contamination | Avoid through preventative measures (e.g. bunding, spill kits)<br>Remedy through cleanup and waste disposal<br>Modify through soil treatment if required | Throughout LoM | Hazardous Substances Act<br>NWA<br>NEMA Duty of Care<br>NEMWA<br>Incident reporting procedures<br>DWAF minimum standards for waste disposal |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | | |
| | | | | |
| General Surface Rehabilitation<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Loss of soil fertility (denitrification, loss of soil nutrient store and organic carbon stores) and loss of land capability | Avoid through preventative measures (e.g. limit area of disturbance)<br>Remedy through soil remediation if required (e.g. fertilizer and Organic Matter applications) | As required and upon final rehabilitation | CARA<br>Rehabilitation and Closure Plan |
| General Surface Rehabilitation<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure | Loss of soil resource and its utilisation potential | Avoid through preventative measures (e.g. limit area of disturbance)<br>Remedy through soil remediation if required (e.g. fertilizer and Organic Matter applications) | As required and upon final rehabilitation | CARA<br>Rehabilitation and Closure Plan |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | | |
| | | | | |
| Infrastructure removal<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Damage/Disruption of services | Avoid through implementation of EMP mitigation measures (e.g. service detection and communication with landowners)<br>Remedy through repair or reinstatement of services if required<br>Control through implementation of ESMS | As required throughout LoM | Stakeholder Engagement Plan<br>Rehabilitation and Closure Plan<br>Grievance Mechanism |
| Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General Surface Rehabilitation<br>Infrastructure removal<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction | Interference with existing land uses | Avoid through implementation of EMP mitigation measures (e.g. communication with landowners)<br>Control through implementation of ESMS | As required throughout LoM | Stakeholder Engagement Plan<br>Rehabilitation and Closure Plan<br>Grievance Mechanism |
| | | | | |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General Surface Rehabilitation<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Site visits<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Direct and indirect mortality of flora and fauna | Control through implementation of EMP mitigation measures (e.g. limit area of disturbance, training)<br>Avoid/Stop through relocation of threatened or protected species<br>Control through implementation of ESMS | Throughout LoM | NEMBA<br>TOPS |
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Habitat fragmentation and blockage of seasonal and dispersal movements | Avoid and control through implementation of EMP mitigation measures (e.g. shape of disturbed areas, maintaining corridors) | Throughout LoM | NEMBA<br>Island Biogeography Principles |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities | Introduction/invasion by alien (non-native) species | Control through implementation of EMP mitigation measures (e.g. alien vegetation management plan) | Throughout LoM | NEMBA<br>TOPS<br>alien vegetation management plan<br>Hazardous Substances Act<br>SANS 10206 |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
| --- | --- | --- | --- | --- |
| Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Site visits<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | Avoid/Stop through preventative measures (e.g. limit extent of disturbance) | | |
| | | | | |
| Decommissioning of Co-Disposal Dump<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Pollution of surface water resources/decreased water quality | Avoid through implementation of preventative measures (e.g. Bunding, Hazardous materials management, Pollution prevention measures, storm water management)<br>Control through implementation of mitigation measures (water treatment when required) | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines |
| Maintenance and operation of site infrastructure and facilities<br>Water management Infrastructure construction | Decrease in Surface Water Availability | Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| | | strategies, optimization of water usage and recycling) | | DWF best practice guidelines |
| | | | | |
| General Surface Rehabilitation<br>Opencast mining<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining | Dewatering of groundwater aquifers | Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling) | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines |
| General decommissioning activities<br>Mineral Processing<br>Opencast mining<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Decrease in groundwater quantity/availability | Avoid and control through implementation of preventative measures (e.g. limitation of water usage, water conservation strategies, optimization of water usage and recycling) | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines |
| Post Closure Monitoring and Maintenance | Acid Mine Drainage | Avoid and control through implementation of preventative measures (e.g. AMD mitigation strategy, mine design and progressive rehabilitation)<br>Remedy through water treatment when required | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan<br>AMD mitigation Strategy |
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing | Pollution of groundwater/decreased water quality | Avoid and control through implementation of preventative measures (e.g. Bunding, Hazardous | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Opencast mining<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Opencast Voids<br>Underground Mine Infrastructure | | materials management, Pollution prevention measures)<br>Control through implementation of mitigation measures (AMD mitigation strategy, progressive rehabilitation) | | NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan<br>AMD mitigation Strategy |
| | | | | |
| Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Decreased water to adjacent wetlands | Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance- i.e.: avoid wetlands and associated buffer zones)<br>Remedy/modify through wetland rehabilitation | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan |
| Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Loss and disturbance of wetland habitat | Avoid and control through implementation of preventative measures (e.g. wetland delineation and mine planning, limitation area of wetland disturbance- i.e.: avoid wetlands and associated buffer zones)<br>Remedy/modify through wetland rehabilitation | Throughout LoM | NWA<br>GN704<br>IWULA Conditions<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>DWF best practice guidelines<br>Rehabilitation and closure plan |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Underground mining | Undermining of wetlands - surface subsidence | Avoid through implementation of preventative measures (e.g. adequate safety factors)<br>Remedy/modify through wetland rehabilitation | As soon as possible after detection and ongoing until closure is granted | MPRDA<br>NWA<br>GN704<br>DWF best practice guidelines<br>Rehabilitation and closure plan |
| | | | | |
| Post Closure Monitoring and Maintenance | Decant from underground workings | Avoid through implementation of suitable progressive rehabilitation and soil management<br>Control/Remedy through interception of decant and treatment of polluted water where required | As soon as possible after detection and ongoing until closure is granted | MPRDA<br>NWA<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>NEMWA<br>GN704<br>DWF best practice guidelines<br>Rehabilitation and closure plan |
| General decommissioning activities<br>Infrastructure removal<br>Mineral Processing<br>Underground mining<br>Water Treatment as required by conditions of IWUL | General Environmental Pollution | Avoid and control through implementation of EMP mitigation measures (e.g. Spill prevention, Hydrocarbon Storage) | Throughout LoM | Hazardous Substances Act<br>NWA<br>MSDS<br>OHSA<br>MHSA<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>NEMWA<br>Incident reporting procedures<br>DWAF minimum standards for waste disposal |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Hydrocarbon spills/contamination | Avoid through preventative measures (e.g. bunding, spill kits)<br>Remedy through cleanup and waste disposal<br>Modify through soil treatment if required | Throughout LoM | Hazardous Substances Act<br>NWA<br>MSDS<br>OHSA<br>MHSA<br>NEMA Duty of Care<br>NEMWA<br>Incident reporting procedures<br>DWAF minimum standards for waste disposal |
| General decommissioning activities<br>Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water Treatment as required by conditions of IWUL | Sewage spills/contamination | Avoid and control through implementation of preventative measures (e.g. location of toilets, spill prevention, waste management) | Throughout LoM | NWA<br>NEMA Duty of Care<br>NEMA Polluter Pays Principle<br>OHSA<br>MHSA |
| | | | | |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Opencast mining<br>Underground mining | Discovery and preservation of fossils | Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief)<br>Modify through removal and curation of fossils | Throughout LoM | NEMA<br>MPRDA<br>NHRA<br>SAHRA permitting requirements<br>Human Tissue Act |
| Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Destruction/damage of palaeontological resources | Avoid and control through implementation of preventative measures (e.g. Palaeontological site visit and training, watching brief)<br>Modify through removal and curation of fossils | Throughout LoM | NEMA<br>MPRDA<br>NHRA<br>SAHRA permitting requirements<br>Human Tissue Act |
| General Surface Rehabilitation<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Destruction/damage of heritage resources | Avoid and control through implementation of preventative measures (e.g. fencing of graveyards, watching brief, chance finds procedure)<br>Stop through relocation of graves if required | Throughout LoM | NEMA<br>MPRDA<br>NHRA<br>SAHRA permitting requirements<br>Human Tissue Act |
| | | | | |
| General Construction Management<br>General Mine Management | Crime and violence | Avoidance and control through preventative measures (e.g. site security, code of conduct) | At onset of construction and throughout LoM | Health and Safety Plan<br>ESMS<br>MHSA<br>OHSA<br>Code of Conduct |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| General Construction Management<br>General Mine Management<br>Mine area site preparation<br>Opencast mining | Influx of migrant workers | Avoidance and control through mitigation measures (e.g. recruitment procedure, grievance mechanism)<br>Control through implementation of ESMS and stakeholder engagement plan | At onset of construction and throughout LoM | Labour Act<br>Basic Conditions of Employment Act<br>SLP Commitments |
| General Construction Management<br>General Mine Management<br>Mineral Processing<br>Opencast mining<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water Treatment as required by conditions of IWUL | Loss of sense of place | Modify through reduction of visual impact | At onset of construction and throughout LoM | Rehabilitation and Closure Plan<br>ESMS |
| General Construction Management<br>General Mine Management | Relocation | Modify and control through mitigation measures (e.g. grievance mechanism, Relocation plan) | At onset of construction and throughout LoM | Constitution of South Africa<br>SLP Commitments |
| General Construction Management<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Underground mining | Social vices | Avoidance and control through mitigation measures (e.g. recruitment procedure, grievance mechanism, code of conduct)<br>Control through implementation of ESMS and stakeholder engagement plan | At onset of construction and throughout LoM | Labour Act<br>Basic Conditions of Employment Act<br>SLP Commitments<br>Code of Conduct<br>Livelihood restoration plan |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| | | | | |
| General Construction Management<br>General Mine Management<br>Opencast mining<br>Underground mining | Economic growth | Maximise through optimisation of economic growth opportunities | At onset of construction and throughout LoM | SLP Commitments |
| Drilling for continued resource evaluation<br>General Construction Management<br>General Mine Management<br>Opencast mining<br>Underground mining | Education, Skills Development and Training | Maximise skills development and training through implementation of SLP | At onset of construction and throughout LoM | SLP Commitments |
| Drilling for continued resource evaluation<br>General Construction Management<br>General decommissioning activities<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Employment Opportunities | Maximise employment opportunities through implementation of SLP | At onset of construction and throughout LoM | SLP Commitments |
| General Construction Management<br>General Mine Management<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining | Impacts on local farm labour | Minimise impacts on local farm labour through compensation, skills development and livelihood restoration | At onset of construction and throughout LoM | SLP Commitments |
| General Construction Management<br>General Mine Management<br>Opencast mining | Loss of jobs and economic opportunities | Minimise impacts of job loss through skills development and livelihood restoration | When jobs are lost and at mine closure | SLP Commitments |
| Drilling for continued resource evaluation | Perceptions and Expectations | Avoid through implementation of | Throughout LoM | Stakeholder Engagement Plan<br>SLP Commitments |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| | | preventative measures (e.g. consultation and communication)<br>Control through ESMS procedures such as recruitment procedure | | Grievance Mechanism |
| General Mine Management | Re-instatement of livelihoods | Minimise impacts of job loss through skills development and livelihood restoration | When jobs are lost and at mine closure | SLP Commitments |
| Opencast mining<br>Underground mining | Coal supply for energy security | Maximise security of coal supply through sound and responsible mine management | Throughout Operation | Legal register<br>SLP Commitments<br>ESMS |
| | | | | |
| Decommissioning of Co-Disposal Dump<br>General Construction Management<br>General decommissioning activities<br>General Mine Management<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Opencast mining<br>Opencast Voids<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground Mine Infrastructure<br>Water management Infrastructure construction | Community health and safety | Avoidance and control through preventative measures (e.g. HIV/AIDS awareness)<br>Remedy through application of mitigation measures in EMP | Throughout LoM | OHSA<br>MHSA<br>SLP Commitments<br>Grievance Mechanism |
| General Construction Management<br>General decommissioning activities<br>General Mine Management | Health impacts | Avoidance and control through preventative measures (e.g. HIV/AIDS awareness) | Throughout LoM | OHSA<br>MHSA<br>SLP Commitments<br>Grievance Mechanism |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction | | Remedy through application of mitigation measures in EMP | | |
| Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining | Fire and explosion hazard | Avoid and control through implementation of preventative measures (e.g. Fire breaks, Blasting procedures, hazardous substances management, adequate ventilation underground) | As required when blasting is undertaken | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast |
| Opencast mining<br>Underground mining | Fly Rock | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | During Blasting | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| | | | | |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Decommissioning of Co-Disposal Dump<br>Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Damage to road infrastructure | Avoid and control through implementation of EMP mitigation measures (e.g. speed limit enforcement, vehicle maintenance) | Throughout LoM | National Road Traffic Act<br>OHSA<br>MHSA |
| Mine area site preparation<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Underground mining<br>Water management Infrastructure construction | Increased traffic | Avoid and control through implementation of EMP mitigation measures (e.g. speed limit enforcement, vehicle maintenance) | Throughout LoM | National Road Traffic Act<br>OHSA<br>MHSA |
| | | | | |
| Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Underground mining | Visual impact of light at night | Avoid and control through implementation of EMP mitigation measures (e.g. directional down lighting) | Throughout LoM | Security specifications |
| Decommissioning of Co-Disposal Dump<br>General Surface Rehabilitation<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Site establishment – Camp<br>Site establishment – Permanent site office<br>Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Visual impact of mine infrastructure, stockpiles and dust | Avoid and control through implementation of EMP mitigation measures (e.g. dust suppression, mine planning and progressive rehabilitation) | Throughout LoM | Rehabilitation and Closure Plan<br>Final landuse objectives |
| | | | | |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Decommissioning of Co-Disposal Dump<br>General decommissioning activities<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>General Surface Rehabilitation<br>Opencast Voids<br>Storm water management<br>Underground Mine Infrastructure<br>Water Treatment as required by conditions of IWUL | Greenhouse gas emissions | Avoid and control through implementation of EMP mitigation measures (e.g. vehicle maintenance, progressive rehabilitation) | Throughout LoM | NEMAQA |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Post Closure Monitoring and Maintenance<br>Re-vegetation<br>Site establishment – Camp | Fugitive emissions (Dust) | Avoid through preventative measures (e.g. speed limit enforcement)<br>Control through implementation of EMP mitigation measures (e.g. dust suppression) | Throughout LoM | Road Traffic Act<br>NEMAQA<br>Dust regulations |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | | | | |
| | | | | |
| Decommissioning of Co-Disposal Dump<br>Drilling for continued resource evaluation<br>Drilling monitoring boreholes<br>General decommissioning activities<br>General Surface Rehabilitation<br>Infrastructure removal<br>Maintenance and operation of site infrastructure and facilities<br>Mine area site preparation<br>Mineral Processing<br>Opencast mining<br>Opencast Voids<br>Re-vegetation<br>Site establishment – Camp<br>Site establishment – Permanent site office Infrastructure<br>Storm water management<br>Underground Mine Infrastructure<br>Underground mining<br>Water management Infrastructure construction<br>Water Treatment as required by conditions of IWUL | Disturbing and/or nuisance noise | Avoid through preventative measures (e.g. communication with landowners, timing of activities)<br>Control through implementation of EMP mitigation measures (e.g. Noise abatement measures) | Throughout LoM | ECA noise regulations<br>SANS 10103<br>OHSA<br>MHSA |
| | | | | |
| Opencast mining<br>Underground mining | Air Blast | Avoid and control through implementation of preventative measures | During Blasting | Explosives Act<br>MHSA<br>OHSA |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| | | (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | | MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Ground Vibration and human perception | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | During Blasting | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Ground Vibration Impacts on productivity of farm animals (cattle, chickens, pigs, etc.) | Avoid and control through implementation of preventative measures (e.g. blast procedures, monitoring, communication with landowners, emergency response procedures) | During Blasting | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Impacts on Infrastructure (roads, communications infrastructure, services, houses, boreholes) | Avoid and control through implementation of preventative measures (e.g. structural surveys, blast procedures, monitoring, | During Blasting | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting |

