September 2016

GLENCORE OPERATIONS SOUTH AFRICA (PTY) LTD

iMpunzi Phoenix and Office Pit Draft Environmental Impact Assessment Report and Environmental Management Programme

Submitted to:
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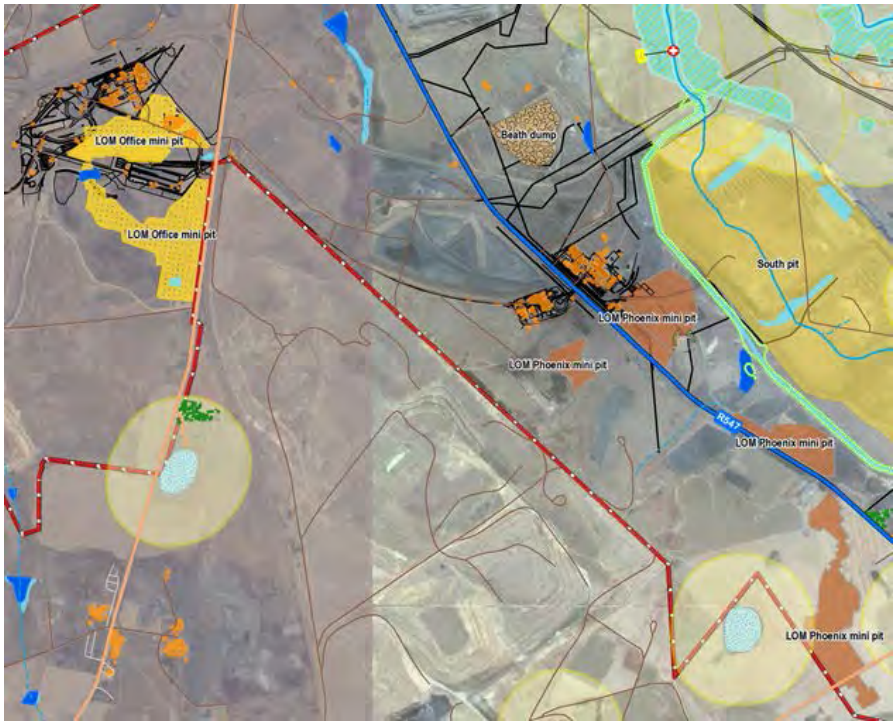

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1 x electronic copy to Glencore Coal South Africa
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REPORT

VOLUME I

Golder Associates

Purpose of this Document

Glencore Operations South Africa (GOSA), is considering the expansion of the opencast operations at their iMpunzi mining complex on the farms Kromfontein 30 IS, Middeldrift 43 IS and Blesbokfontein 31 respectively in the Magisterial District of Emalahleni in the Mpumalanga Province. iMpunzi has applied for environmental authorisation for listed activities in terms of the 2014 Environmental Impact Assessment (EIA) Regulations (GN R.982, GN R.983, GN R.984 and GN R.985) on the above farms.

In terms of the Mineral and Petroleum Resources Development Act (No 28 of 2002, as amended, hereafter MPRDA) and the EIA Regulations, iMpunzi is required to undertake an Environmental Impact Assessment (EIA) process and submit a Scoping Report, an EIA Report and an Environmental Management Programme (EMPr), which describe the environmental impacts of the proposed development and how they will be managed and mitigated.

Golder Associates Africa (Pty) Ltd, an independent environmental and engineering company, is conducting the EIA and associated licensing processes.

In line with international standards, such as the Equator Principles (EP) and the requirements of the International Finance Corporation (IFC), this EIA is subject to a process of environmental, social and health impact assessment (ESHIA). This process is being carried out in a number of phases, namely:

a) Project Screening – entailing an evaluation of the project and EIA against international standards to identify gaps in information and the requirements to update the study;
b) Project Definition – carrying out studies to evaluate the most viable project configuration;
c) ESHIA Scoping - development of the methodology (Plan of Study) to carry out the impact assessment;
d) Baseline Studies – to provide an evaluation of the environment that may be affected by the project;
e) ESHIA Impact Assessment and Management System Development – carrying out an evaluation of impacts and benefits of the project and proposing measures to mitigate impacts and enhance positive benefits; and
f) Decision Making – the ESHIA will be provided to the South African government departments dealing with environmental and mining authorisations for a decision on whether the project may go ahead and, if so, under what conditions.

During this process the public is consulted on an on-going basis, with issues and concerns being recorded and incorporated into the process for evaluation. Feedback will be provided when a decision on the project has been made. The public is also given the opportunity to comment on the project, the proposed activities and the proposed environmental management measures.

This Draft EIA/EMPr Report is being presented to stakeholders so that they may confirm that their comments have been received and to provide them with more information and an additional opportunity to provide comment and/or raise issues of concern.

Comments received during the public review period will be acknowledged and recorded in the final version of the EIA /EMPr Report, which will be submitted to the DMR and other relevant permitting authorities.

Summary of what the Draft Environmental Impact Assessment Report contains

This report contains:

- A description of the proposed mining activities;
- An overview of the EIA process, including public participation;
- A description of the existing environment in the proposed project area;
- The environmental issues and impacts which have been identified;
- The scope of the specialist studies undertaken during the Impact Assessment phase;
- The findings of the specialist studies;
- Assessment of the environmental impacts of the proposed mining operation;
- Recommended mitigation measures;
- An environmental management programme;
- Copies of the specialist reports;
- A list of Interested and Affected Parties; and
- A Comment and Response Report listing all comments received and responses provided.

Public review of the EIA report

The Draft EIA Report was available for comment from **23 September 2016** until **24 October 2016** on the Golder Associates Africa website www.golder.com/public, from the Public Participation Office upon request and at the following public places:

Public Place	Contact Person	Telephone Number
Ogies Public Library	Librarian	013-643-1027
Emalahleni Public Library	Ms Maria Rozmiarek	013-690-6232
Ogies Clinic	Sister Choko Motau	013-643-2037

OPPORTUNITIES FOR PUBLIC REVIEW

Stakeholders wishing to comment on the EIA Report, could do so in any of the following ways:

- Written submissions directly to the DMR, copies to Golder; and
- Comment to Golder by e-mail or telephone.

Comments could be made directly to Ms M Ratsela at the Department of Mineral Resources (Matshilele.Ratsela@dmr.gov.za, Tel. 013 653 0500, Fax 013 690 3288, and copied to the public participation office as indicated below.

DUE DATE FOR COMMENT ON Draft EIA REPORT

24 October 2016

Please submit comments to the Public Participation Office:

Toni Pietersen or Taryn Smith

Golder Associates

P O Box 6001

HALFWAY HOUSE, 1685

Tel: (011) 313 1072

Fax: (011) 315 0317

Email: Apietersen@golder.co.za

Executive Summary

iMpunzi, a Glencore Operations South Africa (Pty) Ltd coal mine, intends to expand its mining operations at Arthur Taylor Colliery Opencast Mine (ATCOM) Phoenix and Arthur Taylor Colliery (ATC) Office Pits. The proposed new mining venture includes the opencast mining of 4# seam coal reserves in the Office and Phoenix areas of the larger iMpunzi Complex.

According to the latest mine plan, mining at these areas will commence in 2026 and 2025 respectively. Coal will be mined in these areas by means of the truck and shovel method following a roll over progression. The coal mined at the Office and Phoenix Pit areas will be processed at the existing ATC Plant and ATCOM Central Plant respectively. The Office Pit area has an estimated Life of Mine (LOM) of 3-4 years and the LOM of the ATC Office Pits is estimated at three years.

iMpunzi appointed Golder Associates Africa (Pty) Ltd to undertake the required environmental impact assessment (EIA) process.

The following potential environmental impacts were identified during the scoping phase of this EIA and have been investigated during the environmental impact assessment phase of the project:

Surface water

A number of potential direct and indirect impacts were identified through the surface water specialist study. The identified impacts pertain to:

- Changes in surface water catchment areas, through disruption and reduction in land due to mining of Office and Phoenix Pits;
- Changes in surface water quality, through poor quality runoff from mining and associated activities; and possible fuel and lubricants spillage from equipment and other chemical spills.
- Increased surface water runoff due to vegetation and soil removal. therefore decreasing infiltration into soil; and runoff impact due to mining activities during operation and rehabilitation; and
- Erosion on site due to clearance of vegetation, causing increased silt load in runoff.

Wetlands

All wetland habitat located within the direct mining footprints is expected to be permanently lost. Adjacent wetland habitat located downslope is also likely to be indirectly impacted through a reduction in flows, both in terms of surface flow (due to exclusion of part of the catchment as a dirty water area) and sub-surface flow (interception of interflow and lowering of the local groundwater table due to drawdown associated with the opencast pits).

A number of potential impact have been identified and pertain to:

- Loss and disturbance of wetland habitat;
- Increased sediment transport into wetlands;
- Water quality deterioration;
- Decreased water make to adjacent wetlands;
- Discharge of stormwater into wetlands;
- Altered hydrology;
- Increased sediment transport into wetlands; and
- Increased alien vegetation.

Groundwater

The proposed iMpunzi Office and Phoenix pits fall within a highly mined area. It is also evident from the existing monitoring data that mining activities have already impacted on the aquifers in terms of lowering of water level and degradation in water quality. Historical and current mining activities are closely spaced and intertwined, resulting in collective accumulative impacts.

Consequently the groundwater impact assessment for the proposed Office and Phoenix pits opencast mining areas is discussed according to two identified impacts throughout the life cycle phases of the operation:

- The impact on the groundwater level (lowering) due to opencast mining; and
- The impact on the quality of the groundwater (deterioration).

Ecology

The project will result in the inevitable removal of vegetation from the proposed footprint of the pits. Due to the relatively small combined footprint of these pits (i.e. 235 ha) and the fact that very little of these areas are covered by virgin vegetation, it is not anticipated that these developments will have significant impacts on the current condition of the local ecology. Impacts will be mitigated through the proposed roll over mining and rehabilitation method, ensuring that the surface area that will be bare at any time is minimised.

Air quality

Particulate mobilisation by drilling, blasting, loading, hauling, stockpiling, backfilling and coal processing has the potential for an impact on air quality within and in the vicinity of the Office and Phoenix Pit areas, particularly in the downwind direction. Gaseous emissions due to blasting and the diesel engines on mining vehicles are expected to have an impact on air quality. Again, it is important note that the proposed pits are comparatively small in relation to the surrounding opencast mining operations and are not expected to have any significant added impact on the air quality.

Furthermore, given the truck and shovel mining method proposed for the Office and Phoenix Pits, the boxcuts and haul roads will have a negative impact on the air quality, as vehicle entrainment is the main contributor to the particulate matter loading within mining areas, especially if the haul roads are unpaved. The expected sources of air quality impacts include the boxcuts, dust from vehicular activity on the haul roads and mining operations themselves.

Noise

The proposed Office and Phoenix Pit operations are expected to impact on identified sensitive receptors through general mining activities, opencast blasting, and the movements of haul trucks.

Blasting and vibration

During the operational phase, it is expected that mining activities; stockpile management; road maintenance; opencast blasting; and transport and handling of material will generate vibrations during the operational phase.

A number of sensitive receptors are located in close proximity to the various pits associated with the Phoenix area and without mitigation, the blasting and vibration impacts associated with the Phoenix operations, could have significant impacts on these receptors. It is imperative that iMpunzi implement the outlined mitigation measures to prevent and minimise any impacts.

Visual

The proposed Office and Phoenix Pit operations are expected to contribute to the visual impacts in the area through the visibility of the opencast operations (pits, associated stockpiles and haul roads). Portions of the proposed operations, specifically the phoenix operations are situated in close proximity to the R 547 regional road and a community located to the South East of the proposed operation, and it is expected the visual impacts will be most prominent from these receptors.

Cultural and Heritage

The sites of archaeological and cultural significance at iMpunzi are largely associated with cemeteries and grave sites located on site. iMpunzi is currently in the process of having all grave sites onsite relocated through the necessary legal, public engagement and regulatory processes. It is envisaged that all grave sites will be re-located by the time operations are to start. It is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix Pit operations.

Socio-economics

Given the scale and nature of the proposed Office and Phoenix Pit operations, it is unlikely that they will in themselves have any significant socio-economic impacts in the area. The project will rather contribute to the current socio-economic impacts as a result of the larger iMpunzi mine.

Potential impact contributions in relation to the proposed Office and Phoenix operation could include, but are not limited to the following:

Positive impacts, such as:

- Temporary job creation during the construction phase;
- More permanent job creation during the operational phase;
- Indirect and induced benefits to the local economy; and
- Social investment and infrastructure development undertaken as part of the mine's SLP commitments.

Negative impacts such as:

- Physical intrusion impacts on surrounding communities (related to noise, dust, etc.);
- Negative effects on the values of surrounding properties; and
- Potential displacement of households or communities living on or adjacent to the project footprint.

Public participation

The proposed project was announced as follows:

- Distribution of a letter of invitation to participate and announcing the project, availability of the project documents to all I&APs on an existing stakeholder database, accompanied by a registration and comment sheet that was mailed/emailed to the entire stakeholder database. In addition, the registration and comment sheet was also available online via the Golder website (http://www.golder.com/public);
- Placing site notices on the boundary of the proposed project area;
- Publishing a mandatory advertisement in the local newspaper, namely the ***Witbank News*** on ***the 17th of June 2016***;
- Placing the abovementioned documents at the public places listed below (also refer to page ii of this document) and posting them to the Golder website www.golder.com/public; and
- Capturing the comments received in a Comment and Response Report**.**

The Scoping Report was made available for public review for 30 days from ***the 17th of June 2016*** **until the 18th of July 2016.** Stakeholders were invited to participate in the EIA and public participation process, to pass on the information to friends/colleagues/neighbours who may be interested and to register as I&APs. Furthermore, the registration and comment sheet included a sentence encouraging I&AP's to indicate the names of their colleagues and friends who may also be interested in participating.

Opinion on whether the activity should be authorised

Provided that all the environmental management measures described in the EIA report/EMPr are applied diligently, the proposed Office and Phoenix operations within the area shown on Figure 2-2 will have no

environmental impacts that cannot be adequately mitigated to protect the environment, and authorisation of iMpunzi's application would be justified on the basis that the positive effects of the project are likely to outweigh the remaining negative impacts.

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FIGURES

APPENDICES

Glossary of terms and list of acronyms

Acronym	Description
AMD	Acid Mine Drainage
ASAPA	Association for Southern African Professional Archaeologists
ATC	Arthur Taylor Colliery
ATCOM	Arthur Taylor Colliery Opencast Mine
CARA	Conservation of Agricultural Resources Act No 43 of 1983
CRR	Comments and Response Report
CV	Curriculum Vitae
DARDLEA	Department of Agriculture, Rural Development, Land and Environmental Affairs
dBa	A-weighted decibels - a unit in which sound levels are measured
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EHS	Environmental Health and Safety
EIA	Environmental Impact Assessment
EIS	Ecological Importance State
EMPr	Environmental Management Programme
EMS	Environmental Management System
EO	Environmental Officer
EP	Equator Principles
EPFIs	Equator Principles Financial Institutions
ESHIA	Environmental, Social and Health Impact Assessment
ESMS	Environmental and Social Management System
GAA	Golder Associates Africa (Pty) Ltd
GDP	Gross Domestic Product
GNR	Government Notice Regulation
GOSA	Glencore Operations South Africa
Ha	Hectare
HRD	Human Resources Department
IAPs	Interested and Affected Parties
IDP	Independent Development Plan

IFC	International Finance Corporation
IWWMP	Integrated Water and Waste Management Plan
L/s	Litres per second
LOM	Life of Mine
mamsl	meters above mean sea level
MAP	Mean Annual Precipitation
mbgl	meters below ground level
MPRDA	Mineral and Petroleum Resources Development Act
MRA	Mining Rights Area
MU	Management Unit
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act, No.107 of 1998
NEMAQA	National Environmental Management: Air Quality Act, No. 39 of 2004
NEMWA	National Environmental Management Waste Act, No. 59 of 2008
NEMWAA	National Environmental Management: Waste Amendment Act, No. 26 of 2014
NWA	Nation Water Act, No. 36 of 1998
PCD	Pollution Control Dam
PES	Present Ecological State
PPV	Particle Displacement Velocity
PS	Performance Standards
ROM	Run of Mine
RWQO	Resource Water Quality Objectives
SACNASP	South African Council for Natural Scientific Professionals
SAHRA	South African National Heritage Resources Act, No. 25 of 1999
SANS	South African National Standards
SHE	Safety, Health and Environment
SLP	Social and Labour Plan
SPL	Sound Power Level
SWMP	Storm Water Management Plan
WQG	Water Quality Guideline
WTP	Water Treatment Plant
WUL	Water Use Licence
WULA	Water Use Licence Application

PART A
SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1.0 INTRODUCTION AND OVERVIEW

1.1 Background

iMpunzi, a Glencore Operations South Africa (Pty) Ltd coal mine, intends to expand its mining operations at Arthur Taylor Colliery Opencast Mine (ATCOM) Phoenix and Arthur Taylor Colliery (ATC) Office Pits. The proposed new mining venture includes the opencast mining of 4# seam coal reserves in the Office and Phoenix areas of the larger iMpunzi Complex.

Glencore Operations South Africa's iMpunzi Complex is located 23km south east of eMalahleni in the Mpumalanga Province, near the towns of Ogies and Kriel. The Complex consists of four (4) sections, namely: Arthur Taylor Colliery (ATC), Phoenix (decommissioned), Arthur Taylor Colliery Opencast Mine (ATCOM), and ATCOM East. The proposed new project will use existing infrastructure within the iMpunzi Complex.

Glencore Operations South Africa (GOSA) previously operated under the Environmental Management Programme (EMPr) (Reference No. OT6/2/2/132 and Mining License No ML31/1994). This EMPr was approved in 2001 under the Minerals Act, 1991 (Act 50 of 1991), Glencore then embarked on a Section 102 application in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002) (MPRDA), to consolidate the various collieries under the Tavistock mining right and to include the new mining operations into a single EIA/EMPr document as well as to include the ATCOM East area, which was then owned by BHP Billiton Energy Coal South Africa (formerly Ingwe Collieries Limited and currently known as South 32).

The application was forwarded to the Department of Mineral Resources in support of the relevant Section 11 application and was then approved under the current EMPr (MP30/5/1/2/2/375MR) in 2015. This EMPr supersedes all other previously approved EMPrs and amendments. The potential future mining activities listed in the EMPr include the Office and Phoenix pit developments. According to the latest mine plan, mining at these areas will commence in 2026 and 2025 respectively. The Office pit will be mined from 2026, while it is anticipated that mining will commence at the Phoenix area in 2025.

The farm portions associated with the approved EMPr are the farms Blesbokfontein 31 IS and 38 IS, Frischgewaagd 60 IS, Hartbeestfontein 39 IS Klipplaat 14 IS, Kromfontein 30 IS, Steenkoolprspruit 18 IS, Middeldrift 42 IS, Nooitgedacht 37 IS, Van Dyksdrift 19 IS, Vleifontein 16 IS, and Roodepoort 40 IS. The approved EMPr attached in APPENDIX B details the environmental impacts and mitigation measures within the ambit of the larger iMpunzi area.

iMpunzi requires environmental authorisation for a number of listed activities associated with the proposed mining operations at the Office and Phoenix pits - see Table 2-4.

1.2 Contents of this Report

The main purpose of this EIA/EMPr report is to provide a description of the current baseline environmental conditions within the proposed project area, and to describe the assessed environmental impacts and mitigation measures for the proposed Office and Phoenix pit project.

This document has been structured as follows to meet the requirements of the International Finance Corporation (IFC), the Equator Principles and the South African environmental legislation:

- **Introduction and overview** – Introduces the Project and the Project proponent, gives an overview of the Project, provides the details of the environmental practitioner, and explains the EIA process;
- **Project Motivation** – Provides an indication of the need for and desirability of the Project;

- **EIA Process** – Summarises the process being undertaken with respect to Environmental, Social and Health Impact Assessment for the Project, inclusive of the methodology utilised for Scoping;
- **Description of the Proposed Project** - Provides a summary of the key Project components, the Project location, scale, nature and design, production process, main inputs and outputs, schedule and activities during different phases of the Project, inclusive of a description of the Project location and the properties on which the Project will take place;
- **Project Alternatives** – Summarises alternatives considered by the Project proponent;
- **Policy, Legal and Administrative Framework** – Discusses the environmental policy, legal, and administrative framework applicable to the Project. This includes a summary of relevant South African regulations, the applicable administrative framework, and the environmental permitting process;
- **Description of the Environment that may be affected** – Describes the current pre-project biophysical, socio-economic, and cultural status of the area, key characteristics (sensitive or vulnerable areas), important heritage resources, current land use and livelihoods;
- **Environmental Issues and Potential Impacts of the Project -** Describes the identified impacts and recommended mitigation measures;
- **Public Consultation** – This section provides a summary of the public consultation activities undertaken as part of the EIA/EMPr processes;
- **Next Steps in the Process** – Indicates what the next steps in the process are; and
- **References** – References to literature consulted.

Appendices – Technical material supporting the EIA/EMPr, including the Curricula Vitae (CV) of the EIA team, stakeholder engagement plan and supporting information, and comments and response report, and document limitations.

2.0 PROPONENT AND PRACTITIONER DETAILS

2.1 Details of the Proponent and Environmental Assessment Practitioner

2.1.1 Details of the Proponent

For purposes of this EIA, the following person may be contacted at Glencore:

Table 2-1: Proponent's contact details

Contact Person	Tebogo Chauke
Address	Glencore Operations South Africa (Pty) Ltd iMpunzi Complex Private Bag x7265 Witbank 1035
Telephone	013 687 8299
Cell phone	073 765 0999
E-mail	Tebogo.Chauke@glencore.co.za

2.1.2 Details of Environmental Assessment Practitioner

Glencore appointed Golder Associates Africa (Pty) Ltd (GAA) as an independent Environmental Assessment Practitioner (EAP) to undertake the EIA/EMPr process that is required to support the application for a mining right and funding from the IFC or a bank that is a signatory to the Equator Principles.

Golder Associates Africa is a member of the world-wide Golder Associates group of companies, offering a variety of specialised engineering and environmental services. Employee owned since its formation in 1960, the Golder Associates group employs more than 6 500 people who operate from more than 165 offices located throughout Africa, Asia, Australasia, Europe, North America and South America. Golder Associates Africa (GAA) has offices in Midrand, Pretoria, Florida, Durban, Rustenburg, Cape Town, Maputo and Accra. GAA has more than 300 skilled employees and is able to source additional professional skills and inputs from other Golder offices around the world.

GAA has no vested interest in the proposed project and hereby declares its independence as required by the South African EIA Regulations.

For purposes of this EIA, the following persons may be contacted at GAA (see Table 3):

Table 2-2: Contact details of environmental assessment practitioner

Contact Persons	**Gareth Isenegger**	**Toni Pietersen**
Purpose	Technical	Public Participation
Address	P O Box 6001 Halfway House 1685	P O Box 6001 Halfway House 1685
Telephone	011 254 4800	011 254 4800
Fax	011 315 0317	011 315 0317
Cell phone	072 683 5350	083 227 8681
E-mail	gisenegger@golder.co.za	tpietersen@golder.co.za

2.1.3 Expertise of Environmental Assessment Practitioner

2.1.3.1 Qualifications

Gareth Isenegger holds an Honours degree in Environmental Management and Analysis from the University of Pretoria and is a South African Council for Natural Scientific Professionals (SACNASP), registered Scientist.

Antoinette Pietersen holds a BA (Hons) in psychology from the Potchefstroom University for Christian Higher Education. She has more than 18 years' experience in the design, facilitation and management of public participation processes to local and international standards. She is a past President of the Southern African Affiliate of the International Association for Public Participation (IAP2) and an internationally certified trainer in public participation processes.

2.1.3.2 Summary of Past Experience

Gareth Isenegger

- Nov 2010 to Feb 2011: BHP Billiton, BECSA Mines – Middelburg, South Africa, Environmental Contractor - Compilation and investigation of BECSA water footprint for the Middelburg, Klipspruit, Wolvekrans and Khutala mines;
- 2011-2012: Department of Environmental affairs, South Africa – Marion Island, Environmental control officer – Waste, path and alien invasive species management, debris collection, permit control, environmental impact assessment, and report writing; and

- 2012 – Present: Golder Associates Africa (Pty) Ltd – Is currently an Environmental Practitioner, involved in the Environmental Planning Business Unit, which deals with various environmental authorisations and management requirements as per environmental legislation and is closely involved with a team looking at an array of environmental permitting projects, including Environmental Impact Assessments, Water Use Licence Applications and Integrated Water and Waste Management Plans.

Antoinette Pietersen

1995-1996: Department of Water Affairs and Forestry –Communications Officer responsible for internal and external newsletters, preparation of media releases and radio interviews and event coordination, including press conferences and ministerial functions.

1996 – Present: Public participation practitioner at environmental consultancies Strategic Environmental Focus, Ferret Mining and Environmental Services and Golder Associates Africa (Pty) Ltd.

2.2 Description of the Property

Table 2-3: Details of area applied for

Aspect	Description
Farm Names	Kromfontein 30 IS, Middeldrift 43 IS and Blesbokfontein 31
Magisterial District	Emalahleni Local Municipality of the larger Nkangala District Municipality
Distance and direction from nearest town	110 km east of Johannesburg and 27 km south of the town of eMalahleni / Witbank
SG Codes	T0IS00000000003000004/7/9/28, T0IS00000000004200002/3, and T0IS00000000003100000

2.3 Locality Map

Figure 2-1 and Figure 2-2 below illustrate the regional locality of the iMpunzi Complex in relation to the surrounding towns, roads and regional watercourses, and also the locality of the proposed Office and Phoenix Pits in relation to the current iMpunzi operation.

The iMpunzi Complex is located 23km south-east of eMalahleni in the Mpumalanga Province, near the towns of Ogies and Kriel in the Mpumalanga Province and forms part of the Nkangala District Municipality and falls within both the Emalahleni and Steve Tshwete Local Municipalities.

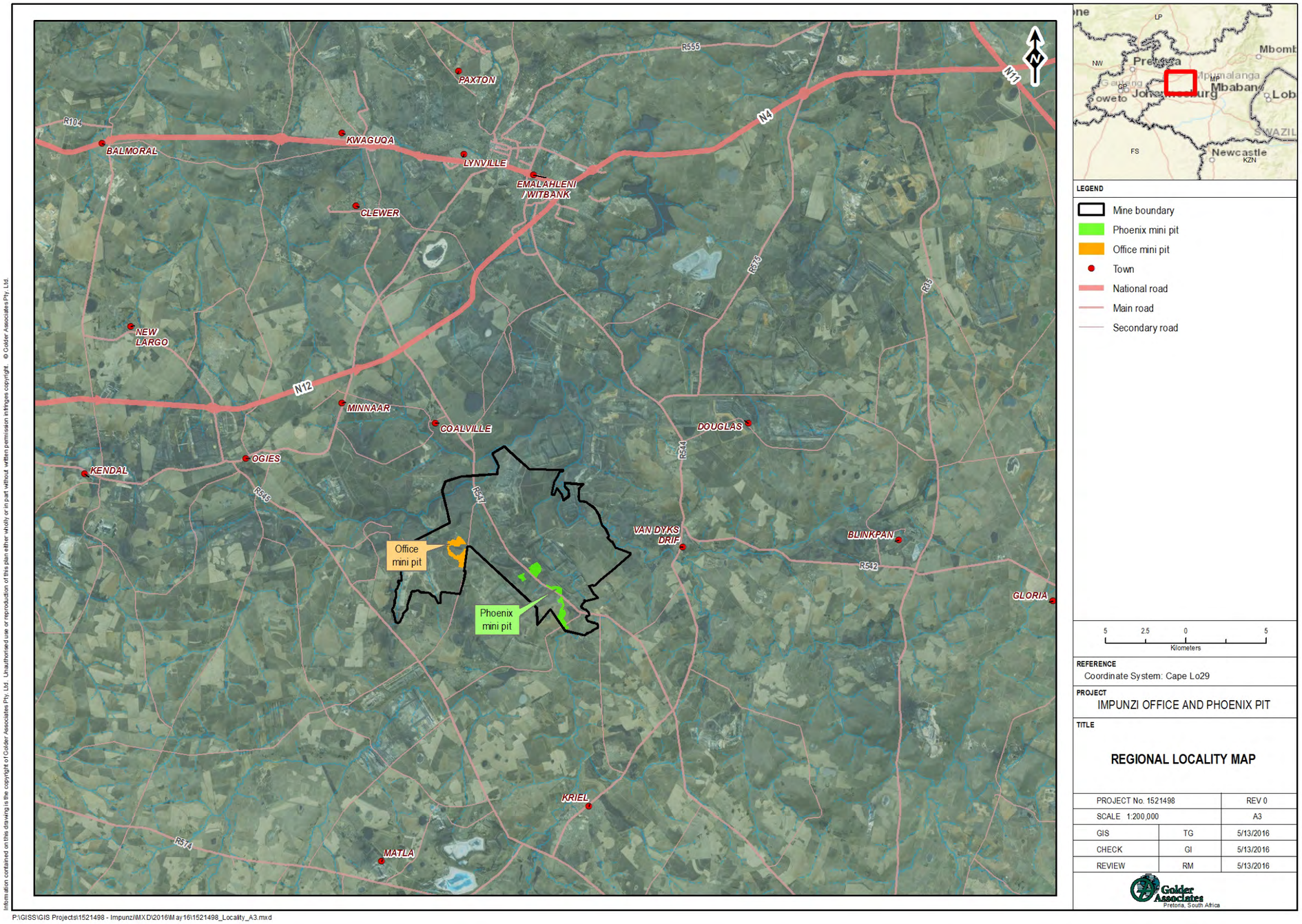


Figure 2-1: Regional locality Map

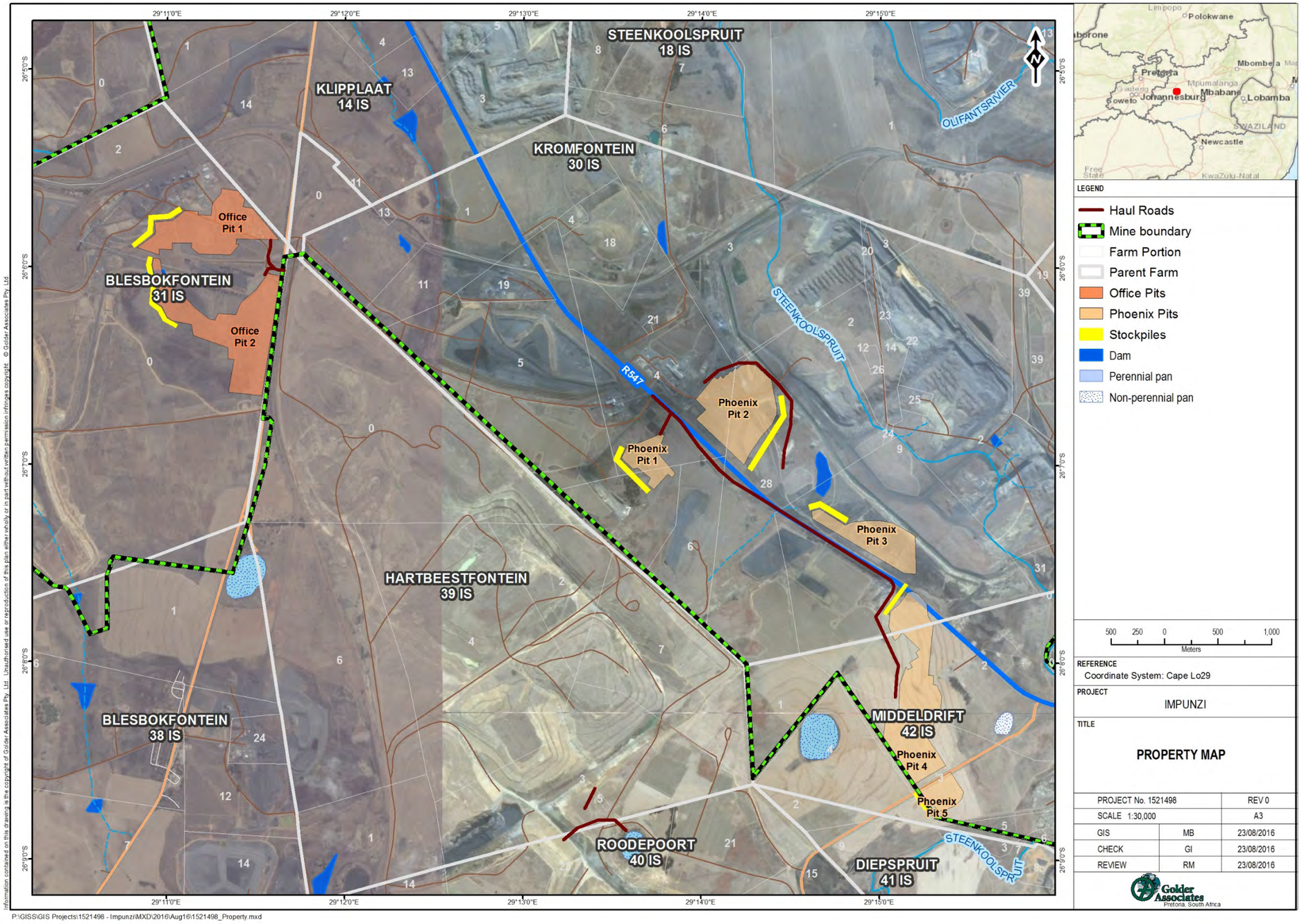


Figure 2-2: iMpunzi Office and Phoenix Pit areas

2.4 Description and Scope of the Proposed Overall Activity

2.4.1 iMpunzi Mining Operations

The physical extent of the entire iMpunzi Complex for which there is a mining authorisation extends over approximately 6 835 Ha. Although the iMpunzi Complex was historically predominantly an underground mining operation, all underground mining operations have ceased and there are no plans to carry out further underground mining at the complex.

All remaining mining will be by opencast methods. All opencast mining is undertaken using the strip mining method using draglines, and truck and shovel at the smaller open pits. All hard overburden (shale/sandstone) and coal is blasted using bulk explosives (heavy anfo emulsion). The coal is taken by a truck fleet to the Crushing and Pillar Screening Plant.

It is important to note that iMpunzi is an existing mining operation with existing infrastructure. There are a number of Infrastructural components and servitudes that are still in use and relevant to water and waste management.

- The existing infrastructure at the iMpunzi Mining Complex includes the following:
- Primary river / stream diversion;
- Secondary water management in the form of canals;
- Various in-pit channels;
- Stockpiles (ROM and product);
- Tipping and crushing facilities;
- Coal processing plants;
- Water treatment plant (potable water);
- Sewage treatment plants;
- Offices;
- Workshop areas;
- Stores;
- Water management canals and pipeline systems;
- Pollution Control Dams (PCDs);
- Settling Dam Facilities;
- Stores;
- On-site roads (tar and gravel which also allow access to the neighbouring farms);
- Power lines that pass from east to west through the mine lease area;
- Roads which include the R547, local road to Onverwacht which links the R547 and R545 north / south, local road to Frischgewaagd which links the R547 and R545 east/ west, and local road between Klipplaat and Leslie;
- The main Richards Bay coal transporting railway line; and
- Eskom 132, 88, 33, 21 and 11 kV power lines with substations.

2.4.2 Office and Phoenix Pit areas

A number of expansions and process related projects have been undertaken at the iMpunzi Complex. This report has project-specific focus and includes the proposed opencast mining at the Office and Phoenix Pit areas.

According to the latest mine plan, mining at these areas will commence in 2026 and 2025 respectively. Coal will be mined in these areas by means of the truck and shovel method following a roll over progression. The coal mined at the Office and Phoenix Pit areas will be processed at the existing ATC Plant and ATCOM Central Plant respectively. The Office Pit area has an estimated Life of Mine (LOM) of 3-4 years and the LOM of the ATC Office Pits is estimated at three years.

The proposed rollover method (see Figure 2-3) will involve the stripping and stockpiling of topsoil and overburden from the first cut of the opencast mine at the position of the last cut. As the mining progresses, the overburden and topsoil from each successive cut will be backfilled into the void from the previous cut, and the surface will be shaped to be free draining. The disturbed topsoil will be analysed and treated as needed in terms of fertilisation and will be re-vegetated. At the end of the life of the opencast mine the final void will be backfilled with the overburden from the final cut of the last remaining pit.

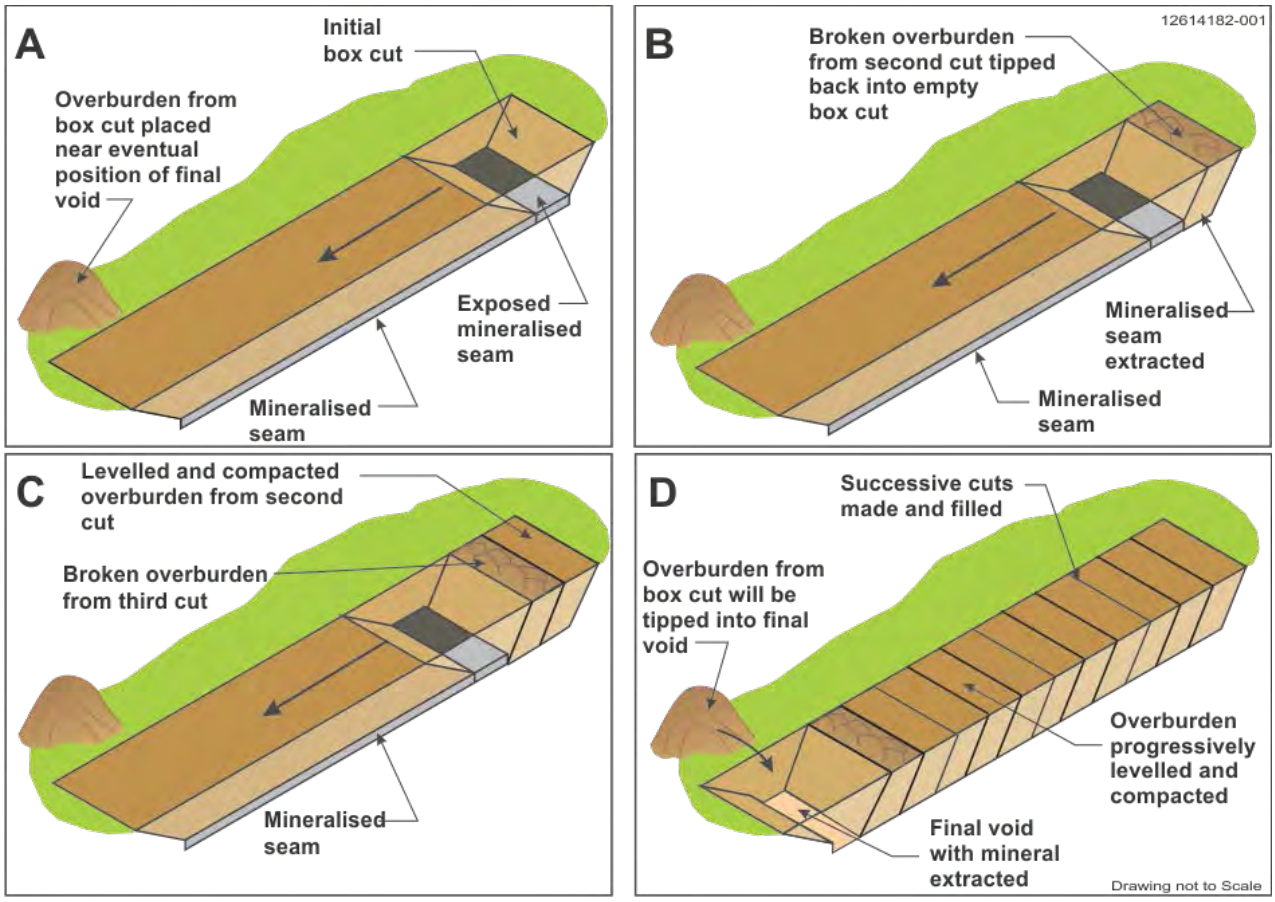


Figure 2-3: Illustration of roll over mining method

2.4.3 Other Operations

As mentioned above, the larger iMpunzi is an existing mining operation with the necessary support infrastructure and facilities to accommodate the proposed mining at the Office and Phoenix Pits.

Other operations associated with the mining of the Office and Phoenix Pits will entail the following:

- Removal of ingress water in the pit, to minimise any contamination of water and to maintain a safe working environment in and around the pit. Water removed from the pits will be incorporated into the existing dirty water circuit onsite for which there is adequate capacity and infrastructure; and
- Diversion of storm water around the extent of the opencast pits to minimise runoff into the pits and to prevent contamination of clean runoff.

2.4.4 Listed and Specific Activities

The listed activities which require authorisation in terms of the relevant EIA regulations (2014) are indicated below in Table 2-4.

Table 2-4: Listed activities requiring environmental authorisation

Listing Notice	Listed Activities	Project component
GNR 983 Activity No. 9	The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.	Cut off trenches/pipes to prevent storm water entering the opencast pits; clean water diversion trenches around opencast pits.
GNR 983 Activity No. 12	The development of- (i) canals exceeding 100 square metres in size; (ii) channels exceeding 100 square metres in size; (iii) bridges exceeding 100 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area, exceeds 100 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area, exceeds 100 square metres in size; (vi) bulk storm water outlet structures exceeding 100 square metres in size; (vii) marinas exceeding 100 square metres in size; (viii) jetties exceeding 100 square metres in size; (ix) slipways exceeding 100 square metres in size; (x) buildings exceeding 100 square metres in size; xi) boardwalks exceeding 100 square metres in size; or (xii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs- (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; - excluding- (aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour; (bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies; (cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; (dd) where such development occurs within an urban area; or (ee) where such development occurs within existing roads or road reserves.	Cut off trenches/pipes to prevent storm water entering the opencast pits; clean water diversion trenches around opencast pits.
GNR 983 Activity No 24	The development of- (i) a road for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or (ii) a road with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres; but excluding- (a) roads which are identified and included in activity 27 in Listing Notice 2 of 2014; or	Construction of haul roads for hauling coal from the opencast areas.

	(b) roads where the entire road falls within an urban area.	
GNR 983 Activity No. 27	The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Possible clearance of indigenous grassland areas at the proposed opencast areas.
GNR 983 Activity No 45.	The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure- (bb)has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (bb)where the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion- (aa) relates to transportation of water or storm water within a road reserve; or (bb) will occur within an urban area.	Possible expansion of current water conveyance infrastructure to accommodate the water generated at the opencast areas
GNR 983 Activity No 46.	The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure- (bb) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (bb) where the facility or infrastructure is expanded by more than 1000 metres in length; or (b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more; excluding where such expansion- (aa) relates to transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes within a road reserve; or (bb) will occur within an urban area.	Possible expansion of current water conveyance infrastructure to accommodate the water generated at the opencast areas.
GNR 983 Activity No. 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre- (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.	Possible widening of existing roads in the construction of haul roads to haul coal, discard etc. from the opencast areas.
Listing Notice	**Listed Activities**	**Possible project component**
GNR 984 Activity No. 6	The development of facilities or infrastructure for any process or activity which requires a permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding (i) activities which are identified and included in Listing Notice 1 of 2014; (ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act responsible for mineral No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or (iii) the development of facilities or infrastructure for the treatment of effluent, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less.	The mine will need a water use licence for various water uses associated with the proposed opencast mining operations
GNR 984 Activity No.15	The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for- (i) the undertaking of a linear activity; or (ii) maintenance purposes undertaken in accordance with a maintenance management plan.	Opencast mining will take place on approximately 138ha of land. Indigenous vegetation will be cleared ahead of the mining front.
GNR 984 Activity No 17.	Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including associated infrastructure, structures and earthworks, directly	Opencast mining at the Office and Phoenix Pits areas.

	related to the extraction of a mineral resource, including activities for which an exemption has been issued in terms of section 106 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).	
GNR 984 Activity No.21	Any activity including the operation of that activity associated with the primary processing of a mineral resource including winning, reduction, extraction, classifying, concentrating, crushing, screening and washing but excluding the smelting, beneficiation, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies.	Opencast mining at the Office and Phoenix Pits areas.
Listing Notice	**Listed Activities**	**Possible project component**
GNR 985 Activity No. 4	The development of a road wider than 4 metres with a reserve less than 13, 5 metres. (a) In Free State, Limpopo, Mpumalanga and Northern Cape provinces: i. In an estuary; ii. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas; or (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or iii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Seawards of the development setback line or within urban protected areas.	Construction of Haul roads wider than 13.5 metres for hauling coal from the opencast areas, which impact on wetland areas.
GNR 985 Activity No. 14	The development of- (i) canals exceeding 10 square metres in size ; (ii) channels exceeding 10 square metres in size; (iii) bridges exceeding 10 square metres in size; (iv) dams, where the dam, including infrastructure and water surface area exceeds 10 square metres in size; (v) weirs, where the weir, including infrastructure and water surface area exceeds 10 square metres in size; (vi) bulk storm water outlet structures exceeding 10 square metres in size; (vii) marinas exceeding 10 square metres in size; (viii) jetties exceeding 10 square metres in size; (ix) slipways exceeding 10 square metres in size; (x) buildings exceeding 10 square metres in size; (xi) boardwalks exceeding 10 square metres in size; or (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or	Construction of Haul roads wider than 13.5 metres for hauling coal from the opencast areas, which impact on wetland areas.

	(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. a) In Free State, Limpopo, Mpumalanga and Northern Cape provinces: i. In an estuary; ii. Outside urban areas, in: (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an International Convention; (ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; (ff) Core areas in biosphere reserves; (gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas; or (hh) Areas seawards of the development setback line or within 1 kilometre from the high-water mark of the sea if no such development setback line is determined; or iii. In urban areas: (aa) Areas zoned for use as public open space; (bb) Areas designated for conservation use in Spatial Development Frameworks adopted by the competent authority or zoned for a conservation purpose; or (cc) Seawards of the development setback line or within urban protected areas.	

2.4.5 Activities to be undertaken

The specific activities associated with the mining of the Office and Phoenix Pit areas will entail the following:

- Drilling of infill boreholes for detailed mine planning;
- Stripping and stockpiling of topsoil in front of the advancing mining front, with bulldozers and front end loaders;
- Drilling and charging of blast holes, followed by blasting, where necessary. Vibration levels and fly rock occurrence will be recorded during each blast and used to plan subsequent blasts;
- Excavation, loading, hauling and transport of overburden and coal. The coal will be transported to the respective processing plants by fleets of haul trucks;
- Stockpiling of overburden, discard coal and product coal. The overburden will be stockpiled separately from the topsoil and the discard coal;
- Continuously backfilling the voids with discard, overburden and topsoil, in that order, followed by fertilisation and re-vegetation with indigenous vegetation;
- Constructing and operating a storm water control system comprising of diversion berms and collection and conveyance channels to the existing dirty water systems, and
- Construction of haul roads.

2.5 Policy and Legislative Context

This section provides a brief overview of both the national and international requirements that must be met by this project.

2.5.1 South African Legislation

2.5.1.1 Mineral and Petroleum Resources Development Act

In terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) the MPRDA Regulations R.527 and the EIA Regulations GN R.982 of 8 December 2014, an application for a mining right must be supported by an EIA process, consultation must take place with interested and affected parties (I&APs), a scoping report conforming to Appendix 2 of GN R.982 must be submitted to the DMR, followed by an environmental impact assessment report conforming to Appendix 3 of GN R.982 and an environmental management programme conforming to Appendix 4 of GN R.982.

It is important to note that iMpunzi, as part of the EMPr and mining right consolidation process described above, followed the required section 102 application process as part of the consolidation process.

2.5.1.2 National Environmental Management Act

In terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998)(NEMA), as amended and the EIA Regulations, an application for environmental authorisation for certain listed activities must be submitted to the provincial environmental authority, the national authority (Department of Environmental Affairs, DEA), depending on the types of activities being applied for or, when mining and mineral processing activities are involved, the Department of Mineral Resources (DMR) - see section 2.5.1.1 above.

The current EIA regulations, GN R.982, GN R.983, GN R.984 and GN R.985, promulgated in terms of Sections 24(5), 24M and 44 of the NEMA and subsequent amendments, commenced on 8 December 2014. GN R.983 lists those activities for which a Basic Assessment is required, GN R.984 lists the activities requiring a full EIA (Scoping and Impact Assessment phases) and GN R.985 lists certain activities and competent authorities in specific identified geographical areas. GN R.982 defines the EIA processes that must be undertaken to apply for Environmental Authorisation.

2.5.1.3 National Water Act

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) is the primary legislation regulating both the use of water and the pollution of water resources. It is applied and enforced by the Department of Water and Sanitation (DWS).

Section 19 of the National Water Act regulates pollution, which is defined as "the direct or indirect alteration of the physical, chemical or biological properties of a water resource so as to make it:

- Less fit for any beneficial purpose for which it may reasonably be expected to be used; or
- Harmful or potentially harmful to -
  - the welfare, health or safety of human beings;
  - any aquatic or non-aquatic organisms;
  - the resource quality; or
  - property.

The persons held responsible for taking measures to prevent pollution from occurring, recurring or continuing include persons who own, control, occupy or use the land. This obligation or duty of care is initiated where there is any activity or process performed on the land (either presently or in the past) or any other situation which could lead or has led to the pollution of water.

The following measures are prescribed in the section 19(2) of the NWA to prevent pollution:

- Cease, modify or control any act or process causing the pollution;
- Comply with any prescribed standard or management practice;
- Contain or prevent the movement of pollutants;
- Eliminate any source of the pollution;
- Remedy the effects of pollution; and
- Remedy the effects of any disturbance to the bed or banks of a watercourse.

Section 21 of the NWA lists the water uses for which a water use licence (WUL) is required. iMpunzi's intention to opencast mine the Office and Phoenix Pits may constitute the following water uses:

a) Taking water from a water resource;

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

(i) Altering the beds, banks, course or characteristics of a watercourse; and

(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.

The Water Use Licence Application (WULA) and the Integrated Water and Waste Management Plan (IWWMP) will have to be approved by the DWS. These processes are running concurrent to this EIA process.

2.5.1.4 National Environmental Management: Waste Act

The NEMWA commenced on the 1st of July 2009. In terms of this Act, all listed waste management activities must be licensed and in terms of Section 44 of the Act, the licensing procedure must be integrated with the environmental impact assessment process.

Government Notice 921, which commenced on 29 November 2013, lists the waste management activities that require licensing in terms of the NEMWA. Licence applications for activities involving hazardous waste must be submitted to the national authority, the Department of Environmental Affairs (DEA) and those for general waste to the provincial authority, in this case the DARDLEA.

One of the major amendments effected by the National Environmental Management Amendment Act 2014 is the insertion of section 24S, as a result of which the NEMWA also became applicable to mining residue deposits and residue stockpiles, as follows:

"Management of residue stockpiles and residue deposits

24S. *Residue stockpiles and residue deposits must be deposited and managed in accordance with the provisions of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008), on any site demarcated for that purpose in the environmental management plan or environmental management programme in question."*

In terms section 18, Schedule 3 of the National Environmental Management: Waste Amendment Act, 2014 (Act No. 26 of 2014) (NEMWAA), which commenced on 2 June 2014, mining residues must also be managed in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)(NEMWA). The applicable regulations are GN R.634 to 636.

2.5.1.5 National Environmental Management: Air Quality Act

The main objectives of the National Environmental Management: Air Quality Act 2004 (Act No. 39 of 2004) (NEMAQA) are to protect the environment by providing reasonable legislative and other measures to:

- Prevent air pollution and ecological degradation;
- Promote conservation; and
- Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development in alignment with sections 24a and 24b of the Constitution of the Republic of South Africa.

The Act has devolved the responsibility for air quality management from the national sphere of government to local spheres of government (district and local municipal authorities), who are tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and development of emissions reduction strategies.

National Ambient Air Quality Standards (NAAQS) for common pollutants, as set in terms of the NEMAQA, are reproduced in Table 2-5.