| Activity | Potential Impact | Mitigation Type | Time period for Implementation | Compliance with Standards |
|---|---|---|---|---|
| | | communication with landowners) | | for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |
| Opencast mining<br>Underground mining | Noxious fumes | Avoid and control through implementation of preventative measures (e.g. structural surveys, blast procedures, monitoring, communication with landowners) | During Blasting | Explosives Act<br>MHSA<br>OHSA<br>MPRDA<br>United States Bureau of Mines (USBM) criteria for safe blasting for ground vibration and recommendations on air blast<br>Blast Procedures<br>Emergency response procedure |

# 24 FINANCIAL PROVISION

## 24.1 CLOSURE GOALS AND OBJECTIVES

The goals and objectives for closure were determined based on the baseline environment and the land uses that will be established post mining. The overall closure objectives include:

- To return land, mined by opencast methods, to a minimum level of natural grazing land;
- Reshape the land disturbed by mining so that it is stable, adequately drained and suitable for the desired long-term end land use (ELU);
- To ensure that as little water as possible seeps out of the various sections of the mine and where this is unavoidable, to ensure that the water is contained, if the volume is significant and if it does not meet the statutory water quality requirements;
- To clean up all coal stockpiles, loading areas and spillages within the opencast areas and to rehabilitate these so as to meet the ELU Objectives. The cleared coal, if not saleable, will be placed on the discard dump;
- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Waste rock piles must be stable in the long term to prevent erosion, subsidence or collapse;
- These facilities must also be closed in such a way that they do not continue to contribute to long term water quality problems form leachates which spread in an uncontrolled fashion;
- Remove the entire infrastructure other than the discard dumps and other waste disposal facilities such as the slurry dams unless alternative users can be found;
- Remove and/or bury all rubble and waste, at approved sites;
- Rehabilitate areas as soon as possible (during operational phase if possible);
- Return rehabilitated land to the pre-mining environment where possible;
- Minimise the impact on the local community;
- Each area will be maintained and monitored for a period of three to five years following re- vegetation and, if this monitoring shows that the objectives have been met, an application for closure will be made;
- To demolish and remove salvageable infrastructure (steel, wood, etc.), dump unsalvageable material and rubble in the adit, seal the access ways and rehabilitate the adit or box cut;
- To ensure that the areas mined by underground methods do not subside and that it will be safe to conduct normal activities above these workings by using appropriate safety factors and mine design.
- To close off all entries to the underground workings so that the water table will be restored thereby preventing the ingress of air and preventing spontaneous combustion of the pillars. Any access to the working will also be restricted in accordance with the MPRDA.

## 24.2 CONFIRM SPECIFICALLY THAT THE OBJECTIVES FOR CLOSURE HAVE BEEN CONSULTED WITH LANDOWNERS AND I&AP'S

The Ilima Colliery is an existing mine and several authorisation processes have been undertaken for the mine to date. The EIA processes undertaken have included extensive PPP and stakeholders have been given an opportunity to provide input into the EIA process including comments on the final land use objectives. The Stakeholder Engagement process is ongoing throughout the LoM and landowners will continue to be engaged with regards to the reinstatement of preferred landuses post mining. The Closure Cost Report is included in Appendix P of this report.

## 24.3 REHABILITATION PLAN

### 24.3.1 INTEGRATED REHABILITATION AND CLOSURE PLAN

The mine shall develop and implement a detailed Integrated Rehabilitation and Closure Plan. This commitment has been included in the mitigation measures presented in this EMPR Amendment. The rehabilitation plan shall be based on the following objectives and principles:

- The Integrated Rehabilitation and Closure Plan will be developed in consultation with landowners and other directly affected stakeholders including the local community. The final landuse shall be determined in consultation with the above parties and must be compatible with the climate, soil, topography of the final landform and the degree of the management available after rehabilitation.
- The mine shall aim to maximise progressive rehabilitation, where possible, so that the rate of rehabilitation is similar to the rate of mining;
- Decant from various decant sources shall be managed in a manner and for a period acceptable and agreed to by the DWS.

### 24.3.2 MINE CLOSURE PROCESS

Phase 1: Making Safe

The purpose of opencast rehabilitation is to ensure the site becomes safe for humans and animals. All the voids will be filled with the adjacent overburden. The overburden will be loaded, trucked and placed into the voids, and the topography in the area adjacent to these voids shaped to ensure that a free draining topography results.

Once all the voids have been backfilled, 300mm thick topsoil or soft overburden in place of topsoil will be spread on rehabilitated areas. Once placed, the “growth medium” should then be fertilised, ripped and revegetated. A small topsoil stockpile should be left for remedial work.

The following actions are required to meet the objectives of this phase:

- Remove all the facilities and equipment from the site;
- Inert ceramic and buried waste with a salvage value to individuals such as scrap metal, building materials, etc. will be removed and disposed of at a suitable facility;
- The company contracted to supply fuel will be requested to remove all fuel storage and reticulation facilities;
- Those sections of haul road where a lot of coal and shale spillage has occurred, will be picked up and the waste material taken back to the discard dump;
- Remove or control residual hazardous materials. Identify any potential toxic overburden or exposed strata and manage them so as to prevent environmental damage;
- All coal material on the surface should be collected by grading and transported to the plant area for processing or depositing on the discard dump. The underlying soil material should be analysed to

determine if it has become acidified, and liming of the area should be done if required. A layer of soil (approximately 300mm) should be placed on the area, it should be fertilised, ripped and re-vegetated.

- Access roads around the site should be ripped for all areas except those needed to access the facilities for inspection after closure. Roads that can and will be used by other users post closure should, however, be left provided this is agreed upon by all parties concerned. For the rehabilitation of roads, a cost has been allocated to rip the area, add 300 mm topsoil and vegetate.
- Haul roads not required by subsequent landowners will be cross-ripped and then vegetated in the normal way. Where there is topsoil this will be spread on the surface. Where this is not available the soil will be ameliorated using the addition of organic material. They will be re- established to a natural grassland/grazing land capability;
- Backfill opencast voids;
- Sealing of shafts will be required to ensure that surface runoff does not enter the mine and to reduce the potential for ground water contamination.

Phase 2: Landform Design, Erosion Control, and Re-Vegetation

All the disturbed and void areas that have been filled, top soiled and levelled, will have to be prepared for planting.

- Deep rip compacted surfaces to encourage infiltration and allow plant root growth;
- Reinstate natural drainage patterns disrupted by mining wherever possible;
- Characterise the topsoil and retain it for use in rehabilitation. It is preferable to reuse the topsoil immediately rather than storing it in stockpiles. Only discard if it is physically or chemically undesirable, or if it contains high levels of weed seeds or plant pathogens;
- If topsoil is unsuitable or absent, identify and test alternatives substrates, e.g. overburden that may a suitable substitute after addition of soil improving substances;
- Lime and superphosphate are applied to the surface;
- Compound (NPK + Zn) fertilizer is applied, and disked in as part of seedbed preparation;
- A seed mixture is then planted, usually with first rains, or after rains have commenced; and
- Consider spreading the cleared vegetation on disturbed areas
- Re-vegetate the area with plant species consistent with the post mining land use.
- The site is then mulched together with an indigenous grass seed mix. This is to stimulate the long-term establishment of indigenous vegetation and to reduce erosion during early plant growth.

Phase 3: Monitoring, Maintenance, and Relinquishments

Maintenance and aftercare must be planned for 2-3 years after the land preparation and replanting of vegetation has been completed. This will apply to the plant area, discard dumps and voids and that will be backfilled. In addition, Ilima has already backfilled TZP, Haarlem 4 and 5 voids which will also require further maintenance.

Maintenance will specifically focus on annual fertilising the rehabilitated area (where required), control of all other alien plants and general maintenance, including rehabilitation of cracks, subsidence and erosion gullies.

Continuous erosion monitoring of rehabilitated areas and slopes should be undertaken and zones with excessive erosion should be identified. The cause of the erosion should be identified, and rectified. Zones with erosion will need to be repaired with topsoil.

The mine shall continue to monitor and manage rehabilitation areas until the vegetation is self-sustaining and stable.

## 24.4 REHABILITATION AIMS AND OBJECTIVES

The objectives for rehabilitation and closure have been provided in section 24.1 above. The rehabilitation plan is based on good industry practise and is based on the described objectives for rehabilitation and closure which in turn are based on the end land use objectives defined during the original EIA studies in consultation with landowners and key stakeholders. Further to this, the ongoing stakeholder engagement as per the ESMS will allow for continued consultation landowners with regards to the reinstatement of preferred land uses post mining.

## 24.5 FINANCIAL PROVISION QUANTUM CALCULATION

This closure cost calculation is based on the rehabilitation DMR guidelines in the "Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine". The focus of this financial provision calculation is the cost to backfill voids, demolishing of the plant and the general surface rehabilitation of the disturbed areas.

The approach followed for the calculation of the closure liability costs was to reflect the "snapshot-in-time" principle. Costs have been calculated assuming that the mine would have to close immediately and would have to rehabilitate or remediate the impacts without delay. Savings are however possible through the application of progressive rehabilitation and various other management measures; whereby environmental liabilities can be reduced during the mines operations or after closure. Conversely a number of environmental liabilities can only be better defined through more detailed investigations, or as their extent is confirmed during reclamation operations.

The Ilima Colliery is an existing mine that has been in operation for many years. The original quantum calculations for the financial provision were calculated by Digby Wells in 2006 for the mining right application and amounted to **R 2,142,884.45**. Subsequent to this, the mine has revised and updated the quantum calculation in 2014 and amounted to **R43 599 579.85.** A new independent specialist environmental liability assessment for the Ilima Colliery (MP30/5/1/2/2/112MR) was undertaken and submitted to the DMR on the 31st March 2017 (refer to Appendix P). This updated assessment considers the entire MP30/5/1/2/2/112MR, including new open cast mining areas undertaken, as well as the sealing of shafts and adits associated with the proposed underground mining of Zandvoort 10IT (i.e. TZP Shafts) and rehabilitation work undertaken since the previous assessment. In addition, the status of closure and rehabilitation of the remaining sections of the mine has been reassessed and considered. Therefore, on the basis of the 2016 independent specialist annual closure cost assessment, it is understood that the current closure cost and liability assessment for MP30/5/1/2/2/112MR is **R32,727,558.00** excluding VAT.