Table 2-5: South African Ambient Air Quality Standards for Criteria Pollutants

Pollutant	Averaging Period	Limit Value (µg/m^3)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date
Sulphur dioxide (SO_2)[(a)]	10 minute	500	191	526	Immediate
	1 hour	350	134	88	Immediate
	24 hours	125	48	4	Immediate
	1 year	50	19	0	Immediate
Nitrogen dioxide (NO_2)[(b)]	1 hour	200	106	88	Immediate
	1 year	40	21	0	Immediate
Particulate matter <10 micrometres in diameter (PM_{10})[(c)]	24 hour	75	-	4	Immediate
	1 year	40	-	0	Immediate
	24 hours	65	-	4	Immediate

Pollutant	Averaging Period	Limit Value (µg/m³)	Limit Value (ppb)	Frequency of Exceedance	Compliance Date
Particulate matter <2.5 micrometres in diameter ($PM_{2.5}$)[d]	24 hours	40	-	4	01/01/2016 – 31/12/2029
	24 hours	25	-	4	01/01/2030
	1 year	25	-	0	Immediate
	1 year	20	-	0	01/01/2016 – 31/12/2029
	1 year	15	-	0	01/01/2030
Ozone (O_3)[e]	8 hours	120	61	11	Immediate
Lead (Pb) [f]	1 year	0.5	-	0	Immediate
Carbon monoxide (CO)[g]	1 hour	30,000	26,000	88	Immediate
	8 hour (1 hour averages)	10,000	8,700	11	Immediate
Benzene (C_6H_6) [h]	1 year	5	1.6	0	01/01/2015

a. *The reference method for the analysis of SO_2 shall be ISO 6767*
b. *The reference method for the analysis of NO_2 shall be ISO 7996*
c. *The reference method for the determination of the particulate matter fraction of suspended particulate matter shall be EN 12341*
d. *The reference method for the analysis of $PM_{2.5}$ shall be EN14907*
e. *The reference method for the analysis of ozone shall be the UV photometric method as described in ISO 13964*
f. *The reference method for the analysis of lead shall be ISO 9855*
g. *The reference method for analysis of CO shall be ISO 4224*
h. *The reference methods for benzene sampling and analysis shall be either EPA compendium method TO-14 A or method TO-17*

The National Dust Control Regulations (GN R.827), which were promulgated on 1 November 2013, define acceptable dust fall rates for residential and non-residential areas as listed in Table 2-6.

Table 2-6: Acceptable dust fall rates

Defined areas	Dust fall rate (mg/m²/day over a 30 day average)	Permitted frequency of exceedance
Residential areas	Dust fall < 600	Two per annum (not in sequential months)
Non-residential areas	600 < Dust fall < 1 200	Two per annum (not in sequential months)

Although Glencore will not require an atmospheric emission licence for its proposed operations at the Phoenix Opencast and ATC Office Pits, it will have to operate within the NAAQS and the National Dust Control Regulations.

2.6 Need and Desirability of Proposed Activities

South Africa is endowed with large coal reserves. The Department of Minerals and Energy, in its *South Africa's Mineral Industry 2001/2 Report*, estimated economically recoverable coal reserves at 55.3 billion tonnes. The largest coal deposits occur in the Ecca Group a stratum of the Karoo Super group, dating back between 280 and 250 million years. The Ecca Group is extensive, covering around two thirds of South Africa and contains more than a third of all coal reserves in the Southern Hemisphere.

South Africa is one of the seven largest coal producing and one of the top five coal exporting countries in the world. In 2004, the coal and lignite mining industry generated a gross income of R39 billion and directly employed 50,000 people (Coal in South Africa, 2014).

Coal plays a vital role in South Africa's energy economy. It accounts for 70% of primary energy consumption, 93% of electricity generation and 30% of petroleum liquid fuels. In terms of sales value, coal is currently the most valuable mineral in South Africa and it is essential not only for electricity generation and poverty alleviation, but also in the production of steel, cement, liquid fuels and chemicals (Eberhard, A;, 2011).

At least five large Eskom power stations will still be in operation after 2040. Coal is expected to be the second largest source of primary energy and the largest source for electricity generation in the next 30 years, during which time Eskom will need about four billion tons of coal. Coal exports are also important to the South African economy, particularly at this time of a precarious current account deficit.

Coal is South Africa's third largest source of foreign exchange, platinum being the largest and gold second (Hall, I;, 2014).

The iMpunzi Phoenix and Office Pits project is aimed at augmenting coal supplies to Eskom and export markets. Other benefits of the project include employment and income generation in the area as well as the development of BEE opportunities during construction, operation and eventual closure and rehabilitation.

2.7 Period for which Environmental Authorisation is required

According to the latest mine plan, mining at these areas will commence in 2026 and 2025 respectively. Coal will be mined in these areas by means of the truck and shovel method following a roll over progression. The coal mined at the Office and Phoenix Pit areas will be processed at the existing ATC Plant and ATCOM Central Plant respectively. The Office Pit area has an estimated Life of Mine (LOM) of 3-4 years and the LOM of the ATC Office Pits is estimated at three years.

To accommodate the time needed for construction, operations, closure and rehabilitation, the authorisation is required for a period of 25 years.

2.8 Process followed to identify preferred sites

2.8.1 Project alternatives

In terms of Regulation 50 (d) of the MPRDA Regulations R. 527 under the Mineral and Petroleum Resources Development Act, Act 28 of 2002, an environmental impact assessment report must include *inter alia* the following:

> *"(d) A comparative assessment of the identified land use and development alternatives and their potential environmental, social and cultural impacts."*

Alternatives considered for the proposed project are as follows:

2.8.1.1 Opencast vs Underground Mining

The coal reserves that are to be mined at the Office and Phoenix Pit areas are rather shallow, with the target #4 seam reserves being approximately 20 meters below the surface. Underground mining of these comparatively small reserves would be uneconomical and thus the opencast option is preferred.

2.8.1.2 Location of Infrastructure

As mentioned in section 2.4.1, of this report, the larger iMpunzi operation is an existing mining operation with the associated supporting infrastructure (processing plants, stockpiles etc.) in place.

The only infrastructural components envisaged for the Office and Phoenix Pit operations are those associated with the operational management of the opencast pits:

- Haul roads for the transportation of coal ore form the pits to the various processing plants; and
- Diversion trenches and water channels for the conveyance of storm water around the pits.

The locations of these infrastructural components have been chosen with practical, economic, logistical and environmental considerations in mind.

2.8.1.3 No Project Option

The coal situated in the Office and Phoenix Pit areas is considered good quality coal. If these reserves are left unmined, the economic benefits to Glencore and its employees and the spin-off socio-economic benefits to the local communities and businesses would not materialise.

2.9 Public participation process

This section provides an overview of the public participation process undertaken during the scoping phase of the EIA.

2.9.1 Objectives of public participation

The public participation process was designed to provide information to and receive feedback from interested and affected parties (I&AP) for use throughout the EIA process, thus providing organisations and individuals with an opportunity to raise concerns and make comments and suggestions regarding the proposed Project. By being part of the assessment process, stakeholders had the opportunity to influence the Plan of Study of the EIA.

Opportunities for Comment

Documents were made available at various stages during the EIA process to provide stakeholders with information, further opportunities to identify issues of concern and suggestions for enhanced benefits and to verify that the issues raised have been considered.

The principles that determine communication with society at large are included in the principles of the National Environmental Management Act (NEMA) (Act 107of 1998, as amended) and are elaborated upon in General Notice 657, titled *"Guideline 4: Public Participation"* (Department of Environmental Affairs and Tourism, 19 May, 2006), which states that: *"Public participation process means a process in which potential interested and affected parties (I&APs) are given an opportunity to comment on, or raise issues relevant to, specific matters."*

Public participation is an essential and regulatory requirement for an environmental authorisation process, and was undertaken in terms of Regulations 39 to 44 of the EIA regulations GN R.982 (8 December 2014). Public participation is a process that is intended to lead to a joint effort by stakeholders, technical specialists, the authorities and the proponent/developer who work together to produce better decisions than if they had acted independently.

The public participation process was designed to provide sufficient and accessible information to I&APs in an objective manner and:

During the Scoping Phase to enable them to:

- Understand the context of the EIA;
- Become informed and educated about the proposed project and its potential impacts;
- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their comments, issues of concern and suggestions have been recorded;
- Assist in identifying reasonable alternatives; and
- Contribute relevant local information and traditional knowledge to the environmental assessment.

During the impact assessment phase to assist them to:

- Contribute relevant information and local and traditional knowledge to the environmental assessment;

- Verify that their issues and suggestions have been evaluated and considered in the environmental investigations and feedback has been provided;
- Comment on the findings of the EIA; and
- Identify further issues of concern from the findings of the EIA.

During the decision-making phase:

- To advise I&APs of the outcome, i.e. the authority decision, and how the decision can be appealed.

Table 2-4 provides an overview of the typical flow of a public participation process and how it integrates with the technical environmental assessment process.

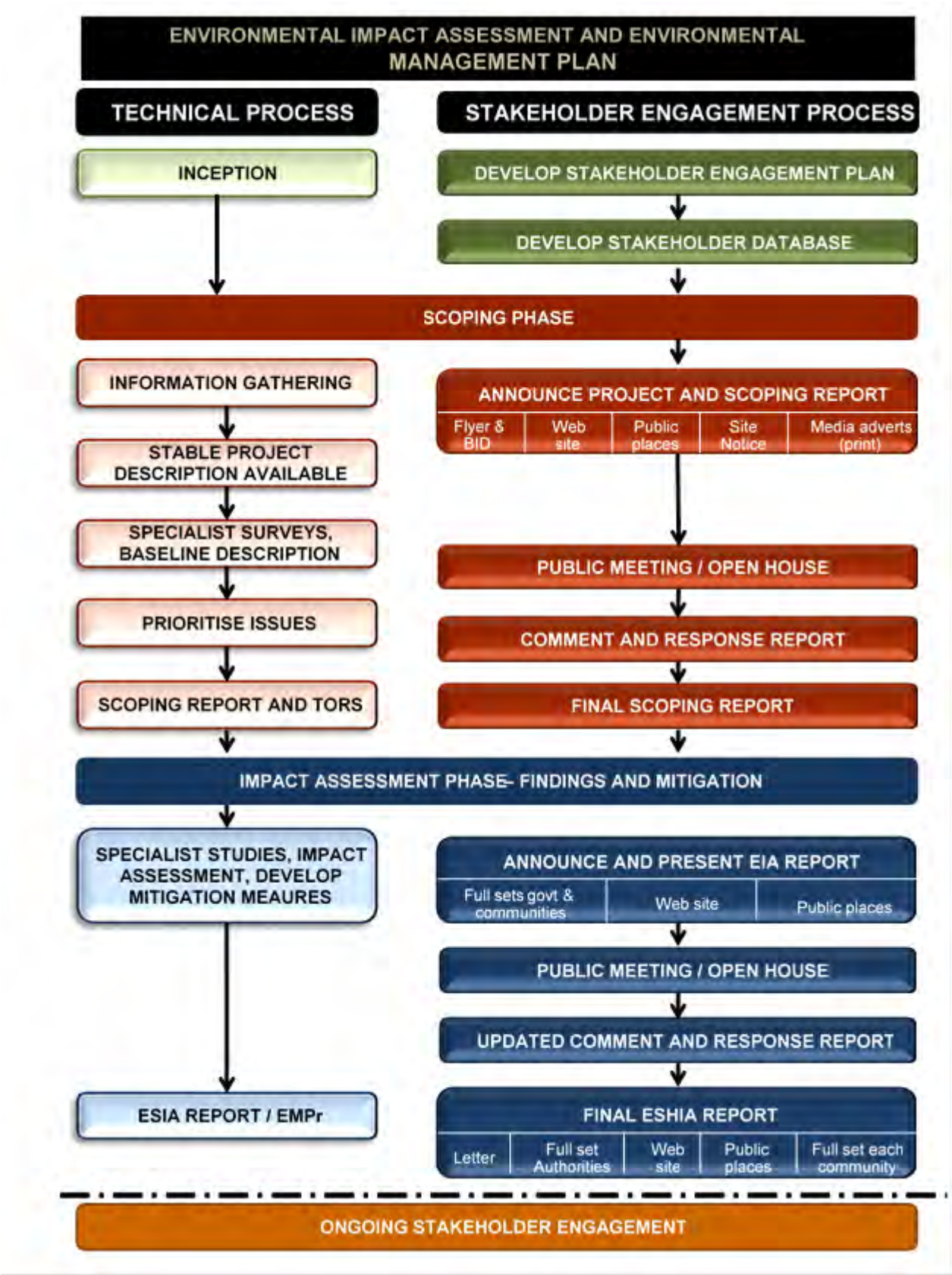


Figure 2-4: The flow diagram shows the typical structure of the EIA process

2.9.2 Pre-Scoping Phase: Capacity Building

IFC PS 1 stipulates that stakeholder consultation should include *elements of capacity building* to ensure the process is considered "*free, prior and informed*".

As mentioned above, iMpunzi is an existing operation which has been in operation for many years. Apart from the fact that landowners and residents in the area have been exposed to mining developments in the area for years, Glencore's Community Liaison Officers have been in regular contact with adjacent landowners and affected communities. During these meetings, Glencore explained the mining processes and associated impacts, and provided progress feedback.

2.9.2.1 Identification of I&APs

I&APs were initially identified through a process of networking and referral, obtaining information from iMpunzi's existing stakeholder database, liaison with potentially affected parties in the vicinity of the project area, newspaper advertisements and a registration process requiring I&APs to complete and submit a registration and comment sheet.

2.9.2.2 Register of I&APs

The NEMA Regulations distinguish between I&AP's and *registered* I&APs.

I&APs, as contemplated in Section 24(4) (d) of the NEMA include: "*(a) any person, group of persons or organisation interested in or affected by an activity; and (b) any organ of state that may have jurisdiction over any aspect of the activity".*

In terms of the Regulations:

"An EAP managing an application must open and maintain a register which contains the names, contact details and addresses of:

(a) All persons who; have submitted written comments or attended meetings with the applicant or EAP;
(b) All persons who; have requested the applicant or EAP managing the application, in writing, for their names to be placed on the register; and
(c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

Registering as an I&AP

Stakeholders could register as I&APs at any time during the EIA process by contacting the public participation office as indicated on page ii of this report.

A register for I&APs was opened after announcement of the project and it currently comprises 283 stakeholders. APPENDIX C shows the list of I&APs who received information about the proposed project.

The I&AP register was updated throughout the scoping and EIA phase. As required by the EIA Regulations, subsequent notifications about the EIA process and availability of EIA documents were sent to *registered* I&APs only.

2.9.2.3 Public participation during Scoping

This section provides a summary of the public participation process followed during the Scoping Phase of the EIA.

2.9.2.4 Scoping Report

The Scoping Report was made available for public review for 30 days from ***the 17th of June 2016* until the 18th of July 2016.** Stakeholders were invited to participate in the EIA and public participation process, to pass on the information to friends/colleagues/neighbours who may be interested and to register as I&APs. Furthermore, the registration and comment sheet included a sentence encouraging I&AP's to indicate the names of their colleagues and friends who may also be interested in participating.

The proposed project was announced as follows:

- Distribution of a letter of invitation to participate and announcing the availability of the Draft Scoping Report to all I&APs on the database, accompanied by a registration and comment sheet that was mailed/emailed to the entire stakeholder database. In addition, the registration and comment sheet was also available online via the Golder website (http://www.golder.com/public). Copies of the letter and registration and comment sheet are attached as APPENDIX D;
- Placing site notices on the boundary of the proposed project area (see APPENDIX E);
- Publishing a mandatory advertisement in the local newspaper, namely the ***Witbank News*** on ***the 17th of June 2016*** (see APPENDIX E);
- Placing the abovementioned documents at the public places listed below (also refer to page ii of this document) and posting them to the Golder website www.golder.com/public; and
- Capturing the comments received in a Comment and Response Report (see APPENDIX F)**.**

Name of Public Place	Contact Person	Contact Number
Ogies Public Library	Librarian	013-643-1027
Emalahleni Public Library	Ms Maria Rozmiarek	013-690-6232
Ogies Clinic	Sister Choko Motau	013-643-2037

2.9.2.5 Final Scoping Report

The Scoping Report was updated and submitted to the Department of Mineral Resources (DMR), the Department of Water and Sanitation (DWS) and the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) for consideration. The document was also made available on the Golder website www.golder.com/public.

2.9.2.6 Summary of issues raised by I&APs

A summary of the issues raised during the scoping phase include the following:

Environmental impacts

- I&APs expressed concern about the impacts of the proposed project on soil as well as surface water and groundwater.

Public participation process

- I&APs indicated that due process should be followed and that adjacent communities should be consulted, preferably by means of convening public meetings.

The Comment and Response Report (see APPENDIX F) contains the issues that were raised.

2.10 Public participation during the Impact Assessment Phase

Public participation during the impact assessment phase of the EIA entailed a public review of the findings of the EIA, as presented in the Draft EIA Report and Environmental Management Programme (EMPr), and the specialist studies. These reports were made available for public comment for a period of 30 days, from the

23rd September 2016 to 24 October 2016. They were made available at the public places listed on page ii of this Report and posted to the Golder website www.golder.com/public.

2.10.1 Notification of interested and affected parties

All registered I&AP's were advised timeously and by e-mail, fax or telephone call of the availability of these reports, which they could either download from Golder's public website or request from Golder's Public Participation Office. They were encouraged to comment either in writing (mail or email) or by telephone.

2.10.2 Final EIA report/ EMPr

A draft EIA/EMPr Report has been compiled after completion of all the specialist studies. These reports along with the draft EIA/EMPr have been made available for public comment for a period of 30 days.

All the issues, comments and suggestions raised during the comment period on the draft EIA Report/EMPr will be added to the Comments and Response Report (CRR) that accompanies the Final EIA Report/EMPr. The Final EIA Report/EMPr will be submitted to the Department of Mineral Resources (DMR), and the Department of Water and Sanitation (DWS).

On submission of the Final EIA Report/EMPr to the authorities, a personalised letter will be sent to every registered I&AP to inform them of the submission and the opportunity to request copies of the final reports.

2.11 Notification of authority decision

Registered I&APs will receive a letter to notify them of the decision taken by the competent authority on whether or not the proposed project may proceed. The letter will also include information on the appeal process.

2.12 Environmental Attributes and Description of the Baseline Receiving Environment

This section of the report provides a description of the receiving environment and existing conditions on and in the vicinity of the proposed project. Information elaborated upon in this section was partially sourced from the Consolidated Tavistock EIA and EMPr amendment, XST 1364, dated April 2014, (Digby Wells 2014), the Integrated Water and Waste Management Plan for iMpunzi Colliery and various specialist studies referenced in the text.

2.12.1 Geology

The iMpunzi Complex falls within the southern margin of the central portion of the Witbank-Springs Coalfield. The coalfield is underlain by pre-Karoo formations, mainly Bushveld felsite. Historic glaciation events resulted in the deposition of tillite (Dwyka Formation) over most of the area. Within the Karoo Sedimentary Sequence the Ecca Group rests on top of the Dwyka Formation. In the Witbank-Springs Coalfields the coal bearing Vryheid Formation occur at the bottom of the Ecca Group conformably to the underlying Dwyka Formation.

The Dwyka Formation consists of tillite, siltstone and sometimes a thin shale development. The Ecca Group consists predominantly of sandstone, siltstone, shale and coal. The Vryheid Formation in the Ecca Group contains five bituminous coal seams, numbered as No. 1 to No. 5 from bottom to top. The No. 2, No. 4 and No. 5 seams are the most economical coal seams to mine in the Witbank-Springs Coalfield.

2.12.2 Climate

Regional Climate

iMpunzi is situated within the "Highveld" climatic region of South Africa, which has a warm, mild, summer rainfall climate. Precipitation occurs as showers and thunderstorms mainly from October to March, with the maximum rain fall occurring in November through to January. Rainstorms are often violent with severe lightning and strong winds, occasionally accompanied by hail. The winter months are dry with the combined rainfall in June, July, and August making up less than 5% of the annual total precipitation.

Sunshine is abundant and cloud cover is meagre over the region, consequently annual potential evaporation is higher than average annual rainfall, as in most of the rest of the country. Winds, usually light except during thunderstorms, are generally from the north-west, north or north-east.

Temperature

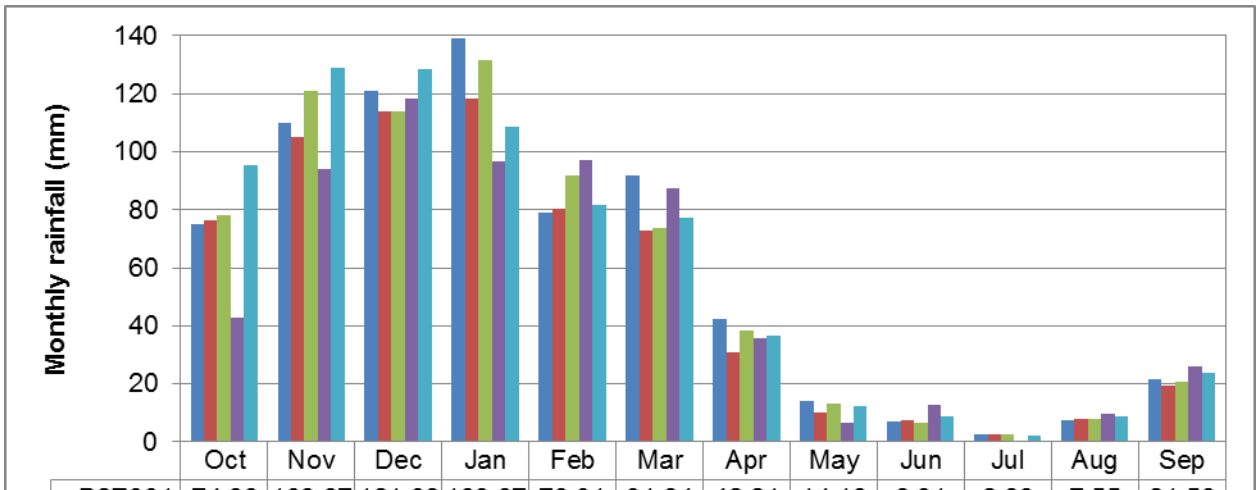
Maximum daily temperatures occur during February with average daily maximum temperatures reaching up to 26.6 °C. During July, average daily maximum temperatures seldom rise above 18.4 °C. The mean daily minimum temperatures vary between 15 °C in summer months and 4.2 °C during winter. Extremely cold mean daily minimum temperatures of 3.3 °C have occurred in the past.

Rainfall

Information regarding the rainfall was sourced from the Surface Water Specialist Report for iMpunzi Office and Phoenix Pits, 1538558-299271-1, January 2016, (Golder 2016).Rainfall data was found using the Department of Water and Sanitation's (DWS) website Daily Rainfall Extraction Utility (Department of Water Affairs, 2008) in the area around the iMpunzi Complex site.

Figure 2-5 shows the average monthly rainfall distributions for the five rainfall stations in the eMalahleni area for the duration of the rainfall record period. It can be seen that the monthly rainfall is fairly uniform with the exception of B1E005 which may be due to its relatively short record period. The B1E001 Witbank @ Witbank Dam station was chosen as the station most representative, as it represented the average among the stations analysed and further due to its distance from iMpunzi and also its 45 year data record period.

The mean annual rainfall for B1E001 Witbank @ Witbank Dam station is 700.5 mm. The lowest rainfall year was 1965 with 377.5 mm and the highest rainfall year was 1995 with 1 111.7 mm.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
B2E001	74.93	109.97	121.06	138.87	79.01	91.64	42.21	14.13	6.91	2.63	7.55	21.58
B1E003	76.51	105.04	114.03	118.30	80.36	72.95	30.86	10.14	7.34	2.73	7.93	19.37
B1E001	78.30	121.02	114.09	131.53	91.80	73.88	38.46	13.38	6.78	2.81	7.74	20.71
B1E005	42.72	94.23	118.37	96.56	97.22	87.58	35.87	6.53	12.73	0.47	9.73	26.10
B1E004	95.38	128.84	128.57	108.83	81.63	77.36	36.44	12.38	8.80	2.23	8.63	23.74

Figure 2-5: Monthly rainfall distribution for rainfall stations in the eMalahleni area

The higher monthly rainfalls occur between November and February while very little rain falls between May and August.

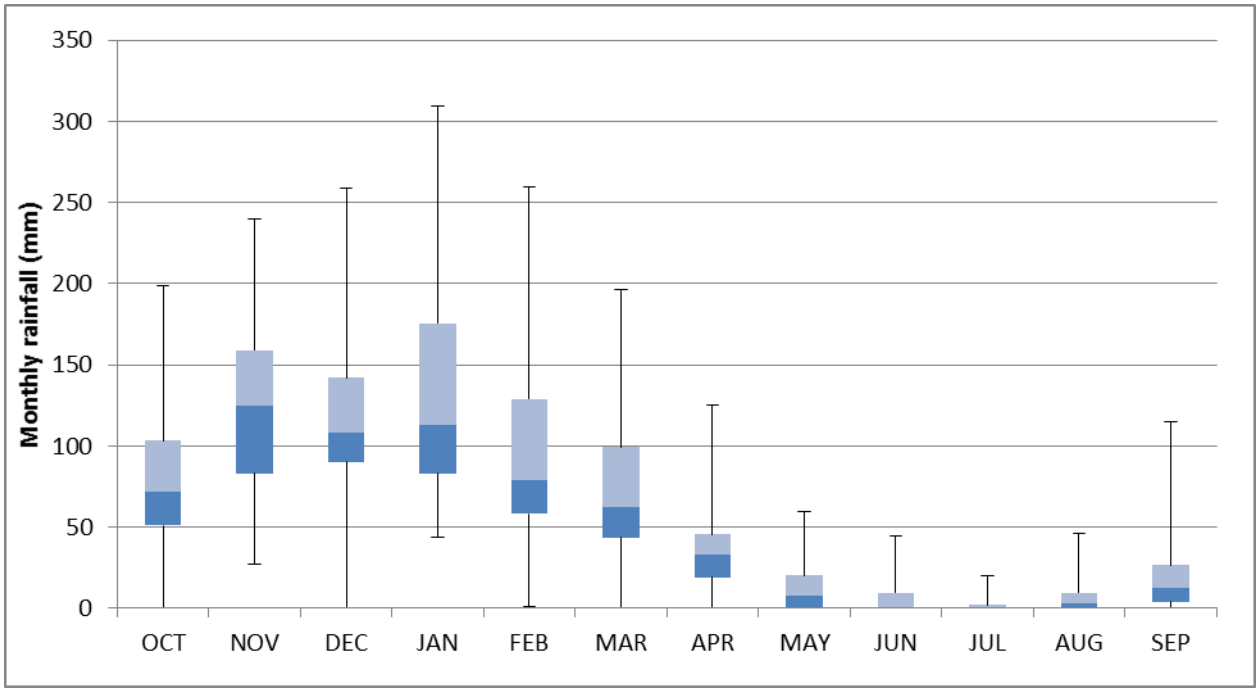


Figure 2-6: Monthly rainfall boxplot for B1E001 Witbank @ Witbank Dam station

Evaporation

The mean annual S-pan evaporation depth in the area for station B1E001 is 1 441 mm/annum.

Table 2-7 below summarises the average monthly evaporation values for station B1E001.

Table 2-7: Average monthly S-pan potential evaporation for B1E001 station

Month	Monthly Evaporation (mm)
Oct	161.03
Nov	156.65
Dec	161.92
Jan	156.69
Feb	136.99
Mar	126.15
Apr	95.32
May	78.07
Jun	64.30
Jul	71.24
Aug	97.36
Sep	134.99
Annual Evaporation (mm)	**1440.70**

2.12.3 Air quality

Air pollution in the region arises from the numerous mining operations, farming activities and coal-fired power stations in the area. Sources of dust pollution at the mines include dust entrainment from haul roads, blasting in opencast sections, discard dumps and soil stockpiles.

There is a small community situated to the south-east of the existing iMpunzi operations and also the proposed Office and Phoenix pit area (see Figure 2-7), which is considered the main sensitive receptor in terms of air quality, noise, vibration and blasting. iMpunzi, in conjunction with the larger Glencore contingent in the areas, has a comprehensive dust fall monitoring network. Dust fall monitoring takes place on a monthly basis as part of the iMpunzi air quality monitoring programme. The locations of air quality monitoring points are illustrated below in Figure 2-8.

Based upon the findings of the most recent monitoring period, the National Dust Control Regulation standards for residential and industrial areas were exceeded on a number of occasions. Exceedances of the daily and annual average National Ambient Air Quality Standards for PM_{10} and $PM_{2.5}$ concentrations were also recorded at iMpunzi.

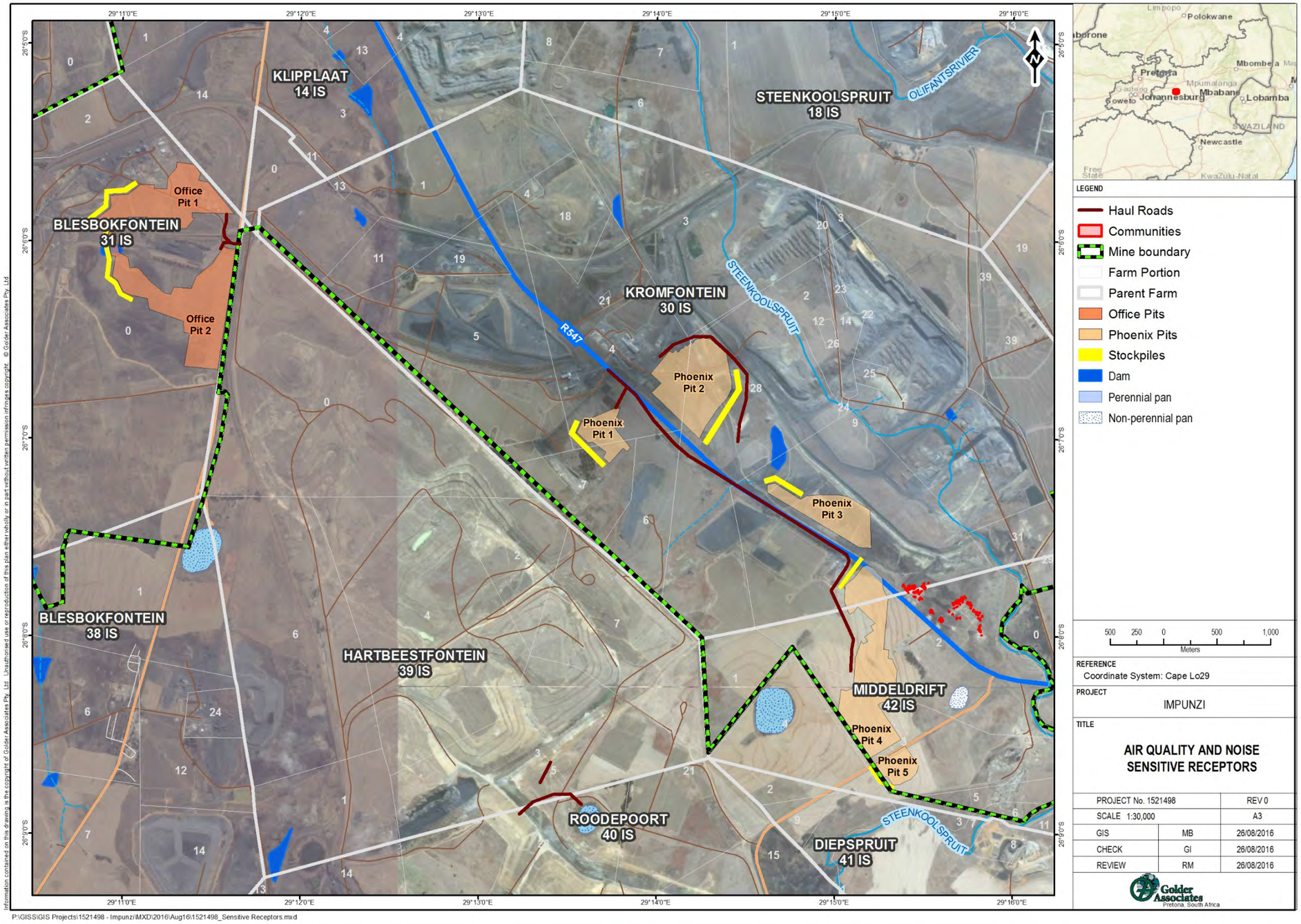


Figure 2-7: Air quality and noise sensitive receptors in proximity of the Office and Phoenix areas.

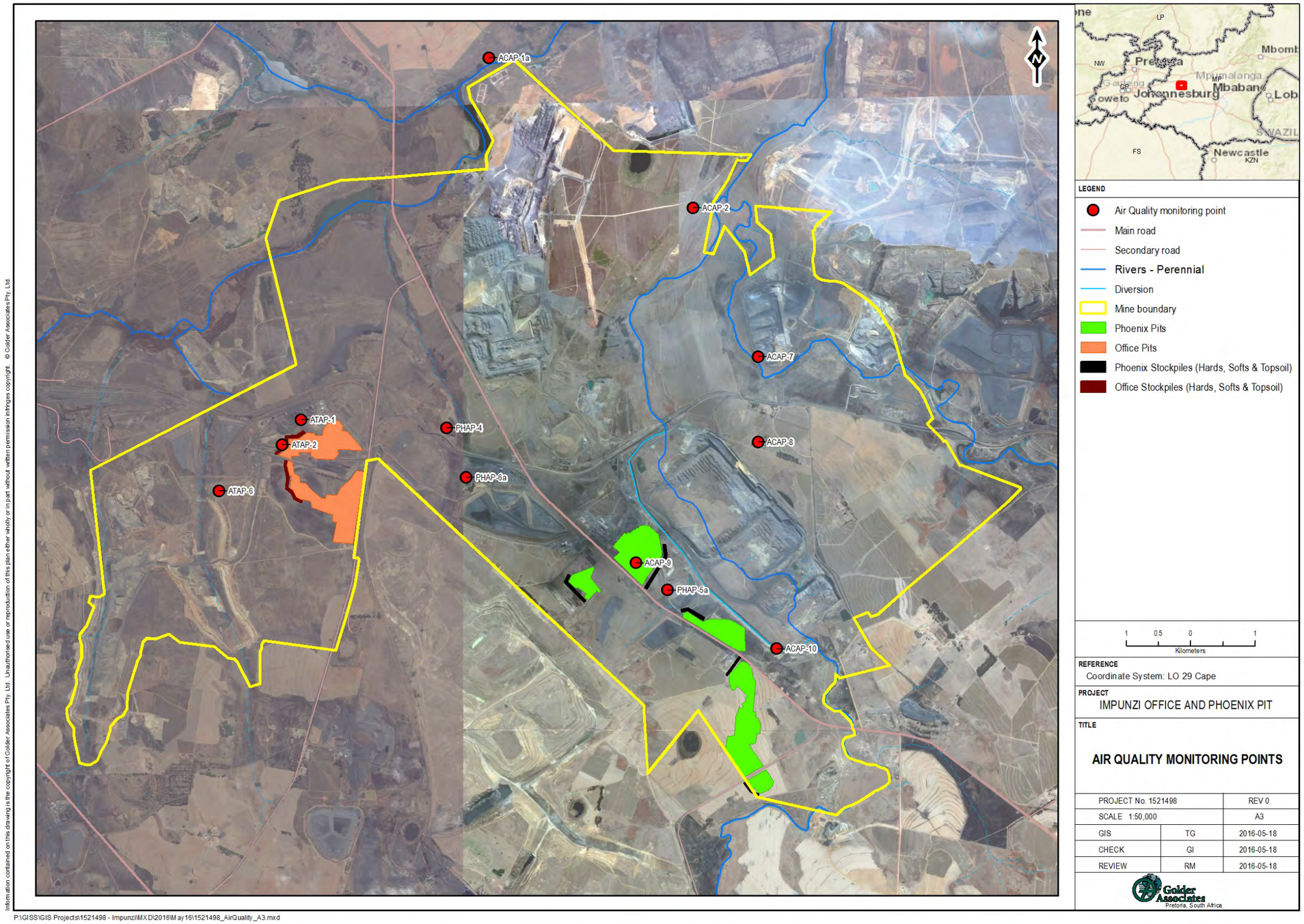


Figure 2-8: Air Quality Monitoring points at iMpunzi

2.12.4 Noise

Mining activities in an around iMpunzi all contribute to noise levels. A limited amount of noise pollution from the mining activities arises from opencast blasting, movements of haul trucks, conveyors, ventilation fans and beneficiation plants The noise impacts are specific to the various sites throughout the property and do not cause significant public nuisance. A number of noise monitoring points have been put in place on site, see Figure 2-9 below.

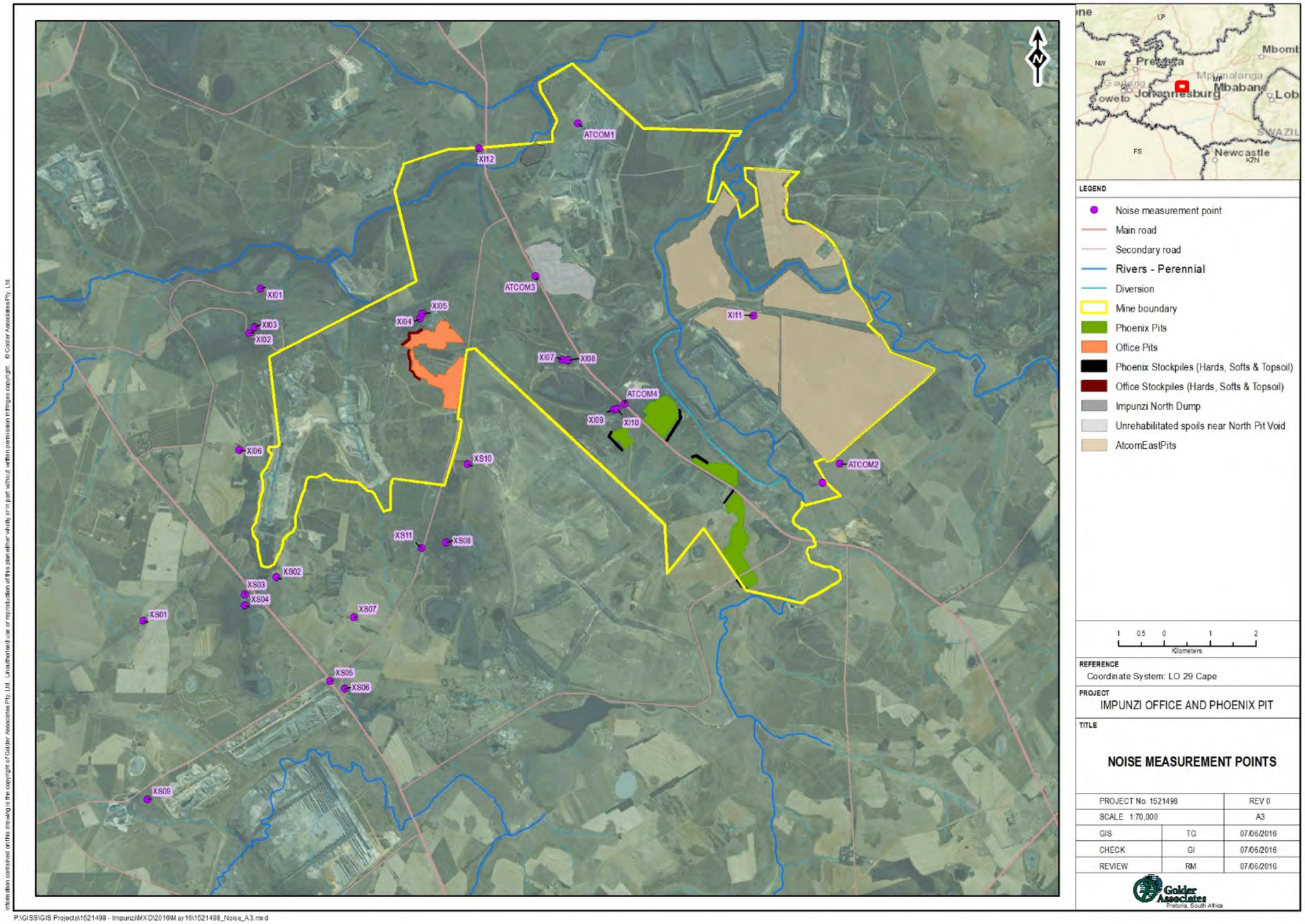


Figure 2-9: Noise monitoring points in the iMpunzi area

2.12.5 Visual

iMpunzi is not situated on any main tourist routes and most of the traffic on surrounding roads is of local origin and is associated with local businesses. Mine infrastructure, such as the conveyor belts, loading bins and discard dumps are clearly visible from the main roads. However, these do not represent an anomalous view, since the whole region is dotted with coal mines and power stations and mining is a long standing activity in the region. Dust is visible during windy and dry conditions. The visual impact is thus limited to road users and associated routes. The mine is not visible from any major freeways or towns.

2.12.6 Topography

The iMpunzi area has a gently undulating topography, characteristic of the underlying rocks of the Karoo sequence. Most of the area has a natural slope of less than 8 % and topographic elevations generally range from 1520 to 1620 meters above mean sea level (mamsl). It is important to note however that the topography of the larger iMpunzi area has been significantly altered through past mining activities. Opencast voids, pits, stockpiles, discard facilities and infrastructure complexes have changed the natural topography.

2.12.7 Soils

A number studies have been undertaken at iMpunzi, generating significant amounts of information on the soils found in the area, the land capability and the land use.

The soils in the study area are characteristic of a typical Highveld catena with a complexity of soil forms occupying different topographical localities. The soil types in the study area can be grouped into three categories, according to their topographical locations in the landscape. This includes soils of the upland regions, middle slopes and soils of drainage lines and seepage areas. Two non-soil related units, based on disturbances are also identified, namely disturbed area (Dst) and excavated trenches (Exp).

Deep, free draining red soils of the Hutton and Bainsvlei Forms occur in the upland regions overlying dolerite dykes. Where the parent material consists of quartzitic sandstone, yellow-brown apedal soils of the Avalon, Clovelly and Glencoe Forms are found. Soils of the Mispah Form occur where a shallow orthic A-horizon overlies hard rock.

Avalon Form soils are found on the upper middle slope regions where drainage is somewhat restricted. These soils often occur near Longlands and Glencoe Form soils lower on the slope, where iron and manganese oxides have accumulated to form a layer of soft or hard plinthite, respectively. Westleigh form soils are found where a yellow brown apedal layer is replaced by a soft plinthite layer. Wasbank Form soils occur in zones of periodic wetness, where iron and manganese oxides have accumulated to form an indurated layer of hard plinthite.

A fair portion of the study area consists of soils which, due to their position in the landscape, are either seasonally or permanently wet. They often have pale-coloured, leached upper horizons, which overlie gleyed, mottled or indurated subsoil horizons. Longlands form soils occur where the leached upper horizons overlie a soft plinthic horizon. Kroonstad and Katspruit Form Soils are found in wetland and vlei areas alongside rivers and around prominent pan features.

A summary of the soils' agricultural potential and suitability for rehabilitation is provided below in Table 2-8.

Table 2-8: Summary of soil types and agricultural potential at the iMpunzi

Soil form	General soil description	Agricultural potential			Suitability for rehabilitation	
		Properties affecting potential	Irrigation potential	Dryland potential	Upper soil	Lower soil
Hutton (Hu)	Reddish brown sandy loam with gradually increasing clay to red sandy clay loam with no soil restrictions to at least 1 500 mm.	Rapidly permeable, deep soil with no restricting layers <1 500 mm.	High	High	Upper 1 000 mm is very good soil for rehabilitation.	Subsoil is acceptable for rehabilitation.
Avalon (Av)	Dark brown sandy clay loam overlies yellowish brown sandy clay loam becoming mottled reddish orange at about 600 mm and grey brown mottled red at about 800 mm.	Under moist climatic conditions has good potential, however can be fairly wet.	Moderately low	Fairly good	Upper 600 mm is good soil for rehabilitation	Mottled wettish soil not ideal for rehabilitation.
Glencoe (Gc)	Dark yellowish brown sandy loam overlies strong brown sandy clay loam becoming mottled at about 600 mm and overlying ferricrete at 1 000 mm	Soils tend to be waterlogged after rain.	Low	Moderately low	Top 600 mm is good material for rehabilitation.	Concretionary containing layer (ferricrete) not suitable.
Longlands (Lo)	Very dark greyish brown sandy loam overlies brown sandy loam leached layer often mottled reddish brown overlying grey mottled high clay at 450 mm.	Seasonally wet soils.	Low	Low	Sandy and infertile - poor rehabilitation material.	Not suitable.
Westleigh (We)	A dark brown sandy loam (400 mm) overlies a mottled reddish brown to grey brown mottled red at 600 mm plus.	Soil too wet to consider agricultural practices.	Very low	Low	Material above the mottled subsoil may be used.	The mottled subsoil is not good for rehabilitation.
Wasbank (Wa)	Dark yellowish brown loamy sand overlies pale brown sandy leached layer often mottled onto hard plinthite at 500 mm.	Soil usually compacted –difficult to cultivate. Poorly drained.	Low	Low	Good quality – limited to 300 mm.	Subsoil very shallow.
Mispah (Ms)	Dark brown sandy loam overlies weathered sandstone at 500 mm.	Soil wet following rain and dry other times.	Very low	Low	Sandy and infertile - poor material.	-
Clovelly (Cv)	A brown sandy loam overlies a yellowish brown sandy clay loam.	Excellent dryland cropping soils.	Moderately high	High	Upper 800mm is good soil for rehabilitation.	Subsoil is also suitable for rehabilitation.
Bainsvlei (Bv)	A dark reddish brown sandy loam with increasing clay content and iron nodules overlies soft plinthite at approximately 1 000 mm .	Soil not free draining under high rainfall conditions.	Fairly good	High	Soil containing iron nodules is usable for rehabilitation.	Soft plinthite, not very suitable.
Dresden (Dr)	Very shallow, grey, imperfectly- drained, sandy soils underlain by hard plinthite. Part of a temporary wetland zone.	Very shallow, imperfectly-drained, hard plinthite.	Low	Low	Sandy and infertile – poor suitability.	Not suitable.
Fernwood (Fw)	Deep, grey, imperfectly-drained, sandy soils underlain by weathered rock. Part of a temporary wetland zone.	Poorly drained, infertile.	Low	Low	Sandy and infertile – poor suitability.	Not suitable.
Kroonstad (Kd)	Shallow, grey, imperfectly-drained, sandy soils underlain by gleyed clay. Part of a seasonal wetland zone.	Poorly drained, high clay content, infertile.	Very low	Very low	Not suitable.	Not suitable.
Dist	Disturbed areas where natural soils are disturbed, removed or contaminated by mining activities.	-	Low	Low	-	-
Exp	Excavation - deep drainage channel.	-	None	None	-	-

2.12.8 Land Capability and Use

Land capability is generally determined by evaluating and categorising soil properties such as effective soil depth, mechanical limitations, internal drainage, soil texture, soil structure, erosion susceptibility and slope percentage. According to the Chamber of Mines (COM) 1991 guideline the land capability of the iMpunzi area can be classified into the following four classes:

- Wetland: The wetland areas are defined in terms of the wetland delineation guidelines, which use both soil topography as well as botanic criteria to define the limits to this domain. In general, wetland soils are dominated by hydromorphic soils and plant life that is associated with aquatic processes. The soils are generally dark grey to black in the topsoil horizons, high in transported clays, and show pronounced mottling on greyed backgrounds in the subsoils. These soils occur within the zone of groundwater influence;
- Arable land: The land capable of sustaining arable crop production will require the utilisation of the deep, well drained, yellow-brown (Clovelly) soils that occur on the mid slope and upper mid slope positions. In addition, there are some of the deeper hydromorphic soil forms that are capable of sustaining agricultural crop production, if good management practices are employed. The more structured and shallow hydromorphic soils are not considered to be arable soils under the classification;
- Grazing land: The areas that can be classified as grazing land are generally confined to the shallower, transitional zone, hydromorphic soil forms that are moderately well drained. These soils are generally darker in colour and are not always free draining. They occur to a depth of 750 mm, but are capable of sustaining palatable plant species on a sustainable basis, especially since only the subsoils (at a depth of 500 mm) are periodically saturated. In addition, there should be no rocks or pedocrete fragments in the upper horizons of any of the soil groups, which would limit the land capability to wilderness land; and
- Wilderness: The areas that classify as either conservation or wilderness land are associated with the shallower and rockier soils.

The major land use in the iMpunzi area is mining and its associated activities. Other minor land uses include agriculture, particularly maize production, fallow land recently utilised for agriculture and grazing, as well as vacant land.

2.12.9 Ecology

Significant ecological work has been done in the larger iMpunzi area, and has collectively lead to a comprehensive understanding of the flora and fauna species that occur in the area. The information outlined below is sourced from the Consolidated Tavistock EIA and EMPR amendment, XST 1364, dated April 2014, (Digby Wells 2014).

Flora

iMpunzi falls in the Grassland Biome which is found mainly on the high central plateau of South Africa, and the inland areas of KwaZulu Natal and the Eastern Cape.

Grasslands are dominated by a single layer of grasses and the amount of cover depends on rainfall and the degree of grazing. These grasslands are maintained largely by the combination of relatively high summer rainfall and fires, frost and grazing, which preclude the presence of shrubs and trees.

More specifically, the study area falls within the False Grassveld Vegetation Biome. This is a mixture of open savannah and sour bushveld. Historically the entire region has been subject to intensive farming, and as a consequence a large proportion of the area was under maize prior to mining. At present the vegetation in the natural pastures is dominated by weeping lovegrass (*Eragrostis curvula*), couch grasses, predominantly kweekgras (*Cynodon dactylon*), Khaki bush (*Tagetes minuta*) and black jack (*Bidens pilosa*). In the low-lying areas vlei grasses and forbes are common. In disturbed areas such as old maize lands cattail dropseed (*Sporobulus pyrimidalis*), goose grass (*Eleusine indica*) and wild melons are common.

More specifically, the study area falls within the False Grassveld Vegetation Biome. The veld type is known as Bankenveld (Type no. 61). A more recent classification of the vegetation types of South Africa describes the veld type as the "Moist Sandy Highveld Grassland" (Type no. 38).

According to a biodiversity study and management plan conducted at iMpunzi, the larger area can be divided into four Biodiversity Management Units (BMU's) with high biodiversity conservation value, namely BMU1 (Valley bottom wetlands), BMU2 (Pans), BMU3 (Shrub land and Herb land) and BMU4 (Primary grassland).

- BMU1: Includes the various channelled and un-channelled valley –bottom wetlands occurring in the iMpunzi area, as well as the floodplains and riparian habitats of the Olifants River, Steenkoolspruit and Zaaiwaterspruit;
- BMU2:Includes the large pan areas on the northern boundary of the iMpunzi area;
- BMU3: Occurs on sandstone scarps and ridges above the Olifants River, the Steenkoolspruit and the Zaaiwaterspruit; and
- BMU4: This BMU occurs in fragmented areas across the entire iMpunzi area with the largest area occurring in the Atcom area.

The biodiversity management actions of the mine should be focused on these BMU's. Two BMU's were classified as having moderate value in terms of biodiversity value. These BMU's also justify some effort in terms of biodiversity management on the mine. The remainder of the BMU's were classified as having low to negligible value in terms of biodiversity conservation.

Alien invasive and exotic species found in the study area have been categorised according to the Conservation of Agricultural Resources Act as Category 1 plants (*) and Category 2 plants (**).

Table 2-9: Alien invasive species identified at iMpunzi

Species name	Common name	Ecological status	Growth form
Acacia dealbata	Silver wattle	Alien Invasive**	Tree
Amaranthus hybridus	Pigweed	Weed	Shrub
Argemone mexicana	Mexican poppy	Exotic	Shrub
Aristida junciformis	Ngongoni Three-awn	Invasive	Grass
Bidens formosa	Cosmos	Alien Invasive	Herb
Bidens pilosa	Black Jack	Weed	Shrub
Bromus catharticus	Rescue Grass	Alien Invasive	Grass
Conyza albida	Tall Fleabane	Weed	Herb
Conyza bonariensis	Horseweed	Weed	Herb
Cortaderia selloana	Pampas grass	Weed	Shrub
Cyperus esculentus	Yellow nutsedge	Weed	Sedge
Datura stramonium	Thorny apple	Exotic	Shrub
Digitaria sanguinalis	Crab finger grass	Exotic	Grass
Eucalyptus camaldulensis	Red River Gum	Alien Invasive**	Tree
Galinsoga parviflora	Gallant Soldier	Alien Invasive	Herb
Gomphrena celosioides	Batchelor's Button	Exotic	Herb

Kylinga erecta		Weed	Sedge
Melia azedarach	Seringa	Exotic	Tree
Oenothera rosea	Rose Evening Primrose	Alien Invasive	Herb
Paspalum notatum	Bahia grass	Invader	Grass
Pennisetum clandestinum	Kikuyu	Exotic	Grass
Persicaria lapathifolia	Spotted knotweed	Weed	Herb
Phytolacca octandra	Inkberry	Exotic	Shrub
Populus x canescens	Grey Poplar	Exotic	Tree
Richardia brasiliensis	Tropical Richardia	Alien Invasive	Herb
Ricinus communis	Castor oil plant	Weed	Herb
Schkuhria pinnata	Dwarf marigold	Weed	Herb
Solanum incanum	Thorn apple	Alien Invasive	Shrub
Solanum panduriforme	Yellow Bitter-apple	Medicinal/Alien	Shrub
Solanum sisymbrifolium	Wild Tomato	Alien invasive*	Shrublet
Tagetes minuta	Tall Khaki Weed	Alien Invasive	Herb
Verbena bonariensis	Tall Verbena	Alien invasive	Shrub

No threatened or near threatened species were found during the various biodiversity studies conducted onsite, but species which are on the orange list (Least Concern- Declining) either recorded or likely to occur, are listed below in Table 2-10.

Table 2-10: Orange list species (Least Concern-Declining) recorded onsite or likely or occur

Species	Family	BMU where recorded or where likely to occur
Boophone disticha	Amarylidaceae	BMU 1 and BMU 2
Callilepis leptophylla	Asteraceae	BMU 1 and BMU 2
Crinum bulbispermum	Amaryllidaceae	BMU 1 and BMU 2
Hypoxis hemerocallidea	Hypoxidaceae	BMU 1

Fauna (Mammals)

Similar to the floral information presented above, a number of studies have described the faunal situation at iMpunzi. This information is summarised below. The remaining viable habitat at iMpunzi is mostly fragmented, with anthropogenic activities (mining, buildings, roads, agricultural fields, train tracks and fences) isolating areas of viable habitat. The relative abundance of mammals observed on site during the various studies conducted is less than may be expected in grassland areas of similar size.

Limited remaining habitat around the pans and drainage lines, the isolation of pans from other natural grasslands by agricultural fields, the lack of refuges, the proximity of human dwellings and human activities are among the reasons for scarcity, and influences what species will still occur in the area. It is probable that other rodent species also occur at many of the sites, but this could only be determined by trapping. Larger

mammals appear to occur at low densities and species such as mongoose appear to be persecuted according to the flight behaviour of individuals seen. Many larger mammals are likely to be transient due to persecution and the lack of refuges. All mammals that have been observed fall into the Least Concern Red Data category.

Mammal species encountered are common residents of the Highveld Grassland and none of them are protected species. All species were found at sites in areas where natural habitat was available, and not in rehabilitated areas. Animals were found within areas of preference, e.g. Water mongoose (*Atilax paludinosus*) was found close to areas where permanent water is available, while the Common duiker (*Sylvicapra grimmia*) was found within dense tall grass stands, also close to permanent water. No particular site was found to contain a high percentage of mammals; however, the number of mammals seen on each site will increase with the amount of observation time spent on the particular site.

During the various surveys undertaken in 2006, 2007 and 2011 the following species were seen:

- Black-backed jackal (*Canis mesomelas*);
- Cape clawless otter (*Aonyx capensis*);
- Serval (*Felis serval*);
- Yellow mongoose (*Cynictis penicullata*);
- Slender mongoose (*Galerella sanguinea*);
- Water mongoose (*Atilax paludinosus*);
- Dwarf mongoose (*Helogale parvula*);
- Aardvark (*Orycteropus afer*);
- Warthog (*Phacochoerus aethiopicus*);
- Grey duiker (*Sylvicapra grimmia*);
- Steenbok (*Raphicerus campestris*);
- Springbok (*Antidorcas marsupialis*);
- Cape Porcupine (*Hystrix africaeaustralis*);
- Greater Canerat (*Thryonomys swinderianus*);
- Common Molerat (*Cryptomys hottentotus*);
- Brants' (Highveld) Gerbil (*Tatera brantsii*);
- Vlei Rat (*Otomys irroratus*);
- Angoni Vlei Rat (*Otomys angoniensis*);
- Striped mouse (*Rhabdomys pumilio*);
- Water Rat (*Dasymys incomtus*);
- Namaqua Rock Mouse (*Aethomys namaquensis*);
- Single-striped Mouse (*Lemniscomys rosalia*);
- Multimammate mouse (*Mastomys coucha*);
- Scrub hare (*Lepus saxatilis*); and
- Jameson’s red rock rabbit (*Pronolagus randensis*).

Avifauna (Birds)

Bird species that were observed in the study area include three near threatened bird species, the Melodious Lark (*Mirafra cheniana*), the Grass Owl (*Tyto capensis*) and the Blue Korhaan (*Eupodotis caerulescens*). One vulnerable species, the Greater Flamingo (*Phoenicopterus ruber*) was also sighted.

The Blue Korhaan has decreased in numbers in the east of its range in the face of dense human settlement and extensive agriculture and other threats that impinge on its grassland habitat. Given that the future of the Grassland Biome is under severe threat, this endemic species should be monitored. The Grass Owl has a preference for wet grassland and vlei areas where it nests on the ground. Its main threats include habitat degradation and destruction and disturbance to its nesting sites by people and various farm stock animals. To preserve this species its breeding habitat will need to be preserved. The Greater Flamingo has its core range in the central areas of South Africa where its occurrence matches the distribution of endorheic pans. A decline in the populations can be attributed to soda ash and salt mining at breeding sites, disturbance by low-flying aircraft, fences across water bodies, collision with utility lines, fluctuating water levels and other forms of human interference (Barnes, 2000).

A total of 88 bird species were observed at iMpunzi during surveys in 2006, 2007 and 2011.

Herpetofauna (Reptiles and Amphibians)

The herpetofauna of wetlands in general tends to be poor due to a paucity of habitat diversity. In addition, they are difficult to see in a dense field layer in grasslands and go into hiding when disturbed. Special attention was given to the rocky outcrops, but no sightings were recorded during the various surveys. It is therefore difficult to assess their presence or absence.

Given the abundance of wetlands in the area and the diversity of aquatic habitats, it is expected that amphibian diversity is high. The same can be said for reptiles with regard to the diversity of terrestrial habitats and the availability of food.

The frequency of grass fires is detrimental to the existence of reptiles and amphibians not only directly, but also indirectly as they are exposed to predation following the removal of cover, which will result in reduced abundance and possibly in local extinctions of some species.

The lack of reptile and amphibian sightings is by no means an indication of their absence. The abundance of favourable habitat and remoteness of many of the areas is actually an indication of a high probability of their presence. The reason for the very few reptile and amphibian diversities recorded within the area of interest, is because of the degraded state of the area. This low species diversity may be attributed to mining and associated activities that have occurred in the area historically and currently.

Terrestrial invertebrates

The number of represented families collected during the Biodiversity Assessment was relatively high for the Grassland Biome, based on other assessments done in grasslands in the Witbank Coalfields area. The reason for this is that areas sampled are still relatively natural sites and a diversity of habitats were sampled within the area such as rocky outcrops, pans and areas along rivers.

Key conclusions

The larger iMpunzi and surrounding area is comprised mainly of highly impacted landscapes, either through mining, agricultural or other anthropogenic activities. The movement of wildlife is certainly impacted by these activities, influencing the habitat connectivity for free range species. It is important to note that the proposed new developments at iMpunzi are relatively small compared to the extent of the rest of the operation and also the regional extent of the mining operations in the vicinity.

2.12.10 Surface Water

Water management area

iMpunzi falls within the upper Olifants river catchment, water management area 4, upstream of the Witbank dam catchment area. The quaternary catchments associated with the larger iMpunzi Complex are B11B,

B11E and B11F, while the office and phoenix pits areas will fall specifically in the B11E and B11F catchments (see Figure 2-10). The iMpunzi Complex falls within the Upper Olifants River Water Management area, which is sub-divided into 9 smaller management units. The iMpunzi Complex falls within MU5 and MU7 (Atc, Phoenix and Atcom) as well as MU9 (portion of Atcom East) of these smaller units.

Surface water hydrology

The larger iMpunzi Complex is characterised by a number of surface watercourses namely; the Zaaiwaterspruit, Olifants River and the Steenkoolspruit all flow through portions of the larger iMpunzi Complex. These watercourses generally flow in a North-North-Western direction towards and ultimately into the Witbank dam, which supplies urban and industrial water to Emalahleni and Middelburg.

In terms of the more project specific nature of this EIA report/EMPr, the most important and relevant watercourse associated with the iMpunzi Complex is the Steenkoolspruit. The course of the Steenkoolspruit was historically diverted to allow access to coal reserves at the current South Pit Area. It was initially intended for the river diversion to be a temporary structure, but as elaborated upon above, Glencore has recently received authorisation to permanently divert the Steenkoolspruit.

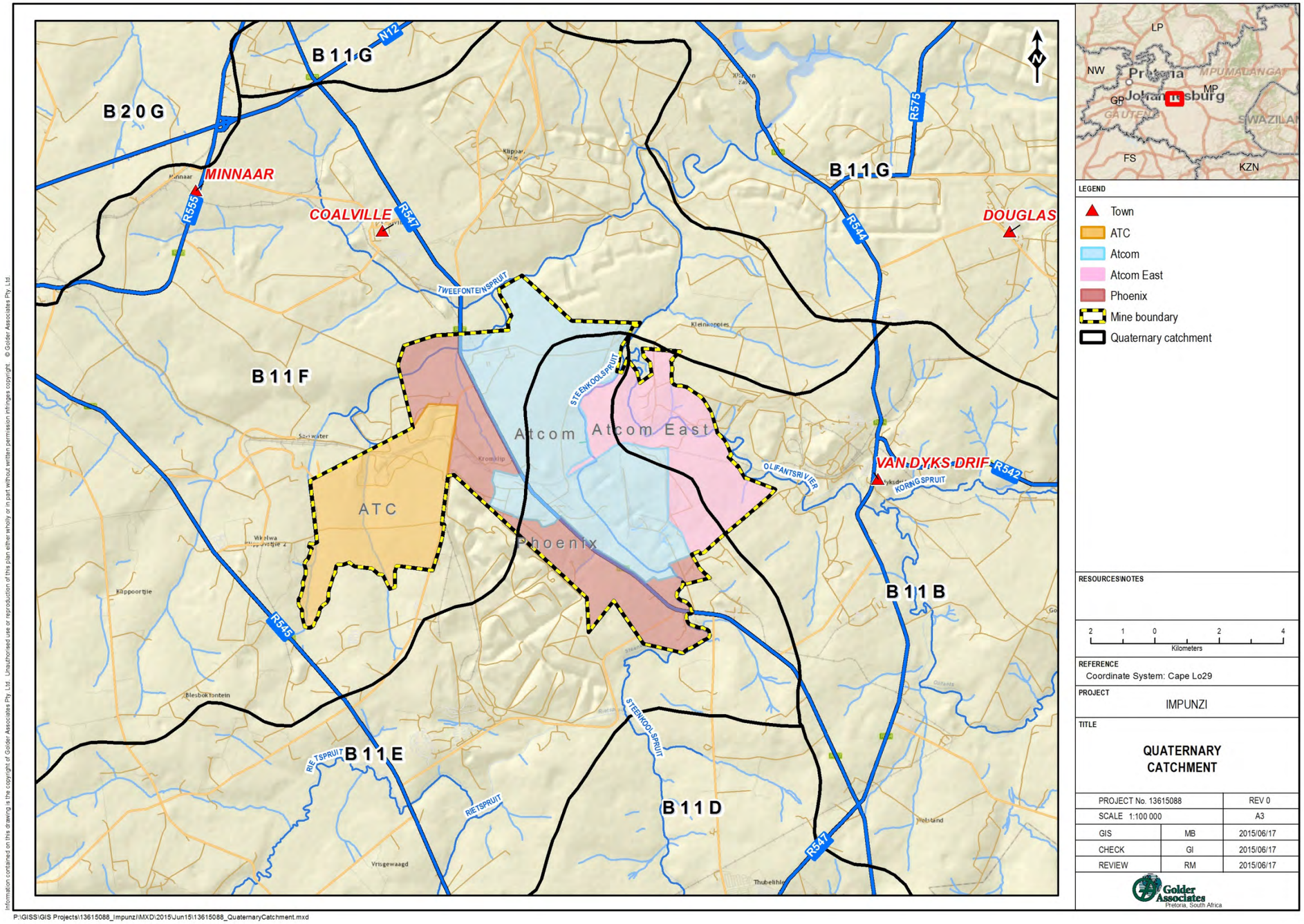


Figure 2-10: iMpunzi quaternary catchments.

Surface water quality

The current water quality status was arrived at by analysing the data provided by the mining complex. The data spanned the period January 2012 to July 2014 and represented monthly sampling. This produced an average of 30 samples per month. In addition to the actual point of discharge, five (5) surface water monitoring points were assessed. These were:

- PHSR-3 (also a controlled release and DWS monitoring point – B1H021);
- ACSR-3 - Olifants river, before confluence with Steenkoolspruit;
- ACSR-2 - Olifants river pump station after the Olifants-Steenkoolspruit confluence; and
- ACSR-4 - Steenkoolspruit, downstream from ATCOM and 250 m upstream of proposed discharge point.

The figures below show the median, minimum, maximum and 95th percentile parameter values of the selected monitoring points for the period January 2012 to July 2014, see Figure 2-12, and Figure 2-13). The values are compared to the Resource Water Quality Objectives (RWQO) set for Management Unit (MU) 7 (and MU9 – for ACSR-2 surface water sampling point).

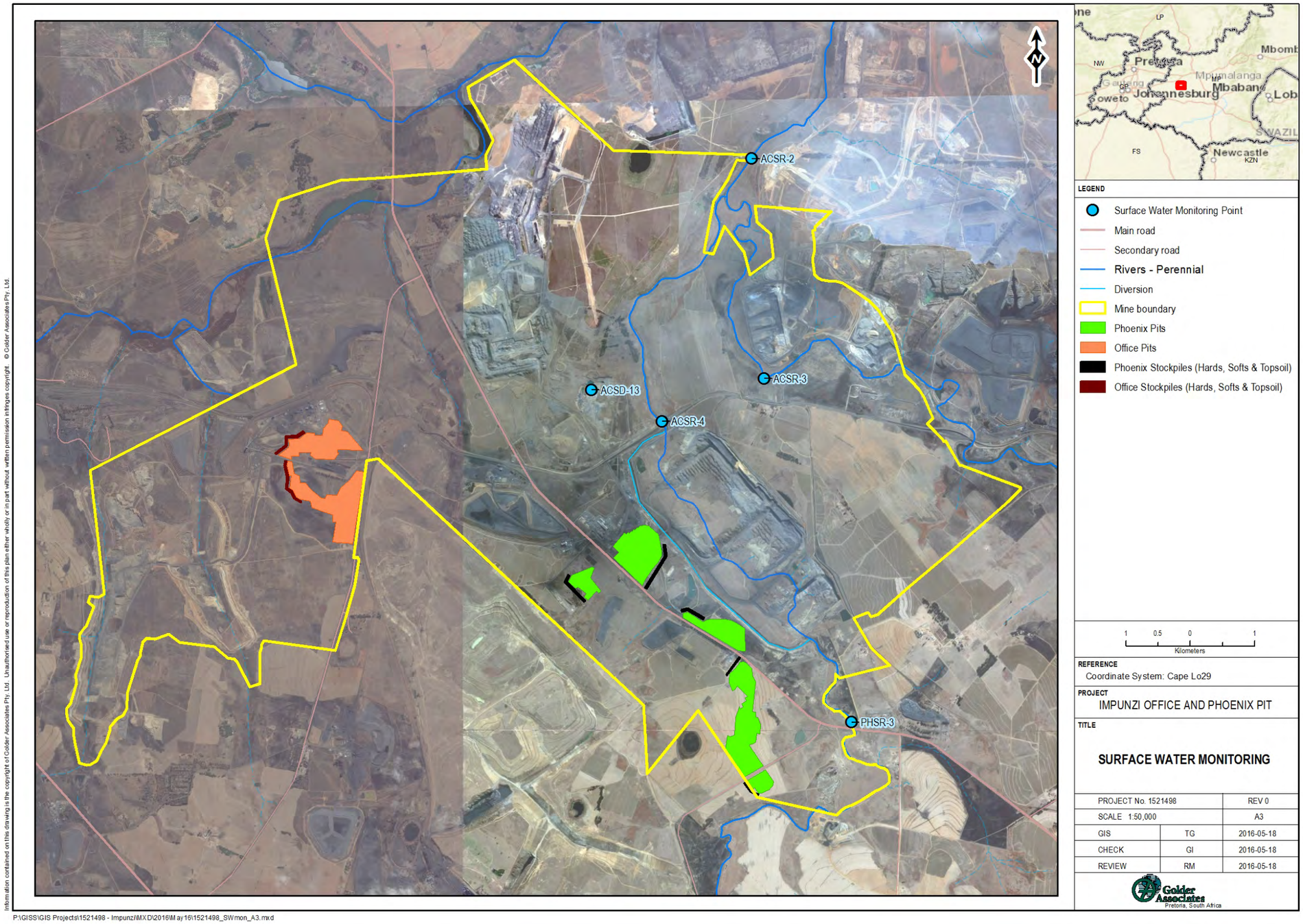


Figure 2-11: iMpunzi surface water monitoring points

Water quality constituent	Units	RWQO MU7	ACSD-13				ACSR-4				B1H021				PHSR-3			
			Median	Min	Max	95th	Median	Min	Max	95th	Median	Min	Max	95th	Median	Min	Max	95th
Conventional																		
Total Alkalinity as CaCO3	mg/l	-	1	1	8	8	104	66	180	157	118	63	**223**	**198**	105	37	184	161
Electrical Conductivity as EC	mS/m	70	**1168**	**887**	**2430**	**2430**	48	28	**155**	**84**	40	25	**88**	66	37	26	61	57
pH	pH units	6.5 to 8.4	2.46	1.94	2.61	2.61	8.29	7.40	**9.40**	**9.20**	7.68	6.81	**9.21**	**8.52**	8.15	7.26	**9.10**	**9.00**
Total Dissolved Solids as TDS	mg/l	450	**14210**	**8777**	**37228**	**37228**	302	177	**1191**	**605**	245	162	**618**	434	217	133	424	360
Major Ions																		
Calcium as Ca	mg/l	150	**493**	**312**	**576**	**576**	37	24	138	70	28	15	113	50	26	19	45	40
Chloride as Cl	mg/l	25	11	3	**48**	**48**	16	5	**41**	**37**	22	12	**48**	**40**	15	7	**38**	**35**
Fluoride (mg/L)	mg/l	1	0.5	0.0	**274.0**	**274.0**	0.3	0.0	0.5	0.5	0.4	0.1	0.7	0.6	0.3	0.0	0.7	0.5
Magnesium as Mg	mg/l	70	1699	1034	4971	4971	25	13	113	48	17	10	37	31	16	12	29	25
Sodium as Na	mg/l	70	31	15	**75**	**75**	23	12	**85**	57	31	16	64	57	23	8	**103**	**99**
Sulphate as SO4	mg/l	140	**11486**	**7280**	**31380**	**31380**	111	37	**836**	**312**	59	30	**236**	116	49	22	**185**	**148**
Dissolved Metals																		
Aluminium as Al	mg/l	0.02	**267.50**	**231.00**	**876.00**	**876.00**	0.00	0.00	-0.10	-0.10	**0.09**	-0.01	**6.00**	**0.49**	0.00	0.00	**1.77**	**0.10**
Iron as Fe	mg/l	1	**1244.0**	**421.0**	**2948.0**	**2948.0**	0.0	0.0	0.1	0.1	0.1	0.0	**1.7**	0.6	0.0	0.0	**1.6**	0.3
Manganese as Mn	mg/l	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note Figures in red illustrate exceedances of the Receiving Water Quality Objectives*

Figure 2-12: Water quality statistical results for iMpunzi Complex for selected monitoring points

Water quality constituent	Units	RWQO MU9	ACSR-2				ACSR-3			
			Median	Min	Max	95th	Median	Min	Max	95th
Conventional										
Total Alkalinity as CaCO3	mg/l	120	107	28	**167**	**149**	130	45	191	184
Electrical Conductivity as EC	mS/m	70	55	25	136	132	84	31	202	187
pH	pH units	6.5 to 8.4	8.11	7.70	**9.70**	**9.00**	8.19	7.25	**8.90**	**8.51**
Total Dissolved Solids as TDS	mg/l	450	369	171	1043	912	563	161	1736	1688
Major Ions										
Calcium as Ca	mg/l	150	48	20	116	113	69	22	196	189
Chloride as Cl	mg/l	25	18	7	**35**	**33**	21	10	65	60
Fluoride (mg/L)	mg/l	1	0.4	0.0	0.7	0.6	0.4	0.0	0.8	0.5
Magnesium as Mg	mg/l	70	30	8	95	84	46	13	170	154
Sodium as Na	mg/l	70	27	9	**567**	70	41	8	125	122
Sulphate as SO4	mg/l	200	140	61	652	566	293	50	1120	1078
Dissolved Metals										
Aluminium as Al	mg/l	0.02	0.00	0.00	0.10	0.10	0.00	0.00	0.10	0.10
Iron as Fe	mg/l	1	0.0	0.0	0.1	0.1	0.0	0.0	0.6	0.3
Manganese as Mn	mg/l	0.4	-	-	-	-	-	-	-	-

Note Figures in red illustrate exceedances of the Receiving Water Quality Objectives*

Figure 2-13: Water quality statistical results for iMpunzi Complex for selected monitoring points (continued)

Flow monitoring

The DWS maintains river flow monitoring stations in the area surrounding iMpunzi. Two flow stations are in close proximity to the operation. One is located downstream and the other upstream of the proposed Office and Phoenix pits. The upstream station B1H021 has flow data from 12/10/1990 to 21/10/2015 while the downstream station B1H005 has flow data from 13/07/1972 to 21/10/2015. Figure 2-14 shows the locations of the two flow stations. The downstream station is located on the Olifants River after the confluence with the Steenkoolspruit and Tweefonteinspruit, which accounts for the high flows. Table 2-11 shows the flow monitoring stations information.

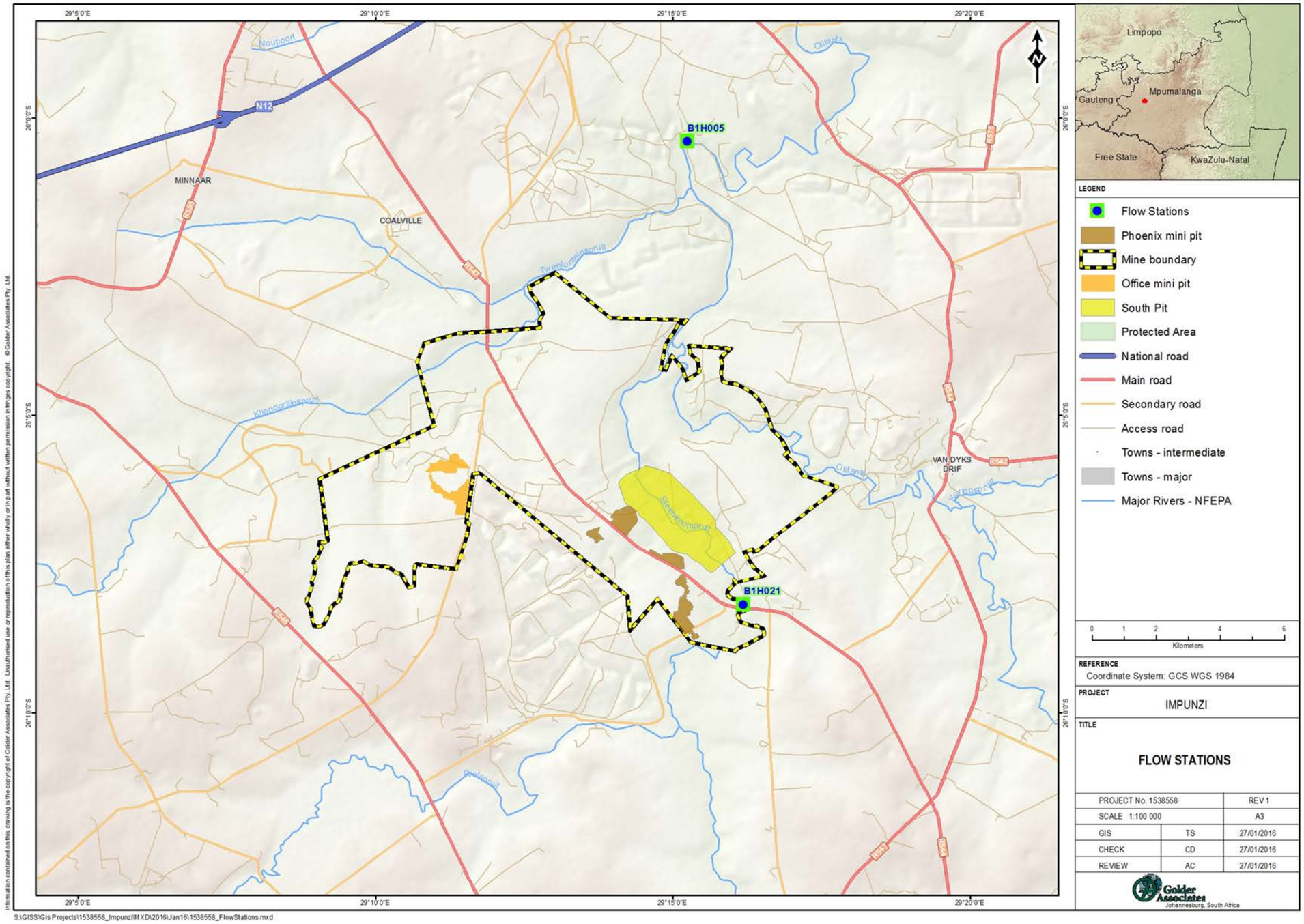


Figure 2-14: Flow monitoring stations in the eMalahleni area

Table 2-11: Flow monitoring stations in the eMalahleni area

Station name	Station	Latitude	Longitude	Catchment area (km²)	River	Location
Steenkoolspruit @ Middeldrift	B1H021	26°08'10"S	29°16'11"E	1356.3	Steenkoolspruit	Upstream
Olifants River @ Wolwekrans	B1H005	26°00'23"S	29°15'14"E	3256	Olifants	Downstream

Daily flow for station B1H021 in the Steenkoolspruit is shown in Figure 2-15.

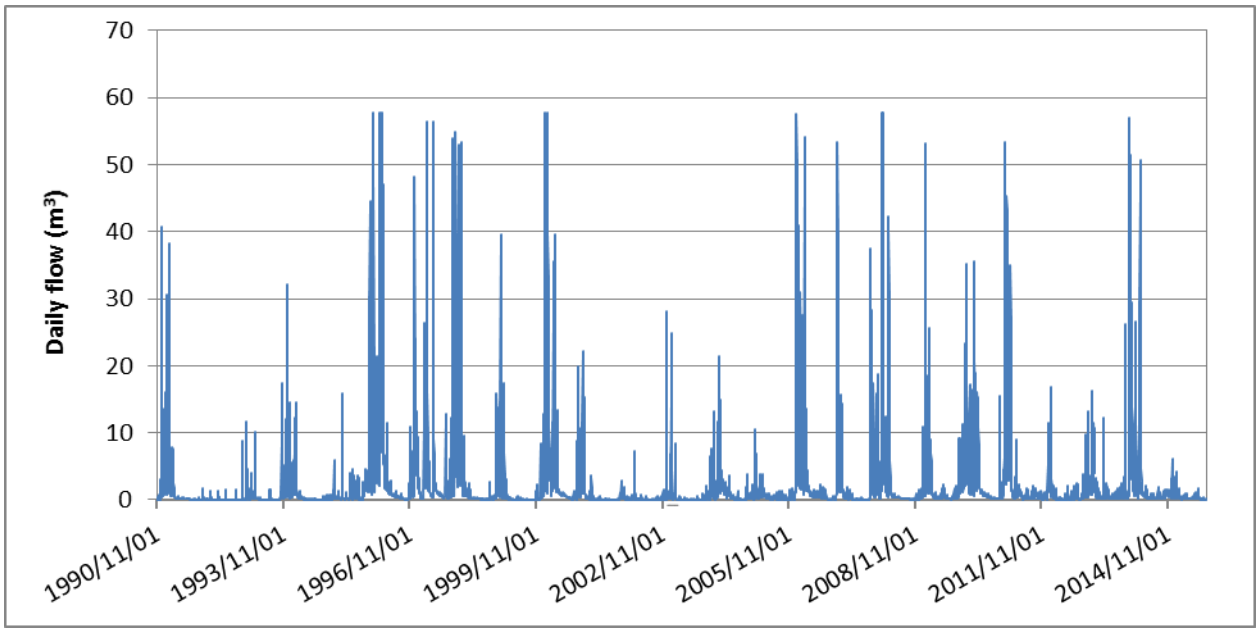


Figure 2-15: Daily flow data measured at flow station B1H021 Steenkoolspruit @ Middeldrift

Figure 2-16 shows the box and whisker plot for station B1H021.

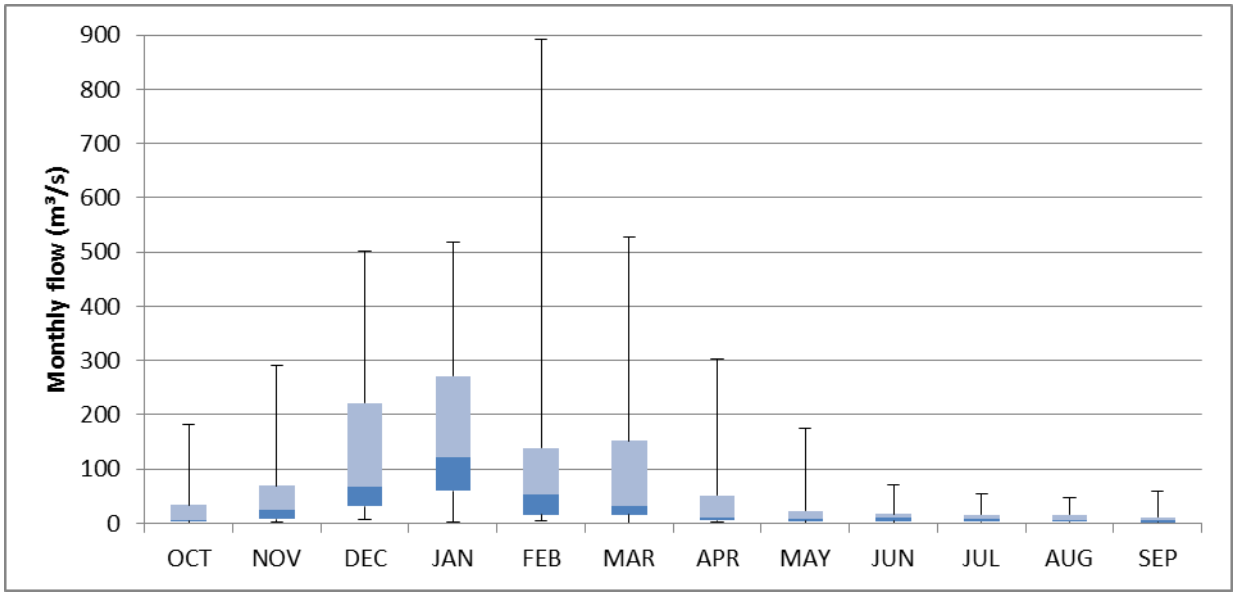


Figure 2-16: Boxplot for flow monitoring station B1H021 Steenkoolspruit @ Middledrift

Daily flow for station B1H005 in the Olifants is shown in Figure 2-17.

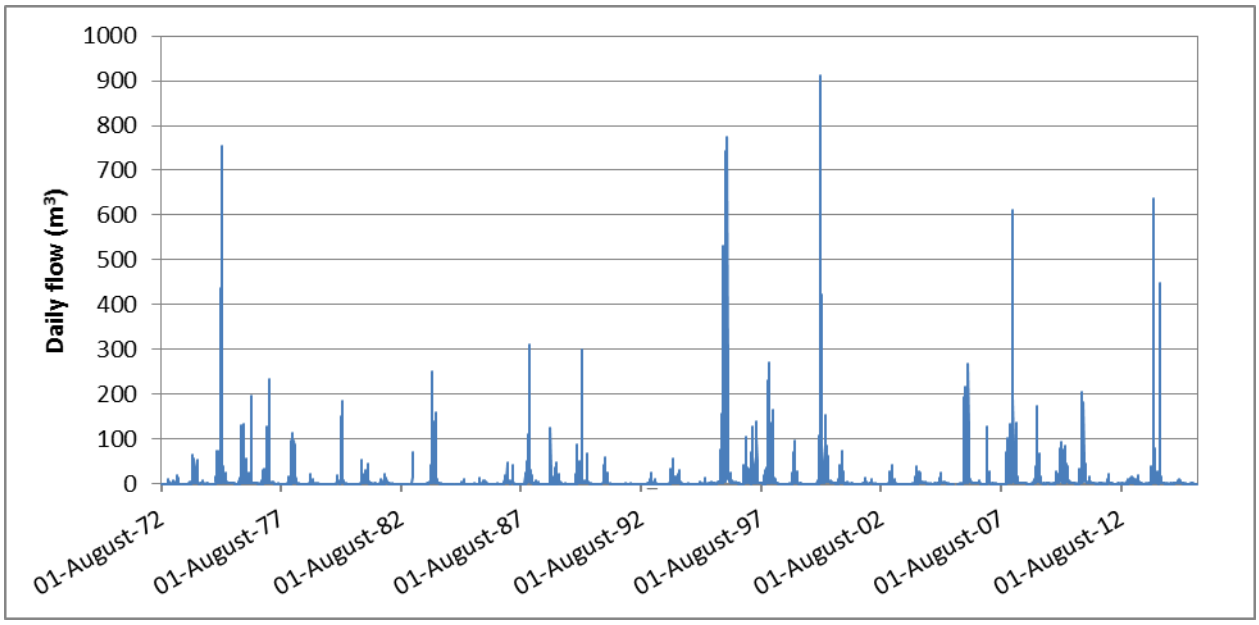


Figure 2-17: Daily flow data measured at flow station B1H005 Olifants River @ Wolvekrans

Figure 2-18 shows the box and whisker plot for station B1H005.

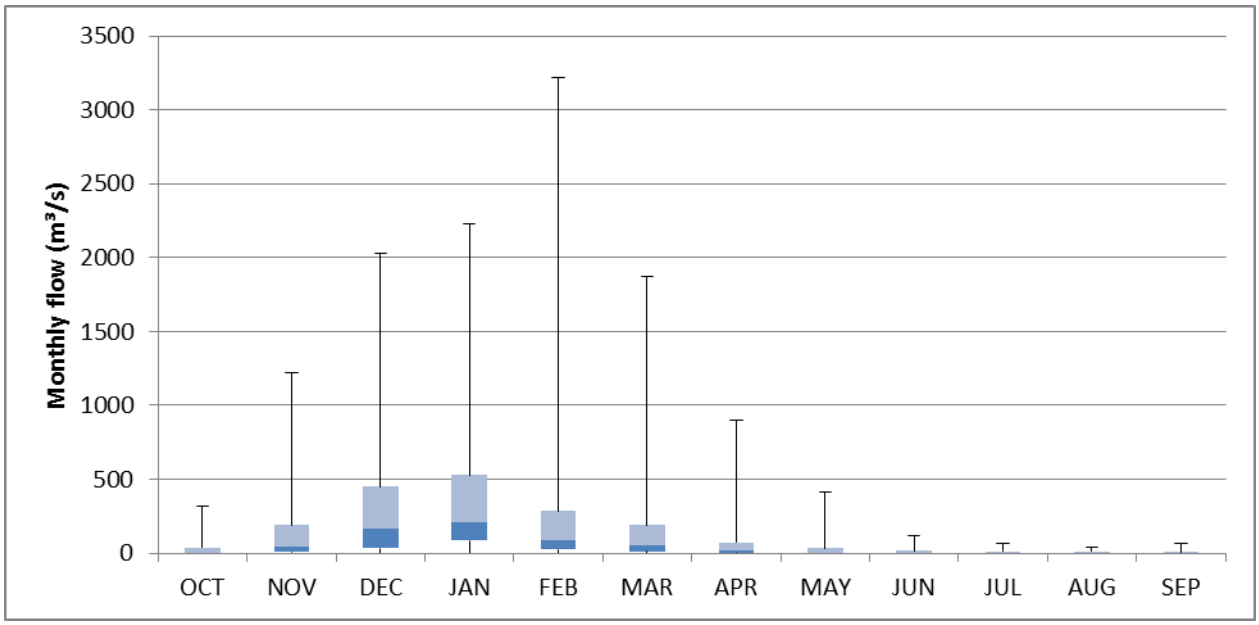


Figure 2-18: Boxplot for flow monitoring station B1H005 Olifants River @ Wolvekrans

2.12.10.1 Wetlands

Information pertaining to the wetlands in the Office and Phoenix areas, was sourced from the wetland study, (Wetland Delineation & Impact Assessment for the Proposed Office and Phoenix Opencast Pits, Glencore iMpunzi, Mpumalanga, 1190-2016, Wetland Consulting Services (Pty) Ltd, dated May 2016), (WCS 2016).

More than 3 170 hectares of wetland habitat occur within the iMpunzi Mining Right Area (MRA), covering 22.5 % of the study area (Table 3). Hillslope seepage wetlands are by far the most extensive wetland type,

making up over 80 % of the delineated wetland area. Approximately 4.5 % of the wetland area is made up of dams and other artificial wetlands (e.g. water-filled quarries and excavations), see (Figure 2-19, Figure 2-20, and Figure 2-21).

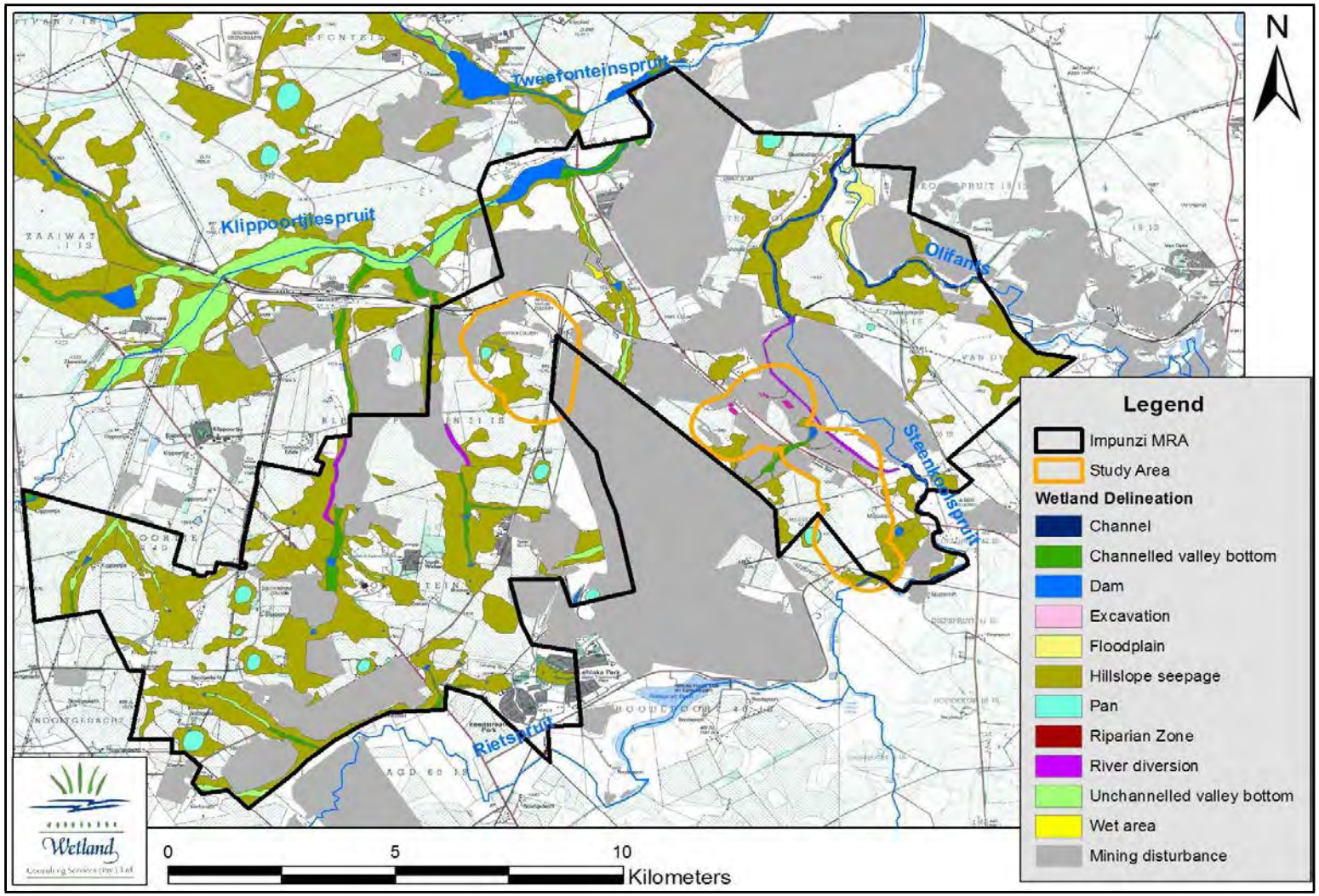


Figure 2-19: delineated wetlands within the iMpunzi MRA.

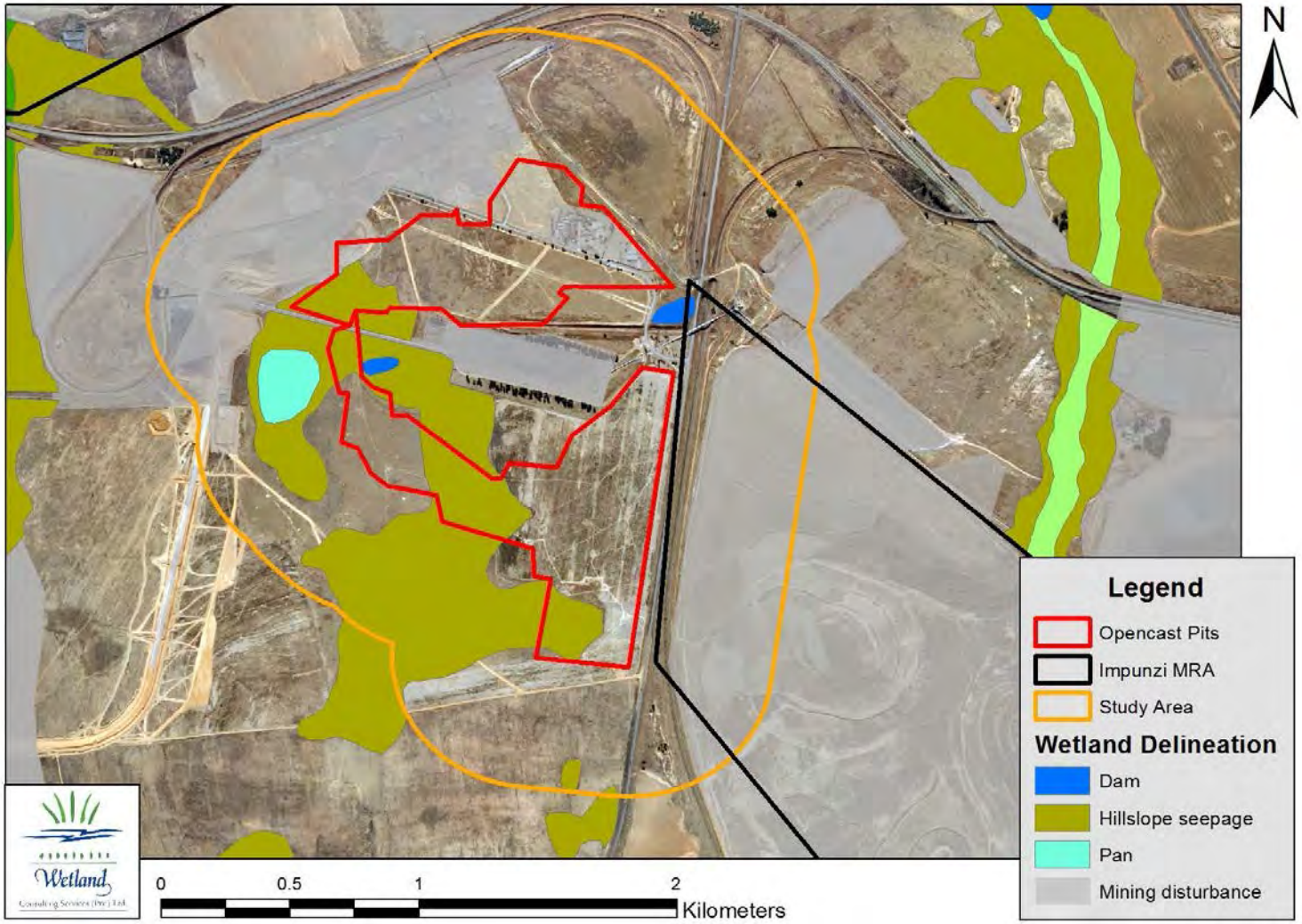


Figure 2-20: Delineated wetland habitat within the direct vicinity of the proposed Office Pits.

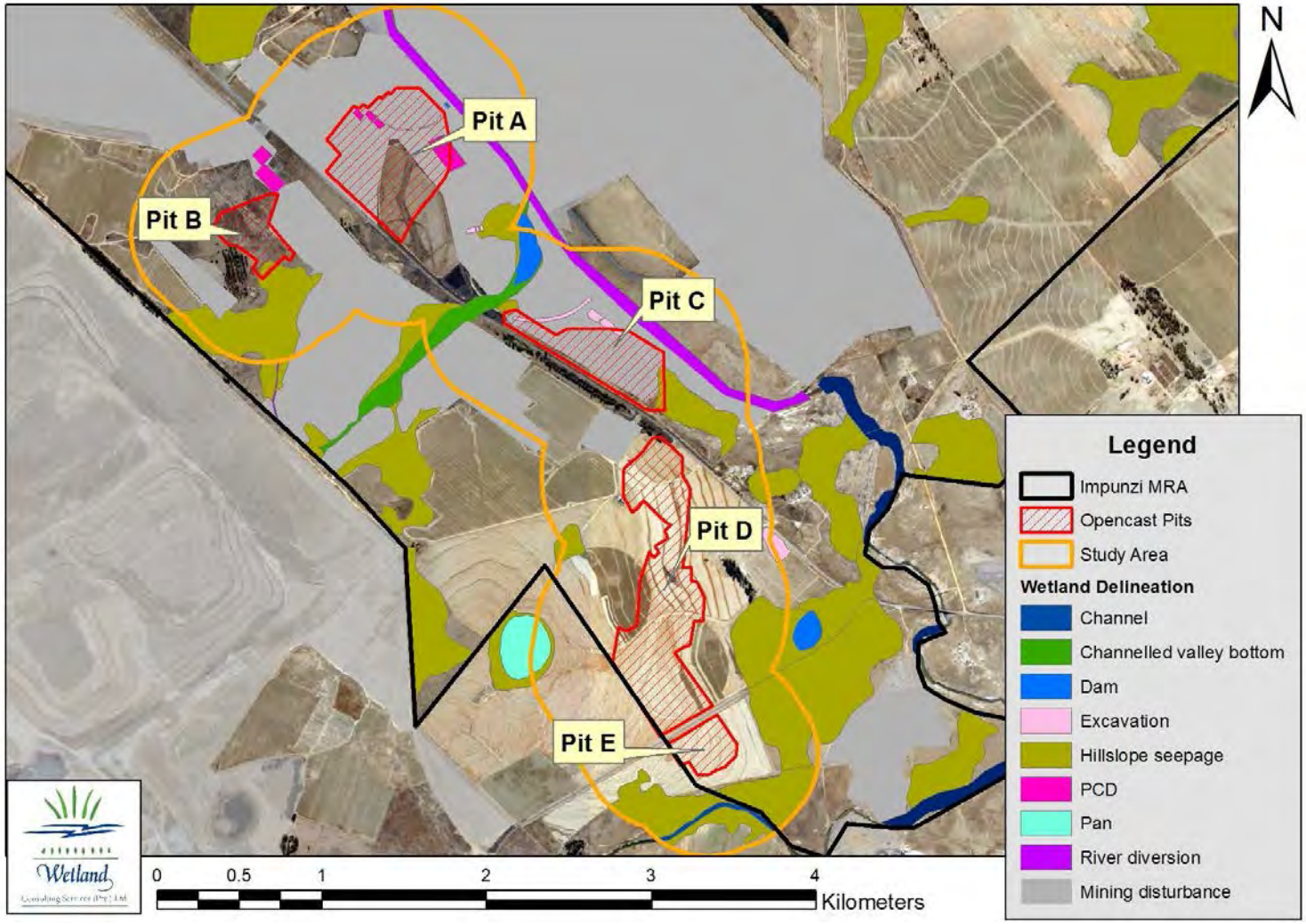


Figure 2-21: Map of the delineated wetlands within the direct vicinity of the proposed Phoenix Pits.

Six different hydro-geomorphic wetland types have been recorded on site, listed in order of extent:

- **Hillslope seepage wetlands** – the most extensive wetland type on site. These wetlands were mostly connected to valley bottom wetlands or pan wetlands, though some isolated seepage wetlands were also observed. Characterised predominantly by subsurface movement of water and appears as moist grassland on site;
- **Channeled valley bottom wetlands** – always in association with the watercourses and streams on site. Channel indicates greater erosive energy of flows;
- **Un-channeled valley bottom wetlands** – generally associated with low energy valley bottom environments in the upper reaches of drainage lines on site, as well as reed dominated systems;
- **Pan wetlands** – 13 pans/depression wetlands occur within the iMpunzi MRA, varying in size from 0.25 to 16 hectares;
- **Channel** – associated with the larger channels of the Olifants and Steenkoolspruit Rivers; and
- **Floodplain** – associated with the Olifants River on site.

In terms of goods and services that individual wetlands provide (WET- EcoServices Assessment) all of the wetlands on site play a role in moderating water quality through the trapping and removal of sediment, nitrates and phosphates. The pan wetlands are however considered to be less important in this regard as they are not generally connected to downstream watercourses.

Those wetlands characterised by more intact natural vegetation, i.e. the Phoenix pan and the Steenkoolspruit hillslope seepage wetland both scored highly in terms of biodiversity maintenance. Both of these wetlands could potentially support Red Data bird species, while the Steenkoolspruit hillslope seepage in particular supports a high diversity of habitat types due to the presence of the rocky outcrops along the northern bank of the Steenkoolspruit River.

Neither the hillslope seepage wetlands nor the pans are considered particularly important in terms of flood attenuation, though the seeps can play a minor role in regulating stream flow. Direct human benefits are rated low across the board, although the dam within the Phoenix hillslope seepage wetland is likely used in some form for water supply, while all of the wetlands are also used for livestock grazing. This provision of grazing is elevated in importance due to the extent of cultivation in the area.