The quantum calculation is provided in Table 83 below. On the basis of the latest closure cost calculation (i.e. 2016), the total amount to be provided is R32 727 558.00 excluding VAT. This will need to be updated annually to include the new mining areas.

**Table 83: Quantum Calculation**

| CALCULATION OF THE QUANTUM | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 112MR | Location: | Pembani Coal Carolina | | | | |
| | Digby Wells Environmental | Date: | Dec-16 | | | | |
| Description: Class C (Medium Risk) | | Unit: | A Quantity | B Master rate | C Multiplication factor | D Weighting factor 1 | E=A*B*C*D Amount (Rands) |
| Component | | | Step 4.5 | Step 4.3 | Step 4.3 | Step 4.4 | |
| 8(A) | Rehabilitation of overburden & spoils | ha | 0.00 | R133 179.10 | 1.00 | 1.10 | R 0 |
| 8(B) | Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste) | ha | 0.00 | R165 872.16 | 1.00 | 1.10 | R 0 |
| 8(C) | Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste) | ha | 0.87 | R481 771.38 | 0.80 | 1.10 | R 368 353 |
| 9 | Rehabilitation of subsidised areas | ha | 0.00 | R111 517.43 | 1.00 | 1.10 | R 0 |
| 10 | General surface rehabilitation | ha | 61.27 | R105 500.31 | 1.00 | 1.10 | R 7 110 439 |
| 11 | River diversions | ha | 0.00 | R105 500.31 | 1.00 | 1.10 | R 0 |
| 12 | Fencing | m | 3109.00 | R120.34 | 1.00 | 1.10 | R 411 565 |
| 13 | Water management | ha | 36.48 | R40 114.19 | 0.67 | 1.10 | R 1 078 500 |
| 14 | 2 to 3 years of maintenance & aftercare | ha | 263.25 | R14 039.97 | 1.00 | 1.10 | R 4 065 592 |
| | Specialist study (Hydrogeological study) | SUM | 1.00 | R133 149.72 | 1.00 | 1.10 | R 146 465 |
| | Specialist study (Auditing) | SUM | 1.00 | R63 290.69 | 1.00 | 1.10 | R 69 620 |

| CALCULATION OF THE QUANTUM | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 112MR | **Location:** | Pembani Coal Carolina | | | | |
| | Digby Wells Environmental | **Date:** | Dec-16 | | | | |
| **Description: Class C (Medium Risk)** | | **Unit:** | **A** **Quantity** | **B** **Master rate** | **C** **Multiplication factor** | **D** **Weighting factor 1** | **E=A*B*C*D** **Amount (Rands)** |
| **Component** | | | **Step 4.5** | **Step 4.3** | **Step 4.3** | **Step 4.4** | |
| 8(A) | Rehabilitation of overburden & spoils | ha | 0.00 | R133 179.10 | 1.00 | 1.10 | R 0 |
| 8(B) | Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste) | ha | 0.00 | R165 872.16 | 1.00 | 1.10 | R 0 |
| 8(C) | Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste) | ha | 0.87 | R481 771.38 | 0.80 | 1.10 | R 368 353 |
| 9 | Rehabilitation of subsidised areas | ha | 0.00 | R111 517.43 | 1.00 | 1.10 | R 0 |
| 10 | General surface rehabilitation | ha | 61.27 | R105 500.31 | 1.00 | 1.10 | R 7 110 439 |
| 11 | River diversions | ha | 0.00 | R105 500.31 | 1.00 | 1.10 | R 0 |
| 12 | Fencing | m | 3109.00 | R120.34 | 1.00 | 1.10 | R 411 565 |
| 13 | Water management | ha | 36.48 | R40 114.19 | 0.67 | 1.10 | R 1 078 500 |
| 14 | 2 to 3 years of maintenance & aftercare | ha | 263.25 | R14 039.97 | 1.00 | 1.10 | R 4 065 592 |
| | Specialist study (Hydrogeological study) | SUM | 1.00 | R133 149.72 | 1.00 | 1.10 | R 146 465 |
| | Specialist study (Auditing) | SUM | 1.00 | R63 290.69 | 1.00 | 1.10 | R 69 620 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CALCULATION OF THE QUANTUM** | | | | | | | |
| | 112MR | **Location:** | Pembani Coal Carolina | | | | |
| | Digby Wells Environmental | **Date:** | Dec-16 | | | | |
| **Description:**<br>**Class C (Medium Risk)** | | **Unit:** | **A**<br>**Quantity** | **B**<br>**Master rate** | **C**<br>**Multiplication factor** | **D**<br>**Weighting factor 1** | **E=A*B*C*D**<br>**Amount (Rands)** |
| **Component** | | | **Step 4.5** | **Step 4.3** | **Step 4.3** | **Step 4.4** | |
| | | | | | | | **R 23 376 827** |
| | Weighting Factor 2 (step 4.4) | | | 1,05 | | **Sub Total 1** | R 24 545 668 |
| | Preliminary and General | | | 12% of Sub Total 1 | | | R 2 805 219 |
| | Administration and supervision costs | | | 6% of Sub Total 1 | | | R 1 402 610 |
| | Engineering Drawings and specifications | | | 2% of Sub Total 1 | | | R 467 537 |
| | Engineering and Procurement of specialist work | | | 2.5% of Sub Total 1 | | | R 584 421 |
| | Development of a closure plan<br>Final Groundwater modelling | | | 2.5% of Sub Total 1 | | | R 584 421 |
| | Contingency | | | 10% of Sub Total 1 | | | R 2 337 683 |
| | | | | | | **Sub Total 2** | **R 32 727 558** |
| | | | | | | VAT (14%) | R 4 581 858 |
| | | | | | | **GRAND TOTAL (Incl. VAT)** | **R 37 309 416** |

## 24.6 CONFIRMATION OF AMOUNT TO BE PROVIDED

In terms of the MPRDA and the Income Tax Act, the financial provision for closure must be assessed annually in order for any additional infrastructure or negative impact to be incorporated into the financial provision costing during the annual assessment as the project progresses.

In terms of Section 51(b) (v) and Regulation 53 and 54 of the MPRDA, Ilima Colliery is required to make financial provision for the rehabilitation of negative impacts associated with its activities under the mining right. In terms of said Act, the company is further required to determine the quantum of the financial provision for the cost of pre-mature closure, decommissioning and final closure and post-closure management of the residual and latent environmental impacts.

Once said closure quantum has been calculated, Ilima Colliery must begin the process of setting aside funds to ensure, that through annual (theoretically equal) contributions, the full amount required to cover de-commissioning, rehabilitation closure and post-closure activities will be provided for over a 30 year period or the life of mine, whichever is shorter. These funds must be set aside in a separate mine closure trust fund whose operation is governed by the Income Tax Act 58 of 1962 (as amended) Section 10 (1) (cH).

In addition, in terms of Regulation 53 (1) of the MPRDA, Ilima Colliery as the owner/operator must lodge a guarantee (in the form of a bank guarantee from a registered South African bank) in order to provide security against a closure funding shortfall in the case of un-planned or premature closure.

Finally, Regulation 54 (2) of the MPRDA provides for the annual review of the financial quantum for mine closure. This review must be informed by any adjustments of the Life of Mine plans, revisions of the EMPR and new legislative requirements and include the new mining areas that form part of this report as well. Depending upon the outcome of the review, annual contributions to the mine closure provision/ mine closure trust fund will be adjusted to ensure that sufficient funds are available for rehabilitation, decommissioning and closure of the Ilima Colliery.

# 25 COMPLIANCE MONITORING

## 25.1 METHOD OF MONITORING IMPACT MANAGEMENT ACTIONS

Ilima is required to develop an auditing and reporting procedure in support of the ESMS to be developed and implemented. The purpose of the auditing and reporting procedure is to clearly define the requirements for compliance monitoring and audits and the reporting of the information gathered. Through integration with the ESMS, the procedure will allow management to take rapid corrective action for concerns and non-conformances identified during inspections and audits. This section provides a framework for the detailed procedure which will be developed by the mine.

Different reporting mechanisms may include:

- Inspections;
- Reporting accidents and emergencies;
- Measuring performance indicators and interpreting and acting on the indicators;
- Records of monitoring activities to test the effectiveness of mitigation measures and impact controls, as well as for compliance auditing purposes; and
- Training programmes and evidence of appropriate levels/amount of skills/capacities created.

All monitoring and auditing must be accompanied by applicable records and evidence (e.g. delivery slips, photographic records, etc.). All reports must be retained and made available for inspection by the ECO, the Applicant and /or the Relevant Competent Authorities. All reports shall be signed by the relevant parties to ensure accountability. Ilima must use the audit report findings to continually ensure that environmental protection measures are working effectively on site through a system of self-checking. The EMPR Amendment should be viewed as a dynamic document aimed at continual environmental performance improvement.

The framework for compliance monitoring and auditing is summarised in the sections below.

**Table 84: Proposed framework for compliance monitoring and audits**

| Resource | Document | Implementation | | Checking/Monitoring/Audit | | | Reporting | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Responsible Party | Frequency | Responsible Party | Type | Frequency | To | Type | Frequency |
| Ilima Environmental Manager | Ilima ESMS Procedures | Yes | As Required | Yes | Report Review | As Required | Mine Management | Board Report | As Required |
| | EMP/EMPR's | Yes | As Required | Yes | Report Review | As Required | Mine Management | Board Report | As Required |
| | IWULA | Yes | As Required | Yes | Report Review | As Required | Mine Management | Board Report | As Required |
| | NEMA EA | Yes | As Required | Yes | Report Review | As Required | Mine Management | Board Report | As Required |
| | Other Licences, Permits or Approvals | Yes | As Required | Yes | Report Review | As Required | Mine Management | Board Report | As Required |
| Ilima Environmental Officer | Ilima ESMS Procedures | Yes | Weekly | Yes | Site Inspection | Weekly | Environmental Manager | Report | Monthly |
| | EMP/EMPR's | Yes | Weekly | Yes | Site Inspection | Weekly | Environmental Manager | Report | Monthly |
| | IWULA | Yes | Weekly | Yes | Site Inspection | Weekly | Environmental Manager | Report | Monthly |
| | NEMA EA | Yes | Weekly | Yes | Site Inspection | Weekly | Environmental Manager | Report | Monthly |
| | Other Licences, Permits or Approvals | Yes | Weekly | Yes | Site Inspection | Weekly | Environmental Manager | Report | Monthly |
| Environmental Control Officer | Ilima ESMS Procedures | No | - | Yes | Sample Audit | Monthly | Environmental Manager | Audit Report | Monthly |
| | EMP/EMPR's | No | - | Yes | Sample Audit | Monthly | Environmental Manager | Audit Report | Monthly |
| | IWULA | No | - | Yes | Sample Audit | Monthly | Environmental Manager | Audit Report | Monthly |

| Resource | Document | Implementation | | Checking/Monitoring/Audit | | | Reporting | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Responsible Party | Frequency | Responsible Party | Type | Frequency | To | Type | Frequency |
| | NEMA EA | No | - | Yes | Sample Audit | Monthly | Environmental Manager | Audit Report t | Monthly |
| | Other Licences, Permits or Approvals | No | - | Yes | Sample Audit | Monthly | Environmental Manager | Audit Report | Monthly |
| Independent Environmental Auditor | Ilima ESMS Procedures | No | - | No | | | | | |
| | EMP/EMPR's | No | - | Yes | Performance Assessment | Annual | Environmental Manager | | Annual |
| | IWULA | No | - | Yes | Audit | Annual | Environmental Manager | | Annual |
| | NEMA EA | No | - | Yes | Audit | Annual | Environmental Manager | | Annual |
| | Other Licences, Permits or Approvals | No | - | Yes | Audit | As Per Licence | | | As Per Licence |

## 25.2 MONITORING AND REPORTING FREQUENCY

The following auditing and reporting shall be required during operations:

- Weekly Compliance Reports: These reports must be prepared by the designated Mine EO and must aim to monitor and report on-site environmental performance;
- Monthly Compliance Audits: These audits must be undertaken by the mine EO and must aim to monitor and report on compliance with the requirements of the relevant authorisations. licences and permits, the approved EMPR; and
- Quarterly Audit Reports: The ECO must compile quarterly compliance reports (audits) which are to be submitted to the applicant for his review and correction of non-compliance issues. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified.