The Present Ecological State (PES) assessment of the wetland areas on site indicates that no pristine wetlands occur within the study area, due mainly to the various agricultural and mining impacts. The wetlands in the Office Pit area are considered moderately (PES C) to largely (PES D) modified (see Figure 2-22). Wetlands in the Office Pit area have been impacted by mining and agricultural activities. It was found that large portions of the wetland area were historically cultivated.

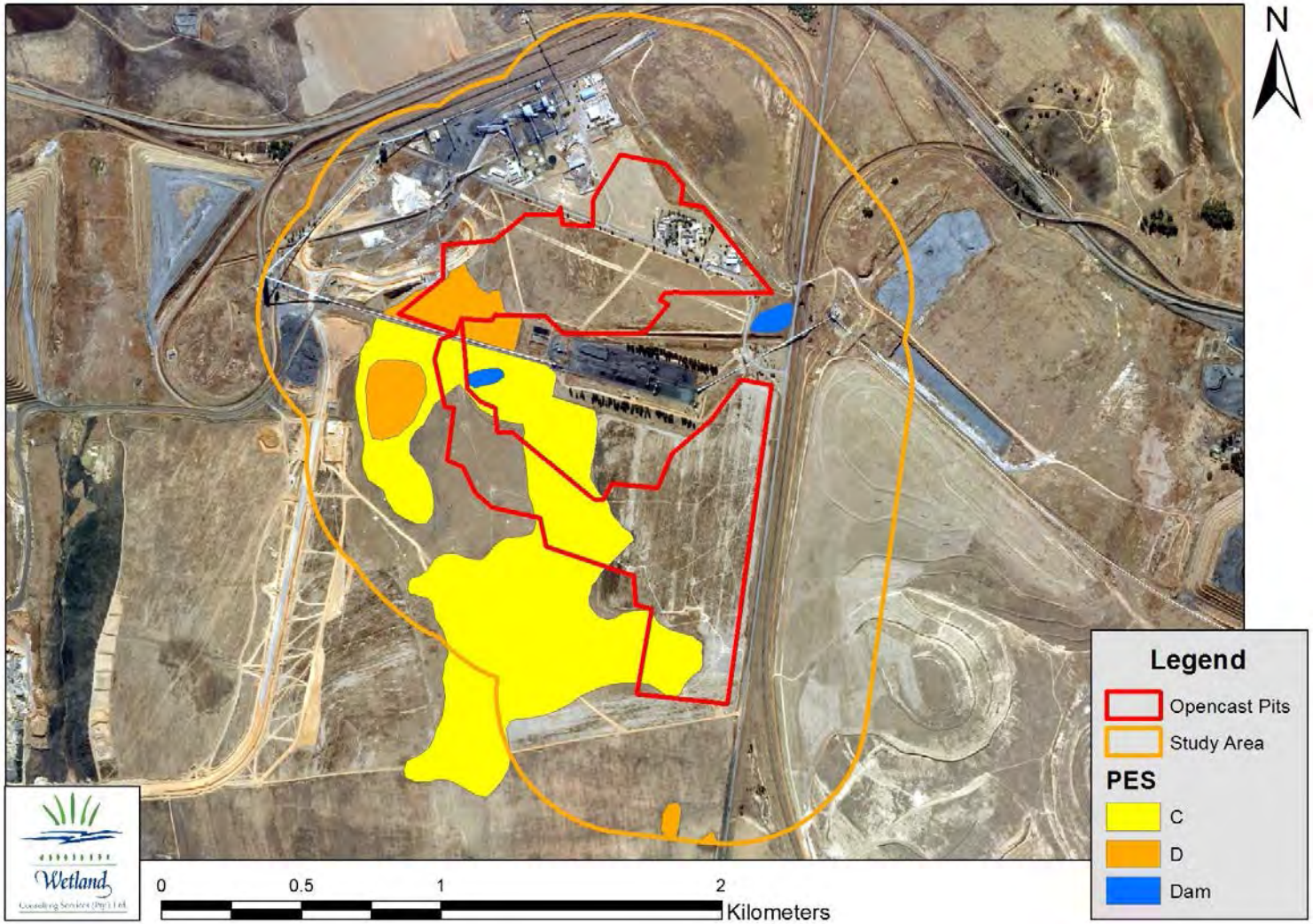


Figure 2-22: PES state for the Office Pit wetlands.

The wetlands in the Phoenix Pit area range in PES classification. The Phoenix pan is considered largely natural (PES B), with its associated seepage wetland moderately modified (PES C). The surrounding agricultural activities have led to impacts to the seepage wetland. The seepage wetlands in the north of the Phoenix Pits study area, as well as the valley bottom wetland draining into the Kromfontein Dam have been more significantly impacted and are considered largely (PES D) to seriously (PES E) modified. Other wetlands on site were rated moderately (PES C) to largely modified (PES D).

The Steenkoolspruit on site consists predominantly of a river diversion around the South Pit. The Hillslope seepage Steenkoolspruit wetland has also been heavily impacted by the mining activities and the construction of the river diversion and these sections of the hillslope wetland are considered moderately important, which fall within a PES C category.

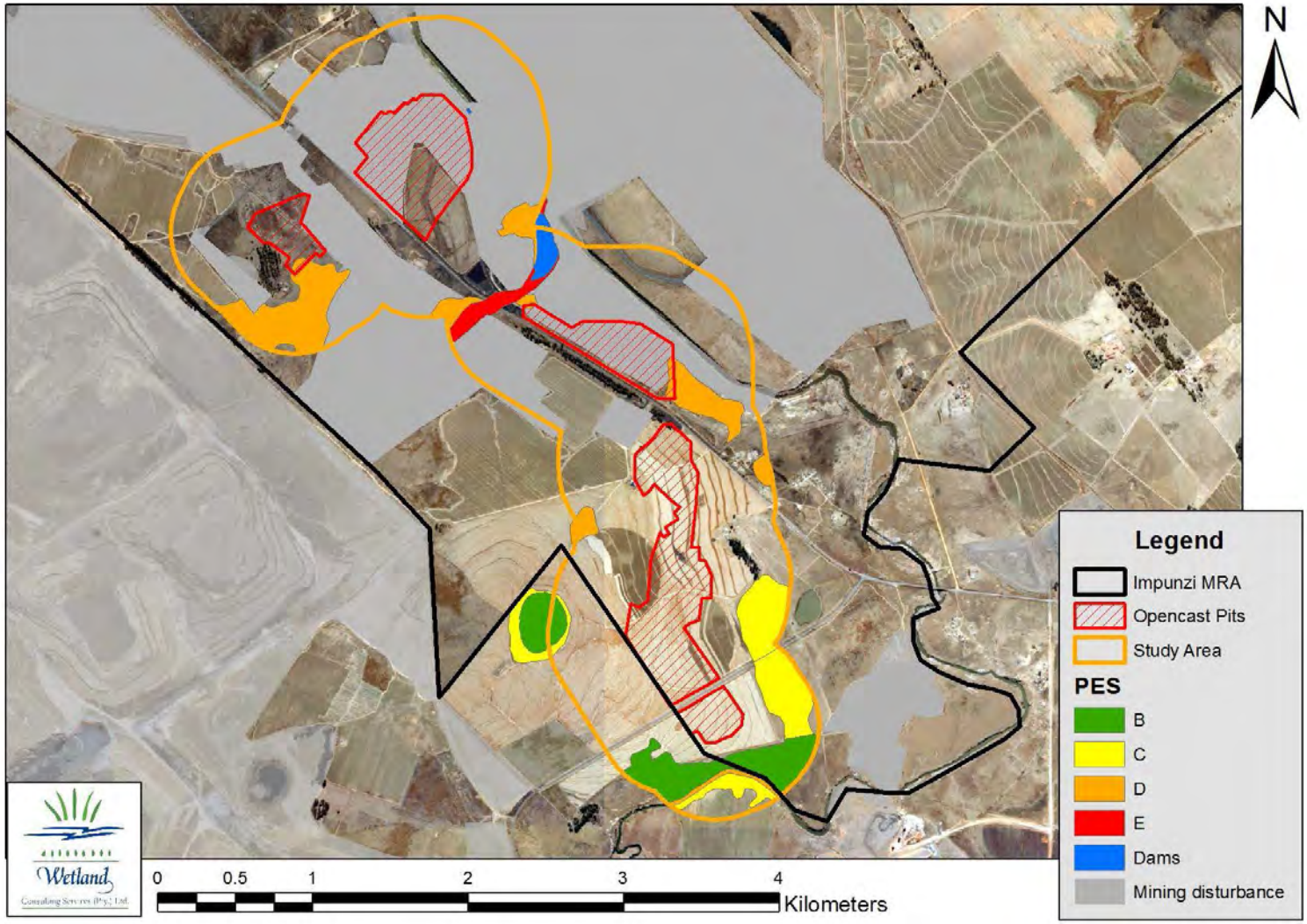


Figure 2-23: PES state for the Phoenix Pits wetlands

The wetlands within the study area all form part of the Olifants River Primary catchment, which is a heavily utilised and economically important catchment. Wetlands and rivers within the Olifants River Catchment upstream of Loskop Dam have been greatly impacted upon by various activities, which include mining, power stations, water abstraction, urbanization, agriculture etc.

In terms of the Ecological Importance State (EIS) of the wetlands in the Office and Phoenix Pits areas (see Figure 2-24, and Figure 2-25), the hillslope seepage wetland and pan within the Office Pit study area are considered to be of Moderate importance and sensitivity. This score is a reflection of the level of degradation these wetlands have undergone, which has impaired the biodiversity support functions of the wetlands. The wetlands do however still play a role at the local level in supporting hydrological functions of importance to downstream water resources. North of the conveyor the more impacted state of the hillslope seepage wetland has resulted in a Low/Marginal score.

The wetlands within the Phoenix Pits study area ranged from High to Low/Marginal importance and sensitivity. The Phoenix pan was rated as High importance mostly due to its role in supporting avifauna. Although the pan was dry at the time of the current field survey, the pan is known to support a diverse assemblage of waterfowl, including the Red Data listed Greater Flamingo. The hillslope seepage wetland along the northern banks of the Steenkoolspruit river was also rated as being of High importance, a score which also relates to the biodiversity importance of the wetland; this wetland is characterised by a diversity of habitat types which include rocky outcrops and stands of Imperata cylindrica that is potentially suitable habitat for the African Grass Owl.

The hillslope seepage wetlands more heavily impacted by mining activities have generally been rated as being of Moderate to Low/Marginal importance and sensitivity.

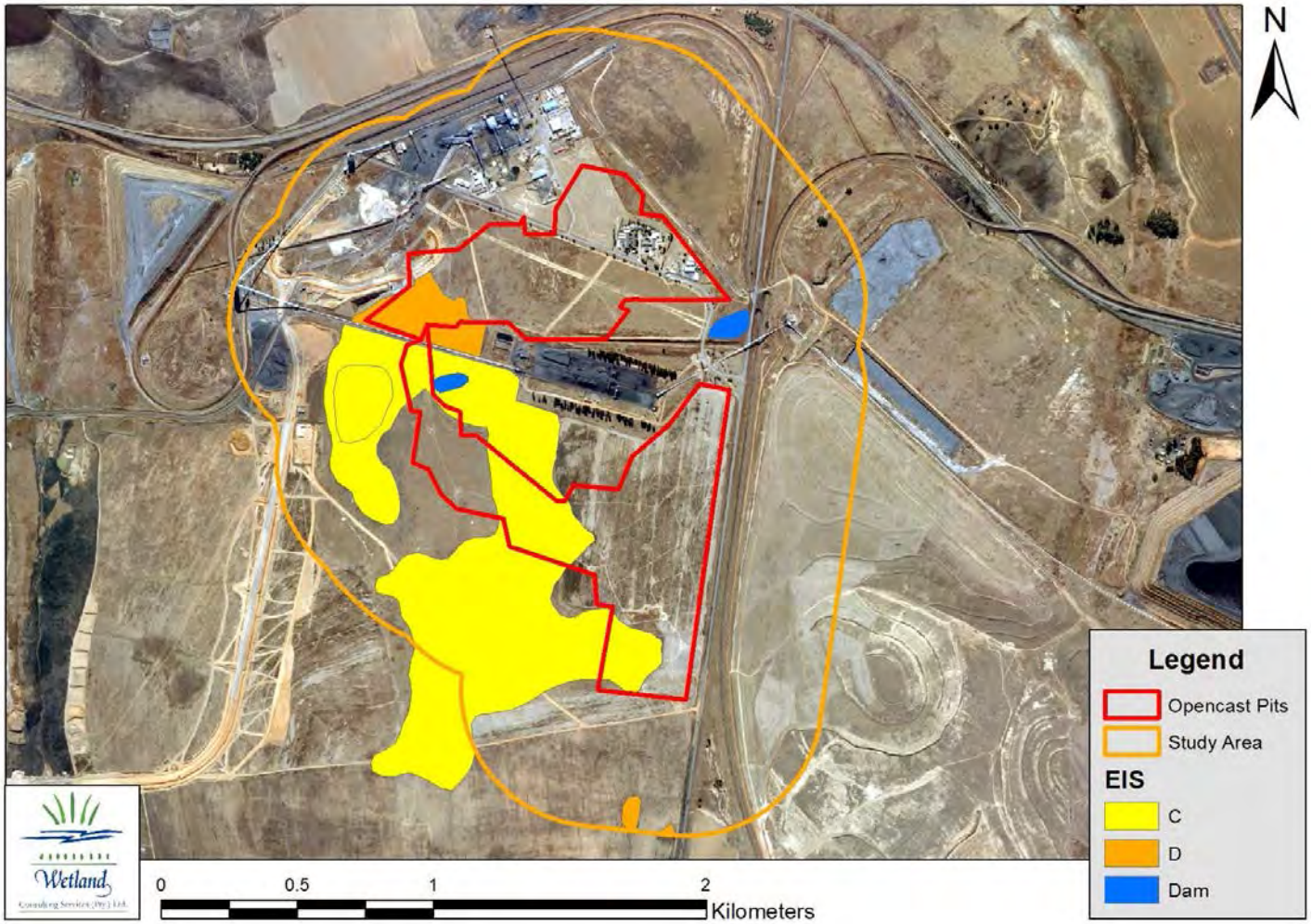


Figure 2-24: EIS state of the proposed Office Pit.

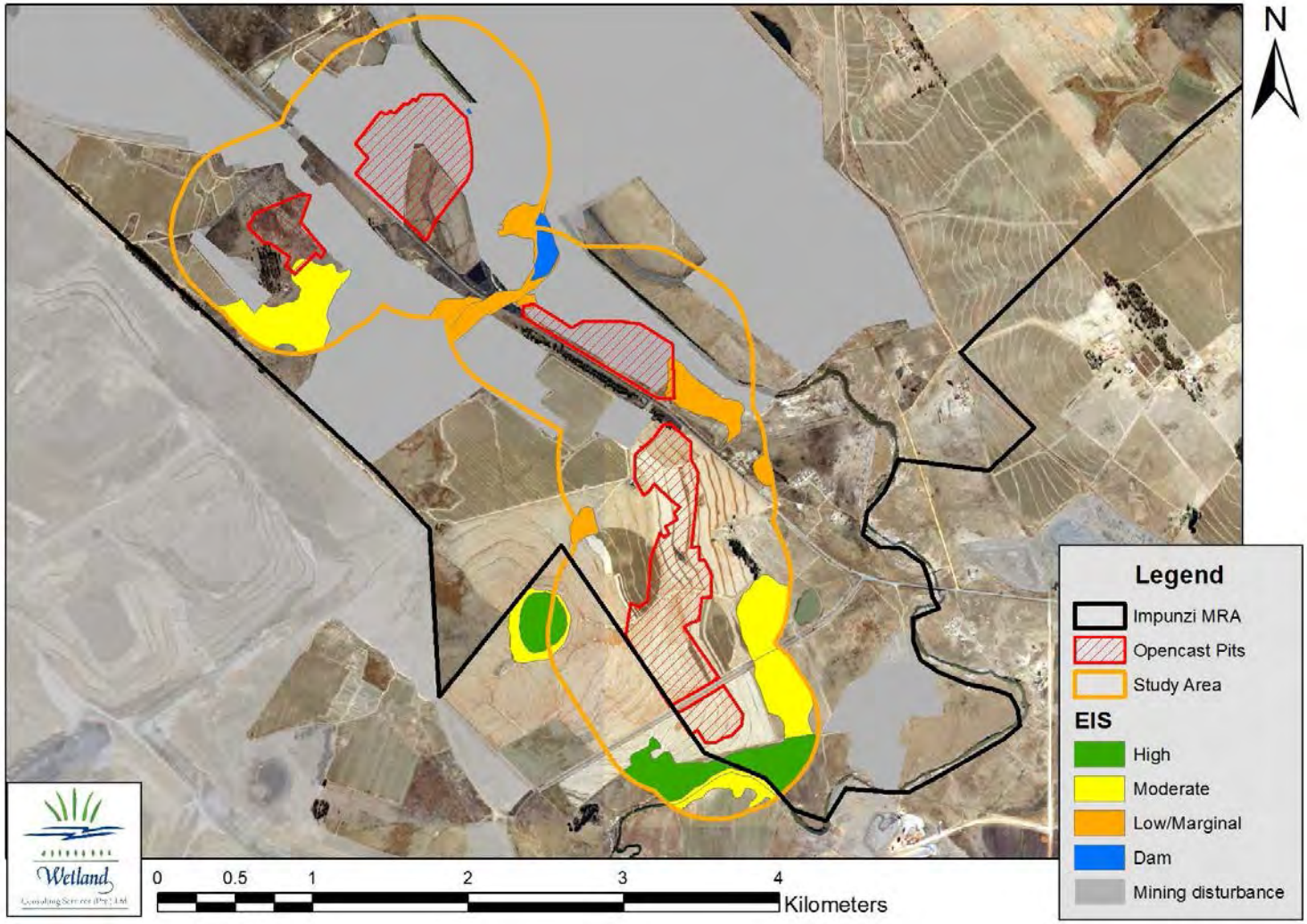


Figure 2-25: EIS state of the proposed Phoenix Pits.

2.12.11 Groundwater

Significant groundwater work has been undertaken at iMpunzi, mostly on a project-specific basis, thus providing valuable insight into the groundwater situation in the area.

The groundwater information presented in this report is sourced from a groundwater study at iMpunzi specifically for the groundwater situation currently at iMpunzi South pit and Beath dump (Golder, 2011a), a geo-chemistry analysis which was completed as part of the South Pit and Beath dump rehabilitation project (Golder 2014), a groundwater assessment conducted as part of the iMpunzi North Pan Project, (Golder 2015) and lastly from a groundwater specialist study specifically aimed at determining the impact of the proposed Office and Phoenix opencast pits on the groundwater resource in the area (Golder 2016).

Aquifer Classification

The hydrogeology of the area has been interpreted from a review of the 1:500,000 hydrogeological map 2526, Johannesburg. The iMpunzi site is underlain by an intergranular and fractured aquifer type consisting mostly of erinaceous rocks. The aquifer systems are considered to be unconfined to semi-unconfined.

The hydrogeological map defined the principal groundwater occurrence of the area as predominately from an intergranular and fractured aquifer. Borehole yield classification is **D2** (0.1 to 0.5 l/s) for the north of the iMpunzi site and **D3** (0.5 to 2.0 l/s) for the south of the iMpunzi site. The location of the boundary between borehole yield classification types approximates with the contact between the B11F and B11E sub-catchments.

The formation associated with the underlying geology is associated with low primary permeability, storage and transmissivity, however secondary processes such as weathering and fracturing are required to enhance the groundwater potential. The main aquifers comprise of intergranular, weathered and fractured aquifers. Often contact zones between the intrusive bodies and host rock contain fractures which may act as preferred groundwater flow paths which are subsequently targeted for groundwater exploration.

- Groundwater potential of the Ecca Formation sediments is negligible in the primary state unless altered by weathering, fracturing, faulting, and intrusions. The aquifer system is represented by an intergranular or fractured aquifer system with typical borehole yields between 0.5 and 2 l/s;
- The aquifer system of the Dwyka Formation can be regarded as a fractured aquifer system with typical borehole yields between 0.5 and 2 l/s. Groundwater derived from the Dwyka Formation tillite can often be of poor quality and boreholes characteristically have low sustainable yields;
- Groundwater associated with the Dwyka formation is often of poor quality;
- Joints and fractures can be targeted for groundwater development in shales and sandstone with yields up to 2.0 l/s. Better water quality in this aquifer is associated with high yielding areas; and
- The contact areas between the shale and carbonaceous shale layers generally form good groundwater targets and have a high aquifer potential.

The aquifer systems specifically in the Office and Phoenix Pits areas are both considered to be minor systems.

Aquifer Recharge

The Chloride Ratio Method was used to estimate the aquifer recharge for the proposed Office and Phoenix Pit areas. Recharge =10.5 % of the MAP of 615mm = 64.6.mm per annum. This recharge value is slightly higher than the values indicated on the published hydrogeological maps as 37 to 50mm per annum, but is more site specific and may reflect the increased recharge from the open cast mining areas.

Hydrocensus

No dedicated hydrocensus investigation has been done for the larger iMpunzi Complex. As with many of the previous studies, hydrocensus information has been collected on a project specific basis. As part of the iMpunzi North Pan project in which Glencore aimed to expand their opencast mining operations into the

North Pan area, a hydro-census exercise was conducted as part of the groundwater impact assessment. The information presented in this section reflects the hydro census information collected during that project (Golder 2015), (see Figure 2-26).

Borehole data from the DWA NGBD database was used to identify boreholes in the general area that could potentially be accessed to provide background information on groundwater elevations. During the hydrocensus process, seven boreholes (see Table 2-12) were visited and information for 36 additional boreholes (see Table 2-13) was collected to inform the groundwater situation (see Figure 2-26). Even though within the ambit of the North Pan project, the hydrocensus provided information relevant to the larger iMpunzi Complex and also the proposed Office and Phoenix pit project.

Table 2-12: Borehole information from accessible boreholes

Borehole Number	Latitude	Longitude	Elevation (mamsl)	Casing Height	Water Level mbgl	Piezometric Level (mamsl)	Date
ACGF-11	-26.08833	29.22505	1553	0.5	21.04	1531.96	05-Mar-15
ACGF-12	-26.096898	29.22953	1544	0.5	10.83	1533.17	05-Mar-15
ACGF-13	-26.095105	29.221751	1566	0.5	15.86	1550.14	05-Mar-15
ACGF-4	-26.105785	29.233814	1543	0.5	29.75	1513.25	05-Mar-15
ACGF-8	-26.121091	29.229628	1556	0.5	9.54	1546.46	05-Mar-15
ACGM-2	-26.067995	29.241508	1542	0.5	36.17	1505.83	05-Mar-15
AEGM-1	-26.091403	29.249842	1550	0.5	32.97	1517.03	05-Mar-15

Table 2-13: Historical borehole data

Borehole Number	Latitude	Longitude	Elevation (mamsl)	Casing Height	Water Level mbgl	Piezometric Level	Date
ACGF-1	-26.082674	29.207081	1548	0.5	18.85	1529.15	Mar-14
ACGF-4	-26.099016	29.25754	1560	0.5	15.4	1544.6	Mar-14
ACGF-7	-26.123105	29.236457	1531	0.5	5.59	1525.41	Mar-14
ACGF-9	-26.104953	29.221995	1567	0.5	-	-	Mar-14
ACGM-1	-26.099092	29.233561	1536	0.5	16.31	1519.69	Mar-14
ACGM-3	-26.121554	29.252773	1527	0.5	34.8	1492.20	Mar-14
ACGM-4	-26.119057	29.256057	1523	0.5	24.5	1498.50	Mar-14
ACGM-5	-26.096012	29.219058	1571	0.5	37.33	1533.67	Mar-14
AEGM-2	-26.090269	29.256621	1524	0.5	48.92	1475.08	Mar-14
AEGM-3	-26.084976	29.261206	1519	0.5	21.18	1497.82	Mar-14
AEGM-4	-26.102115	29.269596	1564	0.5	57.62	1506.38	Mar-14
AEGM-5	-26.110252	29.276202	1566	0.5	56.93	1509.07	Mar-14
AEGM-6	-26.111938	29.268803	1549	0.5	36.37	1512.63	Mar-14
AEGM-7	-26.110778	29.266906	1543	0.5	37.16	1505.84	Mar-14
ATGF-4	-26.095913	29.201889	1567	0.5	10.12	1556.88	Mar-14
ATGM-4	-26.103337	29.16765	1541	0.5	44.60	1496.40	Mar-14

ATGM-5	-26.092042	29.205149	1550	0.5	18.74	1531.26	Mar-14
ATGM-6	-26.093144	29.169854	1533	0.5	20.26	1512.74	Mar-14
ATGO-1	-26.081828	29.198997	1541	0.5	8.36	1532.64	Mar-14
ATGO-2	-26.083468	29.201207	1535	0.5	3.79	1531.21	Mar-14
ATGO-3	-26.083308	29.203717	1536	0.5	4.52	1531.48	Mar-14
ATGO-4	-26.07921	29.192054	1539	0.5	12.74	1526.26	Mar-14
ATGO-5	-26.078556	29.184931	1531	0.5	3.72	1527.28	Mar-14
ATGO-6	-26.081349	29.185985	1541	0.5	11.36	1529.64	Mar-14
ATGO-7	-26.085992	29.186138	1545	0.5	15.90	1529.10	Mar-14
PHGF-1	-26.087763	29.203471	1546	0.5	4.02	1541.98	Mar-14
PHGF-2	-26.098365	29.214556	1565	0.5	2.90	1562.10	Mar-14
PHGM-3	-26.134557	29.244591	1567	0.5	67.3	1499.70	Mar-14
PHGM-4	-26.146871	29.268448	1536	0.5	33.81	1502.19	Mar-14

Table 2-14 represents the chemical data for each of the boreholes outlined above. The data was evaluated against the SANS 241:2011 criteria as well as the South African water quality guideline (WQG) for domestic use. The WQG is more conservative than the SANS 241:2011 criteria and thus where values exceed the SANS guideline they also exceed the WQG.

The results show the following:

- Within the data set SANS 241:2011 values were exceeded for pH, electric conductivity (EC), total dissolved solids (TDS), F and SO_4;
- Only the WQG and not the SANS criteria were exceeded for Na, Mg and Ca;
- No exceedances were reported for the groundwater samples obtained from the borehole closest to the North Pan (ACGM-2);
- Groundwater levels obtained from the hydrocensus indicated that groundwater levels are between 9.54 and 26.17 mbgl. However, historical data suggests that groundwater levels may range between 2.90 and 67.30m bgl; and
- The piezometric water levels for the area range between 1556.88 and 1475.08 mamsl.

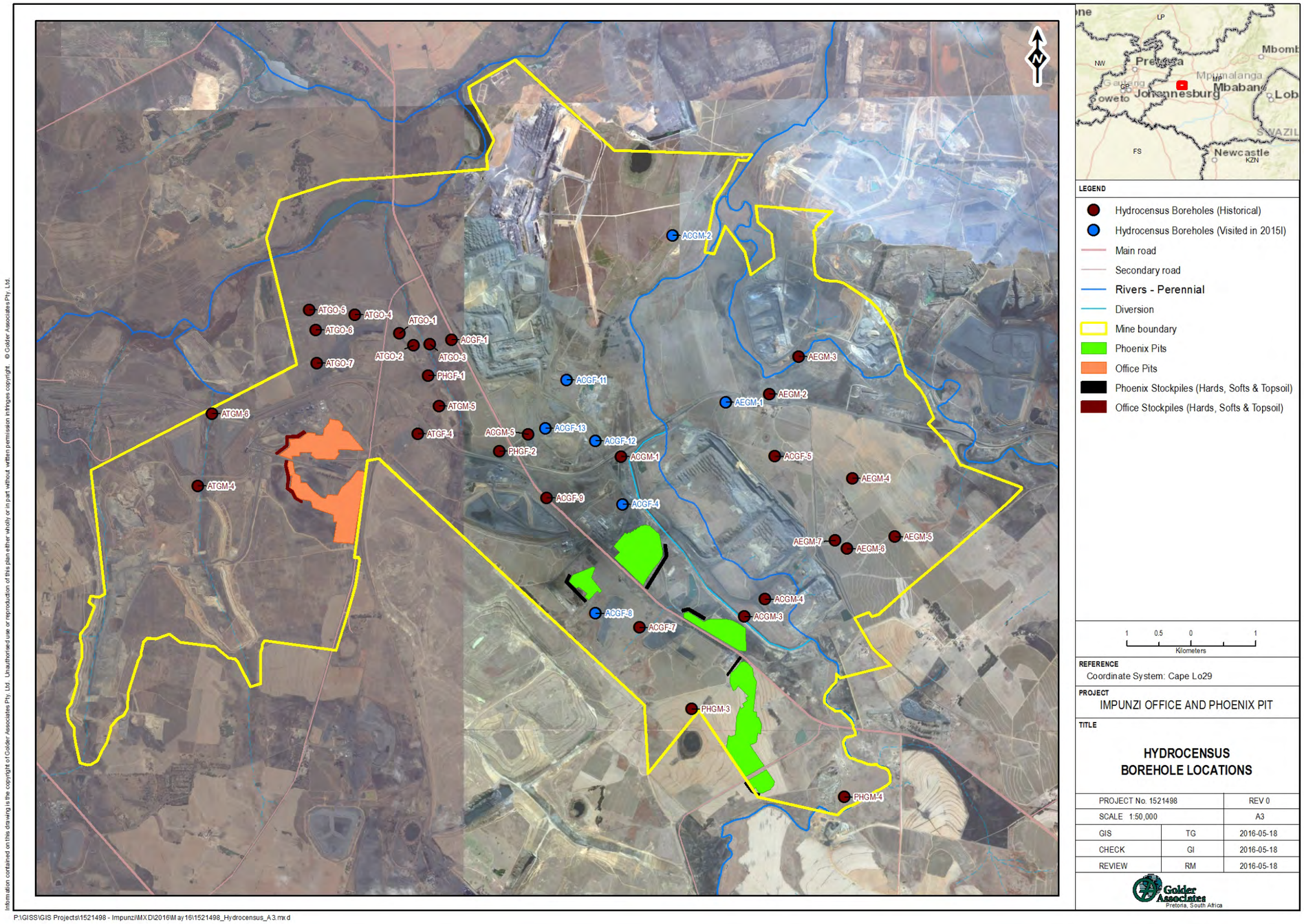


Figure 2-26: Hydro-census boreholes

Table 2-14: Groundwater chemical data

Station ID	Sample Date	pH	Cond	TDS	Na	Mg	Ca	Fe	F	Cl	SO_4	Al	Talk	HCO_3
Unit			mS/m	mg/l	mg/l	mg/l	mg/l	ug/l	mg/l	mg/l	mg/l	ug/l	mg/l	mg/l
SANS 241:2011	-	<5 >9.7*	170**	1200**	200**	ng	ng	2000***	1.5***	300**	500****	300*	ng	ng
Domestic Use	-	<6 >9	ng	450	100	30	32	100	1	100	200	150	ng	ng
ACGF-1	09/06/2014	7.4	37.4	230	55.3	3.86	9.47	brl	4.97	22.5	80.5	brl	38.2	46.604
ACGF-4	13/06/2014	7.6	61.1	377	20.4	32.9	62.8	brl	0.525	8.99	126	brl	170	207.4
ACGF-5	10/06/2014	7.4	8.7	77	2.95	2.27	2.08	brl	0.23	2.72	0.6	brl	11.3	13.786
ACGF-7	10/06/2014	7.5	104	791	32.2	56.2	95.4	3.22	1.02	6.82	531	brl	54.1	66.002
ACGF-8	12/03/2014	7.8	27.4	138	7.78	7.52	13	brl	brl	50.1	8.77	brl	15	18.3
ACGF-9	20/03/2013	7.3	17.4	83	1.28	6.71	14.1	0.28	0.69	3.31	21.3	0.003	49.9	60.878
ACGF-11	14/03/2014	5.1	108	755	16.1	68.9	82.2	brl	0.815	14.5	519	1.97	brl	4.129
ACGF-12	14/03/2014	4.5	242	1986	32.8	236	168	brl	0.835	13.5	1474	11.2	9.99	12.1878
ACGF-13	11/06/2014	6.1	152	1179	31.7	113	139	brl	0.294	12.4	802	brl	57.7	70.394
ACGM-1	17/07/2014	6.7	326	3290	76.6	317	404	brl	0.315	15.9	2369	brl	119	145.18
ACGM-2	17/07/2014	7.8	31.7	198	15.5	13.4	29.5	brl	0.819	9.63	29.8	brl	124	151.28
ACGM-3	18/07/2014	7.4	109	687	74.5	45.8	93.9	0.021	1.06	16.9	133	brl	480	585.6
ACGM-4	18/07/2014	7.4	116	725	128	41.3	73.1	brl	0.725	16.3	111	brl	547	667.34
ACGM-5	17/07/2014	6.6	6.22	55	4.65	1.03	2.86	brl	brl	2.91	4.43	brl	9.27	11.309
AEGM-1	16/07/2014	6.1	12.1	95	7.93	2.69	5.78	brl	brl	16.8	5.94	brl	12	14.64
AEGM-2	15/07/2014	6.6	72.6	455	37	23.5	52.1	brl	0.667	90.3	46.6	brl	78	95.16
AEGM-3	15/07/2014	7.7	168	1268	160	56.2	169	brl	2.98	23.4	678	brl	255	311.1
AEGM-4	15/07/2014	6.5	12.2	101	7.12	4.02	6.2	brl	0.258	7.29	10.2	0.286	23.9	29.158

Station ID	Sample Date	pH	Cond	TDS	Na	Mg	Ca	Fe	F	Cl	SO_4	Al	Talk	HCO_3
AEGM-5	15/07/2014	7.3	232	1722	105	128	271	0.471	0.999	54	972	brl	264	322.08
AEGM-6	15/07/2014	6.7	37.2	236	27.2	17.8	16.6	brl	0.24	28.9	90.4	brl	51.4	62.708
AEGM-7	15/07/2014	7.2	89.8	609	62	32.7	82.2	brl	0.9	11.6	239	brl	235	286.7
ATGF-4	09/06/2014	5.2	120	957	9.07	112	81.1	brl	0.677	5.12	699	1.61	14.3	17.446
ATGM-4	17/07/2014	7.5	260	2313	187	115	336	brl	0.695	82.4	1465	brl	161	196.42
ATGM-5	15/07/2014	7.6	41.8	255	7.53	22.4	28.2	brl	brl	7.61	140	brl	23.7	28.914
ATGM-6	14/07/2014	7.4	202	1541	43.6	114	269	brl	0.369	28.4	975	brl	135	164.7
ATGO-1	09/06/2014	8.8	171	1348	45.9	250	8.49	brl	0.222	12.1	814	brl	298	363.56
ATGO-2	09/06/2014	8.6	159	1239	66.7	198	23.8	brl	0.2	11.3	774	brl	220	268.4
ATGO-3	09/06/2014	7.8	173	1393	59.8	193	74.6	brl	0.443	17.9	621	brl	623	760.06
ATGO-4	09/06/2014	6.7	287	3339	78.3	425	211	11.2	0.664	11.7	2495	brl	131	159.82
ATGO-5	09/06/2014	8.5	115	900	42.1	129	33.5	brl	0.319	7.42	614	brl	89.4	109.068
ATGO-6	09/06/2014	7.9	266	2438	62.5	387	94	brl	brl	18.1	1782	brl	96.3	117.486
ATGO-7	09/06/2014	6.8	296	2819	33.9	340	347	0.509	0.318	26.9	2034	brl	17.6	21.472
PHGF-1	09/06/2014	6.8	102	795	45.5	67.5	85.4	brl	brl	17.5	555	brl	brl	4.129
PHGF-2	10/06/2014	7.5	13.2	67	7.27	1.71	2.17	brl	brl	11.7	2.43	brl	40	48.8
PHGM-3	15/07/2014	7.2	17	145	11.5	5.6	11.3	brl	0.199	7.36	8.44	brl	56.2	68.564
PHGM-4	15/07/2014	7.9	21.7	129	5.29	9.04	21.1	brl	0.254	4.89	25.7	brl	67.7	82.594

Operational*
Aesthetic**
Chronic Health***
Blue: Values exceed the RSA Water Quality Guideline values
Orange: Values exceed the SANS 241:2011 values

Further to the chemical data provided above, as part of the Office and Phoenix pit groundwater study (Golder 2016), a baseline groundwater assessment was undertaken.

The baseline groundwater quality was based on macro chemistry analyses of the iMpunzi monitoring boreholes sampled as part of the project. The concentrations are compared to the SANS 241:2011 water quality standard and the baseline quality is represented by the median of the concentrations. The baseline water quality of the sampled boreholes is summarised in Table 2-15 below.

From this the groundwater quality can be described as having been affected by mining activities and can be classified as moderate to poor. The samples are largely characterised by elevated EC, TDS, Ca, Na, Mg, Cl, Mn, F, and SO_4 values with an average pH value of 7.2.

Table 2-15: Baseline groundwater quality

Item	Physical Parameters			Macro Determinants (Major Ions and Trace Metals)								Minor Determinant		
	pH	EC mS/m	TDS mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	Cl mg/l	SO4 mg/l	NO3 mg/l	MALK Mg/l	F mg/l	Fe mg/l	Mn mg/l
No. of Records	69	69	69	69	69	69	69	63	69	36	65	16	5	44
10th Percentile	5.98	13.12	98.6	5.814	3.49	7.72	2.96	2.31	4.41	0.48	19.6	0.523	0.096	0.073
Median Baseline water Quality	**7.32**	**85.4**	**615**	**63**	**48.3**	**37.9**	**7.44**	**13.6**	**337**	**0.74**	**77.3**	**0.857**	**0.619**	**0.932**
Average	7.2	143.9	1240.9	142.8	123.2	54.8	9.4	17.5	795.0	2.0	127.1	1.5	3.553	3.6
90th Percentile	8.3	355.8	3217	416.2	359.6	127.6	19.86	34.14	2308.4	3.64	256	1.935	10.02	4.544
Max. Allowable Limit (SANS 241:2011)	<5 >9	<170	<1200	<300	<100	<200	<100	<300	<500	<11	-	<1.5	<0.3	<0.5

2.12.12 Sites of Archaeological and Cultural Significance

Information regarding sites of archaeological and cultural significance at iMpunzi was sourced from the Consolidated Tavistock EIA and EMPr amendment, (Digby Wells 2014).

The archaeological and cultural history of the area can be divided into three time periods, namely the Stone Age, Iron Age and the Historical Period.

The Stone Age can be divided into the Early, Middle and Late Stone Age. This period refers to the earliest people of South Africa who mainly relied on stone for their tools. The Early Stone Age ranged from ± 2.5 million to ± 250 000 years ago and was dominated by the archaeological industry of stone tools known as Acheulean. The Middle Stone Age had various lithic (stone or rock) industries dating from ± 250 000 to 22 000 years before the present. The Late Stone Age was the period between ± 22 000 years ago and the period of contact with either Iron Age farmers or European settlers.

The Iron Age as a whole represents the spread of Bantu speaking people and includes both the Pre-Historic and Historic periods. The Historic Period intermingles with the later parts of the Stone and Iron Age, and can loosely be regarded as times when written and oral recounts of incidents became available.

The sites of archaeological and cultural significance at iMpunzi are largely associated with cemeteries and grave sites located onsite. A number grave sites have been located within the larger iMpunzi complex; four of which are located in close proximity to the proposed Office and Phoenix pit areas. iMpunzi has embarked on the necessary regulatory, permitting and stakeholder engagement processes to authorise the re-location of these graves, the status of which per grave site is outlined below and illustrated in Figure 2-27:

- Atcom Game Park 1 (Gravesite number 1), S26° 07’ 31.7” E29° 15’ 08.5”: This cemetery was successfully relocated during November 2010. A total of 65 graves were originally identified and exhumed, of which four proved to be no graves. As a result, the human remains of 61 graves from this cemetery were reburied;
- Atcom Game Park 2 (Grave site 7); S26° 07’ 09.1” E29° 14’ 32.9”: The cemetery comprises four graves, of which two are covered by small rectangular concrete dressings from which the names Linah Mhalangu and M. Mtshweni could be read. The other two graves are those of stillborn babies buried in the remains of a homestead in the vicinity of the graves. Mr. Moses Mtshweni, the family representative for all four graves, agreed to the relocation and signed the permission forms. The permit application process has commenced and permissions have so far been received from the Emalahleni Municipality as well as the South African Police Services. Glencore are currently compiling the South African Heritage Resources Agency (SAHRA) and Mpumalanga Department of Health permit applications with the relocation date being envisaged for 2016;
- ATCOM Game Park 3 (Grave Site 8); S26° 07’ 11.6” E29° 14’ 26.3”: The site is comprised of seven stone concentrations which may be graves. Although no additional supporting information could be found with which the site can be positively identified as a cemetery, Glencore has made the decision to treat the area as a cemetery. The permit application process has commenced and permissions have so far been received from the Emalahleni Municipality as well as the South African Police Services. Glencore are currently compiling the SAHRA and Mpumalanga Department of Health permit applications with the relocation date being envisaged during 2016; and
- ATC cemetery (Grace Site 2); S26° 05’ 50.1” E29° 10’ 37.9”: This cemetery was **successfully relocated** during November 2010. A total of 25 graves were originally identified and exhumed. During the exhumation a family representative indicated that another unmarked grave is also located in proximity to the cemetery. Test excavations were undertaken during which the remains of this individual were also identified, exhumed and reburied. As a result, a total of 26 graves were relocated from this cemetery.

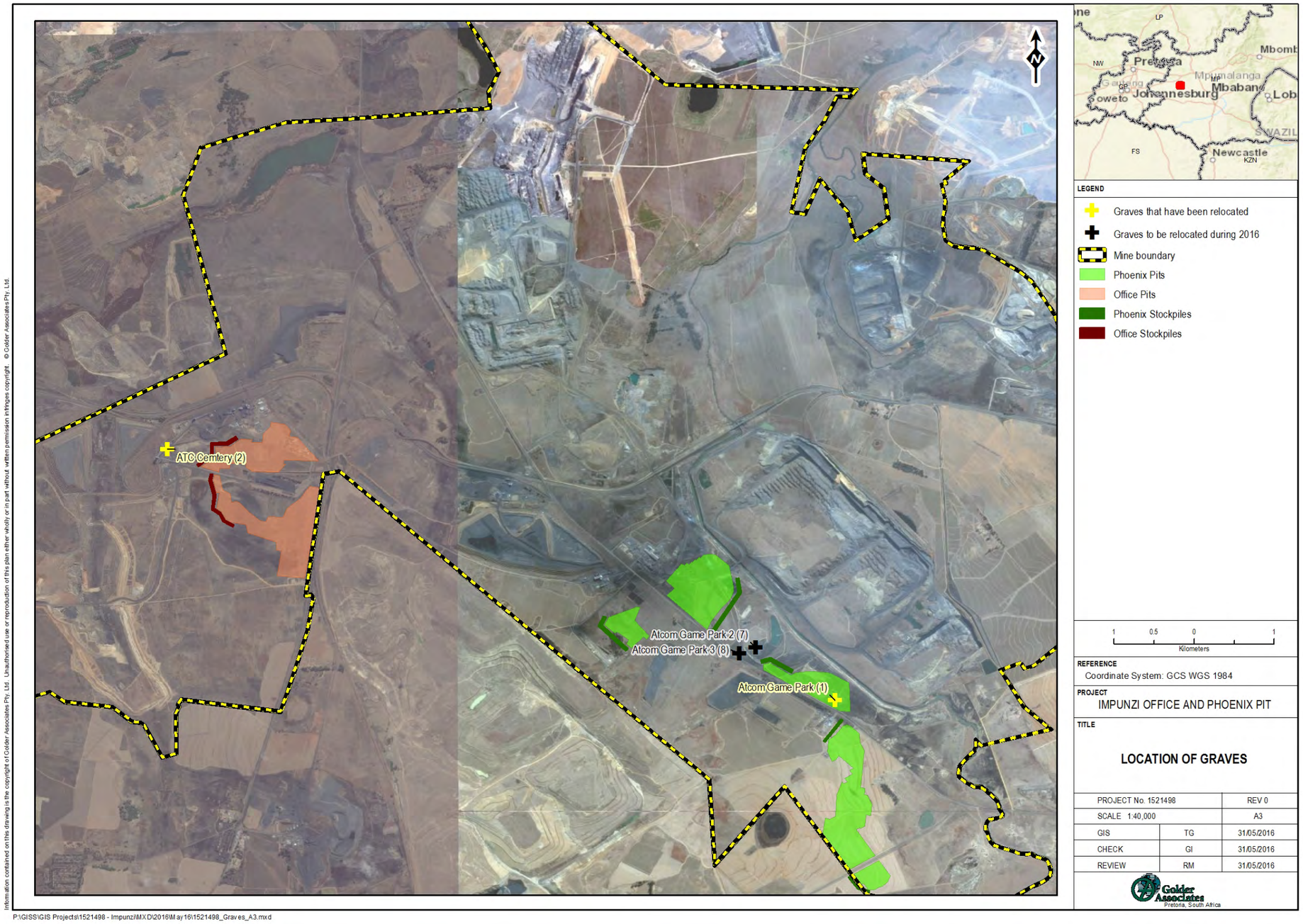


Figure 2-27: Grave sites in close proximity to the proposed Office and Phoenix Pit operations as well as the status of the relocation processes

2.12.13 Socio-economic

Information regarding the socio-economic environment was sourced from the Consolidated Tavistock EIA and EMPR amendment, (Digby Wells 2014).

Economic overview

The Emalahleni Local Municipality's Independent Development Plan (IDP) (ELM, 2008) identifies the southern portion of the municipality as the 'Energy Mecca' of South Africa, due to its richness of coal reserves and the presence of four coal-fired power stations, namely Kendal, Matla, Duvha and Ga-Nala. Construction of the Kusile power station is also underway and is due for commissioning in the coming years.

Mining (specifically coal mining) and manufacturing are the highest contributors to the municipality's Gross Domestic Product (GDP). The third highest contributor is the electricity sector which is linked to the number of power stations in the municipality. The municipality is heavily reliant on the mining and electricity sectors.

Employment

According to Statistics SA (2007), approximately 30% of the municipality's population is economically active. Of the economically active population only 29% were employed in 2007. There has been a large shift in employment by sectors between 2001 and 2007, moving from the community and social services sector to the mining sector. The wholesale and retail trade and manufacturing sectors are the next largest sector contributors to employment.

Results of a Community Baseline Survey, conducted by Digby Wells (Digby Wells, 2010) indicate that almost two thirds of respondents in Kriel and Rietspruit are currently employed. In Ogies, almost half of the respondents are employed whilst 31% are unemployed. Only a small percentage of respondents in Ogies are currently not economically active, however, combined with the unemployed population, the dependency ratio is high. Similarly, less than half of respondents in Phola and KwaGuqa are currently employed, with nearly a third unemployed and a quarter not currently being economically active. In Emalahleni, employment figures are high with nearly three quarters of respondents being employed and only 7% surveyed being unemployed.

Kriel, Rietspruit, Ogies and Emalahleni respondents work in a number of industry sectors of which mining is by far the dominant employer. Other sources of employment include the energy, transport and construction sectors. In Emalahleni a number of respondents are employed in the local government, farming and manufacturing sectors.

The majority of respondents employed in the mining sector are employed by the mining houses in the area, i.e. Glencore, Anglo Coal, South 32 and Exxaro. An economy heavily dependent on one sector is unstable, especially a sector such as mining with a finite life span.

Demography

In the early 2000's the municipality's population was estimated to be 276 412, with approximately 49% of the population being under the age of 15 and only 42.6% within an economically active age group (16 to 64).

Kriel is a relatively stable community where over half of respondents have lived in the community for more than 10 years. Similarly, approximately 40% of respondents in Rietspruit have moved into the community within the last 10 years. A large portion of respondents in Phola have lived in the community for longer than 10 years and only a very small percentage have moved in within the last 5 years. This shows that the community is relatively stable with very little in-migration.

There has been a massive migration into Ogies over the last five years; however, migrants who have lived in Ogies for less than five years comprise less than a quarter of the population. The majority of migrants have migrated for employment reasons.

Less than a third of respondents have lived in Emalahleni for over 10 years. This shows a dynamic community with a significant amount of in-migration with around a quarter of the community having lived in the city for less than a year.

Approximately half of Kwa-Guqa's respondents have lived in the community for more than 10 years and only a small percentage have lived there for less than 5 years. The community is therefore relatively stable with only a small amount of in-migration.

Education levels

In Kriel and Rietspruit education levels of respondents are relatively low with over 60% of the respondents not having completed their high school certificate and 8% have no formal education at all. Similarly the percentage of those who have completed a tertiary level diploma, degree or certificate is very small and therefore highly skilled and skilled workers are scarce.

The Ogies respondents have low education levels with approximately half not having completed their high school certificate and approximately 4% without any formal schooling. Only 10% of respondents have completed a tertiary level diploma, degree or certificate. Similarly, respondents in Phola and KwaGuqa generally have little education, skills and qualifications.

Emalahleni respondents were relatively well educated in comparison with the rest of the local municipalities. Approximately 23% have finished matric and approximately half of respondents had completed a tertiary level degree, diploma or certificate.

Livelihood and income

Monthly household incomes for Kriel range from low to high with the largest percentage of households surveyed earning in the middle to higher income brackets. There is however still a large percentage of households who earn in the lowest income levels. The majority of Rietspruit, Phola and KwaGuqa households earn in the lower income brackets with a very low percentage earning in the middle and higher income brackets. Respondents in Kriel and Rietspruit were mostly dependent on income from formal employment whilst almost 20% were most dependent on grants, pensions and remittances. Approximately a third of the population of Phola rely on government grants, pensions and remittances as their primary household income sources. One quarter of the KwaGuqa population is mostly reliant on pensions, grants and remittances for household income.

There is a fairly large percentage of Ogies respondents earning within the lower income brackets with a peak in the middle income group and very few earning in the higher income levels. Just over half of the households surveyed are mostly dependent on monthly income from formal employment whilst approximately 44% rely on pensions, grants and remittances.

Only a small percentage of Emalahleni households surveyed earn in the lower income brackets with a significant percentage earning in the higher income brackets. Approximately 80% of households depend on formal employment as the source of income.

Infrastructure and services

The municipality is currently experiencing considerable demand for maintenance and upgrading of existing infrastructure. This can be partly ascribed to old infrastructure that needs replacing, as well as the increasing population requiring additional infrastructure development to meet their needs. Roads within the municipality are in a poor condition and this has been attributed to the high volume of coal trucks, articulated trucks and other industrial vehicles operating between the coal mines and the Kendal Power Station (ELM, 2008). According to the Community Baseline Survey (Digby Wells, 2010) Kriel respondents generally have access to services and infrastructure with the majority of respondents living in brick houses, having access to flush toilets, municipal water supply and electricity.

In Rietspruit, Emalahleni and KwaGuqa all houses are brick houses and no shacks or traditional structures were identified. Similarly, all houses have flush toilets and between 90% and 100% have access to running water in their houses. Electricity is also the dominant energy source used for both cooking and lighting in Rietspruit and Emalahleni.

The majority of Ogies respondents have access to municipal services and brick housing, while approximately 20% of houses surveyed are mud huts and shacks. Nearly a quarter of respondents use pit latrines (without

ventilation) and 2% have no toilet facilities. Less than two thirds of the population have running water within their households and a number of respondents rely on alternative water sources such as shared taps, water trucks and boreholes.

Although a high percentage of Phola respondents had access to brick housing and municipal services and infrastructure, a significant percentage of respondents are living in shacks and mud huts using pit latrines (with and without ventilation) and the bucket system. Only 59% of respondents had access to running water within their households and half had taps on their property. It is also evident that the Phola community do not all have access to the national electricity supply.

2.13 Identified Impacts

Considering specifically the developments associated with the Office and Phoenix opencast pits; the following potential impacts were identified during the scoping phase:

1) **Surface water**: The activities associated with the proposed Office and Phoenix Pit may have direct and indirect impacts on the surface water. These impacts pertain to the potential change in surface water catchment areas, changes in the surface water quality, changes in the surface water runoff, and erosion. See section 3.2.4 for the surface water impact assessment.