## 25.3 RESPONSIBLE PERSONS

**Table 85: Roles and responsibilities for environmental resources on site**

| Environmental Resource | Key Responsibility | Tasks | Reporting |
|---|---|---|---|
| Ilima Environmental Manager (EM) | Overall responsibility for environmental management at the mine | Develop and implement the ESMS<br>Develop procedures for the ESMS<br>Review compliance monitoring reports and audit reports<br>Assign responsibilities for corrective actions and addressing non-compliance<br>Liaison with authorities<br>Issuance of NCR's<br>Reporting KPI's to mine management<br>Liaison with landowners and Key stakeholders with regards to environmental issues<br>Supervise Environmental Monitoring Programmes | Reports to Mine management |
| Environmental Control Officer (ECO) | Responsible for **external** compliance monitoring | Acts as an external check/verification of environmental compliance<br>Review EO reports<br>Conduct inspections and report on environmental compliance<br>Advise EM in corrective actions for non-compliance<br>Recommendations for improvement<br>Environmental training and support | Reports to EM |
| Ilima Environmental Officer (EO) | The Ilima EO is responsible for **internal** monitoring compliance against the conditions of the EMPR Amendment and other licenses and permits. The EO is only responsible for implementation of management | Undertake regular (at least weekly) site inspections<br>Report on compliance and advise applicant on corrective actions<br>Implement corrective actions where the responsibility lies with Applicant<br>Coordinate and Implement Environmental Monitoring Programmes | Reports to EM |

| Environmental Resource | Key Responsibility | Tasks | Reporting |
|---|---|---|---|
| | measures that are the responsibility of the Applicant | Environmental record keeping | |
| Independent Environmental Auditor (IEA) | Responsible for external compliance audits and annual Performance Assessments | Conducting Auditing<br>Recommendations for improvement | Reports to authorities |

## 25.4 TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS

The time periods for implementation of the impact management actions are provided in Table 84 above.

## 25.5 MECHANISMS FOR MONITORING COMPLIANCE

**Table 86** below provides a summary of the functional requirements for monitoring that needs to be implemented, identifies who is responsible for the monitoring and the frequency of monitoring and reporting.

**Table 86: Mechanisms for monitoring compliance**

| Source Activity | Impacts Requiring Monitoring Programmes | Functional Requirements for Monitoring | Roles and Responsibilities | Monitoring and Reporting Frequency and Time Periods for Implementation |
|---|---|---|---|---|
| Mine Planning and Design | None | None | | |
| Mine Infrastructure Construction | All Impacts Identified during the EIA Amendment | Site Inspections and checklists | Environmental Officer | Daily inspections and checklists |
| | | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Weekly inspections |
| | | | | Monthly Reports |
| | | | Environmental Control Officer | Monthly Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |
| Opencast Mining | All Impacts Identified during the EIA Amendment | Site Inspections and checklists | Environmental Officer | Daily inspections and checklists |
| | | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Weekly inspections |
| | | | | Monthly Reports |
| | | | Environmental Control Officer | Monthly Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |
| Underground Mining | All Impacts Identified | Site Inspections and checklists | Environmental Officer | Daily inspections and checklists |

| Source Activity | Impacts Requiring Monitoring Programmes | Functional Requirements for Monitoring | Roles and Responsibilities | Monitoring and Reporting Frequency and Time Periods for Implementation |
|---|---|---|---|---|
| | | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Weekly inspections |
| | | | | Monthly Reports |
| | | | Environmental Control Officer | Monthly Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |
| Mineral Processing | All Impacts Identified during the EIA Amendment | Site Inspections and checklists | Environmental Officer | Daily inspections and checklists |
| | | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Weekly inspections |
| | | | | Monthly Reports |
| | | | Environmental Control Officer | Monthly Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |
| Decommissioning Activities | All Impacts Identified during the EIA Amendment | Site Inspections and checklists | Environmental Officer | Daily inspections and checklists |
| | | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Weekly inspections |
| | | | | Monthly Reports |
| | | | Environmental Control Officer | Monthly Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |
| Rehabilitation | All Impacts Identified during the EIA Amendment | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Weekly inspections |
| | | | | Monthly Reports |

| Source Activity | Impacts Requiring Monitoring Programmes | Functional Requirements for Monitoring | Roles and Responsibilities | Monitoring and Reporting Frequency and Time Periods for Implementation |
|---|---|---|---|---|
| | | | Environmental Control Officer | Monthly Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |
| Closure - Aftercare and Maintenance | All Impacts Identified during the EIA Amendment | Report Review and Development of Action Plans for Corrective Action | Ilima Environmental Manager | As Required |
| | | Site Inspections and Audits | Environmental Officer | Bi-Monthly inspections |
| | | | | Bi-Monthly Reports |
| | | | Environmental Control Officer | Bi-Annual Audit Reports |
| | | | Independent Environmental Auditor | Annual Performance Assessment |

# 26 THE EMPR PERFORMANCE ASSESSMENT

According to Regulation 55 of the MPDRA regulations compliance with the EMPR must be monitored on a continuous basis. This requirement shall be accomplished through the continuous monitoring of compliance undertaken by the Mine EO and ECO. The performance assessment will focus on the following Key Aspects:

- Compliance with the Approved EMPR Amendment;
- Compliance with the approved SLP; and
- Appropriateness and validity (technical content) of the EMPR Amendment.

An EMPR performance assessment report shall be submitted to the Department of Mineral Resources (DMR) on an annual basis (each year of mining and before applying for closure). The holder of the mining right may appoint an independent qualified person for the monitoring and to compile a report, but the responsibilities remain the holder's. The performance assessment will include:

- The period when the performance assessment was conducted;
- The scope of the assessment;
- The procedures used for conducting the assessment;
- Interpreted information gained from monitoring the EMPR Amendment (e.g. ECO reports);
- Evaluation criteria used during the assessment; and
- Results of the assessment are to be discussed and mention must be made of any gaps in the EMPR Amendment and how it can be rectified.

## 26.1 REVIEW AND REVISION OF THE EMPR

It is important to note that this EMPR Amendment is made legally binding on the applicant at such time as the EMPR is approved by the decision-making authority. Since this is a mining project, the overarching legislation is the MPRDA, and it is important to note that in accordance with Section 102 of the MPRDA, no EMPR may be amended or varied without the written consent of the minister. It is however also important to consider that the EMPR is a dynamic document which may require such alteration and /or amendment as the project evolves. Conditions under which the EMPR would require revision include:

- Changes in legislation;
- Occurrence of unanticipated impacts or impacts of greater intensity, extent and significance than predicted;
- Inadequate mitigation measures (i.e. where environmental performance does not meet the required level despite the implementation of the mitigation measure); and
- Secondary impacts occur as a result of the mitigation measures.

The Applicant in consultation with the ECO should be responsible for ensuring that the registration and updating of all relevant EMPR documentation is carried out. It shall be the responsibility of the

Applicant/Mine Manager to ensure that all personnel are performing according to the requirements of this procedure and to initiate the revision of controlled documents, when required by changes in process or operations and shall notify the ECO of such changes.

It is recommended that a risk assessment protocol must be developed and implemented by the ECO which shall be utilised to evaluate the environmental risk associated with the potential proposed alterations and/or amendments. The results of the risk assessment must then be included in the submission to the competent authority for the amendment process. It is important to note that if alterations and/or amendments are required, these may only be effected with written approval from the competent authority and in accordance with the then-in-effect relevant legal processes.

# 27 ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM

Management of operational risk is a key consideration for Mines operating within the social and economic context of South Africa. Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. Operational risks and impacts are usually managed through the implementation of the Environmental and Social Management System (ESMS) and Safety, Health and Environmental (SHE) system. A formal, effective ESMS is an important requirement for establishing and maintaining effective environmental management and should be undertaken during the planning phase of the Project. As such the Applicant shall be required to appoint a suitably qualified specialist to develop the ESMS to be implemented on the mine. Adequate resources (people, financial and technical) need to be made available to ensure effective establishment, implementation, maintenance and continual improvements of the ESMS. The roles and responsibilities for these key environmental personnel should be clearly defined and communicated throughout the organisation. The ESMS should include the requirement to constantly monitor environmental performance and assess the adequacy of environmental resources provided for the Mine. If required, the Mine would need to procure further environmental resources to ensure the successful implementation of the ESMS and EMPR. The development and implementation of an ESMS will guide compliance with relevant regulatory requirements.

## 27.1 ESMS FRAMEWORK

The Ilima Colliery ESMS will be based on:

- Ilima Colliery's corporate vision;
- South African legal requirements; and
- Mining best practice.

The ESMS to be developed for the Mine should incorporate and provide for:

- A project specific Environmental Policy;
- Organisational capacity and competency;
- The ESMS shall identify roles and responsibilities of key role players;

- The ESMS shall incorporate a mechanism for ongoing identification of risks and impacts.
- Integration of the ESMS with the SHE management system may be undertaken to form a holistic SHE risk management system;
- The ESMS shall comprise appropriate management plans and procedures to ensure effective operational control;
- The ESMS shall provide for emergency response and also make provision for emergency protocols;
- Effective communication (both internal and external) is a key requirement for successful implementation of the ESMS and an appropriate communication procedure to this effect shall be developed;
- The ESMS shall involve engagement between the client, its workers, local communities directly affected by the project (the affected communities) and where appropriate, other stakeholders. It is therefore imperative that there is integration between Stakeholder Engagement procedures and the ESMS;
- The ESMS shall make provision for ongoing compliance monitoring, performance assessment and external audits; and
- The ESMS shall make provision for internal auditing and continual improvement which should be incorporated into internal management review processes. The ESMS should provide for setting and reviewing objectives and targets to demonstrate continual SHE improvements associated with the project.

Ultimately an effective ESMS should provide for effective management of social and environmental risks and impacts whilst maintaining legal compliance and meeting international standards of best practise where these are feasible and appropriate.

### 27.1.1 STAKEHOLDER ENGAGEMENT

Social impacts occur immediately in the planning phase of a project and as such it is imperative to start with stakeholder engagement as early in the process as possible. This report will be placed out for public review in order to encourage stakeholder engagement, in accordance with the relevant legislation. Stakeholder engagement is however required on an ongoing basis throughout the operation of the facility. As such, the mine will need to develop and implement a detailed Stakeholder Engagement Plan, designed to work as a living document for implementation over the entire LoM.

The following stakeholder engagement framework outlines the principles and objectives for stakeholder engagement during all phases of the mining operation.

- To identify and assess the processes and/or mechanisms that will improve the communication between local communities, the wider community and the Ilima Colliery;
- To improve relations between mine staff and the people living in the local communities;
- To provide a guideline for the dissemination of information crucial to the local communities in a timely, respectful and efficient manner; and
- To provide a format for the timely recollection of information from the local communities in such a way that the communities are included in the decision-making process.

This stakeholder engagement plan will assist the Ilima Colliery to outline their approach towards communicating in the most efficient way possible with stakeholders throughout the life of the project. Such a plan cannot be considered a once off activity and should be updated on a yearly basis to ensure that it stays relevant and to capture new information. The Stakeholder Engagement Plan should consist of the following components:

- Stakeholder Identification and Analysis – time should be invested in identifying and prioritising stakeholders and assessing their interests and concerns.
- Information Disclosure – information must be communicated to stakeholders early in the decision-making process in ways that are meaningful and accessible, and this communication should be continued throughout the life of the project.
- Stakeholder Consultation – each consultation process should be planned out, consultation should be inclusive, the process should be documented and follow-up should be communicated.
- Negotiation and Partnerships – add value to mitigation or project benefits by forming strategic partnerships and for controversial and complex issues, enter into good faith negotiations that satisfy the interest of all parties.
- Grievance Management – accessible and responsive means for stakeholders to raise concerns and grievances about the project must be established throughout the life of the project.
- Stakeholder Involvement in Project Monitoring – directly affected stakeholders must be involved in monitoring project impacts, mitigation and benefits. External monitors must be involved where they can enhance transparency and credibility.
- Reporting to Stakeholders – report back to stakeholders on environmental, social and economic performance, both those consulted and those with more general interests in the project and parent company.
- Management Functions – sufficient capacity within the company must be built and maintained to manage processes of stakeholder engagement, track commitments and report on progress.

It is of critical importance that stakeholder engagement takes place in each phase of the project cycle and it must be noted that the approach will differ according to each phase.

### 27.1.2 GRIEVANCE MECHANISM

Ilima Colliery shall establish a specific mechanism for dealing with grievances. A grievance is a complaint or concern raised by an individual or organisation that judges that they have been adversely affected by the project during any stage of its development. Grievances may take the form of specific complaints for actual damages or injury, general concerns about project activities, incidents and impacts, or perceived impacts. Complaints should be addressed promptly using an understandable and transparent process that is culturally appropriate and readily acceptable to all segments of affected communities, and is at no cost and without retribution. The mechanism should be appropriate to the scale of impacts and risks presented by a project and beneficial for both the company and stakeholders. The mechanism must not impede access to other judicial or administrative remedies.

The proposed grievance mechanism shall be based on the following principles:

- Transparency and fairness;
- Accessibility and cultural appropriateness;
- Openness and communication regularity;
- Written records;
- Dialogue and site visits; and
- Timely resolution.