2) **Wetlands**: From preliminary assessments associated with wetland areas in proximity to the proposed Office and Phoenix Pit areas, it is clear that the proposed opencast pits will have direct and indirect impacts on some of the wetland areas in the larger Office and Phoenix Pit area. All wetland habitat located within the direct mining footprints is expected to be permanently lost. Adjacent wetland habitat located downslope is also likely to be indirectly impacted through a reduction in flows, both in terms of surface flow (due to exclusion of part of the catchment as a dirty water area) and sub-surface flow (interception of interflow and lowering of the local groundwater table due to drawdown associated with the opencast pits. See section 3.3.1 for the wetland impact assessment.

3) **Groundwate**r: Two impacts on the groundwater resource are expected through the Office and Phoenix Pit project; first lowering of the groundwater level due to the opencast mining and second, the deterioration of groundwater quality. These impacts can certainly be reduced, through the incorporation of the proposed pits into the larger Glencore water management strategy, which includes the treatment of operation affected water in the Glencore Water Treatment Plant (WTP). See section 3.4.1 for the groundwater impact assessment.

4) **Ecology**; The project will result in the inevitable removal of vegetation from the proposed footprint of the pits. Due to the relatively small combined footprint of these pits (i.e. 235 ha) and the fact that very little of these areas are covered by virgin vegetation, it is not anticipated that these developments will have significant impacts on the local ecology. Any impacts will be further mitigated through the proposed roll over mining and rehabilitation method, ensuring that the surface area that will be bare at any time is minimised. It is important to note that the proposed Office and Phoenix Pits are situated in a regional area that has historically been influenced by large scale mining activities, all of which have impacts on the local ecology. In the greater arrangement of the regional ecology, the Office and Phoenix Pit areas are not expected to have any significant impact. See section 3.5.1 for the Ecology impact assessment.

5) **Air Quality**: Particulate mobilisation by drilling, blasting, loading, hauling, stockpiling, backfilling and coal processing has the potential for an impact on air quality within and in the vicinity of the project area, particularly in the downwind direction. Gaseous emissions due to blasting and the diesel engines on mining vehicles could also have an impact on air quality. See section 3.6.1 for the air quality impact assessment.

6) **Noise**, blasting and vibration: There is a small community situated to the south-east of the existing iMpunzi operations and also the proposed Office and Phoenix pit area. Blasts will have to be designed and monitored with the objective of avoiding any damage from fly rock, air blast and ground vibration at this potentially vulnerable receptor area. Given the proximity of the community to the south-east, the noise, blasting and vibration impacts are expected to be of a **moderate** significance. The duration of

any impact on the identified receptors will depend on the detailed mining plan. See section 3.7.3 for the noise impact assessment.

7) **Visual**: As mentioned above, the proposed Office and Phoenix pits are going to be developed in a landscape that is dotted with coal mines, power stations and mining related infrastructure. The various components of the Office and Phoenix operations will be visible from the regional roads and residents in the area. See section 3.9.1 for the visual impact assessment.

8) **Cultural and heritage**: As mentioned above, there a number of gravesites in the proposed operation areas. Glencore have embarked on the necessary regulatory, permitting and stakeholder engagement process associated with the re-location of the graves within the project areas. The engagements with the family representatives have thus far been fruitful, with all necessary permissions being granted. Furthermore, Glencore have initiated the various applications to the SAHRA and Mpumalanga Department of Health. See section 3.10 for the cultural and heritage impact assessment.

9) **Socio-economics**: As mentioned above, the coal reserves in the Office and Phoenix areas are of a good quality and form an important part of Glencore's strategic planning. Mining of the coal in these areas will allow iMpunzi to continue to operate in the currently very difficult commodity market. iMpunzi as a whole contributes significantly to the local socio-economic environment through direct employment of community members, peripheral economic stimulation through service and product requirements, and being able to mine these reserves would allow iMpunzi to continue with these beneficial impacts of **moderate** significance. See section 3.11 for the socio-economics impact assessment.

2.14 Impact Assessment Methodology

The specialist studies that were undertaken over the project area appear in APPENDIX G to this report. The significance of the identified impacts was determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach incorporates two aspects for assessing the potential significance of impacts, namely occurrence and severity, which are further sub-divided as follows:

Occurrence		**Severity**	
Probability of occurrence	Duration of occurrence	Scale / extent of impact	Magnitude (severity) of impact

To assess each of these factors for each impact, the following four ranking scales are used:

Table 2-16: Ranking scales for assessment of occurrence and severity factors

Probability	**Duration**
5 - Definite/don't know	5 - Permanent
4 - Highly probable	4 - Long-term (7-10 years, impact ceases after site closure has been obtained)
3 - Medium probability	3 - Medium-term (3 months- 7 years, impact ceases after the operational life of the activity)
2 - Low probability	2 - Short-term
1 - Improbable	1 – Immediate
0 - None	
Scale	**Magnitude**
5 - International	10 - Very high/don't know
4 - National	8 - High
3 - Regional	6 - Moderate

2 - Local	4 - Low
1 - Site only	2 - Minor
0 - None	

Once these factors are ranked for each impact, the significance of the two aspects, occurrence and severity, is assessed using the following formula:

SP (significance points) = (magnitude + duration + scale) x probability

The maximum value is 100 significance points (SP). The impact significance will then be rated as follows:

SP >60	**Indicates high environmental significance**	**An impact which could influence the decision about whether or not to proceed with the project regardless of any possible mitigation.**
SP 30 – 60	Indicates moderate environmental significance	An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated.
SP <30	Indicates low environmental significance	Impacts with little real effect and which should not have an influence on or require modification of the project design.
+	Positive impact	An impact that constitutes an improvement over pre-project conditions

2.15 Positive and negative impacts of initial and alternative site layouts

As mentioned in section 2.4.1, of this report, the larger iMpunzi operation is an existing mining operation with the associated supporting infrastructure (processing plants, stockpiles etc.) already in place.

The only infrastructural components envisaged for the Office and Phoenix Pit operations are those associated with the operational management of the opencast pits (see Figure 2-2):

- Haul roads for the transportation of coal ore form the pits to the various processing plants; and
- Diversion trenches and water channels for the conveyance of storm water around the pits.

2.16 Possible mitigation measures and levels of risk

See section 3.0 for the detailed impact assessment and the recommended mitigation measures designed to minimise environmental risks for all environmental aspects during the construction, operational and closure phases.

2.17 Motivation where no alternative sites were considered

Site selection for the proposed Office and Phoenix pit operations was solely dictated by the location of the economically viable coal reserves which are to be mined (see Figure 2-2). Furthermore, as mentioned above, existing coal processing and supporting facilities will be used as part of processing these reserves, negating the need for any supporting infrastructure.

For these reasons, no alternative sites for the Office and Phoenix pits were considered.

3.0 ASSESSMENT OF POTENTIAL IMPACTS AND RISKS

The assessment of the potential impacts and risks associated with the Office and Phoenix Pit project has been informed by the specialist studies conducted for the project and partially from the conclusions of the

Consolidated EIA and EMPR (Digby Wells 2014), attached in APPENDIX B. These documents have been used to assess the impacts and risks during the complete life cycle (i.e. construction, through operational phase to closure and rehabilitation phase). Potential cumulative impacts were also identified and assessed for each component, where applicable.

3.1.1 Construction

The **Construction Phase** marks the beginning of physical changes to the site. During this phase, the following activities will take place:

- Surveying and pegging out of the construction areas for the surface infrastructure;
- Construction of the haul roads, power supply line and stormwater management system (upslope diversion berm, “dirty” water collection drains, water pipelines);
- Installation, testing and cold commissioning of equipment;
- Establishment of topsoil, overburden stockpiles; and
- Landscaping and re-vegetation of exposed areas on the site.

It is anticipated that the construction phase could commence in 2018 (or as soon as all environmental authorisations have been obtained) and take approximately 6 months to complete.

3.1.2 Operation

During the **Operational Phase**, the project components will be hot commissioned and opencast mining will be initiated. Mining, coal processing, concurrent rehabilitation, waste and water management, will take place as described in section 2.4. Mining at these areas will commence in 2026 and 2025 respectively. Mining will continue for five years at these areas and again it is important to note that existing coal processing and supporting facilities will be used as part of processing these reserves.

3.1.3 Closure and Rehabilitation

The activities during the **Closure and rehabilitation Phase** will include:

- Completion of concurrent rehabilitation (i.e. backfilling, landform design implementation, topsoil deposition, re-vegetation etc.)
- Demolition of infrastructure and disposal of the rubble;
- Re-vegetation of all exposed areas on the project footprint with locally indigenous species; and
- Post-closure monitoring of environmental performance against the EMP and other permitting conditions for at least five years.

3.2 Surface water

The specialist study on surface water (Doyle, C; Coleman, T; 2016), attached in (APPENDIX G) identified and assessed potential impacts on the surface water resources in the vicinity of the proposed Office and Phoenix Pits.

3.2.1 Floodline determination

The total drainage area of the mine site region falls within one sub-catchment based on the topography of the area. The sub-catchment area was used in the calculation of the flood peaks for the floodlines. The 1:50 year and 1:100 year floodlines for the tributary of the Steenkoolspruit located between the Phoenix Pits were determined. A flood peak analysis was undertaken to determine the 50 year and 100 year recurrence interval flood peaks for the watercourse.

The sub-catchment characteristics are shown in Table 3-1 and the calculated flood peaks for the 1:50 year and 1:100 year floods are shown in Table 3-2.

Table 3-1: Sub-catchment characteristics used in the flood estimation methods

Catchment	Area (km²)	River Length (m)	10-85 Slope (m/m)	Time of concentration (h)
Tributary	2.82	2 007.44	0.04	0.392

Table 3-2: Computed flood peak flows for the watercourses within the Phoenix Pits area

Sub-catchments	Flood peak for the 1:50 year flood (m^3/s)	Flood peak for the 1:100 year flood (m^3/s)
Tributary	29.62	41.65

Figure 3-1 and Figure 3-2 show the 1:50 year and 1:100 year floodlines for the watercourses within the proposed infrastructure area. The analysis shows that the proposed opencast operations lie outside of the calculated 1:100 year floodline of the watercourse.

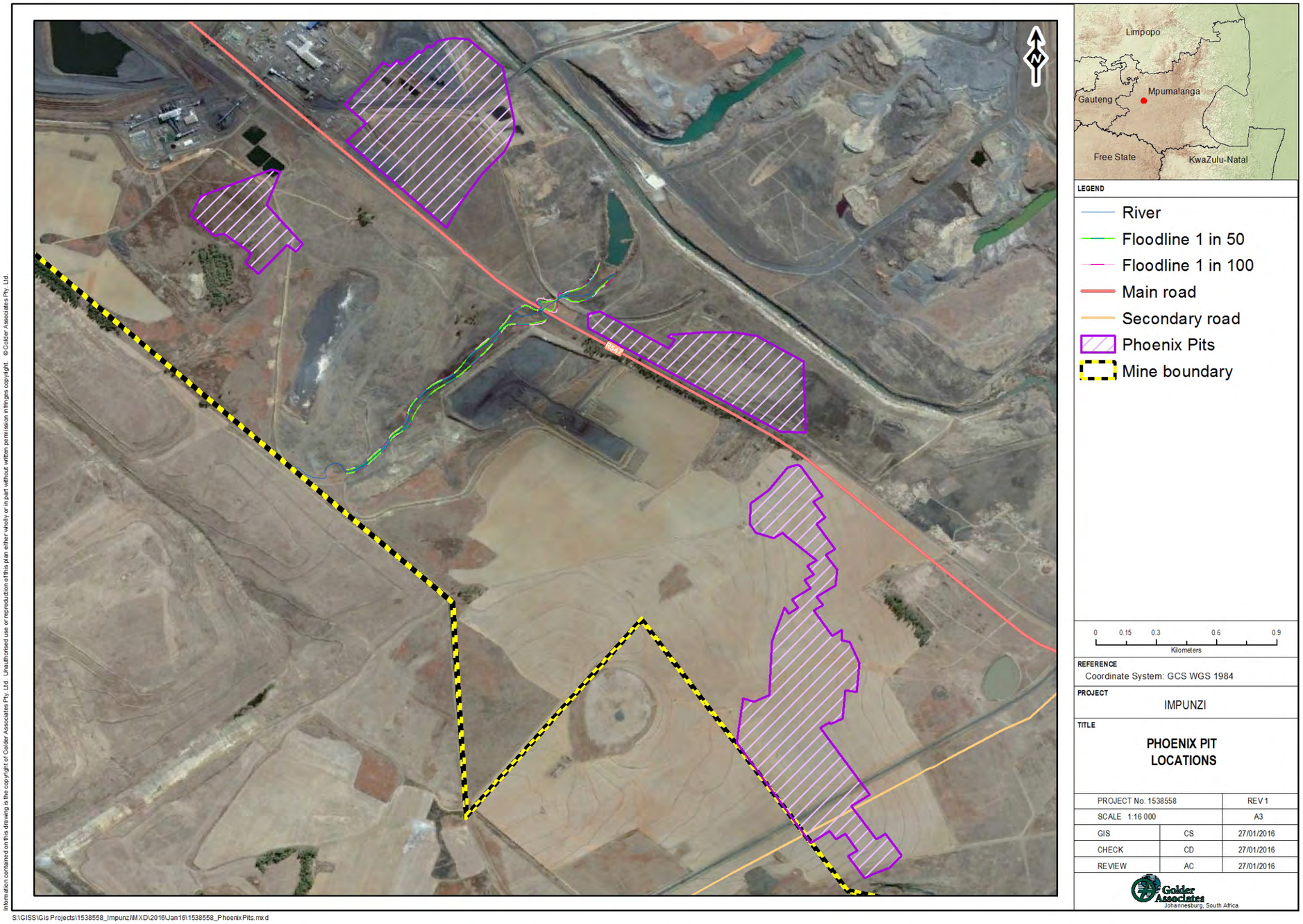


Figure 3-1: 1:50 and 1:100 year floodlines for watercourses within the proposed Phoenix Pit region

Figure 3-2: 1:50 and 1:100 year floodlines for the iMpunzi tributary.

3.2.2 Stormwater management

The iMpunzi facility requires a storm water management plan (SWMP) to mitigate flows around key infrastructure and to prevent clean storm water interacting with potentially polluted runoff water. The design criteria for sizing the stormwater management infrastructure for the iMpunzi site will follow Regulation 704, which states that: "*every person in control of an activity must design, construct, maintain and operate any dirty water system at the activity so that it is not likely to spill into any clean water system more than once in 50 years*". This section describes a conceptual storm water management plan such that iMpunzi site complies with Regulation 704.

Stormwater is only diverted if required such that natural flow is not impeded unnecessarily. Key infrastructure areas that could generate polluted runoff were identified as the stockpile areas at the Office and Phoenix Pits. The stormwater runoff being generated from the surrounding catchments is considered clean. Stormwater runoff will be collected, contained and diverted around the proposed Office and Phoenix Pits. The proposed stormwater management system management structures are described below and illustrated in Figure 3-3, Figure 3-4 and Figure 3-5.

It is important to note that iMpunzi, as an existing mining operation, has an existing dirty water management system to manage any dirty water generated onsite. It is envisaged that the Office and Phoenix Pit operations will fit into the current onsite system, without the need for the development of any major water management infrastructure.

The proposed pit layout was discretised into sub-catchments based on the topography of the region. The parameters used to model the overland and channel flow are given in Table 13. The Manning's 'n' coefficient used in the model for the impervious areas was taken as 0.016 and the coefficient for the pervious areas was taken as 0.15.

Table 3-3: Catchment areas, slopes and computed runoff volumes and flood peaks for the 50 year storm

Catchment Name	Area (ha)	Slope (%)	Total runoff volume per 24 hours (ML)	Peak Runoff (m^3/s)
OP1C_1	29.69	0.64	3.88	1.30
OP1C_2	32.74	1.50	4.93	1.65
OP1SC_1	2.02	0.81	0.37	0.13
OP1SC_2	1.88	0.57	0.34	0.12
OP2C_1	57.58	2.28	7.76	2.60
OP2C_2	54.25	0.70	5.31	1.86
OP2C_3	63.83	1.91	7.45	2.60
OP2SC_1	2.61	1.23	0.36	0.12
OP2SC_2	1.36	1.25	0.19	0.06
PP1C_1	25.75	3.00	3.94	1.32
PP1C_2	18.97	3.06	2.66	0.89
PP1C_3	4.70	1.41	0.92	0.36
PP1SC_1	4.04	1.55	0.74	0.27
PP1SC_2	0.32	1.55	0.09	0.05
PP2C_1	29.91	1.25	2.84	1.00
PP2C_2	25.71	1.59	2.69	0.93
PP2C_3	39.00	1.78	3.92	1.37
PP2SC_1	5.35	1.02	0.81	0.27

Catchment Name	Area (ha)	Slope (%)	Total runoff volume per 24 hours (ML)	Peak Runoff (m^3/s)
PP2SC_2	1.73	3.81	0.48	0.29
PP3C_1	12.00	2.03	1.73	0.58
PP3C_2	32.43	1.93	4.54	1.52
PP3SC_1	2.80	3.15	0.61	0.26
PP4C_1	3.00	1.46	0.48	0.16
PP4C_2	4.73	1.43	0.72	0.24
PP4C_3	94.08	0.78	7.95	2.87
PP4C_4	47.54	1.00	4.76	1.66
PP4SC_1	0.49	1.88	0.10	0.04
PP4SC_2	0.49	1.88	0.10	0.04
PP5C_1	43.00	1.29	4.48	1.55
PP5C_2	3.48	1.68	0.70	0.28
PPSC_1	1.70	3.90	0.41	0.20

All diversion channels have been sized to convey the 50 year return period flood peak. Allowable freeboard standards used were: for flow less than 10 m^3/s a 0.3 m freeboard was added to the maximum flow depth while for flows above 10 m^3/s a freeboard of 0.6 m was added to the maximum flow depth. Channels were modelled as earth lined channels with partial vegetation.

Office Area

Figure 3-3 illustrates the positions of the clean and dirty water conduits and collection sumps as part of the stormwater management plan for Office Pit area. Table 3-4 represents the dimensions and characteristics of the diversion channels at the Office Pit area.

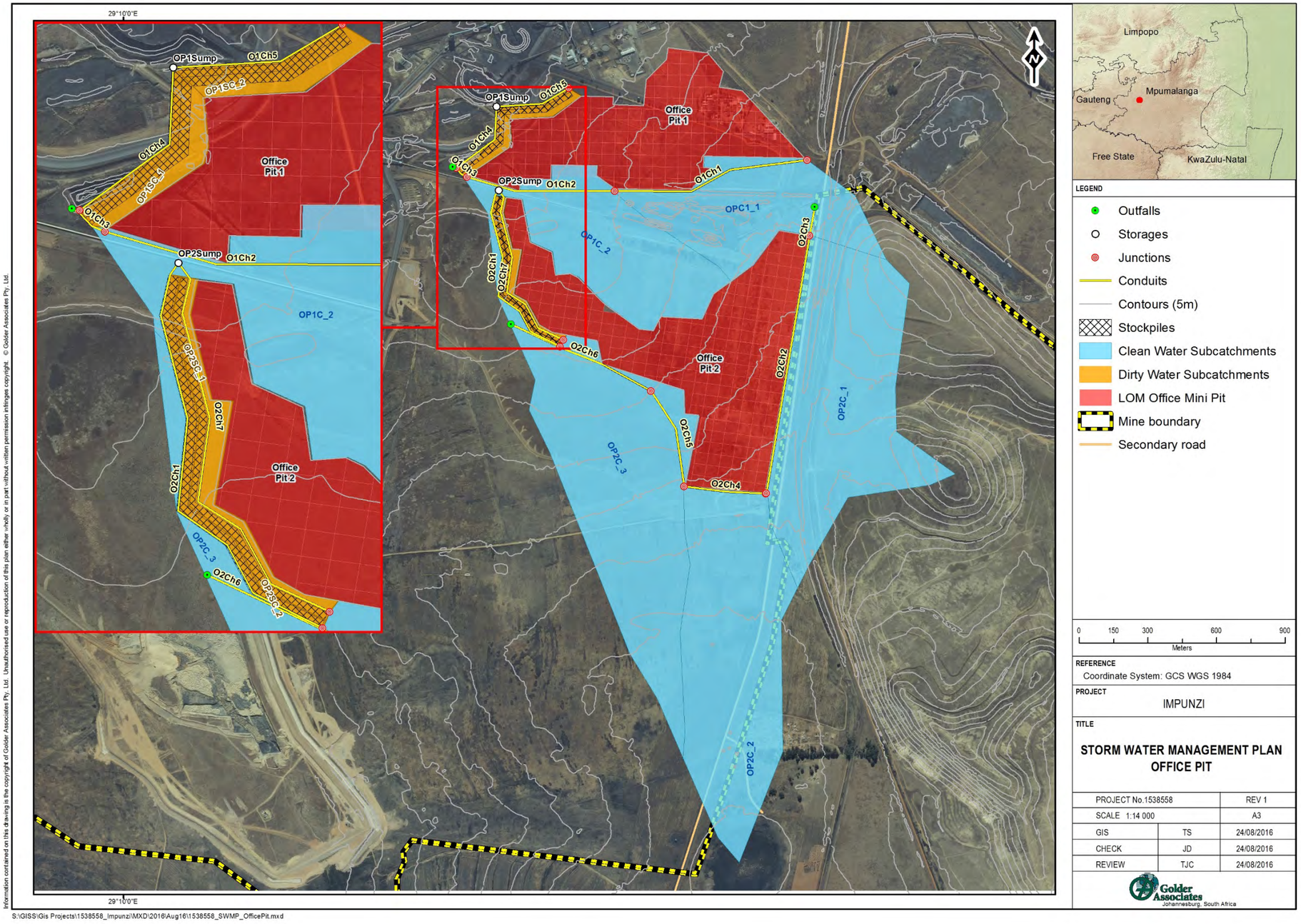


Figure 3-3: Office Pits area stormwater management measures

Table 3-4: Dimensions of the diversion channels to convey the 50 year return flood peak at Office Pit 1 and Office Pit 2

Channel Name	Length (m)	Cross-Section	Height (m)	Bottom width (m)	Side Slopes	Channel Slope (m/m)	Max. Velocity (m/s)
O1Ch1	485	Trapezoidal	1	1.2	1:1.5	1.44%	1.71
O1Ch2	301	Trapezoidal	1	1.2	1:1.5	1.00%	1.04
O1Ch3	394	Trapezoidal	1	1.2	1:1.5	1.40%	1.65
O1Ch4	196	Trapezoidal	1	1.2	1:1.5	0.66%	1.81
O1Ch5	60	Trapezoidal	1	1.2	1:1.5	3.69%	2.2
O1Ch6	195	Trapezoidal	1	1	1:1.5	0.10%	0.4
O1Ch7	143	Trapezoidal	1	1	1:1.5	0.42%	0.54
O1Ch8	125	Trapezoidal	1	1	1:1.5	1.04%	0.76
O1Ch9	181	Trapezoidal	1	1	1:1.5	0.83%	0.68
O2Ch1	485	Trapezoidal	1	1	1:1.5	1.24%	2.01
O2Ch2	649	Trapezoidal	1	1	1:1.5	1.00%	1.83
O2Ch3	126	Trapezoidal	1	1	1:1.5	1.99%	2.09
O2Ch4	323	Trapezoidal	1.2	1	1:1.5	0.62%	1.19
O2Ch5	443	Trapezoidal	1.2	1	1:1.5	2.19%	2.58
O2Ch6	402	Trapezoidal	1.2	1	1:1.5	1.94%	2.49
O2Ch8	942	Trapezoidal	1.2	1	1:1.5	1.43%	2.4
O2Ch9	30	Trapezoidal	1	1.2	1:1.5	6.68%	4.25
O2Ch10	135	Trapezoidal	0.8	0.5	1:1.5	0.74%	0.62
O2Ch11	203	Trapezoidal	0.8	0.5	1:1.5	2.31%	0.91
O2Ch12	370	Trapezoidal	0.8	0.5	1:1.5	1.30%	0.69
O2Ch13	78	Trapezoidal	0.8	0.5	1:1.5	0.64%	0.53
O2Ch14	26	Trapezoidal	0.8	0.5	1:1.5	1.17%	0.7
O2Ch15	112	Trapezoidal	0.5	0.8	1:1.5	0.45%	0.58
O2Ch16	203	Trapezoidal	0.8	0.5	1:1.5	1.72%	0.99
O2Ch17	359	Trapezoidal	0.8	0.5	1:1.5	1.31%	0.85
O2Ch18	64	Trapezoidal	0.8	0.5	1:1.5	1.25%	0.85
O2Ch19	37	Trapezoidal	0.8	0.5	1:1.5	2.18%	1

Phoenix Pit 1 and Phoenix Pit 2

Figure 3-4 illustrates the positions of conduits and collection sumps as part of the stormwater management plan for Phoenix Pit 1 and Phoenix Pit 2. Table 3-5 presents the dimensions of the diversion channels at Phoenix Pit 1 and Phoenix Pit 2.

Table 3-5: Dimensions of the diversion channels to convey the 50 year return flood peak at Phoenix Pit 1 and Phoenix Pit 2

Channel Name	Flow (m)	Cross-Section	Height (m)	Bottom width (m)	Side Slopes	Channel Slope (m/m)	Max. Velocity (m/s)
P1Ch1	463	Trapezoidal	0.8	1	1:1.5	1.73%	1.74
P1Ch2	155	Trapezoidal	0.8	1	1:1.5	0.65%	1.2
P1Ch3	441	Trapezoidal	0.8	0.5	1:1.5	1.59%	1.27
P1Ch4	40	Trapezoidal	0.8	0.5	1:1.5	2.52%	1.18
P1Ch5	36	Trapezoidal	0.8	0.5	1:1.5	1.41%	1.15
P1Ch6	139	Trapezoidal	0.8	0.5	1:1.5	0.58%	0.51
P1Ch7	42	Trapezoidal	0.8	0.5	1:1.5	1.69%	0.76
P1Ch8	357	Trapezoidal	0.8	0.5	1:1.5	0.98%	1.1
P2Ch1	749	Trapezoidal	0.8	0.5	1:1.5	2.40%	1.82
P2Ch2	173	Trapezoidal	1	1	1:1.5	2.43%	1.37
P2Ch3	275	Trapezoidal	1	1	1:1.5	3.38%	1.88
P2Ch4	266	Trapezoidal	1	1	1:1.5	0.56%	1.42
P2Ch5	603	Trapezoidal	0.8	0.5	1:1.5	0.50%	0.72
P2Ch6	196	Trapezoidal	0.8	0.5	1:1.5	2.04%	1.12
P2Ch7	100	Trapezoidal	0.8	0.5	1:1.5	0.50%	0.98

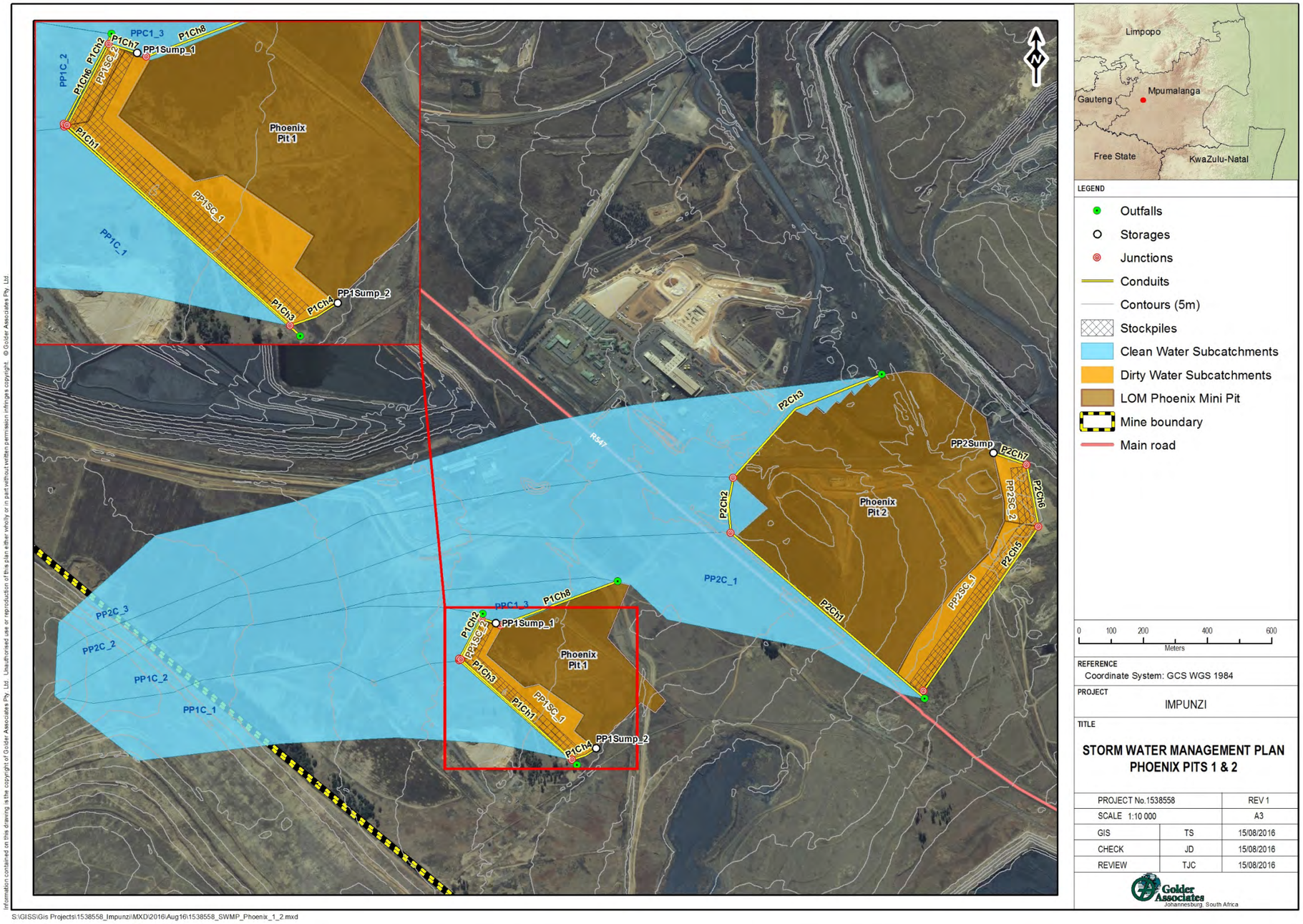


Figure 3-4: Phoenix Pit 1 and 2 stormwater management plan.

Phoenix Pit 3, Phoenix Pit 4 and Phoenix Pit 5

Figure 3-5 illustrates the positions of conduits and collection sumps as part of the stormwater management plan for Phoenix Pits 3-5. Table 3-6 represents the dimensions of the diversion channels at Phoenix Pit 3-5.

Table 3-6: Dimensions of the diversion channels at Phoenix Pits 3-5.

Channel Name	Length (m)	Cross-Section	Height (m)	Bottom width (m)	Side Slopes	Channel Slope (m/m)	Max. Velocity (m/s)
P3Ch1	71	Trapezoidal	0.8	0.5	1:1.5	1.41%	1.25
P3Ch2	303	Trapezoidal	0.8	0.5	1:1.5	3.31%	1.55
P3Ch3	109	Trapezoidal	0.8	0.5	1:1.5	2.76%	1.37
P3Ch4	526	Trapezoidal	0.8	0.5	1:1.5	2.47%	1.91
P3Ch5	146	Trapezoidal	0.8	0.5	1:1.5	6.18%	2.25
P3Ch6	479	Trapezoidal	1	1.3	1:1.5	0.21%	0.91
P3Ch7	116	Trapezoidal	1	1	1:1.5	3.19%	2.17
P4Ch1	522	Trapezoidal	1	1	1:1.5	1.02%	1.79
P4Ch2	359	Trapezoidal	1	1	1:1.5	2.29%	1.95
P4Ch3	221	Trapezoidal	1	1.7	1:1.5	0.54%	1.57
P4Ch4	463	Trapezoidal	1	1.7	1:1.5	1.19%	1.51
P4Ch5	352	Trapezoidal	1	1.7	1:1.5	0.28%	1.09
P4Ch6	217	Trapezoidal	1	1.7	1:1.5	1.29%	1.87
P4Ch7	300	Trapezoidal	1	1.7	1:1.5	2.33%	2.1
P4Ch8	16	Trapezoidal	0.8	0.5	1:1.5	1.27%	1.26
P4Ch9	359	Trapezoidal	0.8	0.5	1:1.5	2.29%	1.18
P4Ch10	14	Trapezoidal	0.5	0.5	1:1.5	1.39%	1.14
P4Ch11	349	Trapezoidal	0.5	0.5	1:1.5	2.29%	1.06
P4Ch12	32	Trapezoidal	0.8	0.5	1:1.5	0.62%	0.59
P4Ch13	12	Trapezoidal	0.8	0.5	1:1.5	1.71%	1.33
P4Ch14	13	Trapezoidal	0.5	0.5	1:1.5	0.00%	0.03
P4Ch15	342	Trapezoidal	0.5	0.5	1:1.5	2.25%	0.76
P4Ch16	17	Trapezoidal	0.5	0.5	1:1.5	1.80%	0.7
P4Ch17	14	Trapezoidal	0.5	0.5	1:1.5	0.00%	0.03
P4Ch18	343	Trapezoidal	0.5	0.5	1:1.5	2.28%	0.74
P4Ch19	15	Trapezoidal	0.5	0.5	1:1.5	1.36%	0.66
P5Ch1	410	Trapezoidal	0.8	0.5	1:1.5	1.95%	1.25
P5Ch2	176	Trapezoidal	0.8	0.5	1:1.5	2.84%	2.59
P5Ch3	155	Trapezoidal	1	1	1:1.5	3.03%	2.21
P5Ch4	172	Trapezoidal	0.8	0.5	1:1.5	2.79%	1.36

P5Ch5	141	Trapezoidal	0.8	0.5	1:1.5	3.20%	1.09
P5Ch6	56	Trapezoidal	0.8	0.5	1:1.5	0.89%	0.93

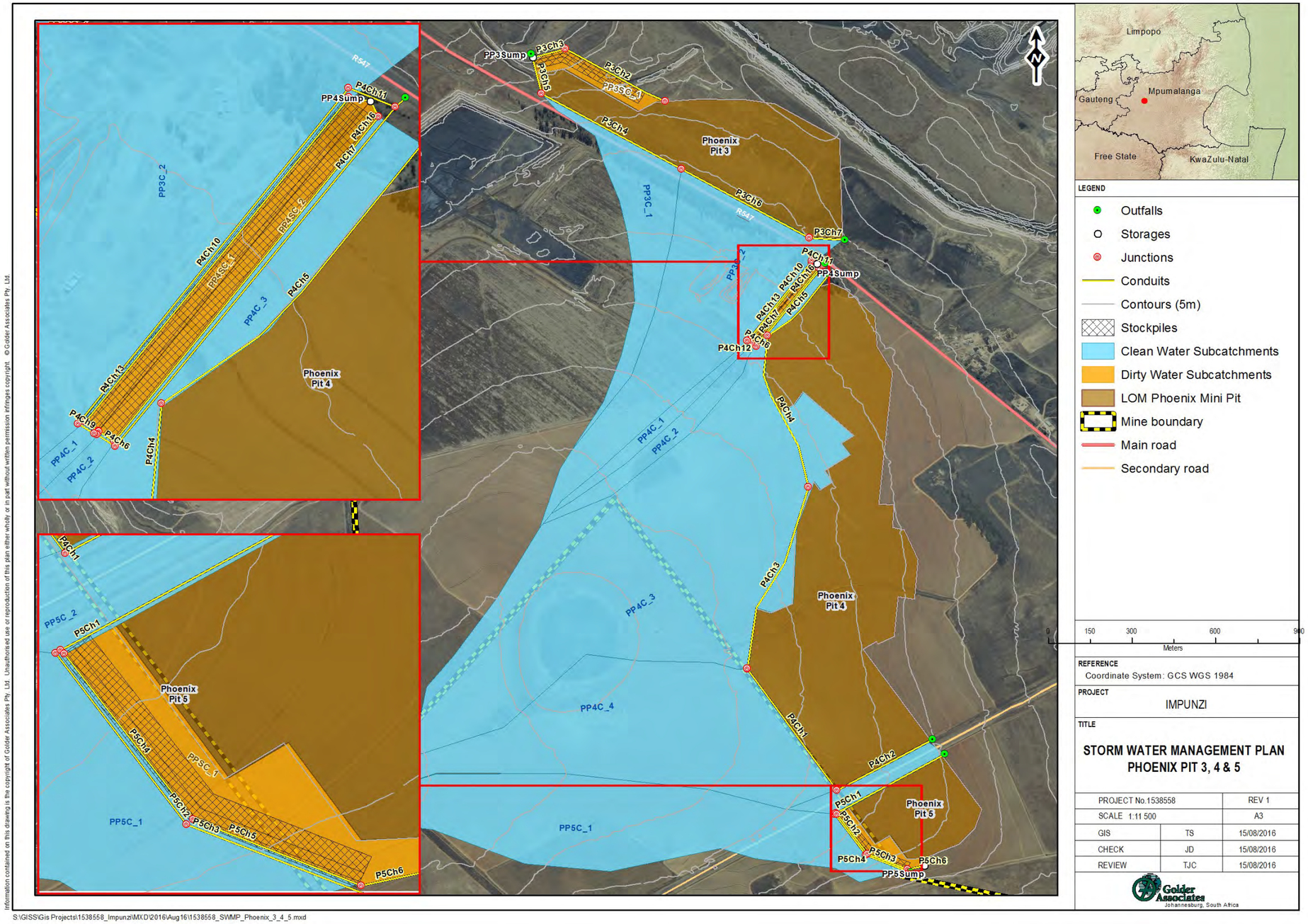


Figure 3-5: Phoenix Pit 3, 4 and 5 stormwater management plan

Collection sumps

It is necessary to route and impound polluted water in order to contain polluted water generated on site. This is to prevent clean storm water interacting with potentially polluted runoff water. Collections sumps are proposed at each pit as seen in Figure 3-3, Figure 3-4 and Figure 3-5. The potential runoff routed by the channel diversions indicate a minimum capacity required to contain the 1 in 50 24-hour storm event. The expected total inflow, and inflow rate are shown in Table 3-7.

Table 3-7: Characteristics of storage units to store polluted water from the 50 year return flood at each pit

Storage unit name	Max. Total Inflow (m^3/s)	Total inflow (ML)
OP1Sump	0.22	0.70
OP1Sump2	0.05	0.09
OP2Sump	0.15	0.55
PP1Sump	0.25	0.74
PP2Sump	0.45	1.28
PP3Sump	0.25	0.61
PP4Sump	0.07	0.19
PP5Sump	0.19	0.41

3.2.3 Waste management

The expected waste materials arising from the mining and coal processing operations are as follows:

- Discard coal of lower quality than required for export;
- Waste rock extracted during the coal mining process; and
- Sediment removed from the collection sumps.

The waste management hierarchy approach of prioritising in terms of avoidance, minimisation, re-use and disposal as a last resort, will be followed.

The Water Use Licence Application (WULA) and the Integrated Water and Waste Management Plan (IWWMP) will be submitted to the DWS in due course. The first three waste streams listed above will all be disposed on the existing and authorised iMpunzi discard dump/s.

Given that the Office and Phoenix Pits are only an extension to the current mining operations onsite and will not require any further supporting infrastructure, it is not envisaged that other waste streams will be generated.

3.2.4 Impact Assessment

A number of potential direct and indirect impacts were identified through the surface water specialist study (Doyle, C; Coleman, T; 2016). The identified impacts pertain to:

- Changes in surface water catchment areas, through disruption and reduction in land due to mining of Office and Phoenix Pits;
- Changes in surface water quality, through poor quality runoff from mining and associated activities; and possible fuel and lubricants spillage from equipment and other chemical spills;

- Increased surface water runoff due to vegetation and soil removal. therefore decreasing infiltration into soil; and runoff impact due to mining activities during operation and rehabilitation; and
- Erosion on site due to clearance of vegetation, causing increased silt load in runoff.

3.2.4.1 Construction phase

During construction, surface water quality could potentially be impacted on negatively through the spillage of fuels, lubricants and other chemicals. The potential impact has been assessed as a **low** (**SP= 24**) significance. Erosion could be caused during construction through the clearance of vegetation. Similarly, the potential impact was assessed as a **low (SP= 15)** significance**,** as the low flow dynamics in the areas are unlikely to cause any surface erosion.

These potential impacts can further be mitigated through the following measures;

- Storing chemicals and/or fuel in bunded areas;
- Clean-up of spills as soon as they occur; and
- Construction of the stormwater management infrastructure before most of the other construction activities commence.

3.2.4.2 Operational phase

The operational activities could result in poor quality runoff being generated at the various dirty catchments with the pre-mitigation assessment being of a **moderate (SP=30)** significance**.** Furthermore, the operational activities could result in reduced catchment areas and thus disrupt and reduce runoff. Without proper mitigation, this impact has been assessed as a **moderate (SP=30)** significance. Erosion on site and surrounding areas may be increased due to mining of the pits and is seen as a **low (SP=28)** significance.

These potential impacts can all be reduced to **low** significance through the proper implementation of the proposed stormwater management plan as described above. Implementation of the stormwater management plan/system will keep the clean water away from the mine area to allow the maximum runoff to enter the environment and will further separate the clean and dirty water as per Regulation 704.

3.2.4.3 Rehabilitation phase

Decommissioning may leave large barren areas that may undergo increased erosion, which might increase the amount of suspended solids in downstream surface water, reducing water quality, but given that iMpunzi proposes to use a roll-over mining method with concurrent rehabilitation, this potential impact has been assessed as a **low (SP=21)** significance. To maintain this as a low significance impact, it is important for iMpunzi to ensure that backfilling of the pits should be completed during the operational phase.

3.3 Wetlands

As mentioned above, a wetland specialist study was conducted as part of the larger project aimed at delineating the wetland areas in the vicinity of the proposed Office and Phoenix operations and further to assess the impact of these operations on the wetlands, (see WCS 2016), attached in (APPENDIX G).

Figure 3-6 below illustrates the proposed opencast pits and stockpiles in relation to delineated wetlands. Expected direct wetland losses are highlighted in orange and amount to 32.2 ha of hillslope seepage wetland in the case of the Office Pits, and 1.8 ha in the case of the Phoenix Pits.

All wetland habitat located within the direct mining footprints is expected to be permanently lost. Adjacent wetland habitat located downslope is also likely to be indirectly impacted through a reduction in flows, both in terms of surface flow (due to exclusion of part of the catchment as a dirty water area) and sub-surface flow (interception of interflow and lowering of the local groundwater table due to drawdown associated with the opencast pits).

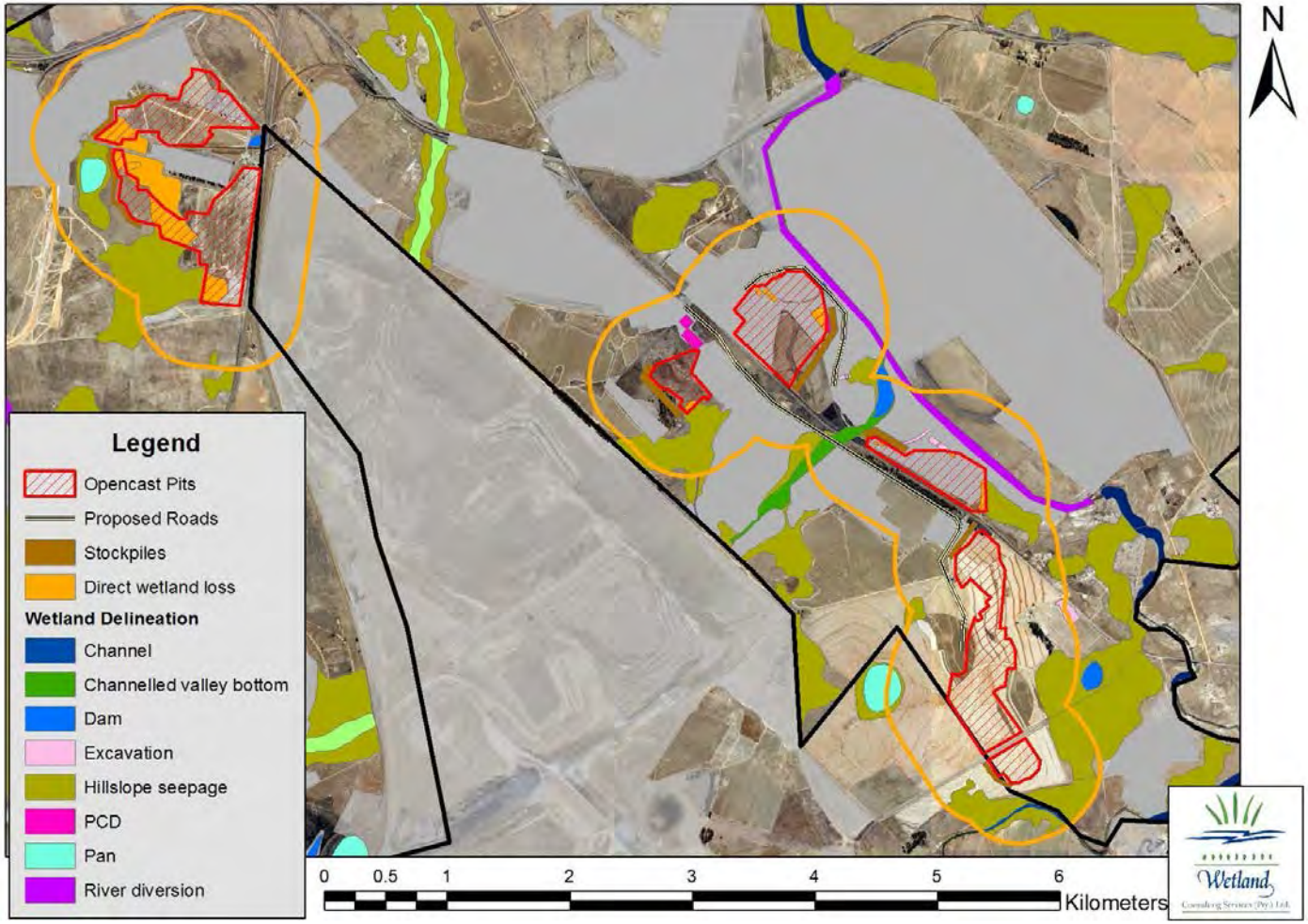


Figure 3-6: Proposed opencast pits and stockpiles in relation to delineated wetlands. Wetland habitat likely to be lost is highlighted in orange, while the haul road crossing is circled in yellow

It is important note that the Phoenix pan (see Figure 3-6) falls outside the proposed opencast pits. In fact, the proposed opencast pits are located outside the surface catchment of the pan. As such the Phoenix pan is not expected to be impacted by the proposed mining activities.

In addition to the impacts due to proposed mining activities, the required stockpiles will further contribute to wetland loss. Approximately 1.56 ha of wetland habitat falls within the footprint of the proposed stockpiles. Required haul roads will also necessitate a crossing over a valley bottom wetland (see Figure 3-6).

3.3.1 Impact assessment

A number of potential impact have been identified and pertain to:

- Loss and disturbance of wetland habitat;
- Increased sediment transport into wetlands;
- Water quality deterioration;
- Decreased water make to adjacent wetlands;
- Discharge of stormwater into wetlands;
- Altered hydrology;
- Increased sediment transport into wetlands; and
- Increased alien vegetation.

3.3.1.1 Construction

Loss and disturbance of wetland habitat

The directly affected wetlands are all hillslope seepage wetlands and vary from moderately to largely modified (PES categories C and D), and Moderate to Low/Marginal importance and sensitivity. Given that construction activities associated with the opencast pits will extend into the wetland habitat on site, it is considered likely that additional disturbances to the wetland vegetation and habitat adjacent to the required opencast pits will occur. Such disturbances can lead to increased erosion in the wetlands (e.g. preferential flow paths created by vehicle tracks), displacement of wetland fauna, changes in wetland vegetation and invasion by alien vegetation. Blasting activities are also likely to result in disturbance and possibly displacement of wetland fauna. The overall impacts are assessed as a **high (SP= 70)** significance, given that wetland areas will be directly affected through the proposed operations.

In terms of mitigation, it is important that the mitigation hierarchy be followed to try and avoid, minimise, and then mitigate impacts. In this regard the mine plan should be optimised to avoid wetlands where possible and minimise the extent of wetland loss, bearing in mind of course that mining has to take place where the coal resource is located. It is however recommended that the Phoenix pan and its entire surface catchment be excluded from mining activities. No opencast mining or placing of stockpiles or any other surface infrastructure should take place within the pan catchment.

Specifically referring to the loss of and disturbance of wetland habitat, the following further recommendations are made:

- All mining activity areas located adjacent to wetland areas should be fenced off prior to commencement of construction activities on site so as to prevent access to wetland areas by construction machinery and personnel. In addition, all wetland areas should be clearly marked and demarcated as such to alert construction staff on site. All construction staff should also be educated on the importance and sensitivity of the wetland systems on site. This should form part of the induction process;
- Develop and implement a construction storm water management plan prior to the commencement of site clearing activities;

- 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 50m maintained from delineated wetland boundaries;
- Rehabilitate and re-vegetate all disturbed areas as soon as possible following disturbance; and
- An alien vegetation management plan should be drawn up by the Environmental Co-ordinator and implemented. Regular removal of invasive alien species should be undertaken. This should extend right through to the decommissioning and closure phase of the project.

The implementation of the mitigation measures will result in the reduction to a **moderate (SP=60)** significance.

Increased sediment transport into wetlands

Stripping of vegetation will increase volumes and velocities of surface runoff generated from the affected areas, increasing erosion risk within downslope receiving wetlands. Soil compaction due to movement of machinery during construction will further increase runoff, while vehicle ruts and tracks resulting from construction activities could provide preferential flow paths that lead to flow concentration, again increasing erosion risk.

Increased sediment loads transported into adjacent wetlands from the sediment rich runoff generated on site will be deposited within the wetlands as flows slow down. Deposited sediments are likely to be colonised by pioneer and ruderal species, leading to deterioration of habitat quality. This impact has been assessed as a **moderate (SP=44)** significance.

In terms of mitigation, the stormwater plan described above must be implemented prior to the commencement of large scale vegetation clearing activities or construction activities and be maintained until the end of the construction phase. Such a plan should aim to minimise the transport of sediment off site as well as prevent the discharge of high velocity flows into downslope wetlands. Sediment traps and sediment barriers should be installed where necessary, and discharge points should incorporate energy dissipaters and be protected against erosion.

Vegetation clearing, soil stripping and major earthmoving activities should be phased to minimise the extent of bare soil surfaces exposed at any one time. Vegetation clearing and soil stripping should also only be undertaken immediately preceding the onset of construction activities on site, i.e. ideally not more than 7 days before the onset of construction activities. A scenario of cleared areas lying bare and unused for weeks on end must be avoided.

The implementation of the mitigation measures will result in the reduction to a **moderate (SP=32)** significance.

Water quality deterioration

During the construction phase, as activities are taking place in close proximity to wetlands, there is a possibility that water quality can be impaired. Water quality may also be impaired as a consequence of accidental spillages and the intentional washing and rinsing of equipment within the wetlands. The small farm dam on site is likely to be most at risk from such washing and rinsing of equipment. It is likely that hydrocarbons will be stored and used on site, as well as cement and other potential pollutants. This impact has been assessed as a **moderate (SP=36)** significance.

In terms of mitigation, where practically possible, no runoff should be introduced into wetlands. Introduction into dryland areas is preferred as the vegetation and soils provide an opportunity to limit the movement of contaminants and the environment is conducive for natural degradation. Potential contaminants used and stored on site should be stored and prepared on bunded surfaces to contain spills and leaks. Sufficient spill clean-up material must be kept on site at all times to deal with minor spills.

The implementation of the mitigation measures will result in the reduction to a **low (SP=24)** significance.