Based on the principles described above, the grievance mechanism process involves four stages:

- Receiving and recording the grievance;
- Acknowledgement and registration;
- Site inspection and investigation; and
- Response.

### 27.1.3 INTERNAL GRIEVANCE PROCEDURE

The Ilima Colliery shall develop a detailed internal grievance mechanism designed to receive and facilitate resolution of workplace concerns and grievances raised by employees (and their organizations, where they exist). Employees must be informed of the grievance mechanism at the time of recruitment and it must be made easily accessible to them. The mechanism should involve an appropriate level of management and address concerns promptly, using an understandable and transparent process that provides timely feedback to those concerned, without any retribution. The mechanism should also allow for anonymous complaints to be raised and addressed. The mechanism should not impede access to other judicial or administrative remedies that might be available under the law or through existing arbitration procedures, or substitute for grievance mechanisms provided through collective agreements.

## 27.2 DOCUMENT CONTROL

A formal document control system should be established during the development of the ESMS. The document control system must provide for the following requirements;

- Documents are approved for adequacy prior to use;
- Review and update documents as necessary and re-approve documents;
- Ensure that changes and the current version status of documents are identified;
- Ensure that relevant versions of applicable documents are available at points of use;
- Ensure that documents remain legible and readily identifiable;
- Ensure that documents of external origin necessary for the ESMS are identified and their distribution controlled; and
- Prevent unintended use of obsolete documents and apply suitable identification to them if they are retained for any purpose.

## 27.3 RECORD KEEPING

It is essential that an official procedure for control of records be developed to ensure records required to demonstrate conformity to environmental and social standards are maintained. The Ilima Colliery is, therefore, required to develop and maintain a procedure for the identification, storage, protection, retrieval, retention and disposal of records as part of the ESMS. Records must be legible, identifiable and traceable.

## 27.4 AUDITING AND REPORTING PROCEDURES

The Applicant shall develop and auditing and reporting procedure, for conveying information from the compliance monitoring activities and to ensure that management is able to take rapid corrective action should certain thresholds be exceeded. The sections below present a framework for the development of the necessary procedures.

Different reporting mechanisms may include:

- Inspections;
- Accidents and emergencies;
- Measuring performance indicators and interpreting and acting on the indicators;
- Records of monitoring activities to test the effectiveness of mitigation measures and impact controls, as well as for compliance auditing purposes; and
- Training programmes and evidence of appropriate levels/amount of skills/capacities created.

All monitoring and auditing must be accompanied by applicable records and evidence (e.g. delivery slips, photographic records, etc.). All reports must be retained and made available for inspection by the ECO, the Applicant and /or the Relevant Competent Authorities. All reports shall be signed by the relevant parties to ensure accountability. The applicant must use the audit report findings to continually ensure that environmental protection measures are working effectively on site through a system of self-checking. The EMP should be viewed as a dynamic document aimed at continual environmental performance improvement.

The following auditing and reporting shall be required throughout the operation phase;

- Weekly Compliance Reports: These reports must be prepared by the designated Mine EO and must aim to monitor and report on-site environmental performance;
- Monthly Compliance Audits: These audits must be undertaken by the ECO and must aim to monitor and report on compliance with the requirements of the relevant authorisations, licences and permits, the approved EMPR; and
- Monthly Audit Reports: The ECO must compile quarterly compliance reports (audits) which are to be submitted to the applicant for his review and correction of non-compliance issues. It is the responsibility of the ECO to report any non-compliance, which is not correctly rectified.

## 27.5 RESPONDING TO NON-COMPLIANCES

Non-compliance will be identified and managed through the following four key activities including;

- **Inspections** of the site and activities across the site;
- **Monitoring** of selected environmental quality variables;
- **Audits** of the site and relevant documentation as well as specific activities;
- **Reporting** on a monthly basis.

An environmental non-conformance and incident register must be prepared and maintained by the ECO throughout the lifespan of the mine in order to monitor environmental concerns, incidents, and non-conformances. The register must include details of date, location, description of the NC or Incident, applicable environmental commitment/standard, corrective action taken, adequacy of corrective action, date rectified, etc.

Non-compliance with the EMPR Amendment or any other environmental legislation, specifications or standards shall be recorded by the ECO in the non-conformance register. This register shall be maintained by the ECO and will be sent to the Applicant on a regular basis (Monthly), and the Applicant shall ensure that the responsible party takes the necessary corrective actions. Non-conformances may only be closed out in the register by the ECO upon confirmation that adequate corrective action has been taken. The register should be utilised to measure overall environmental performance.

## 27.6 ENVIRONMENTAL INCIDENTS

For the purposes of this project, an environmental incident can be divided into three levels, i.e. major, medium and minor. All major and medium environmental incidents shall be recorded in the incident register. Minor incidents do not need to be reported, but require immediate rectification on site. Definitions and examples of environmental incidents are provided in **Table 87** below.

**Table 87: Description of incidents and non-conformances for the purpose of the project**

| | |
|---|---|
| **Non-Conformance** | Any deviation from work standards, practices, procedures, regulations, management system performance etc. that could either directly or indirectly lead to injury or illness, property damage, damage to the workplace environment, or a combination of these. |
| **Major Environmental Incident** | An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in widespread, long-term, irreversible significant negative impact on the environment and/or has a high risk of legal liability.<br><br>A major environmental incident usually results in a significant pollution and may entail risk of public danger. Major environmental incidents usually remain an irreversible impact even with the involvement of long-term external intervention i.e. expertise, best available technology, remedial actions, excessive financial cost etc. Major environmental incidents may be required to be reported to the authorities. The ECO shall make the final decision as to whether a particular incident should be classified as a Major incident.<br><br>An example of a Major environmental incident would be a significant spillage (e.g. 500 litres) of fuel into a watercourse. |

| | |
|---|---|
| **Medium Environmental Incident** | An incident or sequel of incidents, whether immediate or delayed, that results or has the potential to result in widespread or localised, short term, reversible significant negative impact on the environment and/or has a risk of legal liability.<br><br>A medium environmental incident may be reported to the authorities, can result in significant pollution or may entail risk of public danger. The impact of medium environmental incidents should be reversible within a short to medium term with or without intervention. The ECO shall make the final decision as to whether a particular incident should be classified as a Medium incident.<br><br>An example of a Medium environmental incident would be a large spill of fuel (e.g. 20 – 50 litres) onto land. |
| **Minor Environmental Incident** | An incident or sequel of incidents, whether immediate or delayed, where the environmental impact is negligible immediately after occurrence and/or once-off intervention on the day of occurrence.<br><br>An incident where there is unnecessary wastage of a natural resource is also classified as a minor environmental incident. An example would be leaking water pipes that result in the wastage of water.<br><br>A minor environmental incident is not reportable to authorities. An example of a minor incident is day to day spills of fuel or oil onto the ground where the spill is less than one or two litres. |

The following incident reporting procedures shall apply to this project:

- All environmental incidents shall be reported to the Mine EO who shall ensure that the appropriate rectification is undertaken;
- The Mine EO shall record all medium and major incidents in the incident register and advise on the appropriate measures and timeframes for corrective action;
- An incident report shall be completed by party responsible for the incident for all medium and major incidents and the report shall be submitted to the Mine Manager and Mine EO within 5 calendar days of the incident; and
- The Mine EO shall investigate all medium and minor incidents and identify any required actions to prevent a recurrence of such incidents.

In the event of an emergency incident (unexpected sudden occurrence), including a major emission, fire or explosion leading to serious danger to the public or potentially serious pollution of or detriment to the environment, whether immediate or delayed, the Applicant shall notify the relevant authorities in accordance with legal requirements (e.g. Section 30 of NEMA and Section 20 of the NWA). In the event of a dispute in terms of the classification of a such an incident, the Applicant shall engage the ECO to advise on the potential reporting requirements in terms of the above.

## 27.7 ENVIRONMENTAL AWARENESS PLAN AND TRAINING

Training and environmental awareness is an integral part of a complete EMPR. The overall aim of the training will be to ensure that all site staff are informed of their relevant requirements and obligations pertaining to the relevant authorisations, licences, permits and the approved EMPR and protection of the environment.

The applicant must ensure that all relevant employees are trained and capable of carrying out their duties in an environmentally responsible and compliant manner, and are capable of complying with the relevant environmental requirements. To obtain buy-in from staff, individual employees need to be involved in:

- Identifying the relevant risk;
- Understanding the nature of risks;
- Devising risk controls; and
- Given incentive to implement the controls in terms of legal obligations.

The applicant shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. All training must be formally recorded and attendance registers retained. The environmental training should, as a minimum, include the following:

- General background and definition to the environment;
- The importance of compliance with all environmental policies;
- The environmental impacts, actual or potential, of their work activities;
- Compliance with mitigation measures proposed for sensitive areas;
- The environmental benefits of improved personal performance;
- Their roles and responsibilities in achieving compliance with the environmental policy and procedures and with the requirement of the applicant's environmental management systems, including emergency preparedness and response requirements;
- The potential consequences (legal and/or other) of departure from specified operating procedures;
- The mitigation measures required to be implemented when carrying out their work activities; and
- All operational risks must be identified and processes established to mitigate such risk, proactively. Thus, the applicant needs to inform the employees of any environmental risks that may result from their work, and how these risks must be dealt with in order to avoid pollution and/or degradation of the environment.

In the case of permanent staff required during the operational phase of the project, the applicant shall provide evidence that such induction courses have been presented. In the case of new staff (including contract labour) the applicant shall keep a record of adequate environmental induction training.

## 27.8 MANNER IN WHICH EMPLOYEES WILL BE INFORMED OF ENVIRONMENTAL RISKS

The specific requirements for environmental training include:

- Site Environmental Induction Training: All site staff and employees will receive induction training which will be presented by the Health and Safety Manager Representatives. The induction training must include an environmental management component which will be will be prepared by the Mine EO and presented where possible by the Mine EO. The training material must include general environmental awareness and an overview of the EMPR and EA requirements. The Induction Training Material must be reviewed and approved by the ECO;
- Regular Environmental Toolbox Talks: Environmental toolbox talks will be prepared by the Mine EO to cover a range of environmental topics and must be presented to relevant staff during applicable times during all relevant phases. The aim of these toolbox talks will be to inform site employees of environmental requirements pertaining to specific activities, as well as specific EMPR and EA requirements and obligations;
- Informal training of all staff on site is also required on an on-going basis through informal discussions, on-site supervision and through facilitation of day to day activities. Such training must be given or otherwise facilitated by the Mine EO; and
- The Mine EO must review all safe work procedures/risk assessments/DSTI's (daily safe task instruction) from the safety department and include the relevant environmental risks and appropriate mitigation measures. Since the above procedures are specific to the applicable activity being undertaken, the inclusion of environmental measures aims to ensure each activity is undertaken in an environmentally responsible manner.

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

The Ilima Colliery will be required to develop an ESMS which provides a mechanism for ongoing assessment of operational risks and impacts associated with their activities and any new activities that may arise. The impacts and risks identified will be managed through the framework of internal procedures which specify the mechanisms and actions required to effectively manage the risks and impacts on the ground. Where any unexpected events occur that have the potential to result in environmental damage, these shall be manged through the emergency response procedure. The framework for the emergency response procedure is provided below.

### 27.9.1 EMERGENCY RESPONSE PLAN

The Ilima Colliery must identify potential emergencies and develop procedures for preventing and responding to them. There are several options for dealing with high priority impacts and risks, as the paradigm has two components, probability and consequence. The design of control measures rest on the understanding the cause and effect. Best practise is to intervene with the ultimate factors were feasible, rather than treat the outcomes. Emergency response therefore has the option of reducing probability, or reducing the consequence, reducing the probability is the preferred option. Below are some common emergency preparedness approaches:

- Threat consequence if and when the risk eventuates, when the risk becomes an issue;
- Combine reducing the probability and treating the consequence;
- Offset environmental losses by investing in other assets;
- Not manage some of the risks because there are too many; and

- Make provision to manage residual impacts or issues that arise because of shortcomings in risk identification and rating, avoidance and mitigation or because a rare event has occurred.

Residual impacts are those impacts that despite reducing the probability and consequence might still occur. In these cases, parties will have to be compensated, pollution cleaned up and damage to the environment remediated.

The Applicant shall be required to develop and implement an Emergency Preparedness and Response Plan prior to commencing work. The Emergency Preparedness and Response Plan should be based on a baseline Hazard and Risk Assessment and should provide for the following as a minimum:

- Risk assessment (identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted);
- Response procedures;
- Provision of equipment and resources;
- Designation of responsibilities;
- Communication and reporting (including that with potentially Affected Communities);
- Periodic training to ensure effective response; and
- Periodic review and revision, as necessary, to reflect changing conditions.

The Applicant must ensure that the Emergency Preparedness and Response Plan makes provision for environmental emergencies, including, but not limited to;

- Fire Prevention;
- Fire Emergency Response;
- Spill prevention;
- Spill Response;
- Contamination of a water resource;
- Accidents to employees; and
- Use of hazardous substances and materials, etc.

The Applicant must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the lifespan of the project.

#### *27.9.1.1* FIRE

Fires represent a significant risk to mining operations, particularly on the Highveld and require special attention in the Emergency Response Plan. Sparks generated during welding, spontaneous combustion, cutting of metal or gas cutting can result in fires. Every possible precaution shall therefore be taken when working with this equipment near potential sources of combustion. The Applicant must take all reasonable measures to ensure that fires are not started as a result of activities on site. No smoking is allowed near containers with flammable contents or at areas that are highly flammable. Smoking is only permitted at areas designated for smoking. No open fires are permitted on site and no burning of waste is to be allowed on site. The Applicant shall ensure that there is sufficient fire-fighting equipment available on site at all times. Such precautions include having an approved fire extinguisher immediately available at the site of any such activities. The Applicant is to ensure that he/she has the contact details of the nearest fire station in case of an emergency. Appropriate and correctly serviced equipment must be available for all activities that are likely to generate fire.

It is further anticipated that firebreaks will be required around the site perimeter. It is recommended that such fire prevention measures are implemented in consultation with adjacent landowners and where necessary that the Applicant coordinate fire prevention efforts with local Fire Protection Agency (FPA).

#### *27.9.1.2* HEALTH AND SAFETY

The Applicant shall make allowance for the supply, erection, maintenance and removal of the information boards. Information boards shall also provide the name of the process managers, relevant contact person and contact number. This will ensure that the public access to request information and/or to lodge any complaints. The boards will essentially be to advise the public of the construction activities to be undertaken, or being undertaken and to advise of the prohibition of entering demarcated “no-go” areas.

The Applicant must ensure that compliance with the Mine Health and Safety Act (Act No. 29 of 1996) and the Occupational Health and Safety Act (Act No. 85 of 1993) is strictly adhered to. All reasonable measures must be taken to ensure the safety of all site staff and the surrounding community is not compromised. No weapons may be brought onto the property by any person. Where fencing is temporarily affected, temporary security must be provided at all times until the fence is reinstated.

The Applicant must ensure that all vehicles using public roads are in a roadworthy condition, that drivers adhere to the speed limits and that their loads are secured and that all local, provincial and national regulations are adhered to. The Mine shall make provision for flagmen to regulate traffic and construction vehicles when necessary.

The Applicant must ensure that all accidents and incidents are recorded and reported to the ECO. The Applicant must have easy access to all relevant emergency numbers for example, spill response teams, fire authorities, fire protection associations, medical emergency, nearest emergency rooms (hospitals) to the site, of both private and public hospitals. The Applicant must take all reasonable measures to ensure the health and safety of all employees, visitors and the public.

#### *27.9.1.3* SPILL RESPONSE PROCEDURE

All employees, staff and labourers must be instructed regarding implementation of spill prevention measures and spill response procedures. In the event of a spill, the following general requirements shall apply and the detailed spill procedure must cater for these requirements;

- Immediately reporting of spills by all employees and/or visitors to the relevant supervisor and EO (this requirement must be including in induction training);
- Take immediate action to contain or stop the spill where it is safe to do so;
- Contain the spill and prevent its further spread (e.g. earth berm or oil absorbent materials for spill to land or by deploying booms and/or absorbent material for a spill to water);
- Dispose of any contaminated soil or materials according to appropriate waste disposal procedure (waste from spills of hazardous materials shall be disposed of as hazardous waste at a suitably licensed waste disposal facility);
- The Mine EO shall record details of the spill in their respective incident registers; and
- Photographic evidence shall be obtained of the spill clean-up.

In the case of large spills, the services of a specialist spill response agency shall be required, who shall advise on appropriate clean-up procedures and follow-up monitoring (if required).

In the event of any spills which are classified as medium or major incidents, the Mine EO shall immediately inform the ECO. The ECO shall record the incident in the ECO's non-conformance and incident register and advise on the appropriate measures and timeframes for corrective action. Environmental incident reports shall be completed and submitted to the Mine Manger and ECO within 5 working days for all medium and major incidents. If there is a requirement to report the incident to the authorities, this shall be done by the Applicant in consultation with the ECO.

The Applicant must also, (as per Section 30 of the NEMA) notify the Director-General (DWS, DEA and DMR), South African Police Services, MDARDLEA and Local Municipality and any persons whose health may be affected of the nature of an incident including:

- Any risks posed to public health, safety and property,
- Toxicity of the substance or by products released by the incident; and
- Any step taken to avoid or minimise the effects of the incident on public health and the environment.

The Applicant must ensure that lists of all emergency telephone numbers/contact persons (including fire control) are kept up to date and that all numbers and names are posted at relevant locations throughout the lifespan of the project.

#### *27.9.1.4* MEASURES TO CONTROL OR REMEDY ANY CAUSES OF POLLUTION OR DEGRADATION

The broad measures to control or remedy any causes of pollution or environmental degradation as a result of the proposed activities taking place on the Ilima Colliery are provided below:

- Limit the size of the area to be disturbed as far as is practically possible;
- Design and construct infrastructure such as the PCD and Pit dewatering dams with both decant and drainage systems inclusive of storm water runoff measures;
- Conduct regular dam inspections in line with the regulatory requirements;

- Design and construct waste rock dumps and overburden dumps with adequate storm water runoff measures;
- Establish and maintain dirty and clean water systems in line with the regulatory requirements;
- Treat all contaminated water prior to discharge;
- Contain potential pollutants and contaminants (where possible) at source;
- Handling of potential pollutants and contaminants (where possible) must be conducted in bunded areas and on impermeable substrates;
- Ensure the timeous clean-up of any spills;
- Implement a waste management system for all waste stream present on site;
- Investigate any I&AP claims of pollution or contamination as a result of mining activities;
- Continue with concurrent rehabilitation;
- Operate the mine in line with the proposed closure goals and objectives;
- Rehabilitate the proposed mining site in line with the requirements of the detailed rehabilitation and closure plan; and
- Implement the impact management objectives, outcomes and actions, as described in Section 23 above.

It is of critical importance that the broad measures to control or remedy any causes of pollution or environmental degradation are applied during all phases of the proposed mining operation. This is essential and allows for the operation to be conducted in a manner that will allow for the post mining closure goals and objectives to be met.

# 28 SPECIFIC INFORMATION REQUIRED BY THE COMPETENT AUTHORITY

No additional information was requested or is deemed necessary.

# 29 ENVIRONMENTAL MONITORING

## 29.1 FUNCTIONAL REQUIREMENTS OF MONITORING PROGRAMMES

The purpose of monitoring is not merely to collect data, but to provide information necessary to make informed decisions on managing and mitigating potential impacts. Monitoring therefore serves the following functions:

- Serve as early warning system to detect any potential negative impacts;
- To provide information to feedback into management controls to avoid, prevent or minimise potential negative impacts;
- Provide quantitative data that can serve as evidence for the presence of negative impacts or the lack thereof;
- Allows for trending, modelling and prediction of future conditions or potential impacts;

- Based on the above, the mine must ensure that monitoring programmes comprise of the following (at a minimum) in order to obtain valuable environmental data;
- Environmental aspect monitoring must be a formalised procedure;
- All equipment used in monitoring must be correctly calibrated and serviced regularly;
- Samples required for analysis will be sent to an independent and accredited laboratory;
- Monitoring data must be stored;
- Data must be checked and interpreted and tending undertaken on a quarterly basis;
- Both the date and reports on environmental monitoring must be kept on record for the life of mine and where relevant provided to I&AP's; and
- The general and site-specific parameters to be monitored must be identified by an independent specialist, the authorities and where relevant I&AP's.

## 29.2 LIST OF ASPECTS THAT REQUIRE MONITORING PLANS

The list of aspects that require on-going environmental monitoring includes the following:

- Air quality;
- Aquatic biomonitoring;
- Blasting and vibration;
- Surface water;
- Groundwater;
- Soil;
- Noise; and
- Rehabilitation.

As mines and the environment are both dynamic it is likely that future scenarios may require the monitoring of additional or unforeseen impacts. As such, the list provided is by no means conclusive and must instead be used as a guideline for the impacts that require monitoring.

## 29.3 MONITORING PLANS FOR ENVIRONMENTAL ASPECTS

The monitoring of various environmental aspects and the impact on them as a result of the proposed project shall take place by means of both quantitative and qualitative techniques in order to determine whether or not the requirements of the Environmental Management Programme are being complied with. The importance and value of detailed environmental monitoring networks cannot be overstated.

Environmental monitoring serves as a tool to track compliance, assist with potential liability identification, and mitigation throughout the life of the proposed project. This is achieved through the provision of actual evidence based monitoring and reporting thereof. In essence, monitoring is a continuous data-gathering, data interpreting, and control procedure that ranges from visual inspection to in-depth investigative monitoring and reporting. These monitoring plans need to be drawn into standalone plans that can be updated and amended as per authority requirements and additional data requirements identified during the mining activities. These plans need to include the site-specific roles and responsibilities for actions.

### 29.3.1 AIR QUALITY

Air quality monitoring in the form of dust sampling is undertaken at the Ilima Colliery. The dust sampling is undertaken at thirty-seven (37) single buckets, located over nine (9) mining areas on a quarterly basis. The results are compared to the National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEMA: AQA): National Dust Control Regulations 2013 (NDCR, 2013).

Whilst air quality monitoring is currently undertaken a detailed stand-alone procedure which is subject to internal review and update is required to align the mine with current best practice standards. This procedure must incorporate a mechanism for dealing with any exceedances identified.

In terms of air quality, the main pollutant of concern is particulates. As such, the design and implementation of the air quality monitoring programme must incorporate the following considerations:

- Monitoring of select parameters namely dust fallout (TSP), $PM_{10}$ and $PM_{2.5}$ concentrations at both source and receptor indicator sites;
- Use of source and receptor based key performance indicators in monitoring strategies, namely compliance with NAAQS and NDCR;
- Detailed identification and update of all emissions sources;
- Implementation of source based controls;
- Implementation of the technical management options stipulated in the EMPR;
- Internal and external auditing; and
- Review and amendment of the monitoring programme as required.

Based on the above considerations it is recommended that a dust fall network both on and off site be implemented at select locations with the thresholds as stipulated in the NAAQA and NDCR standards utilised as receptor based objectives. In addition, further $PM_{10}$ source sampling is suggested for underground vents to ensure compliance with Health and Safety Regulations, which supersede the standards of the NAAQA and NDCR in this instance. The NAAQQ and NDCR standards are indicated in Table 88 and Table 89 below.

**Table 88: NAAQS $SO_2$, $NO_x$, $PM_{10}$ and $PM_{2.5}$**

| Substance | Molecular Formula | Averaging Period | Concentration (µg/m³) | Permitted Frequency of Exceedance | Compliance Date |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Sulphur Dioxide | $SO_2$ | 10 minutes | 500 | 526 | Immediate |
| | | 1 hour | 350 | 88 | Immediate |
| | | 24 hours | 125 | 4 | Immediate |
| | | 1 year | 50 | 0 | Immediate |
| Nitrogen Dioxide | $NO_2$ | 1 hour | 200 | 88 | Immediate |
| | | 1 year | 40 | 0 | Immediate |
| Particulate Matter | $PM_{2.5}$ | 24 hours | 65 | 4 | Immediate – 31 Dec 2015 |
| | | I Year | 40 | 4 | 1 Jan 2016 – 31 Dec 2029 |
| | $PM_{10}$ | 24 hours | 25 | 4 | 1 Jan 2030 |
| | | I Year | 25 | 0 | Immediate – 31 Dec 2015 |

**Table 89: NDCR Standards**

| Restriction Areas | Dustfall Rate (D) (mg/m²/day, 30 days average)(1) | Permitted frequency of exceeding dustfall rate |
|---|---|---|
| Residential Area | D < 600 | Two within a year, not sequential months |
| Non-Residential area | 600 < D < 1200 | Two within a year, not sequential months |

Dust fall out monitoring is to be undertaken throughout the life of mine and must be accompanied by quarterly reporting thereof. As a result of the above, a dust monitoring network comprised of (at a minimum) four (4) dust buckets at each potential dust source and one (1) dust bucket at each identified sensitive receptor as well as at least one (1) $PM_{10}$ monitor is recommended.

Whilst biomonitoring is currently undertaken a detailed stand-alone procedure which is subject to internal review and update is required to align the mine with current best practice standards.

The purpose of biomonitoring is aimed at assessing the ecological integrity of wetlands and rivers at the time of sampling in relation to the pre-mining condition.