Decreased water make to adjacent wetlands

Construction of the proposed opencast pits and associated surface infrastructure could result in decreased water make to adjacent wetlands. Proposed mining activities will impact on surface flows and interflow by excluding dirty water areas from draining into the adjacent downstream catchment. Surface water is likely to be captured in stormwater infrastructure and interflow will be intercepted by excavations and cut-off trenches. This impact has been assesses as a **moderate (SP=52)** significance.

In terms of mitigation, dirty water areas should be kept as small as possible, while still ensuring the effective separation of clean and dirty water. All clean water from upslope of the dirty water areas should be diverted around the dirty water areas and discharged back into the environment:

- Clean water diversions should ideally take the form of grassed swales rather than simple excavated trenches that present an erosion risk;
- The clean water diversion discharge points should be protected against erosion and must incorporate energy dissipating structures to prevent erosion in receiving wetlands; and
- Discharge points should be regularly inspected and maintained to ensure efficient functioning. Any observed erosion damage should be repaired immediately and the cause addressed.

There is little opportunity to mitigate against the impact of drawdown of shallow groundwater. Even with The implementation of the mitigation measures the significance will only be reduced to a **moderate (SP=48)** significance.

3.3.1.2 Operational phase

Loss and disturbance of wetland habitat

Day to day mining activities, if not strictly controlled, can result in continual disturbances to the wetland vegetation and habitat on site, through for example off-road driving in the wetland area, annual burning, temporary stockpiling of material in the wetland area, or increase in poaching activities. Without mitigation, this impact has been assessed as a **moderate (SP=36)** significance.

In terms of mitigation, the opencast and surface infrastructure areas should be fenced off so as to prevent machinery and personnel accessing adjacent wetland areas outside the disturbance footprint. No stockpiling of material may take place within the wetland areas and temporary camps and infrastructure should also be located away from these areas. Where access into wetland areas is unavoidable, regular cleaning up of the wetland areas should be undertaken to remove litter, while an alien vegetation management plan should be drawn up by the Environmental Coordinator. Regular removal of invasive alien species should be undertaken. This should extend right through to the decommissioning and closure phase of the project.

The implementation of the mitigation measures will result in the reduction to a **Low (SP=18)** significance.

Increased sediment transport into wetlands

Earthworks and bare soil areas, including topsoil and overburden stockpiles, associated with the operation of the opencast mining areas, e.g. stockpiles, will provide potential sediment sources to downslope wetlands, potentially leading to increased sedimentation in these systems and resultant changes in vegetation. This impact has been assessed as a **moderate (SP=48)** significance.

In terms of mitigation, it important for iMpunzi to:

- Implement the stormwater management plan for the opencast areas;
- Divert clean water around the dirty water areas, ideally in grassed swales rather than simple excavated trenches; and
- Install sediment barriers where required to prevent sediment movement off site, specifically around stockpile areas.

The implementation of the mitigation measures will result in the reduction to a **low (SP=27)** significance.

Water quality deterioration

As part of supporting activities for the opencast mining activities, numerous hazardous and potentially polluting substances will be utilised and possibly temporarily stored on site. Spillages and leaks of hydrocarbons could result in the deterioration of water quality should they enter the adjacent wetland areas via surface runoff. Water leaking or overflowing from any dirty water retention facilities on site could also lead to water quality deterioration. This impact has been assessed as a **moderate (SP=40)** significance.

In terms of mitigation, all hazardous substances should be stored on impervious surfaces, outside any wetland areas, that allow for the containment of spills and leakages (e.g. bunded areas). No hazardous materials may be stockpiled in any wetland area on site. Any carbonaceous material stockpiled on site must be located within a dirty water area isolated from the surrounding catchment and all runoff and seepage from the stockpile must be contained. No discharge of such dirty water from the site may take place.

The implementation of the mitigation measures will result in the reduction to a **low (SP=27)** significance.

Decreased water make to adjacent wetlands

This impact is a continuation of the impact described under the construction phase above. The impact will commence in the construction phase and extend right through to the decommissioning phase.

Discharge of storm water into wetlands

Impermeable surfaces and compacted soils associated with the opencast operations and infrastructure (e.g. road surfaces) will result in increased volumes and velocities of run-off. This run-off should be collected in the storm water system and conveyed to the valley bottoms. Release of the storm water through point source discharges increases the risk of erosion within the valley bottoms at the discharge point. This impact has been assessed as a **moderate (SP=40)** significance.

In terms of mitigation, the following measures are recommended:

- Clean and dirty storm water need to be separated;
- No contaminated water should be allowed to enter the clean storm water system;
- Dirty storm water may not be released into the wetlands and should be contained and treated on site, or used for dust suppression;
- The volumes of storm water run-off should be minimised by limiting the area of impermeable surfaces and compacted soils;
- Where possible, storm water should be conveyed through grassed swales rather than concrete channels to aid infiltration and reduce run-off volumes; and
- Where storm water and/or diverted clean water is discharged into wetlands, gabions should be constructed to contain erosion. This should be done in consultation with an appropriate wetland and storm water specialist. The gabion structure should also include measures to dissipate energy of flows and to disperse flows over a greater area.

The implementation of the mitigation measures will result in the reduction to a **low (SP=27)** significance.

3.3.1.3 Rehabilitation phase

Water quality deterioration

The mined out and backfilled opencast areas are likely to fill with water following the completion of mining activities. Once pumping of groundwater stops, groundwater levels will rebound and, if left unmanaged, could eventually start decanting. Decanting water is likely to be acidic as well as metal and sulphate rich. Given the location of the mining area, decant would likely enter into the Steenkoolspruit river system if left unmitigated. The unmitigated impact has been assessed as a **high (SP=72)** significance.

The likelihood of decant occurring, as well as the likely decant points and decant quality should be determined. Based on the outcomes of these investigations, a water management plan should be compiled that will ensure that no dirty water is allowed to decant or be discharged into the environment and which also

addresses the possible migration of a groundwater pollution plume away from the mine. Decanting water should be captured/pumped out of the void to prevent the contaminated water entering any of the wetlands on site. The Glencore Water Reclamation Plant will be in operation by the time mining of these pits commences.

Clean and dirty water separation should be maintained until all contaminated materials have been removed from the dirty water areas. Soils suspected of being contaminated should be analysed and, if possible, remediated on site or, if this is not possible, should be removed and disposed of offsite in suitable waste disposal facilities.

It is important to note that Glencore has developed a long term water management plan, involving the long term water treatment of process affected water at the Glencore Water treatment facility. This facility will treat process affected water from a number of Glencore operations, including iMpunzi. Taking this overall mitigation measure into account, it is believed that the impact post closure on water quality deterioration can be reduced to a **moderate (SP=56)** significance.

Increased sediment transport into wetlands

The mine impacted areas undergoing rehabilitation during the decommissioning phase will be susceptible to erosion during and following rehabilitation, especially in areas that are sparsely vegetated or not vegetated at all. This will result in increased sediment loads in the downslope wetlands, leading to deteriorating water quality (increased turbidity and TSS) and changes in the aquatic fauna. Changes in wetland vegetation can also occur as sediment loving plants and pioneer species become dominant. This impact has been assessed as a **moderate (SP=44)** significance.

In terms of mitigation, all disturbed areas should be landscaped to approximate the natural landscape profile, and should avoid steep slopes and concentrated run-off. Compacted soils should be ripped and scarified. The rehabilitated areas should be re-vegetated as soon as possible following completion of the earthworks to minimise erosion. Regular long-term follow up of rehabilitated areas will be required to ensure the successful establishment of vegetation and to survey for any erosion damage on site. Erosion damage should be repaired immediately.

All rehabilitation activities should consider the need for and implementation of sediment and erosion control measures. Sediment barriers, e.g. straw bales or bidim fences, should also be installed along the downslope edge of disturbed areas until sufficient vegetation cover has been established, especially where bare soil areas will remain exposed during the rainfall season.

The implementation of the mitigation measures will result in the reduction to a **moderate (SP=32)** significance.

Increased alien vegetation

Following the completion of decommissioning, the recently placed and disturbed soils will be susceptible to invasion by alien vegetation, e.g. Acacia mearnsii (black wattle) which is already a significant problem species on site. These alien species could spread to the adjacent wetland areas and result in decreased flows, increased erosion and decreased biodiversity in these systems. This impact has been assesses as a **moderate (SP=48)** significance.

In terms of mitigation, the alien vegetation management plan should be kept in place for several years following mine closure. All species of alien invasive vegetation should be controlled and removed from site. No spread of alien vegetation into any wetlands or adjacent properties should be allowed.

The implementation of the mitigation measures will result in the reduction to a **low (SP=27)** significance.

Altered hydrology

Compared to the pre-mining landscape, the rehabilitated opencast pit will have significantly increased infiltration to groundwater and increased surface runoff. Typically the rehabilitated opencast areas lack the shallow perched water table that characterised the pre-mining landscape. Increased surface runoff will be exacerbated by decreased vegetation cover, resulting in higher flow velocities and volumes leaving the rehabilitated area, and associated with this potentially also increased sediment loads.

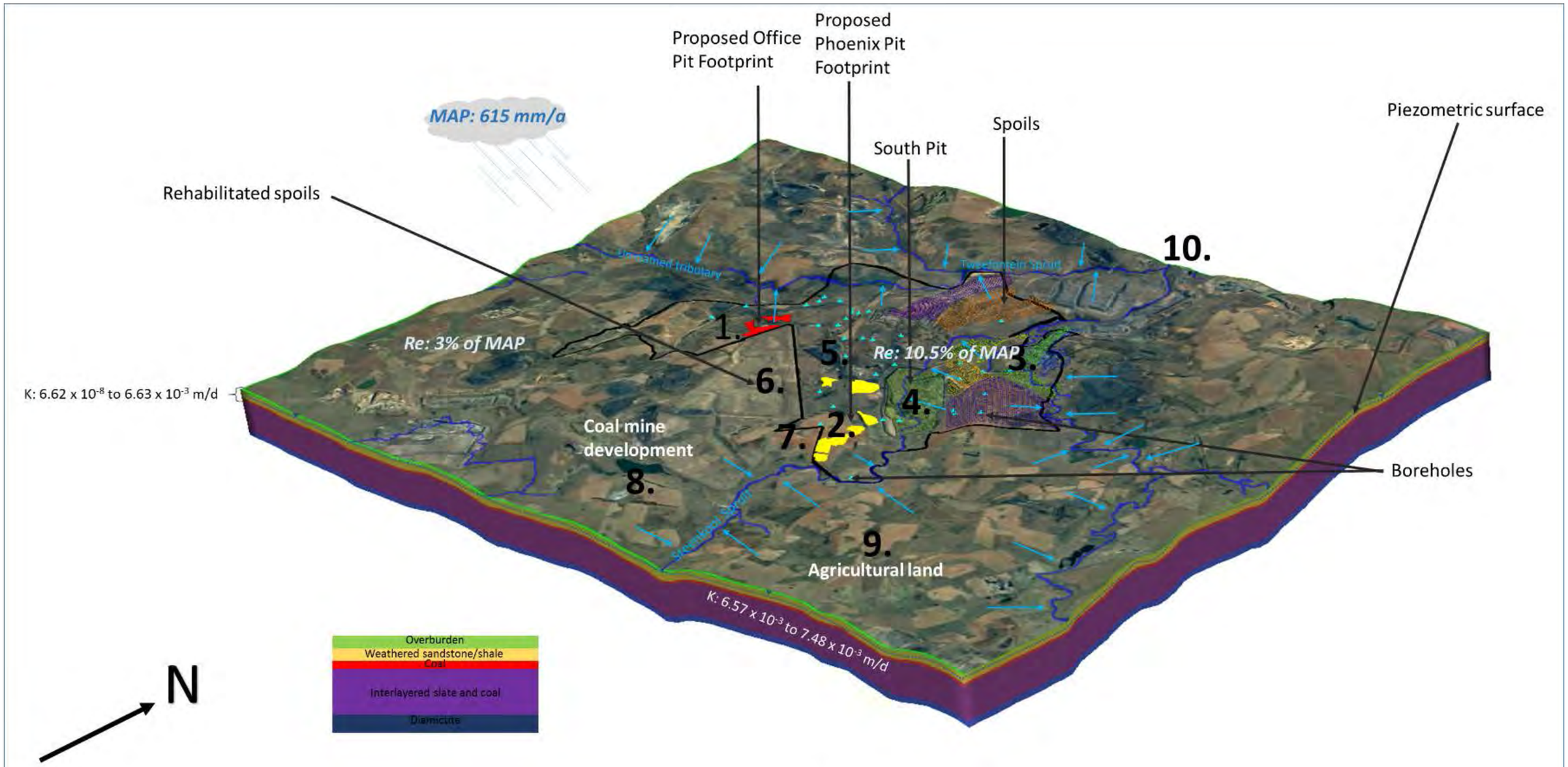
The implications of these changes are that no wetlands are likely to reform on the rehabilitated opencast areas, and that the remaining wetlands downslope of these areas will be faced with altered runoff characteristics from their catchment. Typically, surface runoff volumes and velocities are expected to increase, leading to increases in flood peaks and erosive energy, while subsurface inputs are expected to decrease, reducing low flows and increasing seasonality. This impact has been assessed as a **moderate (SP=52)** significance.

Mitigation options in this regard are rather limited. However, the rehabilitation of the opencast pits should ensure sufficient compaction of replaced spoils to limit ingress of surface water. A sufficient topsoil layer, based on the desired end land use should be replaced. If excess top soil is available, consideration should be given to increase the top soil depth in valley bottom areas/low points within the rehabilitated landscape to encourage the formation of wetlands in these areas. Re-vegetation of the rehabilitated areas and the maintenance of vegetation cover will also be critical.

The implementation of the mitigation measures will result in the reduction to a **moderate (SP=48)** significance.

3.4 Groundwater

As a first measure in determining the expected impacts on the hydrogeological regime in vicinity of the proposed Office and Phoenix pit a conceptual hydrogeological model (see Figure 3-7) was developed as part of the groundwater specialist study conducted for the Office and Phoenix Pit project (Golder 2016), attached in (APPENDIX G).



1. Proposed office pit
2. Proposed Phoenix pit
3. Glenore spoils
4. South Pit
5. Waste rock dumps – major source of contamination to the underlying aquifer
6. Rehabilitated spoils
7. Underground mining – Mining of seam 4 occurs extensively throughout the area
8. Coal mine developments
9. Agricultural lands
10. Major rivers transecting the catchment are the Tweefontein & Steenkool Spruit

Figure 3-7: Conceptual hydrogeological model

The conceptual model, which is drawn from the available site information documented in preceding sections and depicted visually in Figure 3-7, is summarised below;

- **Climate**: The site experiences summer rainfall conditions, the MAP is in the order 615 mm/a. Mean annual evaporation in the area is in the order of 1600 mm/a(WR2005);
- **Topography and drainage:** The study area is located in quaternary catchment B11E. The catchment is drained by the Steenkoolspruit, which flows northerly through the complex and has been diverted to flow around the South Pit. The Tweefonteinspruit, which drains the western extent of the study area is a tributary of the Steenkoolspruit. The confluence is located immediately north of the mine area. The average elevation of the site is 1520 mamsl. The topography at the Office pit area slopes gently north-west towards the Tweefonteinspruit. The Phoenix pits area slopes gently easterly towards the Steenkoolspruit;
- **Land use:** The principal land uses in vicinity of the site are coal mining and agriculture;
- **Geology:** The site is underlain by Ecca formation strata typical of the Mpumalanga coal fields. Based on the conceptual understanding drawn from previous studies, the overburden and weathered sandstone comprise the upper 10 -15 m of the succession. The sandstone is underlain by the economically viable No.4 coal seam. This major seam is in turn underlain by a sequence of slate horizons and coal seams including the deeper economic seam, Seam No. 2. The sequence is concluded with diamictites of the Dwyka Group. No major structural features are depicted on the 1:250 000 geological map describing the area;
- **Groundwater levels and flow directions:** The Karoo stratigraphy gives rise to semi-confined fractured rock aquifers. The measured water levels display poor correlation to surface elevation. This indicates that groundwater flow does not necessarily mimic surface flow directions. The poor correlation is deemed to be a consequence of the mine developments (both open pit and underground) which are widespread in the catchment area.

  Based on limited slug testing, there is similarity in the aquifer parameters of the deep and shallow zones which likely indicates continuity of the aquifer from the shallow weathered zone to the deeper fractured zone. The hydrogeological map series confirms the interpretation of the slug tests, which indicates the aquifers in vicinity of the site are regarded as minor to poor. Borehole yields are not expected to exceed 0.5 l/s.

  Water levels in the vicinity of the proposed Phoenix Pits range from 6 mbgl - 68 mbgl. The variation is indicative of the influence of the underground historical mine voids, the deepest levels are measured where borehole are drilled into or adjacent to the workings. There are no measured water levels within a 1 km radius of the proposed Office Pit footprint, the closest water levels vary between 10 - 40 mbgl.

  There is no available information on the dewatering of surrounding Glencore pits. Information of that nature would assist in determining storativity of the aquifer.
- **Hydro stratigraphy and aquifer parameters:** The shallow weathered aquifer extends to ~12 m weathering depth with perched water levels in certain areas. The hydraulic conductivity for the shallow aquifer ranges from 6.62x10-8 m/day to 6.21x10-3 m/day (Golder 2011).

  The deeper fractured aquifer system is associated with minor fracturing and contact zones in the Karoo sediments and is present below the weathered zone to a depth of at least 40 m. The hydraulic conductivity of the fractured aquifer system ranges from 6.57 x 10 3 m/day to 7.48 x 10-3 m/day (Golder 2011).
- **Recharge:** Recharge to the site has been estimated utilising the chloride method to be approximately 10.5% of MAP. Enhanced recharge in the area is inferred to be a consequence of mining i.e. presence of mining voids, mine dumps and spoils etc.

- **Receptors:** The principle biological receptors within the study area include the wetland systems in vicinity of the proposed pits. The Steelkoolspruit, the Tweeloopspruit and the tributaries of the two river systems. A 120 year legacy of coal mining in the area has resulted in impacts on the groundwater quality in vicinity of the abovementioned receptors (53% of sampled boreholes are significantly impacted) and thus these receptors are not presently pristine;l and
- **Mine plan:** Several satellite pits are proposed to exploit coal from the Number 4 coal seam. The Phoenix pits have an average maximum depth of 14.25 mbgl. The office pits have an average depth of 24.09 mbgl.

Historical underground mining is extensive throughout the area. Seams 1, 2, 4 and, in places, seam 5 have been mined via the board and pillar method. The historical mining has resulted in depression of groundwater levels in the area.

The proposed pits are conceptualised in relation to interpolated water levels in Figure 3-8– Figure 3-12 below.

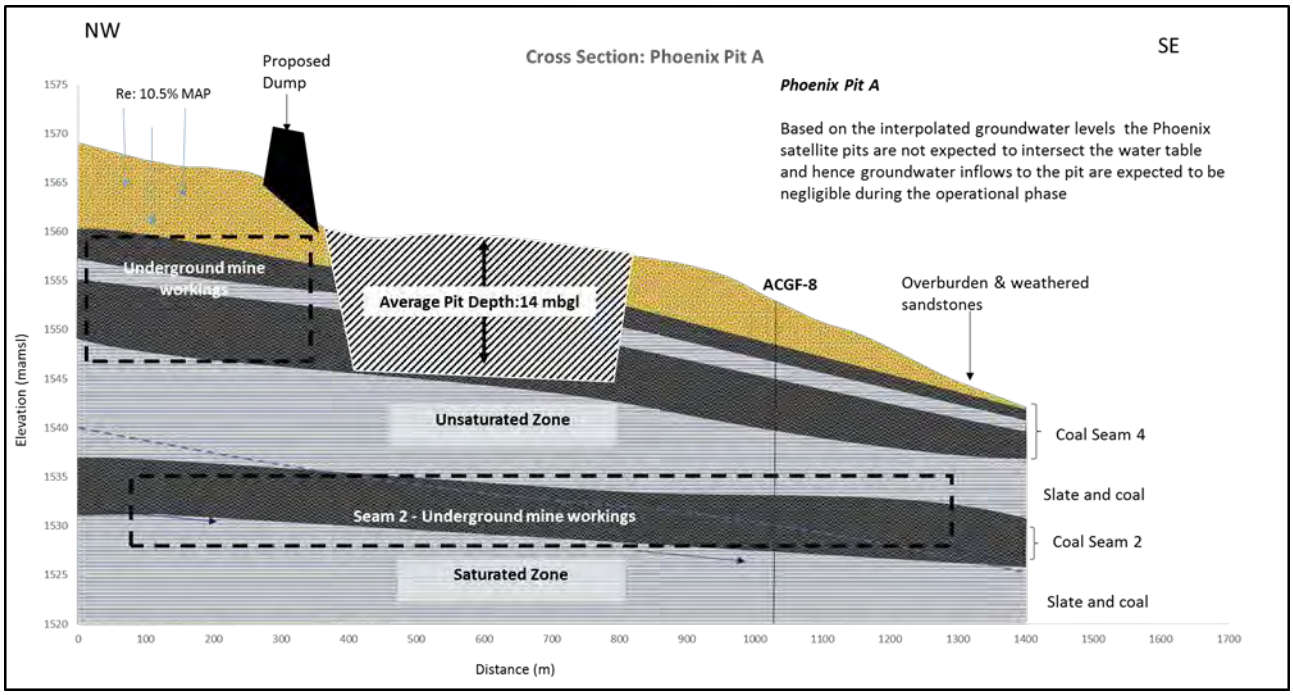


Figure 3-8: Phoenix Pit A – Interpolated groundwater levels and conceptual geology

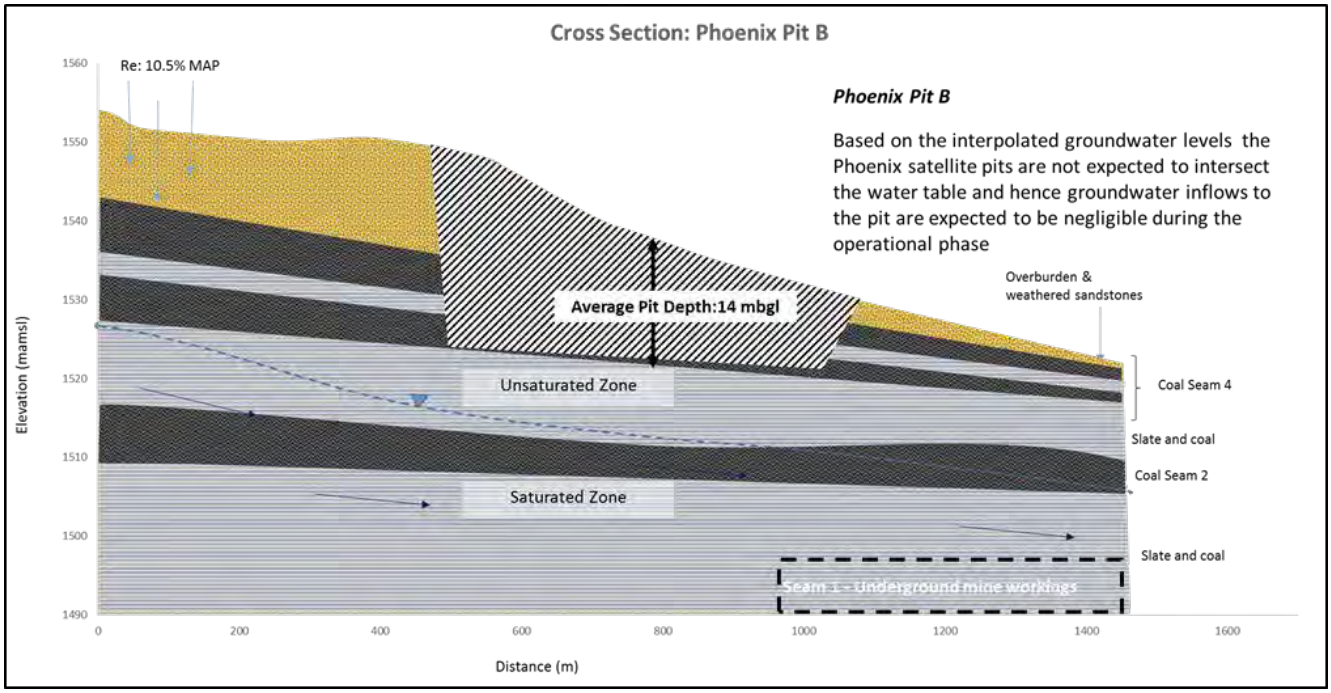


Figure 3-9: Phoenix Pit B – Interpolated groundwater levels and conceptual geology

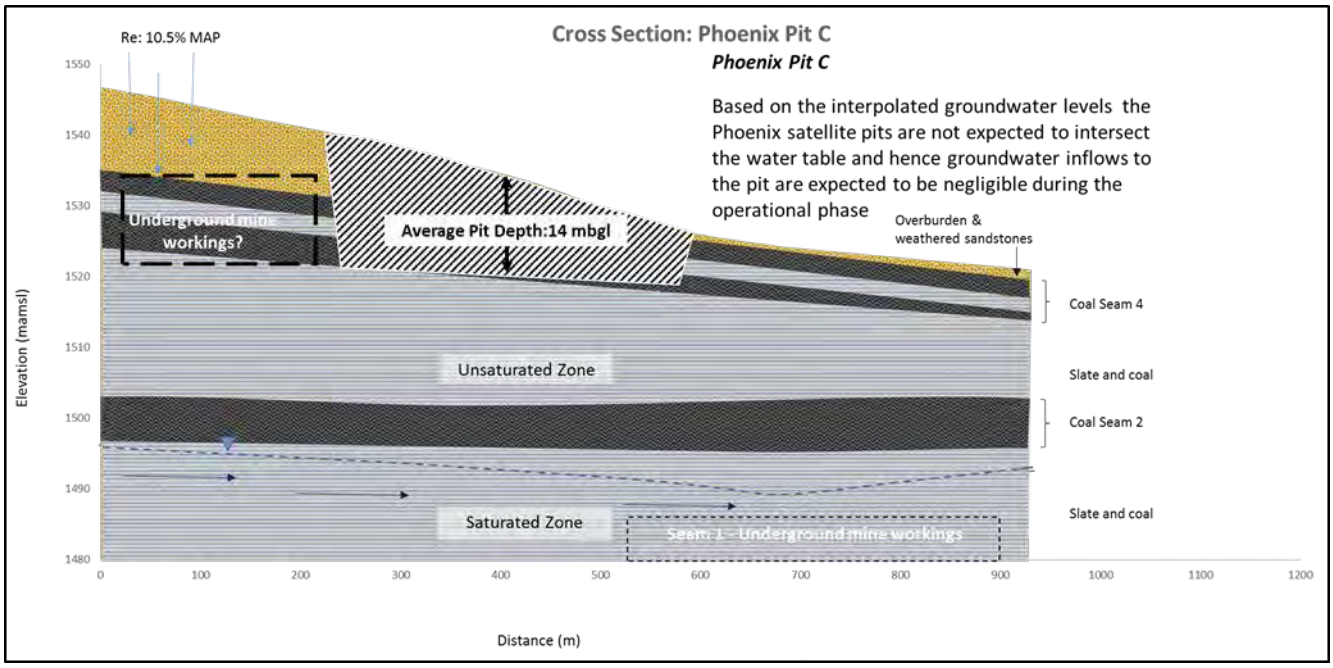


Figure 3-10: Phoenix Pit C – Interpolated groundwater levels and conceptual geology

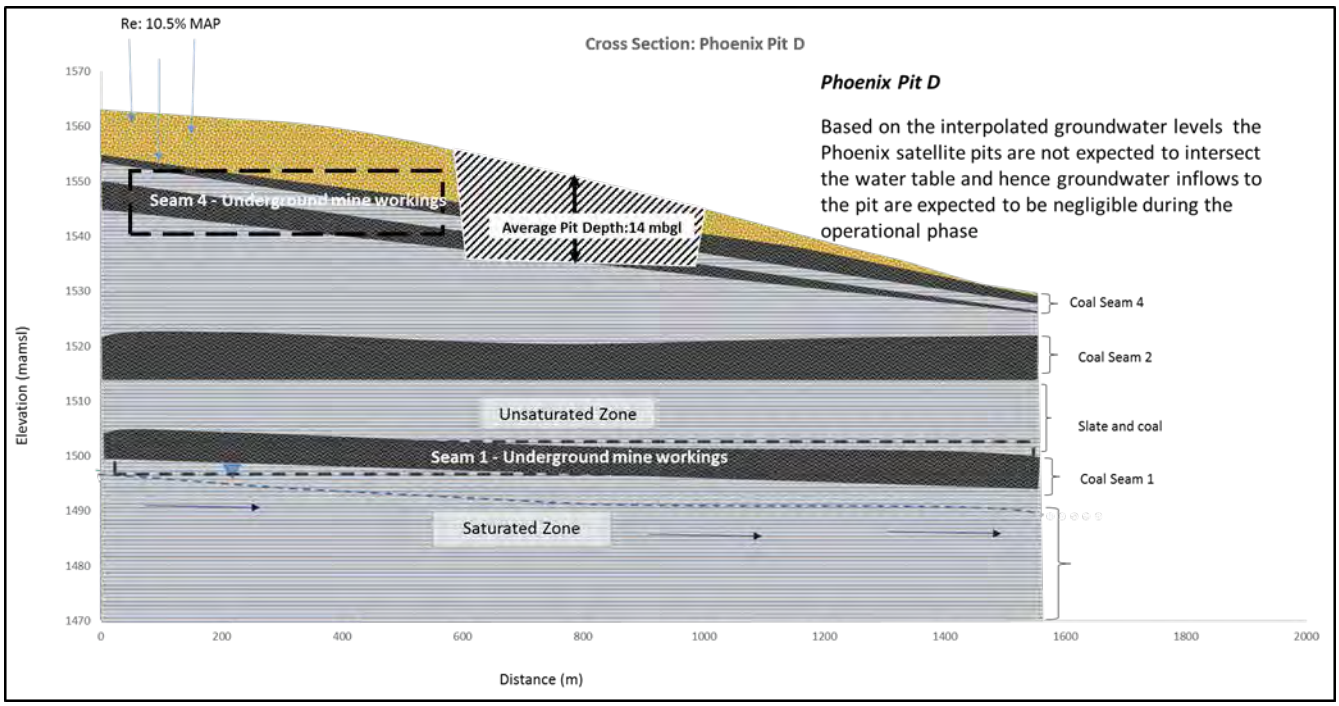


Figure 3-11: Phoenix Pit D – Interpolated groundwater levels and conceptual geology

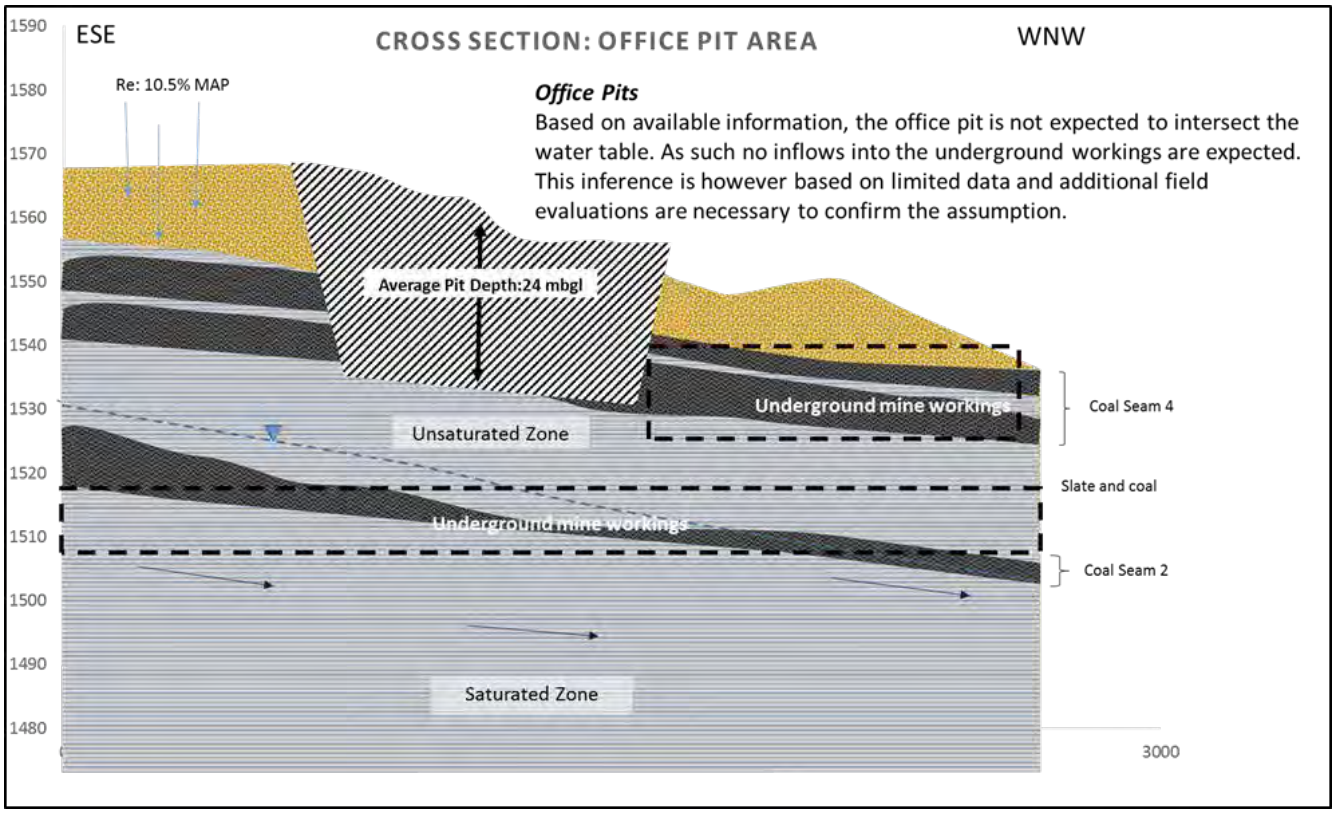


Figure 3-12: Office Pit Area – Interpolated groundwater levels and conceptual geology

Conceptualised impacts associated with open cast development: The conceptualisations in Figure 3-8-Figure 3-12 are based on water level data collected during historical investigations and the 2015 investigations. It was found that the water levels in the vicinity of the satellite pits proposed at Phoenix and the Office pit area are lower than the proposed pit bottoms. The deep water levels are attributed to the underground mine workings of Seam 2 and in some cases Seam 1. Based on the information available it is not expected that mining will intersect the water table and as such inflows into the pits are not expected. Based on the above, the proposed pits are not expected to impact on local ground water levels.

The proposed pits in places may intersect the underground workings of seam 4. However, based on available water levels it is viewed that these workings are not flooded and hence inflows from the workings toward the pits are not expected.

However, very few existing water level measurement points are located proximal to the proposed pits (< 50m), rather the inferences depicted in Figure 3-8 to Figure 3-12 are based on water levels measured at boreholes some distance from the pits. Additionally the depths of the boreholes are not documented in available information. As such it is possible that a persistent water level exists in the shallow aquifer zone while the deeper aquifer zone is dewatered due to the underground workings. Such conditions need to be investigated through the drilling of shallow aquifer boreholes in close proximity to the footprints of the proposed pits (i.e. boreholes drilled to a maximum depth of 30m).

Based on the present understanding, it is not deemed necessary to develop an analytical nor a numerical groundwater model as the proposed mining is viewed unlikely to impact on local water levels. It is however recommended that prior to mining, additional shallow characterisation boreholes be drilled proximal to the proposed pit areas in order to confirm the inferences of water level relative to pit bottom discussed above. Based on the findings of the drilling the requirement for a model may have to be reassessed.

The key findings from the groundwater specialist study are thus;

- The interpolated water level in vicinity of both the Phoenix pit and Office pit appear to be significantly deeper than the average depth of both pits at LoM;
- Based on this inference it is unlikely that significant inflows will occur into the pits during the operational phase and hence there is currently no need for the analytical or numerical model; and
- It is however necessary to confirm the conceptual model understanding outlined in the report through the drilling of shallow (< 30 mbgl) characterization boreholes. This is necessary because the water levels on which the present inferences are based are located some distance (1000 m) from the footprints of the proposed pits.

3.4.1 Impact assessment

The proposed iMpunzi Office and Phoenix pits fall within a highly mined area. It is also evident from the existing monitoring data that mining activities have already impacted on the aquifers in terms of lowering of water level and degradation in water quality. Historical and current mining activities are closely spaced and intertwined, resulting in collective accumulative impacts.

Consequently the groundwater impact assessment for the proposed Office and Phoenix pits opencast mining areas is discussed according to two identified impacts throughout the life cycle phases of the operation:

- The impact on the groundwater level (lowering) due to opencast mining; and
- The impact on the quality of the groundwater (deterioration).

3.4.1.1 Construction phase

Impact on Groundwater Level

The proposed Office and Phoenix pits potentially pose a negative influence upon the groundwater level in the area due to the lowering of the water level during construction and operational phases. The blasting of

the initial boxcuts, and the subsequent mining operations could potentially interrupt, modify and or/or disturb the natural shallow groundwater flow paths etc.

Perched water levels are present to the north of Office Pit and the groundwater levels (64 levels) range from 0.7mbgl to 67.3 mbgl with an average water level of 17.9mbgl. Based upon an interpolation of measured water levels, the water levels in vicinity of both the Office and Phoenix Pits are expected to be deeper than the proposed pit bottoms. This will however be required to be validated through drilling of shallow boreholes proximal to the proposed pits. This impact has been assessed as a **low (SP=16)** significance.

In terms of mitigation, it is important to drill a series of shallow boreholes in order to confirm that water levels in the vicinity of the pits are deeper than the proposed pit bottoms. These boreholes can then be utilised for quarterly monitoring purposes in order to confirm that the excavation of the pits is not having an influence on water levels in in vicinity of the pits.

Impact on groundwater quality

The proposed Office and Phoenix Pits could have a negative impact on the groundwater quality due to exposure of the geology/coal to groundwater. This particular impact will be present throughout the operational lifecycle, but during the construction phase, has been assessed as a **moderate (SP=30)** significance.

In terms of mitigation, it is important for iMpunzi to conduct comprehensive groundwater quality monitoring to assess any variation in quality. Acid base accounting and geochemical characterisation of the coal and back fill material is necessary. The implementation of the stormwater management plan will prevent any stormwater from entering the opencast pits and other dirty areas.

3.4.1.2 Operational phase

Impact on Groundwater Level

Similar to above, the operational activities at the Office and Phoenix Pit areas may have a negative impact on the groundwater level and for the operational phase has been assessed as a **low (SP=16)** significance.

In terms of mitigation, the same mitigation measures as the construction phase apply, i.e. drilling of shallow boreholes to confirm that water levels in vicinity of the pits.

If it is identified that groundwater dependent users within the vicinity of the mine are likely to be impacted during the operational phase of the mine, it is necessary to conduct a water supply options analysis and develop a water supply strategy to meet the deficits likely to be faced by these users. This would need to be implemented should monitoring confirm negative impacts on the existing users.

Rehabilitation of the backfilled spoils should be completed during the operational phase as this would aid in reducing recharge and rather enhance clean runoff and thus reduce ingress into the mined out pits.

Impact on groundwater quality

The impact on groundwater quality during the operational phase is deemed to be more significant and has been rated as a **high (SP=64)** significance.

To mitigate this impact, the same measures are required as during the construction phase. It is important for iMpunzi to continuously monitor the groundwater quality through the monitoring borehole network, which may include the additional shallow boreholes suggested above. Any acid based accounting will further inform any additional requirements that may be needed.

3.4.1.3 Rehabilitation phase

Impact on Groundwater Level

Post closure, recharge to the backfilled pits may result in the pits filling up with groundwater which could result in the decant of potentially poor quality groundwater. This impact has been assessed as a **moderate (SP=60)** significance.

In terms of mitigation, it is important for iMpunzi to incorporate the Office and Phoenix Pit areas into the Glencore long term water management plan, thus ensuring that no decant takes place at the rehabilitated pits. As with the operational phase, if it is identified that groundwater dependent users within the vicinity of the pits are likely to be impacted rehabilitation phase of the mine, it is necessary to conduct a water supply options analysis and develop a water supply strategy to meet the deficits.

Impact on groundwater quality

The impact on groundwater quality during the operational phase is deemed to be more significant and without mitigation has been rated as a **high (SP=80)** significance.

In terms of mitigation, it is important for iMpuzni to continue with monitoring post closure as this would provide an indication of whether there are impacts on the ground water quality. As mentioned above, Glencore has developed a long term water management plan, involving the long term water treatment of process affected water at the Glencore Water treatment facility. This facility will treat process affected water from a number of Glencore operations, including iMpunzi. Taking this overall mitigation measure into account, it is believed that the impact upon groundwater post closure can be reduced to a **moderate** or **low** significance.

3.5 Ecology

The larger iMpunzi and surrounding area is comprised mainly of highly impacted landscapes, either through mining, agricultural and other anthropogenic activities. The movement of wildlife is certainly impacted by these activities, influencing the habitat connectivity for free range species. It is important to note that the proposed new developments at iMpunzi are relatively small compared to the extent of the rest of the operation and also the regional extent of the mining operations in the vicinity.

The impacts on the ecology will be largely confined to the approximately 235 ha footprint of the proposed opencast pits. As mentioned, iMpunzi is an existing operation, and thus very little supporting infrastructure is required for the mining at the Office and Phoenix areas. It is important to note that the proposed Office and Phoenix Pits are situated in a regional area that has historically been influenced by large scale mining activities, all of which have impacts on the local ecology.

3.5.1 Impact assessment

The project will result in the inevitable removal of vegetation from the proposed footprint of the pits. Due to the relatively small combined footprint of these pits (i.e. 235 ha) and the fact that very little of these areas are covered by virgin vegetation, it is not anticipated that these developments will have significant impacts on the current condition of the local ecology. Impacts will be mitigated through the proposed roll over mining and rehabilitation method, ensuring that the surface area that will be bare at any time is minimised.

3.5.1.1 Construction phase

The construction activities will result in habitat destruction by the removal of vegetation and topsoil from the initial box cuts for the various pits. Earth moving and transport activities will generate dust that will settle on vegetation in the area, reducing its ability to photosynthesise and its palatability to herbivores. Human presence and construction noise are likely to drive any remaining birds and wild animals away. The soil disturbance will encourage the establishment and spread of alien invasive plant species. Without preventative measures, sediment and contaminants such as diesel, lubricants, solvents and cement, could be carried into the wetlands and downstream watercourses, causing degradation of water quality and habitat and consequent adverse effects on the riverine taxa.

Taking into account the current ecological condition of the site and the extent of the areas affected, the impact is assessed as a **moderate (SP = 32)** significance. The impact can be reduced to one of **low (SP = 24)** significance by implementing the following mitigation measures:

- Clear demarcation of all construction and laydown areas, which should be chosen to minimise the disturbance footprint;

- Designation of no-go areas (i.e. wetland areas, not to be impacted upon etc.);
- Construct relevant clean and dirty water conveyance and collection infrastructure as per the stormwater management plan, before undertaking any other activities, in order to prevent migration of contaminants off site and into the wetlands and watercourses. This construction work should be undertaken during the dry season;
- All personnel should receive training in environmental awareness and the recognition of Red Data species and should be prohibited from causing damage to any plants other than those that have to be removed. In the unlikely event that any Red Data species are found, the services of a suitable specialist should be sourced to advise on their relocation;
- Dust control by wet suppression;
- Monitoring for and control of declared weeds and invasive flora on the site. The re-occurrence or spread of declared weeds and invasive plants must be controlled by the land user as per the legal requirements of the CARA;
- Re-vegetating all disturbed and exposed areas with locally indigenous species;
- Confining activities to the infrastructure site only and prohibiting access to and activities on adjacent wetlands and bare areas; and
- Monitoring and auditing of the construction activities for compliance with the project-specific Environmental Management Programme (EMPr).

3.5.1.2 Operational phase

The operational activities are unlikely to have any significant additional adverse effects on the remaining vegetation on and in the vicinity of the Office and Phoenix Pit areas, largely as a result of the rollover and concurrent rehabilitation mining method that will be implemented.

The constant human presence and the noise generated on the site are likely to keep most fauna away for the duration of the operational phase, thereby reducing the biodiversity in the vicinity of the site. Without preventative measures, dirty stormwater runoff could enter local drainage lines and migrate to downstream wetland areas and watercourses, causing degradation of water quality and habitat and consequent adverse effects on the taxa.

Taking into account the current ecological condition of the site and the extent of the areas affected, the impact is assessed as a **moderate (SP = 32)** significance. The impact can be reduced to one of **low (SP = 24)** significance by implementing the following mitigation measures:

- Monitoring for and control of declared weeds and invasive flora on the site.
- All personnel should receive training in environmental awareness and the recognition of Red Data species. If any Red Data species are observed, the services of a suitable specialist should be sourced to advise on their safety and whether relocation is required;
- Restriction of vehicle movement to existing roads and tracks;
- Dust control by wet suppression;
- Confining activities to the site only and prohibiting access to and activities on adjacent wetland and bare areas; and
- Continued implementation and improvement of the stormwater management plan.

3.5.1.3 Rehabilitation phase

If rehabilitation is not undertaken correctly, and if soil pollution occurs during closure, the disturbed soil is likely to be colonised by weeds and alien invader species, and runoff could transport sediment and contaminants into downstream wetland and watercourses, leading to additional adverse impacts of **moderate (SP = 44)** significance.

As noted above, the ecology in the regional area has been impacted upon by historic mining and agricultural activities. Implementation of the following measures could restore the ecology on the site to a condition fit for grazing or even improve on its pre-project condition and result in a positive impact of **moderate (SP = 33)** significance:

- Remove steel structures, demolish brick and concrete structures, remove building rubble and dispose of it in accordance with applicable regulatory requirements;
- Remove all weeds and alien plants from the site;
- Rip compacted areas and shape the surface of the site to be free draining. Spread stockpiled subsoil first, then topsoil that has been preserved in the storm water diversion berm and the topsoil stockpile;
- Take care to avoid mixing of subsoil with topsoil. Use light agricultural machinery to avoid compaction;
- Do soil analysis and add soil conditioners and fertilisers as recommended by a qualified soil scientist;
- Re-vegetate with locally indigenous grasses, shrubs and trees to bind the soil and encourage colonisation by fauna; and
- Monitor quarterly until the vegetation has become self-sustaining. If any bare patches develop, the reason should be investigated and addressed, followed by re-vegetation of the patch.

3.6 Air quality

Air pollution in the region surrounding iMpunzi arises from the numerous mining operations, farming activities and coal-fired power stations in the area. Sources of dust pollution at the mines include dust entrainment from haul roads, blasting in opencast sections, discard dumps and soil stockpiles. As mentioned above, there is a small community situated to the south-east of the existing iMpunzi operations and also the proposed Office and Phoenix pit area (see Figure 2-7), which is considered the main sensitive receptor in terms of air quality, noise, vibration and blasting. It is important for iMpunzi to implement the mitigation measures outlined below to minimise the air quality impacts that could affect the sensitive receptor.

3.6.1 Impact assessment

Particulate mobilisation by drilling, blasting, loading, hauling, stockpiling, backfilling and coal processing has the potential for an impact on air quality within and in the vicinity of the Office and Phoenix Pit areas, particularly in the downwind direction. Gaseous emissions due to blasting and the diesel engines on mining vehicles are expected to have an impact on air quality. Again, it is important note that the proposed pits are comparatively small in relation to the surrounding opencast mining operations and are not expected to have any significant added impact on the air quality.

Furthermore, given the truck and shovel mining method proposed for the Office and Phoenix Pits, the boxcuts and haul roads will have a negative impact on the air quality, as vehicle entrainment is the main contributor to the particulate matter loading within mining areas, especially if the haul roads are unpaved. The expected sources of air quality impacts include the boxcuts, dust from vehicular activity on the haul roads and mining operations themselves.

3.6.1.1 Construction phase

During the construction phase it is expected that there would be increased dust emissions due to entrainment of dust particles by the movement and operation of the construction and mining equipment.

Furthermore, construction and mining equipment may potentially lead to increased atmospheric greenhouse gas emissions. This pre-mitigation impact has been assessed as a **High (SP = 65)** significance.

In terms of mitigation, it is important that the following measures be implemented:

- Apply dust suppression on the access and haul roads and other relevant areas as and when necessary to minimise dust generation. Wet suppression is effective, but for roads chemical binders such as Dustex or Dust-A-Side could also be used;
- All earth moving and mining equipment, needs to be inspected and maintained regularly to ensure a proper working order; and
- Dust fall monitoring by dust collection buckets installed downwind of the project area. Monitoring must be done in accordance with SANS 2004.

If properly implemented, it is expected that the significance of this impact can be reduced to a **moderate (SP=33)** significance.

3.6.1.2 Operational phase

During the operational phase, it is expected that there will be increased dust emissions through the entrainment of dust particles by the movement and operations of mining equipment. Similarly, operations of the mining equipment could lead to the generation and emission of greenhouse gases. There will be increased potential for dust emissions due to wind erosion during removal of topsoil, blasting, removal of overburden, as well as exposure of stockpiles to wind erosion. This impact has been assessed as a **high (SP=65)** significance. If the following mitigation measures are implemented, it is expected that the significance of the impact can be reduced to a **moderate (SP= 33)** significance.

- Apply dust suppression on the access and haul roads and other relevant areas as and when necessary to minimise dust generation. Wet suppression is effective, but for roads chemical binders such as Dustex or Dust-A-Side could also be used;
- All earth moving and mining equipment, needs to be inspected and maintained regularly to ensure a proper working order;
- Dust fall monitoring by dust collection buckets installed downwind of the project area. Monitoring must be done in accordance with SANS 2004;
- The drop distance from which topsoil is tipped should be minimized where possible. Topsoil stockpiles will be allowed to naturally vegetate in order to stabilize particles and reduce the risk of wind erosion; and
- Undertaking the most dusty operations (ripping, landscaping and spreading of topsoil) during calm conditions, thus to minimise dust generation.

3.6.1.3 Rehabilitation phase

Given the mining and concurrent rehabilitation methodology proposed for the Office and Phoenix Pits operation, the identified impacts for the rehabilitation phase are expected to be largely the same as the construction and operational phases. Given the rollover and concurrent rehabilitation methodology, the rehabilitation phase will pose a less significant impact and has been assessed as a **moderate (SP= 44)** significance.

In terms of mitigation, it is important that the following measures be implemented:

- Apply dust suppression on the access and haul roads and other relevant areas as and when necessary to minimise dust generation. Wet suppression is effective, but for roads chemical binders such as Dustex or Dust-A-Side could also be used;

- All earth moving and mining equipment, needs to be inspected and maintained regularly to ensure a proper working order;
- Dust fall monitoring by dust collection buckets installed downwind of the project area. Monitoring must be done in accordance with SANS 2004; and
- Undertaking the most dusty operations (ripping, landscaping and spreading of topsoil) during calm conditions, thus to minimise dust generation.

The implementation of these mitigation measures reduce the impact to a **moderate (SP= 30)** significance**.**

3.7 Noise

The existing mining operations in the iMpunzi and surrounding area have long impacted on the ambient noise levels of the area. The existing impacts on the ambient noise levels include but are not limited to: opencast mining activities and the coal processing facilities in the area. The expected noise level of the pre-mining environment was that of rural districts, which is likely to be low, but with the numerous coal mining operations that make up Tavistock, the ambient noise levels have increased in the area.

3.7.1 Standards and guidelines

The time-varying characteristics of environmental noise are described using statistical noise descriptors:

- Leq: The Leq is the constant sound level that would contain the same acoustic energy as the varying sound level, during the same period of time;
- LMax: The instantaneous maximum noise level for a specified period of time; and
- LMin: The instantaneous minimum noise level for a specified period of time.

The following relationships occur for increases in A-weighted noise levels:

- The trained healthy human ear is able to discern changes in sound levels of 1 dBA under controlled conditions in an acoustic laboratory;
- It is widely accepted that the average healthy ear can barely perceive noise level changes of 3 dBA;
- A change in sound level of 5 dBA is a readily perceptible increase in noise level; and
- A 10-dBA change in the sound level is perceived as twice as loud as the original source.