The following biotic components must be assessed on a bi-annual (twice/year) basis by a qualified aquatic ecologist:

- Monitoring and assessing freshwater macro-invertebrate communities, in terms of diversity and abundance. The assessment will be based on the SASS5 index according to the protocol of Dickens & Graham (2001), upstream and downstream of mining activities. The number of taxa with a moderate to high requirement for good water quality should be monitored relative to baseline conditions. The disappearance of one or more sensitive taxon from a site is likely to indicate deteriorating flow, habitat and/or water quality conditions;

- The Present Ecological State, based on SASS5, should be assessed using Dallas (2007) to provide a benchmark against which future changes can be measured. MIRAI (Thirion 2008) should additionally be considered to assess the response of the biota to changes in habitats, flow and water quality;

- Assessing the condition and availability of invertebrate habitats at each site according to the protocol of Kleynhans (1999) (Index of Habitat Integrity) and McMillan (1998) (IHAS). Fixed point photography should be used to facilitate the detection of habitat deterioration (e.g. erosion, sedimentation);

- On site biota-specific water quality parameters, i.e. pH, electrical conductivity, dissolved oxygen and temperature. Laboratory analysis of major anions and cations will provide further value to the biomonitoring programme, in terms of interpreting biotic responses to water quality stressors; and

- An assessment of fish integrity based on and appropriate index (Fish Assemblage Integrity Index (FAII) or Fish Response Assessment Index (FRAI)). The prevalence of *Barbus pallidus* should be carefully monitored. Its disappearance from a site is likely to indicate deteriorating flow and/or water quality conditions.

It is additionally recommended that Whole Effluent Toxicity (WET) testing be done on water sampled from pollution control facilities on site, as well as the wetland downstream of the open-cast mine and mine infrastructure. Where high levels of toxicity is detected, definitive testing should be conducted to determine dilution ratios required to render the water safe for aquatic biota. As watercourses are structurally and functionally linked to their adjacent wetland areas, it is further recommended that wetland integrity be monitored. Declining wetland integrity is likely to lead to a decline in the watercourses they drain into. A detailed water quality assessment should be conducted on all surface water and ground water resources, as per the recommendations given by a water quality specialist.

The resource quality objectives of downstream users should be complied with (as advised by DWS). It is also considered essential that flows leaving the Ilima Colliery area be measured (e.g. by means of a v-notch weir) to ensure that flow requirements of downstream ecosystems are met (as advised by the DWS).

After completion of each biomonitoring survey, a biomonitoring report must be drafted and detail the following:

- Results of the survey;
- Spatial comparison between upstream and downstream sites;
- Comparison with historical data and baseline conditions; and
- Recommendations for management interventions.

### 29.3.2 BLASTING AND VIBRATION MONITORING

Blast monitoring is undertaken at the Ilima Colliery during each blast by a suitably qualified blast manager employed by the Mine. Each blast is monitored and a report compiled by a qualified blasting expert employed by the Mine. No sensitive receptors have been identified and the allowable limits for blasting at these receptors have not been determined. There is no written procedure for identifying exceedances or ensuring that negative impacts on sensitive receptors are avoided. The monitoring results do not include a description of the procedures undertaken.

Whilst blast monitoring is currently undertaken a detailed stand-alone procedure which is subject to internal review and update is required to align the mine with current best practice standards. This procedure must include a list of identified sensitive receptors and allowable limits as well as incorporating a mechanism for identifying and dealing with exceedances incorporate a mechanism for dealing with any exceedances identified.

The design and implementation of a blasting and vibration monitoring programme must incorporate the following considerations:

- The Applicant must undertake a pre-blast baseline survey including photographic inspections of privately owned structures within 1500 m of the mine;
- Monitoring of each individual surface blast must be undertaken and the limits as stipulated by the blasting specialist) adhered to; and
- Further points for off-site vibration and blasting monitoring must also be identified in consultation with surrounding landowners and legal occupiers.

In addition, the following conditions should be incorporated into the blasting and vibration monitoring programme:

- Blasting should not be undertaken in the early morning when it is still cool and the possibility of inversion is present or too late in the afternoon in winter;
- No blasting must be undertaken in the evenings;
- Refrain from blasting when wind conditions are unfavourable and in the direction of receptors;
- Development of a standard blasting time and placement of blast notices to inform I&AP's of blasting operations;
- Develop a list of all boreholes within the project area including location, conditions, and water levels;
- Maintain ground vibration levels below 50 mm/s;
- Document and audit each operation; and

- Provision of blast data and recordings to I&AP's who request it.

The following ground vibration and air blast levels are recommended for blasting operations in this area. Table 90 below gives limits for ground vibration and air blast.

**Table 90: Recommended ground vibration and air blast limits**

| Structure Description | Ground Vibration Limit (mm/s) | Air Blast Limit (dBL) |
|---|---|---|
| National Roads/Tar Roads: | 150 | N/A |
| Electrical Lines: | 75 | N/A |
| Railway: | 150 | N/A |
| Transformers | 25 | N/A |
| Water Wells | 50 | N/A |
| Telecoms Tower | 50 | 134 |
| General Houses of proper construction | USBM Criteria or 25 mm/s | Shall not exceed 134dB at point of concern but 120 dB preferred |
| Houses of lesser proper construction | 12.5 | 134 |
| Rural building – Mud houses | 6 | 134 |

Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Additionally, assistance may be sought when blasting is done close to the highways. This will bring about unbiased evaluation of levels and influence from an independent group. Monitoring could be done using permanent installed stations. Audit functions may also be conducted to assist the mine in maintaining a high level of performance with regards to blast results and the effects related to blasting operations.

### 29.3.3 SURFACE WATER MONITORING

Surface and ground water monitoring is currently being undertaken at the Ilima Colliery in accordance with the requirements of the Integrated Water Use Licence (IWUL). The stated objectives of the monitoring programme have been developed in alignment with section 9 of the NWA and are in correlation with the catchment management strategy, are as follows:

- To establish a continuous database specific to the Ilima Colliery;

- Assessing the general temporal condition of water quality of resources in the vicinity likely to be impacted upon by the mine;
- Identifying any potential pollution sources and determining their extent, in order to circumvent relevant legal liabilities potentially resulting from recorded impacts on the receiving aquatic environment;
- Quantifying and assessing any impacts in obstruction of legislative stipulations in order to develop mitigation or remedial plans where necessary; and
- To set out strategies, objectives, plans, guidelines and procedures for protection, use, development, conservation, management and control of water resources within the water management area.
- The monitoring plan must be amended to take in account the new mining areas.

Surface water monitoring occurs at thirty-five (35) surface water monitoring points on a monthly basis. Surface water quality is assessed against the SANS- 241:2011 Drinking Standards and Background Water Quality Limits. The surface water quality monitoring includes relevant parameters as identified in the IWUL which includes:

- pH;
- Electrical Conductivity (EC) mS/m;
- Total Dissolved Solids (TDS) mg/L;
- Total Hardness mg/L;
- Total Hardness mg/L
- Alkalinity ($CaCO_3$)/L
- Nitrate ($NO_3$) mg/L
- Manganese (Mn) mg/L
- Chloride (Cl) mg/L;
- Sulphate ($SO_4$) mg/L;
- Calcium (Ca) mg/L;
- Magnesium (Mg) mg/L;
- Sodium (Na) mg/L;
- Iron (Fe) mg/L;
- Aluminium (Al) mg/L.
- Potassium (K) mg/L;

Water samples are analysed at a South African National Accreditation System (SANAS) Accredited Testing Laboratory (currently UIS Laboratories). The quarterly and annual surface water assessments are evaluated by a registered Pri. Sci. Nat. Environmental Scientist. The quarterly reports include basic representation of data, evaluated against appropriate water quality guidelines with related discussions.

### 29.3.4 AQUATIC BIOMONITORING

The purpose of aquatic biomonitoring is aimed at assessing the ecological integrity of wetlands and rivers at the time of sampling in relation to the pre-mining condition.

Aquatic Biomonitoring is currently conducted in accordance with the requirements of the IWUL. Biomonitoring for temporal and spatial comparison is undertaken at ten (10) locations on a bi-annual basis. Refer to Section 6.4.2 for the location of each biomonitoring site.

*In situ* measurements for pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS) and Temperature (Temp) are measured. The results obtained from the assessment of the water quality data were compared to benchmark criteria and Target Water Quality Ranges (TWQRs) for aquatic ecosystems.

The Present Ecological State (PES) of the river ecosystems are assessed and monitored by applying the South African Scoring System 5 (SASS5) with associated IHAS. The results of the SASS5 assessment are provided as Ecological Categories ranging from Natural (Category A) to Critically Modified (Category F) for each site assessed. The ecological state of the wetland systems is ascertained by applying the Diatom Assessment Protocol (DAP) as an indication of water quality as indicated by the biotic response of diatoms to the ambient environment.

Whilst surface water monitoring is currently undertaken, a detailed stand-alone procedure which is subject to internal review and update is required to align the mine with current best practice standards. This procedure must incorporate a mechanism for dealing with any exceedances identified.

The design and implementation of the surface water monitoring programme must be undertaken in accordance with the Best Practice Guidelines G3: Water Monitoring Systems (DWAF, 2006). The aim of the surface water monitoring network is to assist with overall water management including but not limited to the following:

- Pollution prevention;
- Assess the performance of pollution prevention; and
- Develop a more holistic understanding of current, baseline water quality on site and the changes that result from mining activities.

It is strongly recommended that any water containment facility in site be subject to water quality and quantity monitoring and on a monthly basis. Quantity should be monitored to ensure the facilities are of a sufficient size for the water volumes they are expected to contain. The water quality results should meet applicable standards or ensure that water released into the environment, either intentionally or unintentionally, are of appropriate quality. The proposed surface water monitoring programme is described below in Table 91:

**Table 91: Surface water monitoring programme outline**

| Aspect | Details | Monitoring Frequency |
| --- | --- | --- |
| Surface Water | Sample point in the wetland upstream and downstream of mining activities | Monthly |

| | | |
|---|---|---|
| | Clean water discharge points (if any) | |
| Drinking water | Treated or supplied water for domestic purposes | Monthly |
| Process water | Outlets of oil and grease traps, washbays, storm water containment, pollution control dams and sewage treatment facilities. | Monthly |

Surface water samples should be analysed for the parameters listed in Table 92 below on a monthly basis. On a bi-annual basis all samples should additionally be submitted for a full ICP-MS metal scan as described in Table 93, also below. This list of parameters should be amended annually to ensure all priority parameters are analysed monthly and lower-priority parameters are only analysed on a bi-annual basis.

**Table 92: Parameters for monthly analyses**

| List of parameters for monthly analyses | |
|---|---|
| pH at 22°C | Chloride (Cl) |
| Conductivity (mS/m) | Sulphate ($SO_4$) |
| Total Dissolved Solids (TDS) | Nitrate ($NO_3$) |
| Calcium (Ca) | Fluoride (F) |
| Magnesium (Mg (mg/l)) | Aluminium (Al) |
| Sodium (Na) | Manganese (Mn) |
| Potassium (K) | Iron (Fe) |
| Total Alkalinity as $CaCO_3$ | Zinc (Zn) |
| Bicarbonate ($HCO_3$) | |

**Table 93: List of parameters for bi-annual analyses**

| List of parameters for bi-annual analyses | |
|---|---|
| Antimony (Sb) | Nickel (Ni) |
| Arsenic (As) | Selenium (Se) |
| Barium (Ba) | Silicon (Si) |
| Beryllium (Be) | Silver (Ag) |
| Bismuth (Bi) | Strontium (Sr) |
| Cadmium (Cd) | Tin (Sn) |
| Cobalt (Co) | Titanium (Ti) |
| Lithium (Li) | Vanadium (V) |
| Mercury (Hg) | Zirconium (Zr) |
| Molybdenum (Mo) | |

The water quality results should be compared to the limits specified in the Water Use Licence (WUL). If limits for some parameters are not specified in the WUL, the Department of Water Affairs' (DWA) South African Water Quality Guidelines (SAWQG) Target Range, Volume 1, Domestic Use (1996) and the South African National Standards for Drinking Water (SANS 241:2011) should be utilised.

### 29.3.5 GROUND WATER MONITORING

Groundwater quality should be assessed against the SANS- 241:2011 Drinking Standards and Background Water Quality Limits. The groundwater-monitoring network must be designed to comply with the risk based source-pathway-receptor principle. The groundwater-monitoring network will be utilised to monitor the impact on water quality and quantity.