The World Bank in its Environmental Health and Safety Regulations applies the following noise level guidelines:

- Residential area – 55 dBA for the daytime and 45 dBA for the night-time period; and
- Industrial area – 70 dBA for the day- and night-time periods.

Some of the noise levels that a person is exposed to on a daily basis in the work place and/or in the home and environment are listed in Table 3-8.

Table 3-8: General noise levels of daily exposure

Activity	Dba
Wisper	30
Normal conversation	55-65
Shouted conversation	90
Baby crying	110

Activity	Dba
Computer	37-45
Radio playing in background	45-50
Microwave oven	55-60
Washing machine	50-75
Clothes dryer	56-58
Alarm clock	60-80
Televisions	70
Flush toilet	75-85
Ringing telephone	80
Hairdryer	80-95
Vacuum cleaner	84-89
Maximum output of stereo	100-110

In South Africa, the noise impact on human receptors is evaluated in terms of the SANS 10103 guidelines for sound pressure levels as listed in Table 3-9 and the typical responses as listed in Table 3-10.

Table 3-9: Noise level standards for various districts

	Equivalent continuous rating level $L_{req.T}$ for ambient noise - dBA					
	Outdoors			Indoors with windows open		
	Day-night LRdn	Daytime LRd	Night time LRn	Day-night LRdn	Daytime LRd	Night time LRn
Rural districts	45	45	35	35	35	25
Suburban districts with little road traffic	50	50	40	40	40	30
Urban traffic	55	55	45	45	45	35
Urban districts with some workshops, business premises and main roads	60	60	50	50	50	40
Central business districts	65	65	55	55	55	45
Industrial districts	70	70	60	60	60	50

LRd, LRn, LRdn = daytime, night time and day-night respectively. Daytime and night time refer to the hours from 06h00 - 22h00 and 22h00 - 06h00 respectively.

Table 3-10: Typical community response to increases in ambient noise level

Excess LReq.T dBA	Response
0	No reaction
0-10	Sporadic complaints
5-15	Widespread complaints

Excess $L_{Req.T}$ dBA	Response
10-20	Threats of community/group action
>15	Vigorous community/group action

Excess $L_{Req.T}$ is calculated from the appropriate of the following:

- Excess $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation minus $L_{Req,T}$ of the residual noise (baseline determined in the absence of the specific noise under investigation).
- Excess $L_{Req,T}$ = $L_{Req,T}$ of ambient noise under investigation minus the typical rating level for the applicable district as determined from Table 3-9.

3.7.2 Potential noise sensitive receptors

As mentioned above, there is a small community situated to the south-east of the existing iMpunzi operations and also the proposed Office and Phoenix pit area (see Figure 2-7), which is considered the main sensitive receptor in terms of air quality, noise, vibration and blasting. It is important for iMpunzi to implement the below outlined mitigation measures to prevent and minimise the noise impacts that could affect the community.

3.7.3 Impact assessment

The proposed Office and Phoenix Pit operations are expected to impact on identified sensitive receptors through general mining activities, opencast blasting, and the movements of haul trucks.

3.7.3.1 Construction phase

During the construction phase, it is expected that there will be increased noise levels through the following activities:

- Site preparation with the use of earthmoving equipment;
- Hauling of materials to and from the site; and
- Blasting at the initial box-cuts;

The pre-mitigation noise during the construction phase is assessed as a **moderate (SP=52)** but can be reduced to a **moderate (SP=44)** significance through the implementation of the following mitigation measures.

- Limiting the noisiest construction activities to reasonable hours (06h00 to 22h00);
- Using equipment with lower sound power levels where possible;
- Installing suitable mufflers on engine exhausts and compressor components;
- Equipping construction vehicles with reverse alarms that emit lower frequencies or white noise. Such alarms are less audible at a distance and people working nearby can more easily hear from which direction the signal comes;
- Keeping construction vehicles and equipment in good repair;
- Where necessary, stationary noisy equipment (e.g. compressors, pumps, pneumatic breakers) should be encapsulated in acoustic covers, screens or sheds. Portable acoustic shields should be used where noisy equipment is not stationary (e.g. angle grinders, chipping hammers, poker vibrators);
- Installing vibration isolation for mechanical equipment;
- Taking advantage during the design stage of natural topography and vegetation as a noise buffer;

- Implementing a system to receive, record and respond to complaints;
- Liaison with local residents on how best to minimise the impact of unavoidable noisy construction activities in the vicinity of noise sensitive areas;
- Machines in intermittent use should be shut down or throttled down to a minimum whenever possible; and
- In general, construction activities should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993); and Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should be obligated to wear hearing protection equipment.

3.7.3.2 Operational phase

During the operational phase, the following activities will generate noise during the operation phase:

- Mining processes;
- Stockpile management;
- Road maintenance; and
- Transport and handling material from the opencast pits.

The pre-mitigation noise during the construction phase is assessed as a **moderate (SP=52)** but can be reduced to a **moderate (SP=44)** significance through the implementation of the following mitigation measures.

- Equipping trucks with reverse alarms that emit lower frequencies or white noise. Such alarms are less audible at a distance and people working nearby can more easily hear from which direction the signal comes;
- Strategic placement of topsoil stockpiles, earth berms and other noise barriers along the regional road, access road and haul roads;
- The latest technology incorporating maximum noise mitigation measures for components of the complex should be designed into the system. When ordering plant and machinery, manufacturers should be requested to provide details of the sound power level (SPL). Where possible, those with the lowest SPL should be selected;
- Keeping all equipment and vehicles in good repair;
- Installing acoustic enclosures for equipment causing radiating noise and vibration isolation for mechanical equipment;
- Confining coal trucking operations to daylight hours; and
- Maintaining the system of receiving, recording and responding to complaints.

3.7.3.3 Rehabilitation phase

Given the mining and concurrent rehabilitation methodology envisaged for the Office and Phoenix Pit operations, it is expected that the noise impacts during the rehabilitation phase will be significantly reduced. The main activities that are expected to generate noise during the rehabilitation phase are associated with the use of earth moving equipment and hauling of material to and from site.

The noise impact during the closure and rehabilitation phase is assessed as being of **moderate (SP = 32)** significance. Similar mitigation measures as those recommended for the construction phase should be applied to reduce the impact to one of **low (SP = 24)** significance, namely:

- Limiting the noisiest activities to daytime hours (06h00 to 22h00);

- Using equipment with lower sound power levels where possible;
- Installing suitable mufflers on engine exhausts and compressor components;
- Installing acoustic enclosures for equipment causing radiating noise;
- Installing vibration isolation for mechanical equipment;
- Re-locating noise sources to areas which are less noise sensitive, to take advantage of distance from receptors and natural shielding; and
- Maintaining the system of receiving, recording and responding to complaints for at least five years after closure and rehabilitation of the Office and Phoenix operations.

3.8 Blasting and Vibration

The guidelines and safe blasting criteria considered in the study are in accordance with the United States Bureau of Mines (USBM) criteria, which are accepted internationally, including in South Africa. There are no specific South African standards.

Opencast blasting is experienced by surface receptors as ground vibrations, which are expressed in mm/sec, while blasting for opencast mining operations also results in fly rock and air blast, which is experienced as air overpressure and is measured in decibels (dB).

3.8.1 Ground Vibration

The human body is an excellent detector of vibration and ground vibration is felt at levels far below those that can cause structural damage. Vibration is expressed as the peak particle displacement velocity (PPV), which is approximately correlated to both building damage and annoyance levels to people. The PPV is measured in mm/s. The human body can detect a PPV in the region of 0.2 mm/s and a level of 1.0 mm/s is clearly perceptible.

Structural and/or cosmetic damage to ordinary buildings occurs in the range of 5.0 to 50.0 mm/s (*ISO10137* of 1992, British Standards *BS7385* 1993). It is generally accepted that residential buildings of sound construction can safely withstand a peak particle velocity (PPV) in the region of 50 mm/s. Poorly constructed buildings should however not be subjected to PPVs of more than 10 mm/s. These levels conform to the British Standards 6472 and the US Bureau of Mines Standards, RU 8507. Air overpressure levels and PPVs experienced at various distances can be minimised by appropriate blast design.

The factors affecting the ground vibrations caused by the shock wave of the blast at any given point can be summarised as follows:

- The larger the mass of the charge per delay - not the total mass of the charge - the greater the vibration energy yielded;
- Ground vibrations attenuate over distance at a rate determined by the charge mass per delay, timing of the detonations and the geology. The vibration energy of the shock wave is reduced by reflections at each geological interface that it encounters; and
- High density materials have high shock wave transferability, while low density materials have low transferability. Solid rock will transmit higher levels of ground vibration than sand for the same distance and charge mass.

The equation below represents a standard accepted mathematical means of calculating ground vibration at various distances.

The two site constants are specific to each blasting site. In new opencast operations the constants are normally quantified by means of carefully sized test blasts in order to predict ground vibrations accurately and safely.

Where:

PPV	=	Predicted ground vibration
a	=	Site constant
b	=	Site constant
D	=	Distance
E	=	Explosive Mass

Figure 3-13 shows the relationship between charge mass, distance and ground vibration limits of 12.5, 25 and 50 mm/sec for typical site constant values (a = 247 and b = -1.62) and Figure 3-14 shows the relationship between ground vibration and distance for minimum, medium and maximum charge masses of 253, 760 and 1922 kg respectively.

3.8.2 Air Blast

The human response of annoyance to blast vibrations is aggravated by secondary noises such as the rattling of crockery, furniture and walls. Meteorological conditions such as wind speed and direction, temperature, cloud cover and humidity will affect the intensity of the air overpressure levels experienced at a given distance from the blasting area. In a motionless atmosphere a doubling of the distance from the blast will result in the air overpressure level (experienced as a shock wave) being attenuated by 6 dB.

Air blast is experienced as air over-pressure by a receptor and is due to the propagation of the shock wave through the air. It is normally associated with frequency levels less than 20 Hz, which is the threshold for human hearing. It is measured in Pascals, but the pressure range is very wide and the pressure levels are converted to dB for reporting purposes. The level experienced at a given point is influenced by meteorological conditions, blast layout, timing, stemming, accessories used, and the topography between the blast and the receptor. Typical effects of various levels of air blast are summarised in Table 3-11.

Table 3-11: Air blast thresholds

Level	Description
120 dB	Rattling of windows and crockery
>130 dB	Resonant response of large surfaces (roofs, ceilings). Complaints start.
150 dB	Some windows break
170 dB	Most windows break
180 dB	Structural Damage

The recommended limit for air blast currently applied in South Africa is 134 dB, but every effort should be made to keep air blast levels below 120 dB in order to minimise the annoyance factor.

Air blast levels as a function of charge and distance were calculated for flat topographical conditions from the formula below and the results are shown in Figure 3-15.

Where:

L = Air blast level (dB)

D = Distance from source (m)

E = Charge mass per delay (kg)

3.8.3 Fly rock

It is possible to blast with little or no fly rock by means of adequate confinement of the explosive charges within the blast holes through the use of proper stemming procedures and materials. Free blasting with no control on stemming will result in poor blast results and possible damage to nearby structures.

Typical causes of fly rock are:

- Burden too small;
- Burden too large;
- Stemming length too short;
- Out of sequence initiation of blast holes;
- Drilling inaccuracies;
- Incorrect blast hole angles; and
- Excessively charged blast holes.

An illustrative relationship between stemming length and fly rock throw distance for face burst hard rock and soft rock is shown in Figure 3-16. Calibration under real field conditions of the equation from which the curves were calculated is needed to provide more accurate and reliable fly rock predictions.

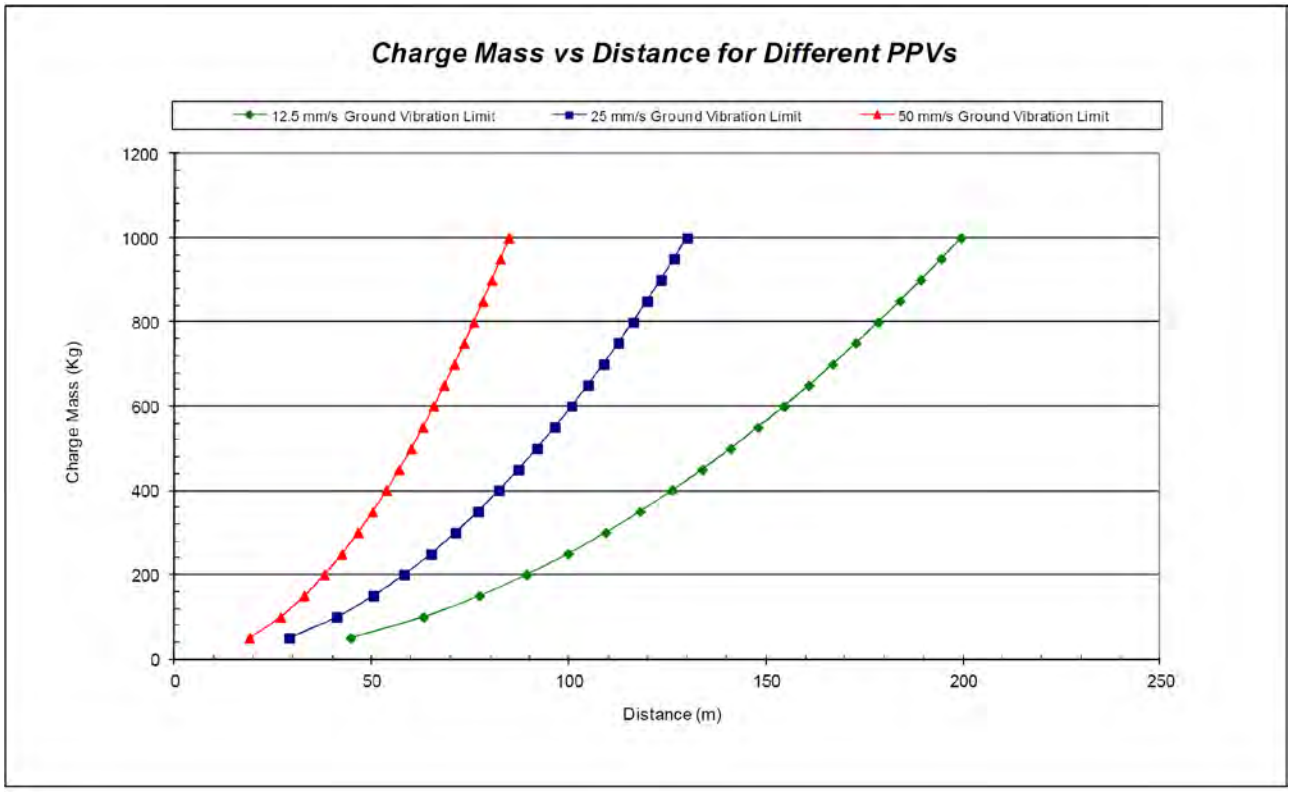


Figure 3-13: Relationship between PPV, charge mass and distance

Figure 3-14: Attenuation of ground vibration with distance

Figure 3-15: Attenuation of air blast with distance

Figure 3-16: Fly rock throw distance as a function of stemming length

3.8.4 Impact Assessment

3.8.4.1 Construction

The activities associated with the construction phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the construction of the site will be too small to affect any of the off-site receptors adversely. Accordingly, the vibration impact is assessed as **negligible (SP = 0).**

If however it is deemed necessary for any blasting activities to take place during construction, the impacts and mitigation measures described below in section 3.8.4.2 will be applicable.

3.8.4.2 Operation

The nearby community identified above as a sensitive receptor, (see Figure 2-7) is located approximately 250 m from the Eastern perimeter of the proposed Phoenix pit No. 4 and approximately 500 m from the South Eastern extent of Phoenix pit No. 3. Furthermore, the proposed individual Phoenix Pits will be well within 500 m of either the R547 regional road or the arterial road which runs between the R 547 and the R 545. It is important to note that many of the structures in the community are of an informal nature and may thus be more susceptible to vibrations, fly rock etc.

Given the proximity of these receptors to the proposed operations, the potential impact of blasting operations during the operational phase is assessed as being of ***high (SP = 80)*** significance, which can be mitigated to one of ***moderate (SP = 44)*** significance by applying the following mitigation measures:

- Blast mats should be used where necessary to minimise the possibility of off-site fly rock injury or damage and the blasting supervisor must ensure that no persons are within the danger zone;
- Blasts should be designed so that:
  - Ground vibration levels do not exceed 12.5 mm/s at off-site structures; and
  - The air over-pressure level does not exceed 134dB at the blast and 120 dB at any of the receptor sites indicated in Figure 2-7.
- Vibration and air over-pressure should be monitored at potentially sensitive areas;
- Blasting times must be communicated to local residents;
- Standard pre-blast safety procedures set out in the Mine Health and Safety Act, (Act No 29 of 1996), must be followed to ensure that nobody is present within a 500 m buffer radius around the blast. This would involve systematic clearing of the local community, closing of the regional and arterial road as well as pre and post blast inspections of the roads and community area for potential damage and safety concerns;
- Ensure that the correct design relationship exists between burden, spacing and hole diameter is followed;
- Ensure that the maximum amount of water resistant emulsion on any one day delay interval, the maximum instantaneous charge, is optimized by considering a reduction in the:
  - Number of holes per detonator delay interval;
  - Instantaneous charge by in-hole delay techniques; and
  - Blast hole depth and diameter.
- Be aware that the perception of blasting events occurs at levels of vibration well below those that can cause structural damage, but nevertheless at levels that can cause concern amongst residents in the vicinity of the mine site;

- Take into account that relatively small changes in blast design can produce noticeable differences in effects experienced by local residents. Complaints are often made in response to changes in the effects experienced rather than their absolute value; and
- The design of the blast should be in line with the blast design chart illustrated in Figure 3-17.

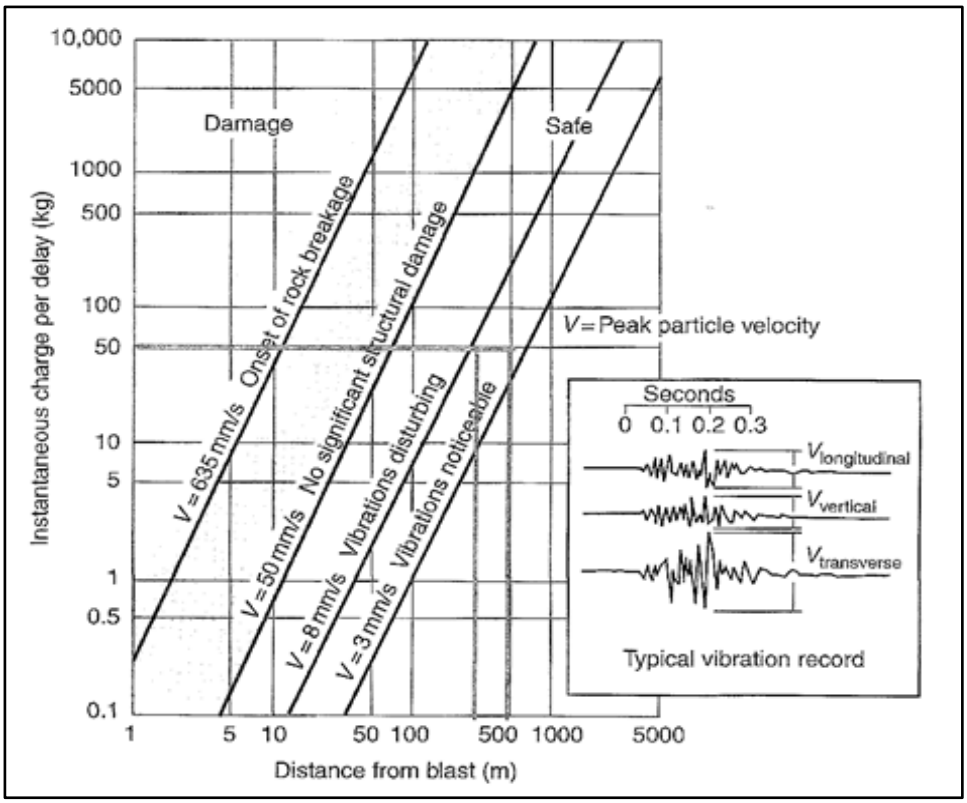


Figure 3-17: Blast design chart (Wyllie and Mah, 2006)

3.8.4.3 Closure and rehabilitation

The activities associated with the rehabilitation phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the rehabilitation of the site will be too small to affect any of the off-site receptors adversely. Accordingly, the vibration impact is assessed as ***negligible (SP = 0)***

3.9 Visual

iMpunzi is not situated on any main tourist routes and most of the traffic on surrounding roads is of local origin and is associated with the mining industry and local business. Mine infrastructure, such as conveyor belts, loading bins and discard dumps are clearly visible from the local roads. However, these do not represent an anomalous view, since the whole region is dotted with coal mines and power stations and mining is a long standing activity in the region. Dust is visible during windy and dry conditions. The mine is not visible from any major freeways or towns.

Based upon the above, the visual impact is largely limited to road users, associated routes and the few communities/households which are present in the area.

3.9.1 Impact assessment

The proposed Office and Phoenix Pit operations are expected to contribute to the visual impacts in the area through the visibility of the opencast operations (pits, associated stockpiles and haul roads). Portions of the proposed operations, specifically the phoenix operations are situated in close proximity to the R 547 regional

road and the community mentioned above (see Figure 2-7), and it is expected the visual impacts will be most prominent from these receptors.

3.9.1.1 Construction phase

The movement of earth moving and personnel vehicles along the local roads and the construction activities on the site will be visible to local residents and travellers. Daytime visibility would be enhanced if the activities give rise to visible plumes of dust, which may be visible over considerable distances, often far greater than the activities that are causing them. Visibility will increase during the construction period as the taller structures are erected (i.e. topsoil and overburden stockpiles).

The visual impact during construction is assessed as being of **moderate (SP = 40)** significance. Implementation of the following mitigation measures is recommended to reduce the impact to one of **low (SP = 24) significance**:

- Leave as much screening vegetation between the site and the potential receptors as possible;
- Strategic placement of topsoil stockpiles and earth berms along the regional road;
- Maintain the construction site in a neat and orderly condition at all times;
- Create designated areas for material storage, waste sorting and temporary storage, batching and other potentially intrusive activities;
- Limit the physical extent of areas cleared for material laydown and parking of vehicles as much as possible and rehabilitate these as soon as feasible;
- Apply sufficient wet suppression to ensure absence of visible dust;
- Unpaved roads should be covered with a layer of crushed rock or gravel, or treated with chemical dust suppressants such as Dustex or Dust-A-Side; and
- Establish a dust bucket system around the site perimeter to monitor dust fall out.

3.9.1.2 Operational phase

The movement of mining and earth moving vehicles along the haul roads and the mining activities on the site will be visible to local residents and travellers along the R547. Daytime visibility would be enhanced if the activities give rise to visible plumes of dust, which may be visible over considerable distances, often far greater than the activities that are causing them. The continued removal of vegetation as mining processes, will also contribute the visual impact of the operations.

Without mitigation, the potential impact is rated as being of **moderate (SP = 52) significance**. The following mitigation measures are recommended to reduce the impact to one of **moderate (SP = 33)** significance:

- Avoid bright, shiny, reflective surfaces such as galvanised steel cladding. Paint surfaces in matt pastel colours (brown, olive green, light grey, grey-green, blue grey, dark buff, rust, ochre, variations of tan) that blend in with the background;
- Plant and maintain a screen of indigenous trees around the perimeter of the site;
- Unpaved roads should be covered with a layer of crushed rock or gravel, or treated with chemical dust suppressants such as Dustex or Dust-A-Side;
- Apply sufficient wet suppression as and when necessary to ensure absence of visible dust;
- Ensure that concurrent rehabilitation takes to minimise the visual impact of bare and disrupted topography;
- Maintain the dust monitoring onsite to ensure compliance with dust fall out requirements;

- Develop a detailed post-closure land use plan for the mine, taking into consideration current and likely future land uses surrounding the site, to ensure that the site is successfully re-integrated into the visual fabric existing at the time of closure.

3.9.1.3 Rehabilitation phase

Given the mining and concurrent rehabilitation methodology envisaged for the Office and Phoenix Pit operations, it is expected that the visual impacts during the rehabilitation phase will be significantly reduced. The visual impacts are expected to be of **moderate (SP = 36)** significance without mitigation and of **low (SP = 27)** significance with the following mitigation measures:

- Establishing good vegetation cover on the rehabilitated pits and other previously disturbed areas of the site;
- Maintenance of an effective tree screen along the perimeter of the site;
- Apply sufficient wet suppression as and when necessary to ensure absence of visible dust.

3.10 Cultural and heritage

As mentioned in section 2.12.12 the sites of archaeological and cultural significance at iMpunzi are largely associated with cemeteries and grave sites located on site.

3.10.1 Impact assessment

Given that iMpunzi plan to have all the necessary gravesite re-locations concluded during 2016, it is not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix Pit operations.

However, it is always possible that an unknown grave or other buried cultural/archaeological items could be unearthed when excavations are being undertaken. In such an event the following chance find procedure must be implemented to mitigate the potential impact from one of **high (SP = 85)** to one of **moderate (SP = 52)** significance:

- Cease all work in the immediate vicinity of the find;
- Demarcate the area with barrier tape or other highly visible means;
- Notify the South African Heritage Resources Authority (SAHRA) immediately;
- Commission an archaeologist accredited with the Association for Southern African Professional Archaeologists (ASAPA) to assess the find and determine appropriate mitigation measures. These may include obtaining the necessary authorisation from SAHRA to undertake the mitigation measures; and
- Prevent access to the find by unqualified persons until the assessment and mitigation processes have been completed.

3.10.1.1 Construction phase

It is not envisaged that any cultural or heritage impacts with occur during the construction phase **(SP=0)**. If however, any cultural resources are uncovered during the construction, the above mentioned procedure should be followed.

3.10.1.2 Operational phase

Similar to the construction phase, it is not envisaged that any cultural or heritage impacts with occur during the operational phase **(SP = 0)**. If however, any cultural resources are uncovered during the operational phase, the above mentioned procedure should be followed.

3.10.1.3 Rehabilitation phase

Similar to above, it is not envisaged that any cultural or heritage impacts with occur during the rehabilitation **(SP = 0)**. If however, any cultural resources are uncovered during the operational phase, the above mentioned procedure should be followed.

3.11 Socio-economics

As mentioned above, the coal reserves in the Office and Phoenix areas are of a good quality and form an important part of Glencore's strategic planning. Mining of the coal in these areas will allow iMpunzi to continue to operate in the current very difficult commodity market. iMpunzi as a whole contributes significantly to the local socio-economic environment through direct employment of community members, peripheral economic stimulation through service and product requirements, and being able to mine these reserves would allow iMpunzi to continue with these beneficial impacts of moderate significance.

3.11.1 Impact assessment

Given the scale and nature of the proposed Office and Phoenix Pit operations, it is unlikely that those operations will in themselves have any significant socio-economic impacts. The project will rather contribute to the current socio-economic impacts as a result of the larger iMpunzi mine.

Potential impact contributions in relation to the proposed Office and Phoenix operation could include, but are not limited to the following:

Positive impacts, such as:

- Temporary job creation during the construction phase;
- More permanent job creation during the operational phase;
- Indirect and induced benefits to the local economy; and
- Social investment and infrastructure development undertaken as part of the mine's SLP commitments.

Negative impacts such as:

- Physical intrusion impacts on surrounding communities (related to noise, dust, etc.);
- Negative effects on the values of surrounding properties; and
- Potential displacement of households or communities living on or adjacent to the project footprint.

3.11.1.1 Construction phase

iMpunzi proposes to make use of mining contractors for the operations at the Office and Phoenix pit areas. It is thus possible that during construction, additional temporary jobs may be created for local contractors. Some local residents may be inconvenienced by noise, dust and increased traffic during the construction period.

The collective socio economic impact for the construction phase is assessed as a **low (SP = 27)** significance. To maintain the low significance it is important that the mitigation measures below are implemented:

- Maintain communication and consultation with local residents, with particular reference to:
  - Blasting times;
  - Noise and vibration disturbance at sensitive receptors, especially the nearest residences;
  - Air quality in the areas surrounding the site;

- Traffic impacts on roads in the vicinity;
- Visual aspects, such as visible dust and lighting at night; and
- Groundwater and surface water availability and quality.

- Use local contractors where practicable;
- Encourage the use of local labour and the purchase of local goods, materials and
- Implement a system to receive, record and respond to complaints.

3.11.1.2 Operational phase

The operational phase is expected to provide employment opportunities for 50-100 people. iMpunzi proposes to make use of mining contractors for the operations at the Office and Phoenix pit areas. An influx of work seekers is possible, but the numbers are likely to be small, as contractors would be able to employ such additional staff as they might need from the local population.

The main annual operating cost is expected to be spent on remuneration, transport and local materials, goods and services. The positive socio-economic impact resulting from the employment opportunities and the cash injection into the local economy are balanced against the potential negative environmental impacts.

Taking into consideration all the potential positive and negative impacts in combination and against the backdrop of the current, pre-project environmental and social conditions the overall impact could be negative of **moderate (SP = 48)** significance, but could be changed to one of **moderately** positive **(SP = +36)** significance by implementing the following mitigation measures:

Maintain communication and consultation with local residents, with particular reference to:

- Wetland, groundwater and surface water availability and quality;
- Blasting times;
- Noise and vibration disturbance at sensitive receptors, especially the nearest residences;
- Air quality in the areas surrounding the site;
- Traffic impacts on roads in the vicinity;
- Visual aspects, such as visible dust and lighting at night; and
- Relations between the mine and local residents.

- Employ local people as far as practicable;
- Purchase materials, goods and services locally as far as practicable;
- Include local community skills development when implementing the mine's social and labour plan (SLP);
- Apply all mitigation measures in the EMPr;
- Maintain the complaints procedure and complaints register; and
- Follow up, resolve and close out each complaint.

3.11.1.3 Rehabilitation phase

The activities undertaken during this phase will be similar to those of the construction phase, but the duration will be shorter (6 to 8 months). The negative impact of the loss of jobs and the sharp reduction of local

expenditure at mine closure will be countered over time by the rehabilitation of the site and its potential use for agricultural or other economic activities that could result in the creation of new jobs. The overall impact is assessed as negative and of **moderate (SP = 44)** significance. The following mitigation measures are recommended to reduce it to an impact of **low (SP = 27)** significance:

- Proactive skills development and training of employees to enhance their value in the labour market and thereby their chances of finding employment after mine closure;
- Development of a retrenchment plan in consultation with employees, starting at least five years before closure;
- Assisting redundant employees to find alternative employment as far as practicable;
- Focusing specifically on sustainable community projects in the SLP, i.e. projects that will remain viable without continued support from Glencore;
- Providing training and start-up assistance to employees who want to start their own businesses;
- Leaving intact such infrastructure as can be used by local community-based organisations, after consultation with the potentially affected parties;
- Diligent application of the rehabilitation plan as set out in the mine's closure plan, which is summarised in the Environmental Management Programme (EMPr); and
- Monitoring surface water and groundwater quality for at least five years after closure of the mine.

3.12 Summary of environmental impacts

3.12.1 Construction phase

Table 3-12, Table 3-13, and Table 3-14 below summarise those impacts directly related to the proposed Office and Phoenix pit project during the construction, operational and rehabilitation phases respectively. The tables Table 3-12, Table 3-13 and Table 3-14 further provide the pre and post mitigation ratings of the various impacts.

3.12.2 Construction phase

Table 3-12: Environmental Impact Assessment Matrix for construction phase of the proposed Office and Phoenix operations.

POTENTIAL ENVIRONMENTAL IMPACT: CONSTRUCTION PHASE	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating
Surface water												
Surface water quality could potentially be impacted on negatively through the spillage of fuels, lubricants and other chemicals	4	2	2	3	24	Low	2	2	1	3	15	Low
Erosion could be caused during construction through the clearance of vegetation	2	2	1	3	15	Low	2	2	1	3	15	Low
Wetlands												
Loss and destruction of wetland habitat through construction and associated activities	8	5	1	5	70	High	6	5	1	5	60	Mod
Increased sediment transport into wetland areas	6	3	2	4	44	Mod	4	3	1	4	32	Mod
Water quality deterioration to wetland feed water	4	3	2	4	36	Mod	4	3	1	3	24	Low
Decreased watermake to adjacent wetland areas	6	5	2	4	52	Mod	6	5	1	4	48	Mod
Groundwater												
Impact on groundwater level	4	2	2	2	16	Low	2	2	2	2	12	Low
Impact on groundwater quality	4	4	2	3	30	Mod	2	4	2	2	16	Low
Ecology												
Habitat destruction by the removal of vegetation and topsoil from the initial box cuts for the various pits. Dust will settle on vegetation, reducing its ability to photosynthesise and its palatability. Human presence and construction noise are likely to drive any remaining birds and wild animals away. Establishment and spread of alien invasive plant species. Sediment and contaminants such as diesel, lubricants, solvents and cement, could be carried into the wetlands and downstream watercourses	4	2	2	4	32	Mod	4	2	2	3	24	Low
Air Quality												
Increased dust emissions due to entrainment of dust particles by the movement and operation of the construction and mining equipment. Furthermore, the construction and mining equipment may potentially lead to increased atmospheric greenhouse gas emissions	8	3	2	5	65	High	6	3	2	3	33	Mod
Noise												
During the construction phase, it is expected that there will be increased noise levels through the site preparation with the use of earthmoving equipment, hauling of materials to and from the site; and blasting at the initial box-cuts	8	3	2	4	52	Mod	6	3	2	4	44	Mod
Blasting and vibration												
The activities associated with the construction phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the construction of the site will be too small to affect any of the off-site receptors adversely	0	0	0	0	0	None	0	0	0	0	0	None
Visual												
The movement of earth moving and personnel vehicles along the local roads and the construction activities on the site will be visible to local residents and travellers. Activities may lead to visible plumes of dust. Visibility will increase during the construction period as the taller structures are erected (i.e. Topsoil and overburden stockpiles)	6	3	1	4	40	Mod	4	3	1	3	24	Low
Cultural and heritage												
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations	0	0	0	0	0	None	0	0	0	0	0	None
Impacts will occur only if human remains or artefacts are unearthed during earthmoving operations	10	5	2	5	85	High	6	5	2	4	52	Mod

POTENTIAL ENVIRONMENTAL IMPACT: CONSTRUCTION PHASE	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating
Socio-economics												
iMpunzi proposes to make use of mining contractors for the operations at the Office and Phoenix pit areas. It is thus possible that during construction, additional temporary jobs may be created for local contractors. Some local residents may be inconvenienced by noise, dust and increased traffic during the construction period	4	3	2	3	27	Low	4	3	2	3	27	Low

3.12.3 Operational phase

Table 3-13: Environmental Impact Assessment Matrix for operational phase of the proposed Office and Phoenix operations.

POTENTIAL ENVIRONMENTAL IMPACT: OPERATIONAL PHASE	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating
Surface water												
Changes in surface water quality, due to poor quality runoff from mining activities	4	4	2	3	30	Mod	4	3	2	3	27	Low
Decreased in catchment area due to decreased runoff as a result of mining and associated activities	2	3	1	5	30	Mod	2	3	1	4	24	Low
Erosion on site and surrounding areas due to mining of the pits	2	4	1	4	28	Low	2	4	1	3	21	Low
Wetlands												
Loss and disturbance of wetland habitat	6	4	2	3	36	Mod	4	4	1	2	18	Low
Increased sediment transport into wetlands	6	4	2	4	48	Mod	4	4	1	3	27	Low
Water quality deterioration	4	4	2	4	40	Mod	4	4	1	3	27	Low
Decreased watermake to adjacent wetlands	6	5	2	4	52	Mod	6	5	1	4	48	Mod
Discharge of stormwater into wetlands	4	4	2	4	40	Mod	4	4	1	3	27	Low
Groundwater												
Impact on groundwater level	4	2	2	2	16	Low	2	2	2	2	12	Low
Impact on groundwater quality	10	4	2	4	64	High	4	4	2	2	20	Low
Ecology												
The constant human presence and the noise generated on the site are likely to keep most fauna away. Without preventative measures, dirty stormwater runoff could enter local drainage lines and migrate to downstream wetland areas and watercourses	4	2	2	4	32	Mod	4	2	2	3	24	Low
Air Quality												
Increased dust emissions through the entrainment of dust particles by the movement and operations of mining equipment. Operation of mining equipment could lead to the generation and emission of greenhouse gases. Potential for dust emissions due to wind erosion during removal of topsoil, blasting, removal of overburden, as well as exposure of stockpiles to wind erosion	8	3	2	5	65	High	6	3	2	3	33	Mod
Noise												
During the operational phase, it is expected that mining activities; stockpile management; road maintenance; opencast blasting; and transport and handling of material will generate noise and vibrations during the operation phase	8	3	2	4	52	Mod	6	3	2	4	44	Mod
Vibration and Blasting												
During the operational phase, it is expected that mining activities; stockpile management; road maintenance; opencast blasting; and transport and handling of material will generate vibrations during the operational phase	8	5	3	5	80	High	6	3	2	4	44	Mod

POTENTIAL ENVIRONMENTAL IMPACT: OPERATIONAL PHASE	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating
Visual												
The movement of mining and earth moving vehicles along the haul roads and the mining activities on the site will be visible to local residents and travellers along the R547. Activities may lead to visible plumes of dust. The continued removal of vegetation as mining progresses, will also contribute the visual impact of the operations	8	3	2	4	52	Mod	6	3	2	3	33	Mod
Cultural and heritage												
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations	0	0	0	0	0	None	0	0	0	0	0	None
Impacts will occur only if human remains or artefacts are unearthed during earthmoving operations	10	5	2	5	85	High	6	5	2	4	52	Mod
Socio-economic												
The operational phase is expected to provide employment opportunities for 50-100 people. An influx of work seekers is possible, but the numbers are likely to be small, as contractors would be able to employ such additional staff as they might need from the local population. The positive socio-economic impact resulting from the employment opportunities and the cash injection into the local economy are balanced against the potential negative environmental impacts	6	3	3	4	48	Mod	6	3	3	3	36	Positive

3.12.4 Rehabilitation phase

Table 3-14: Environmental Impact Assessment Matrix for rehabilitation phase of the proposed Office and Phoenix operations.

POTENTIAL ENVIRONMENTAL IMPACT: REHABILITATION PHASE	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating
Surface water												
Decommissioning may leave large barren areas that may increase erosion, which might increase the amount of suspended solids in downstream surface water reducing water quality	4	1	2	3	21	Low	2	1	2	3	15	Low
Wetland												
Water quality deterioration	8	5	5	4	72	High	6	5	3	4	56	Mod
Increased sediment transport into wetlands	6	3	2	4	44	Mod	4	3	1	4	32	Mod
Increased alien vegetation	6	4	2	4	48	Mod	4	4	1	3	27	Low
Altered hydrology	6	5	2	4	52	Mod	6	5	1	4	48	Mod
Groundwater												
Impact on groundwater level	8	5	2	4	60	Mod	4	3	2	3	27	Low
Impact on groundwater quality	10	4	2	5	80	High	4	4	2	2	20	Low
Ecology												
If rehabilitation is not undertaken correctly, and if soil pollution occurs during closure, the disturbed soil is likely to be colonised by weeds and alien invader species, and runoff could transport sediment and contaminants into downstream wetland and watercourses	6	3	2	4	44	Mod	6	2	2	3	30	Positive
Air quality												
Increased dust emissions through the entrainment of dust particles by the movement and operations of earth moving equipment. Operation of earth moving equipment could lead to the generation and emission of greenhouse gases. Potential for dust emissions due to wind erosion during placement of topsoil as well as exposure of stockpiles to wind erosion	6	3	2	4	44	Mod	6	2	2	3	30	Mod
Noise												

POTENTIAL ENVIRONMENTAL IMPACT: REHABILITATION PHASE	ENVIRONMENTAL SIGNIFICANCE											
	Before mitigation						After mitigation					
	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating
The main activities that are expected to generate noise during the rehabilitation phase are associated with the use of earth moving equipment and hauling of material to and from site	4	3	2	4	36	Mod	4	3	2	3	27	Low
Vibration and Noise												
The activities associated with the rehabilitation phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the rehabilitation of the site will be too small to affect any of the off-site receptors adversely	0	0	0	0	0	None	0	0	0	0	0	None
Visual												
The movement of d earth moving vehicles along the haul roads will be visible to local residents and travellers along the R547. Activities may lead to visible plumes of dust	4	3	2	4	36	Mod	4	3	2	3	27	Low
Cultural and heritage												
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations	0	0	0	0	0	None	0	0	0	0	0	None
Impacts will occur only if human remains or artefacts are unearthed during earthmoving operations	10	5	2	5	85	High	6	5	2	4	52	Mod
Socio-economics												
The negative impact of the loss of jobs and the sharp reduction of local expenditure at mine closure will be countered over time by the rehabilitation of the site and its potential use for agricultural or other economic activities that could result in the creation of new jobs	6	3	2	4	44	Mod	4	3	2	3	27	Low

4.0 ENVIRONMENTAL IMPACT STATEMENT

4.1 Key findings; Potential cumulative environmental impacts

The following potential cumulative impacts were identified and assessed:

4.1.1 Surface water

Without proper application of the mitigation measures described in section 3.2.4, the proposed project has the potential to contaminate adjacent and downstream watercourses with particulates, acid and salts, which would be cumulative to the existing contaminants of largely mining and agricultural origin.

4.1.2 Wetlands

As mentioned above in sections 2.12.10.1, and 3.3 the existing wetland areas in the proposed Office and Phoenix Pit areas, have for the most part already been impacted by historic mining and agricultural practices. Very few of the wetlands in the larger area are seen as pristine or un-affected. It has further been shown that the proposed Office and Phoenix Pit operations will have direct and indirect impacts on the wetlands onsite. These impacts will certainly contribute to the considerable loss of wetland habitat experienced not only within in the iMpunzi mining complex, but also at a regional scale. It is thus pertinent for iMpunzi to implement the proposed mitigation measures to minimise the negative impacts on the remaining wetland areas.

4.1.3 Groundwater

As mentioned above in section 3.4, the groundwater table in the vicinity of the proposed Office and Phoenix Pits is located well below the anticipated depth of the proposed pits. It is thus unlikely that the Office and Phoenix Pit operations will have any impact on the groundwater table. The proposed operations do still however pose a risk to the groundwater resource, and it is important that the identified mitigation measures are properly implemented. The long-term water management strategy developed by Glencore (see section 3.4) will go a long way in preventing and minimising impacts on the ground water resource, not only at iMpunzi, but at a regional scale as well.

4.1.4 Ecology

The removal of current vegetation from the proposed site will be cumulative to the existing impacts of mining and agricultural use which dominated the area. The cumulative impact can be minimised by proper application of the mitigation measures listed in section 3.5. Without implementation of the mitigation measures the already impacted terrestrial and aquatic ecology in the area could be adversely affected.

4.1.5 Air quality

The proposed activities associated with the Office and Phoenix operations will certainly have a cumulative impact on the air quality in the area. As mentioned above in section 2.12.3 there have been a number of exceedances in terms of dust fallout at the existing iMpunzi complex. It is likely that the Office and Phoenix Pit operations could contribute to such exceedances. It is thus imperative that the proposed mitigation measures be implemented, to prevent and minimise the potential impacts.

4.1.6 Noise

The noise, vibration and blasting impacts generated through the proposed Office and Phoenix operations will add to the ambient and man-made noise levels currently generated in the area. It is not expected that the noise levels will reach unacceptable levels at the identified receptors (i.e. nearby community, regional and arterial roads), should the mitigation measures be implemented.

4.1.7 Vibration and blasting

The anticipated vibrations from the blasting and general mining activities will be cumulative to the existing vibration levels experienced in the area. Appropriate blast design and monitoring can keep air blast, noise and ground vibration below levels that would cause damage.

4.1.8 Visual

The project will be visible from the regional and local roads and also the nearby community. The impact will be cumulative to the existing visual transformation of anthropological origin (buildings, mining activities, haul roads etc.). However, taking into account the scale and nature of the proposed Office and Phoenix operations, it is unlikely that the impacts would add significantly to the existing visual impacts of the surrounding area.

4.1.9 Cultural and heritage

As mentioned above in sections 2.12.12, and 3.10, Glencore intends to conclude the grave relocations currently underway during 2016. It thus not envisaged that any cumulative cultural and heritage impacts will take place.

4.1.10 Socio-economic

Mining of the coal in the Office and Phoenix Pit areas will allow iMpunzi to continue to operate in the current very difficult commodity market. It would further allow iMpunzi to continue contributing to the socio-economic environment through direct employment of community members, peripheral economic stimulation through service and product requirements.

4.2 Final site map

See Figure 2-2.

4.3 Summary of positive and negative implications and risks of proposed activity and alternatives

In summary of the points discussed in 3.0, the proposed Office and Phoenix Pit operations will, if properly managed, have a nett positive socio-economic impact within the Emalahleni Municipality, and negative, but acceptable impacts on the local surface water, wetlands, groundwater, ecology, air quality, and visual aspects. The risks include the potential contamination of surface water and groundwater resources, and also contribution to air quality degradation.

4.4 Impact management objectives and outcomes for inclusion in the EMPr

The impact management objectives and outcomes for the proposed Office and Phoenix Pit project are as follows:

- To maximise the positive and minimise the negative socio-economic impacts;
- To capture, contain, treat and recycle all contaminated water arising from the mining operations on site and to prevent the discharge of contaminated water to the environment;
- To conduct the various activities associated with the Office and Phoenix Pit operations in such a manner, so as to minimise the impact on the wetlands in the area, through the timeous and proper implementation of the wetland mitigation measures;
- To carry out blasting in a manner that it will avoid fly rock damage, air blast noise exceeding 120 dB at any receptor, surface vibrations with a particle acceleration of more than 12 mm/second. Blasts will be monitored and the results will be taken into account when designing subsequent blasts;
- To avoid PM10 concentrations exceeding 75 µg/m3 in the local airshed for reasons of public health and to avoid exceeding the national standards for ambient air quality that were set by the publication of Government Notice 1210 in Government Gazette no 32816 on 24 December 2009. Wet suppression will be applied during drilling and after blasting, and air quality will be monitored;

- To minimise the safety and congestion impacts of traffic due to the mining operation by limiting coal trucking to daylight hours, strict enforcement of traffic regulations and road rules, avoiding trucking during peak hours and addressing road maintenance needs in cooperation with the road authorities;
- To soften the visual impact of the project by applying the recommended mitigation measures; and
- To maintain cordial relationships with local residents, authorities and other stakeholders via sustained open communication.

4.5 Final proposed alternative

As mentioned above, site selection for the proposed Office and Phoenix pit operations was dictated by the location of the economically viable coal reserves which are to be mined (see Figure 2-2). Furthermore, as mentioned above, existing coal processing and supporting facilities will be used as part of processing of these reserves, negating the need for any supporting infrastructure.

For these reasons, no alternative sites for the Office and Phoenix Pits were considered.

4.6 Assumptions, uncertainties and gaps in knowledge

The EIA was limited to the scope of the assessment described in detail in sections 2.8 and 3.0 of this document.

The content of this EIA/EMPr was largely sourced from the Consolidated Tavistock EIA and EMPR amendment, XST 1364, dated April 2014, (Digby Wells 2014), the Integrated Water and Waste Management Plan for iMpunzi Colliery and various specialist studies referenced in the text.

Although all efforts were made by the EIA project team to identify all environmental, social and health aspects, impacts and mitigation measures, errors and omissions may have occurred. According to South African legislation, the EMPr will need to be updated or amended with new information whenever significant changes are made during the life of the Project.

Every effort has been made to engage stakeholders to the extent possible, however not every stakeholder may have been consulted or their comments may not have been recorded accurately. A grievance mechanism will be established through which stakeholders are able to raise grievances and continue to contribute their concerns and issues to the relevant iMpunzi personnel.

4.7 Opinion on whether the activity should be authorised

Provided that all the environmental management measures described in the EIA report/EMPr are applied diligently, the proposed Office and Phoenix operations within the area shown on Figure 2-2 will have no environmental impacts that cannot be adequately mitigated to protect the environment, and authorisation of iMpunzi's application would be justified on the basis that the positive effects of the project are likely to outweigh the remaining negative impacts.

Not granting this authorisation will not necessarily result in the coal reserves remaining in the ground permanently. As long as there is a demand for coal, coupled with economically viable mineability of these reserves, there will be a drive to mine them.

4.8 Conditions that must be included in the authorisation

4.8.1 General conditions

iMpunzi must:

- Implement all aspects of the EMPr in section 5.0 of this document;
- Comply with all relevant legislation at all times;

- Undertake bi-annual internal auditing of environmental performance and annual reporting to the DMR; and
- Undertake bi-ennial external auditing of environmental performance and providing the DMR with a copy of the audit report.

4.8.2 Specific conditions

iMpunzi must:

- Update the overall site wide water balance to include the various components of the Office and Phoenix Pit operations;
- Capture, contain, treat and recycle all contaminated water arising from the mining and coal processing operations on site and prevent the discharge of contaminated water to the environment;
- Conduct the various activates associated with the Office and Phoenix Pit operations is such a manner, so as to minimise the impact on the wetlands in the area, through the timeous and proper implementation of the wetland mitigation measures;
- Undertake blasting in a manner that will avoid fly rock damage, air blast noise exceeding 120 dB at any off-site receptor, and surface vibrations with a particle acceleration of more than 12 mm/second. Blasts must be monitored and the results must be taken into account when designing subsequent blasts;
- Apply wet suppression during drilling and after blasting, and monitor air quality in the vicinity of the site; and
- Address concerns about traffic safety and congestion due to the mining operation by strict enforcement of traffic regulations and road rules and by avoiding trucking during peak hours.

4.8.3 Rehabilitation requirements

iMpunzi has a Rehabilitation Management Protocol document that was first drafted in 2011 and which is kept up to date with new projects and mine plan changes. The protocol is within standards compatible with the closure objectives determined in accordance with the baseline studies completed. The intent of this Protocol is to provide guidance for rehabilitation planning, resourcing and execution of the individual operations onsite. It is important that the proposed Office and Phoenix Pit operations as well as the rehabilitation associated with these operations, be conducted in accordance with this protocol.

Rehabilitation as per the protocol, can be divided into two different phases, namely concurrent rehabilitation and final rehabilitation. Concurrent rehabilitation must be carried out along with the operations, and will decrease the final liability that iMpunzi will carry at the time of closure. This concurrent rehabilitation will be carried out within the context of the EMPr. Final rehabilitation will be carried out once the Office and Phoenix Pit project goes into its closure phase. This final rehabilitation will be carried out within the context of the closure plan.

The principles for proper rehabilitation, which should be followed, are:

- Preparing a comprehensive rehabilitation plan prior to the commencement of all future mining areas;
- Concurrently rehabilitating the mining sites, in order to ensure that the rate of rehabilitation is similar to the rate of mining;
- Landform design (levelling, topsoiling) and seeding;
- Maintenance management and eradication of invader species; and
- Minimizing the area cleared for mining and associated facilities to that which absolutely necessary for the safe operation of the mine.

4.9 Period for which environmental authorisation is required

According to the latest mine plan, mining at these areas will commence in 2026 and 2025 respectively. Coal will be mined in these areas by means of the truck and shovel method following a roll over progression. The coal mined at the Office and Phoenix Pit areas will be processed at the existing ATC Plant and ATCOM Central Plant respectively. The Office Pit area has an estimated Life of Mine (LOM) of 3-4 years and the LOM of the ATC Office Pits is estimated at three years.

To accommodate the time needed for construction, operations, closure and rehabilitation, the authorisation is required for a period of 25 years.

4.10 Undertaking

It is confirmed that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the EIA Report and the EMPr.