Ground water monitoring is undertaken at the Ilima Colliery in accordance with the requirements of the WUL. Groundwater monitoring occurs at forty-nine (49) groundwater monitoring points on a quarterly basis. However, additional monitoring points will be required for the new mining areas. Several monitoring points in addition to those required by the WUL have been added to the monitoring programme. Quarterly groundwater samples are analysed as per the IWUL for:

- pH;
- Electrical Conductivity (EC);

- Total Dissolved Salts (TDS) mg/L;
- Total Hardness mg/L ;
- Alkalinity $CaCO_3$/L;
- Potassium (K) mg/L;
- Chloride (Cl) mg/L;
- Sulphate ($SO_4$) mg/L;
- Nitrate ($NO_3$) mg/L;
- Calcium (Ca) mg/L mg/L;
- Magnesium (Mg);
- Sodium (Na) mg/L;
- Dissolved Oxygen
- Iron (F) mg/L;
- Aluminium (Al) mg/L; and
- Manganese (Mn) mg/L

Ground water samples are analysed at a SANAS Accredited Testing Laboratory (currently UIS Laboratories (Pty) Ltd (UIS)). The quarterly and annual groundwater assessments are evaluated by a registered Pri. Sci. Nat. Environmental Scientist and annual groundwater assessments are evaluated by a registered Pri. Sci. Nat. Geohydrologist.

Whilst ground water monitoring is currently undertaken, a detailed stand-alone procedure which is subject to internal review and update is required to align the mine with current best practice standards. This procedure must incorporate a mechanism for dealing with any exceedances identified.

The groundwater monitoring network must be designed to comply with the risk based source-pathway-receptor principle. The groundwater monitoring network will be utilised to monitor the impact on water quality and quantity. The proposed monitoring boreholes associated with the groundwater monitoring network will be located so as to consider contaminant sources, receptors, potential contaminant plumes as well as background quality and quantities. As a result, the groundwater monitoring network will be designed to assess the following:

- Dewatering of the surrounding aquifers through the monitoring of groundwater levels in monitoring boreholes. This will include any other borehole identified within the modelled cone of depression;
- Groundwater inflow (ingress) into the mine workings through the monitoring of groundwater levels in monitoring boreholes including water volumes pumped from the mining work areas;
- Groundwater quality through the sampling of boreholes at the prescribed frequency as well as trending of groundwater quality results; and
- Groundwater recovery rates and potential for decant after physical mining operations cease through the drilling of additional monitoring boreholes into the underground workings which are to be drilled

in the deepest sections of the mine. Stage curves will be drafted to further assess inflow into the defunct workings.

Groundwater monitoring must be undertaken in accordance with the SANS and DWS standards and according to the schedule as described in Table 94 below:

**Table 94: Groundwater monitoring schedule**

| Monitoring Aspect | Sampling Interval | Analysis | Water Quality Standards |
|---|---|---|---|
| Construction, Operation, Decommissioning and Rehabilitation Phases | | | |
| All monitoring boreholes | Quarterly measurements of groundwater levels | N/A | N/A |
| All monitoring boreholes | Quarterly sampling for water quality analysis | Full analysis in April and October | South African Water Quality Guidelines: Domestic Use and Aquatic Ecosystem/WUL standards |
| Rainfall | Daily | N/A | N/A |

The parameters to be monitored and assessed are provided below and laboratory analysis must comply with SABS standards. Revision of the sampling parameters is required, and additional metals must be added to the analyses should pH decrease during the operational phase.

- Full Analysis:
    - Physical parameters;
    - Groundwater levels; and
    - Chemical parameters inclusive of the following:
        - Field measurements: pH and EC;
        - Laboratory analyses: Anions and cations (Ca, Mg, Na, $NO_3$, Cl, $SO_4$, F, Fe, Mn, Al, & Alkalinity, pH, EC and TDS);
    - Petroleum hydrocarbons contaminants where applicable such as near workshops of petroleum handling facilities; and
    - Sewage related contaminants namely *E.Coli* faecal coliforms in boreholes in proximity to septic tanks or sewage plants.

The groundwater monitoring database must be updated on a monthly basis as information becomes available. The database should be used to analyse the information and evaluate trends noted. An annual compliance report should be compiled and submitted to the authorities for evaluation and comment. This report should be submitted annually for the life of mine as well as for two years after mining ceases. The mine must develop a monitoring response protocol. This protocol will describe procedures in the event that groundwater monitoring information indicates that action is required. As groundwater monitoring establishes the extent of contamination in the shallow weathered and deeper fractured aquifers, the numerical model must be updated on a regular basis, as additional monitoring information becomes available, at least once every five years, or if the mining methods or operations change significantly. In this way, all impact predictions will proceed to the level of detail required for closure.

### 29.3.6 NOISE MONITORING

Environmental noise is divided into two distinct categories namely passive monitoring and active monitoring. Due to the low significance of a potential noise impact to develop, no active noise monitoring is recommended. However, should a complaint be registered the mine must investigate the complaint and consider the following during the monitoring and follow up investigation:

- Noise measurement must be taken at the location of the person that registered the complaint. The measurement location must consider the direct surrounding to ensure that other sound sources cannot influence noise readings. A second measurement instrument must also be deployed simultaneously at the mine during the potential noise complaint measurement;
- Ambient sound measurements must be collected as defined in the SANS 10103:2008 standards. Due to variability that naturally occurs in sounds levels it is recommended that a semi-continuous measurement over a period of 16 hours which covers the full night time period of 22:00 – 06:00 be conducted;
- Measurements must be collected in 10 minute bins defining the 10 minute descriptors such as $L_{Aeq,I}$ (National Noise Control Regulation requirement), $L_{A90,f}$ (background noise level as used internationally) and $L_{Aeq,f}$ (Noise level used to compare with IFC noise limit). Spectral frequencies should also be utilised to define the potential origin of the noise;
- Measurements must be conducted during a period or in conditions similar to then the receptors experienced the noise event responsible for the complaint; and
- Noise measurements must also be conducted in accordance with the National Noise Control Regulations ((GN R154 of 1992) and SANS 10103:2008 standards.
- The noise monitoring plan must be extended to take into account the new mining areas.

On completion of the noise monitoring and investigation, a monitoring report must be drafted. The report must be provided to the complainant or noise sensitive receptor. Included in the report must be additional mitigation measures to be employed (if required) and indicate dates for further follow ups to ensure that noise complaint is adequately addressed.

### 29.3.7 SOIL

Nutrient requirements reported in the soil study are based on the monitoring and sampling of the soils at the time of the baseline survey. As these values will definitely alter during the storage stage, they need to be re-evaluated before being used during rehabilitation.

Ongoing evaluation of the nutrient status of the growth medium will be needed throughout the life of the project and into the rehabilitation phase. During the rehabilitation exercise preliminary soil quality monitoring should be carried out to accurately determine the fertilizer requirements that will be needed. Additional soil sampling should also be carried out annually until the levels of nutrients, specifically magnesium, phosphorus and potassium, are at the required levels for sustainable growth.

Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased. An annual environmental audit should be undertaken. If growth problems develop, *ad hoc*, sampling should be carried out to determine the problem.

Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer. Soils should be sampled and analysed for the following parameters:

- pH (H2O);
- Phosphorus (Bray I);
- Electrical conductivity;
- Calcium mg/kg;
- Cation exchange capacity;
- Sodium mg/kg;
- Magnesium mg/kg;
- Potassium mg/kg Zinc mg/kg;
- Clay; and
- Organic matter content (C %).

### 29.3.8 FAUNA AND FLORA MONITORING

The following recommendations have been made for fauna and flora monitoring:

- An alien plant species management plan should be implemented whereby the alien species listed by the specialist should be removed and controlled. Woody species such as *A. mearnsii* and *E. camuldulensis* should be controlled mechanically by strip-barking or felling. Folia pesticides can be applied to *S. sysimbriifolium*. These species should be monitored bi-annually for a period of two to five years until they are completely eradicated from site.
- A Red Data plant screening assessment should be conducted in the summer season to determine the presence of threatened and/or protected plant species that may have been missed during the Autumn-season site visit conducted for this study.
- A buffer of at least 100m should be placed around all wetland areas and regarded as a 'No-Go' zone for development. All wetlands are protected under the National Water Act (No. 36 of 1998) and are of national conservation significance. If any activities are proposed within 500m of a wetland, water use authorisation must be applied for.

The monitoring of the flora and fauna environment is completed by investigating its constituent floral components specifically the herb, grass shrub and tree layers. These components have differentiation within them and these are Red Data / protected, medicinal, endemic, alien invasive and weedy species. The fauna component includes habitat condition, habitat availability, ecosystem function and the species within these ecosystems. A monitoring program needs to evaluate the management actions and their effects on each of these components and the focus needs to be on Red Data/SSC/protected species. The method of monitoring is the Braun Blanquet method for vegetation and line transects, point count transects and trapping and transects for fauna surveys:

- Monitoring must take place annually;
- Monitoring must be completed by qualified specialists;
- Monitoring during the wet summer season is essential; and
- Findings must be compared to previous years to establish ecosystem change.

Monitoring will also confirm the impact of the development on Red Data species and further mitigation can be suggested. The alien vegetation monitoring will be of importance due to the threat posed by surrounding land use, which is farming and other developments that could provide open areas where alien invasive species could establish. Therefore, the open areas created during the construction phase could persist during the operational phase, and thereby create areas where alien invasive species could establish.

Cleared areas should be monitored for colonisation by alien species and a proactive approach should be undertaken to control alien species as soon as they are established. Monitoring and eradication of alien species is part of the mine’s responsibility and failure to do so in the early stages will result in greater investments of resources to remove them at a later stage.

### 29.3.9 REHABILITATION MONITORING

Once the final landform design has been established and stabilized (with re-vegetation or otherwise) the mine will provide for a period of monitoring to verify the success or otherwise of the rehabilitation program. The length of the monitoring period will be determined in consultation with the appropriate regulators and would take the form of periodic inspections by contracted specialists, but is generally assumed to last for at least 3 years for issues other than ground water and possibly more than a decade for ground water. This applies even to the areas directly returned to forestry.

The parameters that may be monitored after rehabilitation should subject to agreement with the regulator, include the following:

- The continued safety of the site;
- Alignment of actual final topography to agreed planned landform;
- Depth of topsoil stripped and replaced;
- The establishment and growth of plants including the return of species not planted as part of re-vegetation, on the areas not returned to forestry;
- The percentage of ground cover and species composition;
- The return of native fauna (where eco-system restoration is intended);
- Soil fertility, ph and salinity;
- Evidence of land erosion or land degradation;

- The presence of vertebrate and invertebrate aquatic species identified in the EIA/EMP as indicator species;
- Surface water drainage systems and surface water quality;
- Groundwater quality at agreed locations (including downstream); and
- Condition of downstream ecosystems.

# 30 UNDERTAKING

The EAP herewith confirms:

a) The correctness of the information provided in the reports;

b) The inclusion of comments and inputs from stakeholders and I&AP's;

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

d) That the information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested and affected parties are correctly reflected herein.

# 31 TECHNICAL SUPPORTING INFORMATION

The following specialist reports have been included as Appendices to this report:

- Appendix H: Social Study Report (2005)
- Appendix I: Heritage and Cultural Resources
  - Appendix I1: Heritage study (2004)
  - Appendix I2: Heritage study (2013)
  - Appendix I3: Heritage Study for proposed underground mining on Zandvoort 10 IT (2015)
  - Appendix I4: Heritage Study for mining on Kwaggafontein 8IT (2017)
  - Appendix I5: Palaeontological Studies for Zandvoort 10IT and Kwaggafontein 8IT (2017)
  - Appendix I6: Heritage and Palaeontology study for proposed extension of Ilima mining operations (2017)
- Appendix J: Ecology
  - Appendix J1: Fauna and Flora Report (2004)
  - Appendix J2: Ecology (Flora & Fauna) study for Zandvoort underground mining expansion (2015)
  - Appendix J3: Biodiversity Study for Kwaggafontein (2017)
  - Appendix J4: Biodiversity study for the proposed Ilima coal mining operations (2017)
- Appendix K: Geohydrology
  - Appendix K1: Groundwater study (2012)
  - Appendix K2: Groundwater study (2015)
  - Appendix K3: Groundwater study (2017)
- Appendix L: Surface Water Study Report (2005)
- Appendix M: Wetland Biodiversity Assessment (2011)
- Appendix N: Soils
  - Appendix N1: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 1 and 4 of the Farm Haarlem 39 IT (2004)
  - Appendix N2: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 5 of the Farm Haarlem 39 IT (2004)
  - Appendix N3: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 4 and R/E of the Farm Haarlem 39 IT and Portion 3 and 9 of The Farm Appeldoorn 38 IT (2004)
  - Appendix N4: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 2 and RE of the Farm Paardeplaats 12 IT (2004)
  - Appendix N5: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 8 of the Farm Twyfelaar 11 IT (2004)

- Appendix N6: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 9 and 10 of the Farm Twyfelaar 11 IT (2004)
- Appendix N7: Pre-mining Soil Assessment of the Proposed Opencast Area on Portions 6, 7, 8 and 17 of the Farm Groenvallei 40 IT (2004)
- Appendix N8: Pre-mining Soil Assessment of the Proposed Opencast Area on Portion LG of the Farm Groenvallei 40 IT (2004)
- Appendix N9: Zandvoort Soil Assessment (2015)
- Appendix N10: Specialist Soils, Land Use and Land Capability Studies (2017)

- Appendix P: Closure Cost Report (2016)

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