4.11 Financial provision

4.11.1 Quantum of financial provision

The quantum of the financial provision for the Office and Phoenix areas, over the course of the LOM has been calculated as recently as 2015. The 2015 financial provision was prepared according to the escalated 2005 DMR rates, (see Table 4-1, Table 4-2). iMpunzi is aware of the necessary changes as per the updated regulations pertaining to the financial provision for prospecting, exploration, mining or production operations set out in (GNR. 1147). iMpunzi is currently in the process of updating the financial provision for the larger iMpunzi complex, according to the new regulations. It is understood that this process will be completed towards the end of 2016, and it is thus proposed that as soon as completed, iMpunzi submit the updated financial provision to the DMR, along with a detailed breakdown on the specific provision necessary for the Office and Phoenix operations.

Table 4-1: Calculation of quantum for the Office area

Office Area	Total (Rands)
Description	
Dismantling of processing plant and related structures (including overland conveyors and powerlines)	R 2 063 583
Demolition of steel buildings and structures	R 18 430 644
Demolition of reinforced concrete buildings and structures	R 333 788
Rehabilitation of access roads	R 5 162 143
Demolition and rehabilitation of electrified railway lines	R 5 065 566
Demolition and rehabilitation of non-electrified railway lines	R 0
Demolition of housing and/or administration facilities	R 7 517 357
Opencast rehabilitation including final voids and ramps	R 40 846 860
Sealing of shafts, adits and inclines	R 1 974 565
Rehabilitation of overburden and spoils	R 8 287 718
Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R 22 829 766
Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R 0
Rehabilitation of subsided areas	R 28 997 357

General surface rehabilitation	R 7 371 770
River diversions	R 0
Fencing	R 1 030 674
Water management	R 0
2 to 3 years of maintenance and aftercare	R 0
Specialist study	R 0
Specialist study	R 0
Subtotal 1.1	R 149 911 790
Preliminary and General (6% of Subtotal 1.1)	**R 8 994 707**
Subtotal 1.2	**R 158 906 498**
Contingency (10% of Subtotal 1.1)	**R 14 991 179**
Subtotal 2	**R 173 897 677**
Grand Total (Subtotal 2) Excl. VAT	**R 173 897 677**
VAT @ 14%	**R 24 345 675**
Grand Total (Subtotal 2) Incl. VAT	**R 198 243 352**

Table 4-2: Calculation of quantum for the Phoenix area

Phoenix Area	**Total (Rand)**
Description	
Dismantling of processing plant and related structures (including overland conveyors and powerlines)	R 873 513
Demolition of steel buildings and structures	R 94 165
Demolition of reinforced concrete buildings and structures	R 0
Rehabilitation of access roads	R 4 463 669
Demolition and rehabilitation of electrified railway lines	R 1 661 405
Demolition and rehabilitation of non-electrified railway lines	R 0
Demolition of housing and/or administration facilities	R 1 613 096
Opencast rehabilitation including final voids and ramps	R 8 462 494
Sealing of shafts, adits and inclines	R 1 11 0552
Rehabilitation of overburden and spoils	R 3 289 847
Rehabilitation of processing waste deposits and evaporation ponds (basic, salt-producing waste)	R 12 988 667
Rehabilitation of processing waste deposits and evaporation ponds (acidic, metal-rich waste)	R 0

Phoenix Area Description	Total (Rand)
Rehabilitation of subsided areas	R 907 082
General surface rehabilitation	R 5 096 415
River diversions	R 0
Fencing	R 123 384
Water management	R 0
2 to 3 years of maintenance and aftercare	R 0
Specialist study	R 0
Specialist study	R 0
Subtotal 1.1	R 40 684 290
Preliminary and General (6% of Subtotal 1.1)	**R 2 441 057**
Subtotal 1.2	**R 43 125 347**
Contingency (10% of Subtotal 1.1)	**R 4 068 429**
Subtotal 2	**R 47 193 776**
Grand Total (Subtotal 2) Excl. VAT	**R 47 193 776**
VAT @ 14%	**R 6 607 129**
Grand Total (Subtotal 2) Incl. VAT	**R 53 800 904**

4.12 Deviations from approved scoping report and plan of study

There are no deviations from the scoping report and plan of study as submitted to the DMR on 8 August 2016.

4.13 Other information required by the DMR

4.13.1 Impact on socio-economic conditions of any directly affected person

The most directly affected people will be members of the small community located to the south-east of iMpunzi, (see Figure 2-2). This community has been identified as a sensitive receptor in terms of air quality, noise, vibration and visual aspects. It is important that iMpunzi closely monitor the impact on the community and to implement the outlined mitigation measures to prevent and minimise the negative impacts.

4.13.2 Impact on any national estate

As mentioned above in sections 2.12.12, and 3.10, Glencore intends to conclude the grave site re-locations currently underway during 2016. It thus not envisaged that any impacts on any national estate will occur.

4.13.3 Other matters required in terms of section 24(4) of the NEMA

This section requires proof of compliance with section 24(4)(b)(i) of the National Environmental Management Act, which section reads as follows:

"24. Environmental authorisations

(4) Procedures for the investigation, assessment and communication of the potential consequences or impacts of activities on the environment -

(b) must include, with respect to every application for an environmental authorisation and where applicable-

(i) investigation of the potential consequences or impacts of the alternatives to the activity on the environment and assessment of the significance of those potential consequences or impacts, including the option of not implementing the activity;"

It is important to note that site selection for the proposed Office and Phoenix pit operations was dictated by the location of the economically viable coal reserves which are to be mined (see Figure 2-2). Furthermore, as mentioned above, existing coal processing and supporting facilities will be used as part of processing these reserves, negating the need for any additional supporting infrastructure.

For these reasons, no alternative sites for the Office and Phoenix pits were considered.

PART B
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

5.0 DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

5.1 Details of Environmental Assessment Practitioner

The required details have been supplied in PART A, section 2.1 of this document.

5.2 Description of the Aspects of the Activity

Please refer to sections 2.4 to 2.7 of this document.

5.3 Composite Map

Please refer to Figure 2-2 in this document.

5.4 Impact management objectives and statements

5.4.1 Environmental quality and managing environmental impacts

To ensure that local environmental quality is not adversely affected by the potential impacts identified as part of this EIA/EMPr, it is important that iMpunzi:

- Maximise the positive and minimise the negative socio-economic impacts;
- Capture, contain, treat and recycle all contaminated water arising from the mining operations on site and to prevent the discharge of contaminated water to the environment;
- Conduct the various activities associated with the Office and Phoenix operations in such a manner as to minimise the impact on the wetlands in the area, through the timeous and proper implementation of the wetland mitigation measures;
- Carry out blasting in a manner that will avoid fly rock damage, air blast noise exceeding 120 dB at any receptor, surface vibrations with a particle acceleration of more than 12 mm/second. Blasts will be monitored and the results will be taken into account when designing subsequent blasts;
- Avoid PM10 concentrations exceeding 75 µg/m3 in the local airshed for reasons of public health and to avoid exceeding the national standards for ambient air quality that were set by the publication of

Government Notice 1210 in Government Gazette no 32816 on 24 December 2009. Wet suppression will be applied during drilling and after blasting, and air quality will be monitored;

- Minimise the safety and congestion impacts of traffic due to the mining operation by limiting coal trucking to daylight hours, strict enforcement of traffic regulations and road rules, avoiding trucking during peak hours and addressing road maintenance needs in cooperation with the road authorities;
- Soften the visual impact of the project by applying the recommended mitigation measures; and
- Maintain cordial relationships with local residents, authorities and other stakeholders via sustained open communication.

5.4.2 Potential risk for acid mine drainage

A project specific acid based accounting investigation for the Office and Phoenix pit operations has not been undertaken, but the Witbank coals are documented to be acid producing and will produce a leachate enriched in sulphate and sodium. Hence, any decant produced from the Phoenix and Office spoils will likely be acidic.

It is important to note that Glencore has developed a long term water management plan, involving the long term water treatment of process affected water at the Glencore Water treatment facility. This facility will treat water process affected water from a number of Glencore operations, including iMpunzi. Taking this into account, no acid mine drainage (AMD) will allowed to decant from the rehabilitated remnants of the Office and Phoenix pits.

5.4.3 Water Use Licence

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) is the primary legislation regulating both the use of water and the pollution of water resources. It is applied and enforced by the Department of Water and Sanitation (DWS).

Section 21 of the NWA lists the water uses for which a water use licence (WUL) is required. iMpunzi's intention to opencast mine the Office and Phoenix Pits will constitute the following water uses:

a) Taking water from a water resource;

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

(i) Altering the beds, banks, course or characteristics of a watercourse; and

(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.

iMpunzi along with the EIA/EMPr have embarked upon the necessary Water Use Licence Application (WULA) process to authorise the water use associated with the Office and Phoenix pit operations. Furthermore, as part of the WULA, iMpunzi are preparing a project specific Integrated Water and Waste Management Plan (IWWMP) which will form the main supporting document for the WULA. These processes are running concurrent to this EIA/EMPr process.

5.5 Potential Impacts to be mitigated in their respective phases

The potential impacts along with the necessary mitigation measures are described in Part A, section 3.0 of this document.

As mentioned above, iMpunzi intends to outsource the mining of the Office and Phoenix pits to contractors. All service agreements with contractors will however contain clauses committing the contractors and their personnel to adhere to all relevant stipulations of this environmental management programme (EMPr). The contracts will also contain penalty clauses that will allow iMpunzi to impose fines, recover remediation costs from contractors and to terminate the contract for specified transgressions.

6.0 SUMMARY OF MITIGATION AND MONITORING MEASURES

This section summarises (Table 6-1) the potential impacts of various aspects of the proposed Office and Phoenix operations in all stages, from construction, through operations to eventual, closure and rehabilitation, together with the appropriate mitigation measures to manage the identified impacts. Responsibilities for implementing the mitigation measures are identified and the frequencies with which the results of the various measures are to be monitored are stated. The responsibility for monitoring and reporting the results to the appropriate level of management within Glencore rests with the Environmental manager.

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Table 6-1: Impacts and mitigations measures summarised for all project phases

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
Construction phase																	
Surface Water																	
Surface water quality could potentially be impacted on negatively through the spillage of fuels, lubricants and other chemicals.	4	2	2	3	24	Low	2	2	1	3	15	Low	• Storing chemicals and/or fuel in bunded areas; • Clean-up of spills as soon as they occur; and • Implementation of a stormwater management plan as construction occurs	Control through management and monitoring. Prevent by restricting spillage from construction vehicles. Control by implementation of storm water management measures.	Throughout project	Waste Management standards/objectives;	Environmental Manager
Erosion could be caused during construction through the clearance of vegetation.	2	2	1	3	15	Low	2	2	1	3	15	Low	• Implementation of a stormwater management plan as construction occurs	Control through management and monitoring	During construction and operation	Water Use Licence standards GN R. 704 (NWA)	Operations and Environmental Manager
Wetlands																	
Loss and destruction of wetland habitat through construction and associated activities	8	5	1	5	70	High	6	5	1	5	60	Moderate	• No mining activity should take place within wetlands area unless if those wetlands are affected by mining footprint and other infrastructure as indicated in the mining plan All wetland areas should be clearly marked and demarcated as such to alert construction staff on site. All construction staff should also be educated on the importance and sensitivity of the wetland systems on site. This should form part of the induction process. • Develop and implement a construction stormwater management plan prior to the commencement of site clearing activities. • 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 50m maintained from delineated wetland boundaries. • Rehabilitate and re-vegetate all disturbed areas following disturbance. • An alien vegetation management plan should be drawn up by the Environmental Co-ordinator and implemented. Regular removal of invasive alien species should be undertaken. This should extend right through to the decommissioning and closure phase of the project.	-Control through Management -Prevent through restricting the disturbed area	During project	Waste Management standards/objectives; Water Use Licence standards -GN R. 704 (NWA)	Environmental Manager

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
Increased sediment transport into wetland areas	6	3	2	4	44	Moderate	4	3	1	4	32	Moderate	• Implementation of stormwater management plan prior to the commencement of large scale vegetation clearing activities or construction activities. • -. • Vegetation clearing, soil stripping and major earthmoving activities should be phased to minimise the extent of bare soils surfaces exposed at any one time. • Vegetation clearing and soil stripping should also only be undertaken immediately preceding the onset of construction activities.	Control through management or remediation options. Control by implementation of storm water management measures	During project	Waste Management standards/objectives Water Use Licence standards GN R. 704 (NWA)	Environmental Manager
Water quality deterioration to wetland feed water	4	3	2	4	36	Moderate	4	3	1	3	24	Low	• Accidental spills (concrete, chemicals, process water, hydrocarbons, waste) need to be reported immediately so that effective remediation and clean-up strategies and procedures can be implemented	Control through appropriate management measures. Prevent by restricting spillage from construction vehicles;	During project	Waste Management standards/objectives; Water Use Licence standards -GN R. 704 (NWA)	Environmental Manager
Decreased watermake to adjacent wetland areas	6	5	2	4	52	Moderate	6	5	1	4	48	Moderate	• Dirty water areas should be kept as small as possible, while still ensuring the effective separation of clean and dirty water. • All clean water from upslope of the dirty water areas should be diverted around the dirty water areas and discharged back into the environment. •Clean water diversions should ideally take the form of grassed swales rather than simple excavated trenches that present an erosion risk. •The clean water diversion discharge points should be protected against erosion and must incorporate energy dissipating structures to prevent erosion in receiving wetlands. •Discharge points should be regularly inspected and maintained to ensure efficient functioning. Any observed erosion damage should be repaired immediately and the cause addressed.	Control through management Control by implementation of storm water management measures	During project	Waste Management standards/objectives; Water Use Licence standards GN R. 704 (NWA)	Environmental Manager
Groundwater																	
Impact on groundwater level	4	2	2	2	16	Low	2	2	2	2	12	Low	• Drill a series of shallow boreholes in order to confirm that water levels in vicinity of the pits are deeper than the proposed pit bottoms.	Control through appropriate management measures.	During project	Waste Management standards/objectives	Environmental Manager
Impact on groundwater quality	4	4	2	3	30	Moderate	2	4	2	2	16	Low	• Conduct comprehensive groundwater quality monitoring to assess any variation in quality. • Acid base accounting and geochemical characterisation of the coal and back fill material is necessary.	Control through appropriate management measures.	During project	Waste Management standards/objectives	Environmental Manager
Ecology																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implement ation	Compliance with Standards	Responsible person
Habitat destruction by the removal of vegetation and topsoil from the initial box cuts for the various pits. Dust will settle on vegetation, reducing its ability to photosynthesise and its palatability. Human presence and construction noise are likely to drive any remaining birds and wild animals away. Establishment and spread of alien invasive plant species. Sediment and contaminants such as diesel, lubricants, solvents and cement, could be carried into the wetlands and downstream watercourses.	4	2	2	4	32	Moderate	4	2	2	3	24	Low	• Clear demarcation of all construction and laydown areas, which should be chosen to minimise the disturbance footprint; • Designation of no-go areas (i.e. wetland areas, not to be impacted upon etc.); • Construct relevant clean and dirty water conveyance and collection infrastructure as per the stormwater management plan, before undertaking any other activities, in order to prevent migration of contaminants off site and into the wetlands and watercourses. This construction work should be undertaken during the dry season; • All personnel should receive training in environmental awareness and the recognition of Red Data species and should be prohibited from causing damage to any plants other than those that have to be removed. In the unlikely event that any Red Data species are found, the services of a suitable specialist should be sourced to advise on their relocation; • Dust control by wet suppression; • Monitoring for and control of declared weeds and invasive flora on the site. The re-occurrence or spread of declared weeds and invasive plants must be controlled by the land user as per the legal requirements of the CARA; • Re-vegetating all disturbed and exposed areas with locally indigenous species; • Confining activities to the infrastructure site only and prohibiting access to and activities on adjacent wetland and bare areas; • Monitoring and auditing of the construction activities for compliance with the project-specific Environmental Management Programme (EMPr)	Control through appropriate management measures.	During project	Bio-diversity action plan and associated standards and objectives	Environmental Manager
Air Quality																	
Increased dust emissions due to entrainment of dust particles by the movement and operation of the construction and mining equipment. Furthermore, the construction and mining equipment may potentially lead to increased atmospheric greenhouse gas emissions	8	3	2	5	65	High	6	3	2	3	33	Moderate	• Apply dust suppression on the access and haul roads and other relevant areas as and when necessary to minimise dust generation. Wet suppression is effective, but for roads chemical binders such as Dustex or Dust-A-Side could also be used. • All earth moving and mining equipment, needs to be inspected and maintained regularly to ensure a proper working order; • Dust fall monitoring by dust collection buckets installed downwind of the project area. Monitoring must be done in accordance with SANS 2004.	Control through appropriate management measures.	During project	Conduct dust suppression techniques to ensure that applicable standards for PM10 and PM2.5 are not exceeded. GN R. 827 (NEM:AQA)	Environmental Manager
Noise																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
Increased noise, vibration and blasting levels through the site preparation with the use of earthmoving equipment, hauling of materials to and from the site; and blasting at the initial box-cuts	8	3	2	4	52	Moderate	6	3	2	4	44	Moderate	• Limiting the noisiest construction activities to reasonable hours (06h00 to 22h00); • Using equipment with lower sound power levels where possible; • Installing suitable mufflers on engine exhausts and compressor components; • Equipping construction vehicles with reverse alarms that emit lower frequencies or white noise. Such alarms are less audible at a distance and people working nearby can more easily hear from which direction the signal comes; • Keeping construction vehicles and equipment in good repair; • Where necessary, stationary noisy equipment (e.g. compressors, pumps, pneumatic breakers) should be encapsulated in acoustic covers, screens or sheds. Portable acoustic shields should be used where noisy equipment is not stationary (e.g. angle grinders, chipping hammers, poker vibrators); • Installing vibration isolation for mechanical equipment; • Taking advantage during the design stage of natural topography and vegetation as a noise buffer; • Implementing a system to receive, record and respond to complaints; • Liaison with local residents on how best to minimise the impact of unavoidable noisy construction activities in the vicinity of noise sensitive areas; • Machines in intermittent use should be shut down or throttled down to a minimum whenever possible; • In general, construction activities should meet the noise standard requirements of the Occupational Health and Safety Act (Act No 85 of 1993); and Construction staff working in areas where the 8-hour ambient noise levels exceed 75dBA should be obligated to wear hearing protection equipment.	Control through appropriate management and monitoring measures	During project	SANS 10103	Environmental Manager
Blasting and vibration																	
The activities associated with the rehabilitation phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the construction of the site will be too small to affect any of the off-site receptors adversely.	0	0	0	0	0	None	0	0	0	0	0	None	If deemed necessary for any blasting activities to take place during construction, the impacts and mitigation measures described in the operational phase will be applicable.	Na	Na	Na	Na
Visual																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
The movement of earth moving and personnel vehicles along the local roads and the construction activities on the site will be visible to local residents and travellers. Activities may lead to visible plumes of dust. Visibility will increase during the construction period as the taller structures are erected (i.e. Topsoil and overburden stockpiles).	6	3	1	4	40	Moderate	6	3	2	4	44	Moderate	• Leave as much screening vegetation between the site and the potential receptors as possible; • Strategic placement of topsoil stockpiles and earth berms along the regional road; • Maintain the construction site in a neat and orderly condition at all times; • Create designated areas for material storage, waste sorting and temporary storage, batching and other potentially intrusive activities; • Limit the physical extent of areas cleared for material laydown and parking of vehicles as much as possible and rehabilitate these as soon as feasible; • Apply sufficient wet suppression to ensure absence of visible dust; • Unpaved roads should be covered with a layer of crushed rock or gravel, or treated with chemical dust suppressants such as Dustex or Dust-A-Side • Establish a dust bucket system around the site perimeter to monitor dust fall out.	Control through appropriate management and monitoring measures	During project	Waste Management standards/objectives	Environmental Manager
Cultural and heritage																	
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations.	0	0	0	0	0	None	0	0	0	0	0	None	None necessary	Na	Na	Na	Na
Impacts will occur only if human remains or artefacts are unearthed during earthmoving operations	10	5	2	5	85	High	6	5	2	4	52	Moderate	• Cease all work in the immediate vicinity of the find • Demarcate the area with barrier tape or other highly visible means; • Notify the South African Heritage Resources Authority (SAHRA) immediately; • Commission an archaeologist accredited with the Association for Southern African Professional Archaeologists (ASAPA) to assess the find and determine appropriate mitigation measures. These may include obtaining the necessary authorisation from SAHRA to undertake the mitigation measures • Prevent access to the find by unqualified persons until the assessment and mitigation processes have been completed.	Control through appropriate management measures.	During project	Regulations and standards, set out in South African Heritage Resources Act (SAHRA)	iMpunzi Management
Socio-economics																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
iMpunzi proposes to make use of mining contractors for the operations at the Office and Phoenix pit areas. It is thus possible that during construction, additional temporary jobs may be created for local contractors. Some local residents may be inconvenienced by noise, dust and increased traffic during the construction period.	4	3	2	3	27	Low	4	3	2	3	27	Low	• Maintain communication and consultation with local residents, with particular reference to; blasting times, noise and vibration disturbance at sensitive receptors, especially the nearest residences, air quality in the areas surrounding the site, traffic impacts on roads in the vicinity, visual aspects, such as visible dust and lighting at night, groundwater and surface water availability and quality. • Use local contractors where practicable; • Encourage the use of local labour and the purchase of local goods, materials • Implement a system to receive, record and respond to complaints.	Control through appropriate management measures and implementation of the Social & Labour Plan.	During project	Recruitment Policy objectives and South African Labour Law	Human Resource Manager
Operational Phase																	
Surface Water																	
Changes in surface water quality, due to poor quality runoff from mining activities.	4	4	2	3	30	Moderate	4	3	2	3	27	Low	• Implementation of the proposed stormwater management plan as described above as per Regulation 704 • Effective diversion of clean stormwater away from the mine area to allow maximum water runoff into the environment and will further separate the clean and dirty water .	Control through management Control by implementation of storm water management measures	During project	Rehabilitation standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards GN R. 704 (NWA)	Environmental Manager
Decreased in catchment area due to decreased runoff as a result of mining and associated activities.	2	3	1	5	30	Moderate	2	3	1	4	24	Low					
Erosion on site and surrounding areas due to mining of the pits.	2	4	1	4	28	Low	2	4	1	3	21	Low					
Wetlands																	
Loss and disturbance of wetland habitat	6	4	2	3	36	Moderate	4	4	1	2	18	Low	• Opencast and surface infrastructure areas should be limited to the footprint layout plan so as to prevent machinery and personnel accessing adjacent wetland areas outside the disturbance footprint. • No stockpiling of material may take place within the wetland areas and temporary camps and infrastructure should also be located away from these areas. • Where access into wetland areas is unavoidable, regular cleaning up of the wetland areas should be undertaken to remove litter • Regular removal of invasive alien species should be undertaken.	Control through appropriate management measures.	During project	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards -GN R. 704 (NWA)	Environmental Manager

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implement ation	Compliance with Standards	Responsible person
Increased sediment transport into wetlands	6	4	2	4	48	Moderate	4	4	1	3	27	Low	• Implement the stormwater management plan for the opencast areas; • Divert clean water around the dirty water areas, ideally in grassed swales rather than simple excavated trenches; • Install sediment barriers where required to prevent sediment movement off site, specifically around stockpile areas.	Control through appropriate management measures.	During project	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards GN R. 704 (NWA)	Environmental Manager
Water quality deterioration	4	4	2	4	40	Moderate	4	4	1	3	27	Low	• All hazardous substances should be stored on impervious surfaces, outside any wetland areas • No hazardous materials may be stockpiled in any wetland area on site. • Any carbonaceous material stockpiled on site must be located within a dirty water area isolated from the surrounding catchment and all runoff and seepage from the stockpile contained • No discharge of such dirty water may take place on site	Control through appropriate management measures.	During project	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards GN R. 704 (NWA)	Environmental Manager
Decreased watermake to adjacent wetlands	6	5	2	4	52	Moderate	6	5	1	4	48	Moderate	• Dirty water areas should be kept as small as possible, while still ensuring the effective separation of clean and dirty water. • All clean water from upslope of the dirty water areas should be diverted around the dirty water areas and discharged back into the environment. •Clean water diversions should ideally take the form of grassed swales rather than simple excavated trenches that present an erosion risk. •The clean water diversion discharge points should be protected against erosion and must incorporate energy dissipating structures to prevent erosion in receiving wetlands. •Discharge points should be regularly inspected and maintained to ensure efficient functioning. Any observed erosion damage should be repaired immediately and the cause addressed.	Control through appropriate management measures.	During project	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards GN R. 704 (NWA)	Environmental Manager
Discharge of stormwater into wetlands	4	4	2	4	40	Moderate	4	4	1	3	27	Low	• Clean and dirty storm water need to be separated; • No contaminated water should be allowed to enter the clean storm water system • Dirty storm water may not be released into the wetlands and should be contained and treated on site, or used for dust suppression • The volumes of storm water run-off should be minimised by limiting the area of impermeable surfaces and compacted soils • Where possible, storm water should be conveyed through grassed swales rather than concrete channels to aid infiltration and reduce run-off volumes	Control through appropriate management measures.	During project	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards	Environmental Manager

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
													• Where storm water and/or diverted clean water is discharged into wetlands, gabions should be constructed to contain erosion. This should be done in consultation with an appropriate wetland and storm water specialist. The gabion structure should also include measures to dissipate energy of flows and to disperse flows over a greater area			-GN R. 704 (NWA)	
Groundwater																	
Impact on groundwater level	4	2	2	2	16	Low	2	2	2	2	12	Low	• Drill a series of shallow boreholes in order to confirm that water levels in vicinity of the pits are deeper than the proposed pit bottoms • If it is identified that groundwater dependent users within the vicinity of the mine are likely to be impacted both during the operational phase of the mine, it is necessary to conduct a water supply options analysis and develop a water supply strategy to meet the deficits likely to be faced by these users • Rehabilitation of the backfilled spoils should be completed during the operational phase as this would aid in reducing recharge and rather enhance clean runoff and thus reduce ingress into the mined out pits.	Control through appropriate management measures.	During project	Waste Management standards/objectives	Environmental Manager
Impact on groundwater quality	10	4	2	4	64	High	4	4	2	2	20	Low	• Conduct comprehensive groundwater quality monitoring to assess any variation in quality. • Acid base accounting and geochemical characterisation of the coal and back fill material is necessary.	Control through appropriate management measures.	During project	Waste Management standards/objectives;	Environmental Manager
Ecology																	
The constant human presence and the noise generated on the site are likely to keep most fauna away. Without preventative measures, dirty stormwater runoff could enter local drainage lines and migrate to downstream wetland areas and watercourses.	4	2	2	4	32	Moderate	4	2	2	3	24	Low	• Monitoring for and control of declared weeds and invasive flora on the site. • All personnel should receive training in environmental awareness and the recognition of Red Data species. If any Red Data species are observed, the services of a suitable specialist should be sourced to advise on their safety and whether relocation is required. • Restriction of vehicle movement to existing roads and tracks • Dust control by wet suppression • Confining activities to the site only and prohibiting access to and activities on adjacent wetland and bare areas • Continued implementation and improvement of the stormwater management plan	Control through appropriate management measures.	During project	Bio-diversity action plan and associated standards and objectives	Environmental Manager
Air Quality																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
Increased dust emissions through the entrainment of dust particles by the movement and operations of mining equipment. Operation of mining equipment could lead to the generation and emission of greenhouse gases. Potential for dust emissions due to wind erosion during removal of topsoil, blasting, removal of overburden, as well as exposure of stockpiles to wind erosion.	8	3	2	5	65	High	6	3	2	3	33	Moderate	• Apply dust suppression on the access and haul roads and other relevant areas as and when necessary to minimise dust generation. Wet suppression is effective, but for roads chemical binders such as Dustex or Dust-A-Side could also be used. • All earth moving and mining equipment, needs to be inspected and maintained regularly to ensure a proper working order; • Dust fall monitoring by dust collection buckets installed downwind of the project area. Monitoring must be done in accordance with SANS 2004. • The drop distance from which topsoil is tipped should be minimized where possible. Topsoil stockpiles will be allowed to naturally vegetate in order to stabilize particles and reduce the risk of wind erosion; • Undertaking the most dusty operations (ripping, landscaping and spreading of topsoil) during calm conditions, thus to minimise dust generation.	Control through appropriate management measures.	During project	Conduct dust suppression techniques to ensure that applicable standards for PM10 and PM2.5 are not exceeded. GN R. 827 (NEM:AQA)	Environmental Manager
Noise																	
During the operational phase, it is expected that mining activities; stockpile management; road maintenance; opencast blasting; and transport and handling of material will generate noise and vibrations during the operation phase.	8	3	2	4	52	Moderate	6	3	2	4	44	Moderate	• Equipping trucks with reverse alarms that emit lower frequencies or white noise. Such alarms are less audible at a distance and people working nearby can more easily hear from which direction the signal comes; • Strategic placement of topsoil stockpiles, earth berms and other noise barriers along the regional road, access road and haul roads; • The latest technology incorporating maximum noise mitigation measures for components of the complex should be designed into the system. When ordering plant and machinery, manufacturers should be requested to provide details of the sound power level (SPL). Where possible, those with the lowest SPL should be selected; • Keeping all equipment and vehicles in good repair; • Installing acoustic enclosures for equipment causing radiating noise and vibration isolation for mechanical equipment; • Confining coal trucking operations to daylight hours; and • Maintaining the system of receiving, recording and responding to complaints.	Control through appropriate management measures.	During project	Conduct dust suppression techniques to ensure that applicable standards for PM10 and PM2.5 are not exceeded. GN R. 827 (NEM:AQA)	Environmental Manager
Blasting and vibration																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
The nearby community identified above as a sensitive receptor, is located approximately 250 m from the Eastern perimeter of the proposed Phoenix pit No. 4 and approximately 500 m from the South Eastern extent of Phoenix pit No. 3. Furthermore, the proposed individual Phoenix Pits will be well within 500 m of either the R547 regional road or the arterial road which runs between the R 547 and the R 545. It is important to note that many of the structures in the community are of an informal nature and may thus be more susceptible to vibrations, fly rock etc.	8	5	3	5	80	High	6	3	2	4	44	Moderate	• Blast mats should be used where necessary to minimise the possibility of off-site fly rock injury or damage and the blasting supervisor must ensure that no persons are within the danger zone; • Blasts should be designed so that: • Ground vibration levels do not exceed 12.5 mm/s at off-site structures; and • The air over-pressure level does not exceed 134dB at the blast and 120 dB at any of the receptor sites indicated in Figure 2-9. • Vibration and air over-pressure should be monitored at potentially sensitive areas; • Blasting times must be communicated to local residents; • Standard pre-blast safety procedures set out in the Mine Health and Safety Act, (Act No 29 of 1996), must be followed to ensure that nobody is present within a 500 m buffer radius around the blast. This would involve systematic clearing of the local community, closing of the regional and arterial road as well as pre and post blast inspections of the roads and community area for potential damage and safety concerns. • Ensure that the correct design relationship exists between burden, spacing and hole diameter is followed; • Ensure that the maximum amount of water resistant emulsion on any one day delay interval, the maximum instantaneous charge, is optimized by considering a reduction in the: • Number of holes per detonator delay interval; • Instantaneous charge by in-hole delay techniques; and • Blast hole depth and diameter. • Be aware that the perception of blasting events occurs at levels of vibration well below those that can cause structural damage, but nevertheless at levels that can cause concern amongst residents in the vicinity of the mine site; • Take into account that relatively small changes in blast design can produce noticeable differences in effects experienced by local residents. Complaints are often made in response to changes in the effects experienced rather than their absolute value; and • The design of the blast should be in line with the blast design chart	Control through appropriate management measures.	During project	Corporate blasting practices and standards. Corporate Health and safety standards. Health and safety requirements as per the Mining Health and Safety Act	iMpunzi Management Environmental Manager Community engagement officer
Visual																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
The movement of mining and earth moving vehicles along the haul roads and the mining activities on the site will be visible to local residents and travellers along the R547. Activities may lead to visible plumes of dust. The continued removal of vegetation as mining progresses, will also contribute the visual impact of the operations.	8	3	2	4	52	Moderate	6	3	2	3	33	Moderate	• Avoid bright, shiny, reflective surfaces such as galvanised steel cladding. Paint surfaces in matt pastel colours (brown, olive green, light grey, grey-green, blue grey, dark buff, rust, ochre, variations of tan) that blend in with the background; • Unpaved roads should be covered with a layer of crushed rock or gravel, or treated with chemical dust suppressants such as Dustex or Dust-A-Side; • Apply sufficient wet suppression as and when necessary to ensure absence of visible dust; • Ensure that concurrent rehabilitation takes to minimise the visual impact of bare and disrupted topography; • Maintain the dust monitoring onsite to ensure compliance with dust fall out requirements; • Develop a detailed post-closure land use plan for the mine, taking into consideration current and likely future land uses surrounding the site, to ensure that the site is successfully re-integrated into the visual fabric existing at the time of closure.	Control through appropriate management and monitoring measures	During project	Waste Management standards/objectives	Environmental Manager
Cultural and heritage																	
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations.	0	0	0	0	0	None	0	0	0	0	0	None	None necessary	Na	Na	Na	Na
Impacts will occur only if human remains or artefacts are unearthed during earthmoving operations	10	5	2	5	85	High	6	5	2	4	52	Moderate	• Cease all work in the immediate vicinity of the find • Demarcate the area with barrier tape or other highly visible means; • Notify the South African Heritage Resources Authority (SAHRA) immediately; • Commission an archaeologist accredited with the Association for Southern African Professional Archaeologists (ASAPA) to assess the find and determine appropriate mitigation measures. These may include obtaining the necessary authorisation from SAHRA to undertake the mitigation measures • Prevent access to the find by unqualified persons until the assessment and mitigation processes have been completed.	Control through appropriate management measures.	During project	Regulations and standards, set out in the South African Heritage Resources Act (SAHRA)	iMpunzi Management
Socio-economics																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
The operational phase is expected to provide employment opportunities for 50-100 people. An influx of work seekers is possible, but the numbers are likely to be small, as contractors would be able to employ such additional staff as they might need from the local population. The positive socio-economic impact resulting from the employment opportunities and the cash injection into the local economy are balanced against the potential negative environmental impacts.	6	3	3	4	48	Moderate	6	3	3	3	36	Positive	• Maintain communication and consultation with local residents, with particular reference to, wetland, groundwater and surface water availability and quality; blasting times; noise and vibration disturbance at sensitive receptors, especially the nearest residences; air quality in the areas surrounding the site; traffic impacts on roads in the vicinity; visual aspects, such as visible dust and lighting at night; and relations between the mine and local residents. • Employ local people as far as practicable; • Purchase materials, goods and services locally as far as practicable; • Include local community skills development when implementing the mine's social and labour plan (SLP); • Apply all mitigation measures in the EMPr; • Maintain the complaints procedure and complaints register; and • Follow up, resolve and close out each complaint.	Control through appropriate management measures and implementation of the Social & Labour Plan.	During project	Recruitment Policy objectives and South African Labour Law	Human Resource Manager
Closure Phase																	
Surface water																	
Decommissioning may leave large barren areas that may increase erosion, which might increase the amount of suspended solids in downstream surface water reducing water quality.	4	1	2	3	21	Low	2	1	2	3	15	Low	Rollover rehabilitation must be practiced	Control through management Control by implementation of storm water management measures	Closure	Rehabilitation standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards GN R. 704 (NWA)	Environmental Manager
Wetlands																	
Water quality deterioration	8	5	5	4	72	High	6	5	3	4	56	Moderate	• The likelihood of decant occurring, as well as the likely decant points and decant quality should be determined. • Based on the outcomes of these investigations, a water management plan should be compiled that will ensure that no dirty water is allowed to decant or be discharged into the environment and which also addresses the possible migration of a groundwater pollution plume away from the mine. • Decanting water should be captured/pumped out of the void to prevent the contaminated water entering any of the wetlands on site. • The Glencore Water Reclamation Plant will be in operation by the time mining of these pits commences. • Clean and dirty water separation should be maintained until all contaminated materials have been removed from the dirty water areas. • Soils suspected of being contaminated should be analysed	Control through appropriate management measures.	Closure	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards -GN R. 704 (NWA)	Environmental Manager

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
													and, if possible, remediated on site or, if this is not possible, should be removed and disposed of offsite in suitable waste disposal facilities.				
Increased sediment transport into wetlands	6	3	2	4	44	Moderate	4	3	1	4	32	Moderate	• All disturbed areas should be landscaped to approximate the natural landscape profile, and should avoid steep slopes and concentrated run-off. • Compacted soils should be ripped and scarified. The rehabilitated areas should be re-vegetated as soon as possible following completion of the earthworks to minimise erosion. • Regular long-term follow up of rehabilitated areas will be required to ensure the successful establishment of vegetation and to survey for any erosion damage on site. • Erosion damage should be repaired immediately. • All rehabilitation activities should consider the need for and implementation of sediment and erosion control measures. • Sediment barriers, e.g. straw bales or bidim fences, should also be installed along the downslope edge of disturbed areas until sufficient vegetation cover has been established, especially where bare soils areas will remain exposed during the rainfall season.	Control through appropriate management measures.	Closure	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards -GN R. 704 (NWA)	Environmental Manager
Increased alien vegetation	6	4	2	4	48	Moderate	4	4	1	3	27	Low	• The alien vegetation management plan should be kept in place for several years following mine closure. • All species of alien invasive vegetation should be controlled and removed from site. • No spread of alien vegetation into any wetlands or adjacent properties should be allowed.	Control through appropriate management measures.	Closure	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards -GN R. 704 (NWA)	Environmental Manager
Altered hydrology	6	5	2	4	52	Moderate	6	5	1	4	48	Moderate	• Rehabilitation of the opencast pits should ensure sufficient compaction of replaced spoils to limit ingress of surface water. • A sufficient topsoil layer, based on the desired end land use should be replaced. If excess top soil is available, consideration should be given to increase the top soil depth in valley bottom areas/low points within the rehabilitated landscape to encourage the formation of wetlands in these areas. • Re-vegetation of the rehabilitated areas and the maintenance of vegetation cover should be completed as soon as possible after mining operations. .	Control through appropriate management measures.	Closure	Waste Management standards/objectives; Water Use Licence (04/B72K/ACGIJ/962) objectives /conditions / standards -GN R. 704 (NWA)	Environmental Manager
Groundwater																	

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
Impact on groundwater level	8	5	2	4	60	Moderate	4	3	2	3	27	Low	•It is important for iMpunzi to incorporate the Office and Phoenix Pit areas into the Glencore long terms water management plan, thus ensuring that no decant takes place at the rehabilitated pits. • As with the operational phase, if it is identified that groundwater dependent users within the vicinity of the pits are likely to be impacted rehabilitation phase of the mine, it is necessary to conduct a water supply options analysis and develop a water supply strategy to meet the deficits.	Control through appropriate management measures.	Closure	Waste Management standards/objectives	Environmental Manager
Impact on groundwater quality	10	4	2	5	80	High	4	4	2	2	20	Low	• it is important for iMpuzni to continue with monitoring post closure . • Glencore by large have developed a long term water management plan, involving the long term water treatment of process affected water at the Glencore Water treatment facility. This facility will treat water process affected water from a number of Glencore operations, including iMpunzi	Control through appropriate management measures.	Closure	Waste Management standards/objectives	Environmental Manager
Ecology																	
If rehabilitation is not undertaken correctly, and if soil pollution occurs during closure, the disturbed soil is likely to be colonised by weeds and alien invader species, and runoff could transport sediment and contaminants into downstream wetland and watercourses.	6	3	2	4	44	Moderate	6	2	2	3	30	Positive	• Remove steel structures, demolish brick and concrete structures, remove building rubble and dispose of it in accordance with applicable regulatory requirements; • Remove all weeds and alien plants from the site; • Rip compacted areas and shape the surface of the site to be free draining. Spread stockpiled subsoil first, then topsoil that has been preserved in the storm water diversion berm and the topsoil stockpile. • Take care to avoid mixing of subsoil with topsoil. Use light agricultural machinery to avoid compaction; • Do soil analysis and add soil conditioners and fertilisers as recommended by a qualified soil scientist; • Re-vegetate with locally indigenous grasses, shrubs and trees to bind the soil and encourage colonisation by fauna; and • Monitor quarterly until the vegetation has become self-sustaining. If any bare patches develop, the reason should be investigated and addressed, followed by re-vegetation of the patch.	Control through appropriate management measures.	Closure	Bio-diversity action plan and associated standards and objectives	Environmental Manager
Air Quality																	
Increased dust emissions through the entrainment of dust particles by the movement and operations of earth moving equipment. Operation ofearth moving equipment could lead to the generation and emission of greenhouse gases. Potential for dust emissions due to wind erosion during placement of topsoil as well as exposure of stockpiles to wind erosion.	6	3	2	4	44	Moderate	6	2	2	3	30	Moderate	• Apply dust suppression on the access and haul roads and other relevant areas as and when necessary to minimise dust generation. Wet suppression is effective, but for roads chemical binders such as Dustex or Dust-A-Side could also be used. • All earth moving and mining equipment, needs to be inspected and maintained regularly to ensure a proper working order; • Dust fall monitoring by dust collection buckets installed downwind of the project area. Monitoring must be done in accordance with SANS 2004; • Undertaking the most dusty operations (ripping, landscaping and spreading of topsoil) during calm conditions, thus to minimise dust generation.	Control through appropriate management measures.	Closure	Conduct dust suppression techniques to ensure that applicable standards for PM10 and PM2.5 are not exceeded. GN R. 827 (NEM:AQA)	Environmental Manager

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
Noise,																	
The main activities that are expected to generate noise during the rehabilitation phase are associated with the use of earth moving equipment and hauling of material to and from site.	4	3	2	4	36	Moderate	4	3	2	3	27	Low	• Limit the noisiest activities to daytime hours (06h00 to 22h00); • Use equipment with lower sound power levels where possible; • Install suitable mufflers on engine exhausts and compressor components; • Install acoustic enclosures for equipment causing radiating noise; • Install vibration isolation for mechanical equipment; • Re-locating noise sources to areas which are less noise sensitive, to take advantage of distance from receptors and natural shielding; and • Maintain the system of receiving, recording and responding to complaints for at least five years after closure and rehabilitation of the Office and Phoenix operations.	Control through appropriate management measures.	Closure	Conduct dust suppression techniques to ensure that applicable standards for PM10 and PM2.5 are not exceeded. GN R. 827 (NEM:AQA)	Environmental Manager
Blasting and vibration																	
The activities associated with the rehabilitation phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the rehabilitation of the site will be too small to affect any of the off-site receptors adversely.	0	0	0	0	0	None	0	0	0	0	0	None	If deemed necessary for any blasting activities to take place during construction, the impacts and mitigation measures described in the operational phase will be applicable.	Na	Na	Na	Na
Visual																	
The movement of d earth moving vehicles along the haul roads will be visible to local residents and travellers along the R547. Activities may lead to visible plumes of dust.	4	3	2	4	36	Moderate	4	3	2	3	27	Low	• Establish good vegetation cover on the rehabilitated pits and other previously disturbed areas of the site; • Maintain an effective tree screen along the perimeter of the site; • Apply sufficient wet suppression as and when necessary to ensure absence of visible dust.	Control through appropriate management and monitoring measures	Closure	Waste Management standards/objectives	Environmental Manager
Cultural and heritage																	
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations.	0	0	0	0	0	None	0	0	0	0	0	None	None Necessary	Na	Na	Na	Na
Impacts will occur only if human remains or artefacts are unearthed during earthmoving operations	10	5	2	5	85	High	6	5	2	4	52	Moderate	• Cease all work in the immediate vicinity of the find • Demarcate the area with barrier tape or other highly visible means; • Notify the South African Heritage Resources Authority (SAHRA) immediately; • Commission an archaeologist accredited with the Association for Southern African Professional Archaeologists (ASAPA) to assess the find and determine appropriate mitigation measures.	Control through appropriate management measures.	Closure	Regulations and standards, set out in the South African Heritage Resources Act (SAHRA)	iMpunzi Management

Potential Impacts	M	D	S	P	SP	Rating	M	D	S	P	SP	Rating	Mitigation	Mitigation Type	Time period for implementation	Compliance with Standards	Responsible person
													These may include obtaining the necessary authorisation from SAHRA to undertake the mitigation measures • Prevent access to the find by unqualified persons until the assessment and mitigation processes have been completed.				
													Socio-economics				
The negative impact of the loss of jobs and the sharp reduction of local expenditure at mine closure will be countered over time by the rehabilitation of the site and its potential use for agricultural or other economic activities that could result in the creation of new jobs.	6	3	2	4	44	Moderate	4	3	2	3	27	Low	• Proactive skills development and training of employees to enhance their value in the labour market and thereby their chances of finding employment after mine closure; • Development of a retrenchment plan in consultation with employees, starting at least five years before closure; • Assist redundant employees to find alternative employment as far as practicable; • Focus specifically on sustainable community projects in the SLP, i.e. projects that will remain viable without continued support from Glencore; • Provide training and start-up assistance to employees who want to start their own businesses; • Leave intact such infrastructure as can be used by local community-based organisations, after consultation with the potentially affected parties; • Diligent application of the rehabilitation plan as set out in the mine's closure plan, which is summarised in the Environmental Management Programme (EMPr); • Monitor surface water and groundwater quality for at least five years after closure of the mine.	Control through appropriate management measures and implementation of the Social & Labour Plan.	Closure	Recruitment Policy objectives and South African Labour Law Objectives of Social & Labour Plan	Human Resource Manager

7.0 FINANCIAL PROVISION

Please refer to section 4.11.

7.1 Overall closure goal

The overall closure goal for the proposed Office and Phoenix pit operations, is to leave behind an ex-mining area that is safe, stable and non-polluting, aligned to the Mpumalanga Spatial Development Framework, as well as current agricultural, tourism and other economic initiatives of the region, towards leaving behind a positive post-mining legacy.

7.2 Closure objectives

The above closure goal is underpinned by the more specific objectives listed below. These objectives are stated qualitatively and will become more specific as the more detailed closure measures are devised during the life of the mine. The objectives apply to the mine site in its final closed state and not while it is in progress towards this state.

7.2.1 Physical Stability

To remove surface infrastructure, stabilise and rehabilitate the opencast pits and to facilitate the implementation of the planned land use, by:

- Closing, dismantling, removing and disposing of all surface infrastructure that has no beneficial post closure use; and
- Ripping, shaping (to be free draining), and vegetating of opencast footprint areas as well as access roads with no beneficial post-closure use and integrating these into the surrounding areas.

7.2.2 Environmental Quality

To ensure that local environmental quality is not adversely affected by possible physical effects and chemical contamination arising from the mine sites as well as to sustain catchment yield as far as possible following closure, by:

- Limiting dust generation on the rehabilitated infrastructural areas that could cause nuisance and/or health effects to surrounding landowners/communities;
- Providing the required measures to limit at source the generation of contaminants which could adversely affect local groundwater and surface water quality; and
- Ensuring that the rehabilitated site is free-draining and runoff is routed to local/natural drainage lines as far as possible.

7.2.3 Health and Safety

To limit the possible health and safety threats to humans and animals using the rehabilitated site by:

- Demonstrating by means of suitable sampling and analysis that the threshold levels of salts, metals and other potential contaminants over the rehabilitated site in terms of the long-term land use planning for human and animal habitation are acceptable;
- Removing, for safe disposal, all potential process-related contaminants to ensure that no hazardous waste is present on the mine site once it has been rehabilitated;
- Demonstrating through a review of monitoring data that no possible surface and/or groundwater contaminant sources remain on the rehabilitated site that could compromise the planned land use and/or pose health and safety threats; and
- Monitoring environmental performance as set out in Table 7-1.

7.2.4 Land Capability/Land-use

To re-instate suitable land capabilities over the affected site to facilitate the progressive implementation of the planned land use, by:

- Upfront zoning of the overall mine site and obtaining agreement with stakeholders on this;
- Upfront materials balancing and handling to ensure that the soil types are stockpiled separately and subsequently placed, during site rehabilitation, to allow the desired land capability and end land use to be achieved;
- Ensuring that the rehabilitated site is safe and stable in the long term; and
- Cleaning up and rehabilitating contaminated soil areas.

7.2.5 Aesthetic Quality

To leave behind a rehabilitated site that, in general, is not only neat and tidy, giving an acceptable overall aesthetic appearance, but which in terms of this attribute is also aligned to the respective land use, by:

- Tidying-up the site by removing demolition waste, rubble, etc.;
- Shaping and levelling disturbed areas to create landforms that emulate the surrounding surface topography and would facilitate drainage; and
- Re-establishing vegetation on the above areas to be self-sustaining, ecologically functional and aesthetically pleasing.

7.2.6 Biodiversity

To encourage, where appropriate, the re-establishment of locally indigenous vegetation on the rehabilitated areas such that the terrestrial biodiversity is largely re-instated over time, by:

- Stabilising disturbed areas to prevent erosion in the short to medium term until a suitable vegetation cover has established;
- Establishing viable self-sustaining vegetation communities that will encourage the re-introduction of local fauna as far as possible;
- Identifying those aspects/obstacles once site rehabilitation has been completed which could inhibit and/or deter animal life from returning to the rehabilitated sites; and
- Removing the identified obstacles without compromising the adopted final land use(s).

7.2.7 Socio-economic Aspects

To ensure that the infrastructure transfers, measures and/or contributions made by the mine towards the long-term socio-economic benefit of the local communities are sustainable, by:

- Negotiating mutually acceptable terms for the relocation of the community, if deemed necessary;
- Identifying infrastructure that could be of commercial and/or other value/benefit to the local community and transferring these to third parties as agreed between the mine and these parties and/or the stakeholders;
- Communicating and negotiating with local communities and related civil structures on the closure of the mine and the possible transfer of surface infrastructure to them;
- Ensuring effective hand-over of pre-determined mining-related surface infrastructure for future use by other parties;

- Providing, until hand-over of the mining-related surface infrastructure, training and awareness creation to empower the community to effectively manage the financial and/or commercial resources transferred from the mine; and
- Clearly defining the roles of the parties responsible for future management of the transferred facilities.

The above closure goals and objectives were developed to restore baseline conditions as far as practically and economically achievable. The mitigation and rehabilitation measures described in section 3.0 of this report are specifically aligned to the closure goals and objectives stipulated in sections 7.1 and 7.2 of this report.

7.3 Implementation of the EMPr

A number of activities must take place before commencement of construction. Certain of these activities are not directly related to physical work on site, but are presented below, as they should be addressed before commencement of, or during the early phases of construction.

7.3.1 Responsibility for EMPr implementation

- Responsibility for implementation of the EMPr will ultimately rest with the General Manager at iMpunzi. The General Manager will be assisted by a number of support staff (i.e. SHE manager, environmental co-ordinator etc.);
- The General Manager will appoint a Safety, Health and Environmental (SHE) Manager, who will be based on site. The General Manager / SHE Manager will prescribe to the Glencore safety procedures, which will be implemented at the mine. The SHE Manager will ensure that all environmental activities delegated to contractors operating on site are implemented. Similarly, the SHE Manager will ensure that all conditions of the EMPr are implemented. It will furthermore be the responsibility of the SHE Manager to resolve any conflicts that may arise between iMpunzi and contracting parties regarding implementation of the EMPr. (Such responsibilities are captured by the legal appointment of the SHE Manager);
- iMpunzi will ensure that the responsibility for implementing and adhering to the conditions of the EMPr forms part of the conditions of appointment of all contractors;
- iMpunzi will ensure that all contracting companies tendering for work receive a copy of this EMPr and understand their responsibility to operate within the framework of the measures defined in this EMPr;
- When adjudicating tenders, iMpunzi will ensure that contractors have made appropriate allowance for management of environmental matters;
- iMpunzi will ensure that, upon appointment, all contracting companies operating on the site receive a copy of this EMPr and understand their responsibility to operate within the framework of the measures defined in this EMPr;
- iMpunzi will ensure that contractor SHE induction includes environmental and social issues and awareness training (“Environmental Awareness Plan”, see section 8.0) to build capacity of staff and contract staff regarding management of the environment;
- The SHE Manager will brief contractors about no development / no go areas. These to include:
  - No access to neighbouring properties without prior approval; and
  - No access to fenced-off sensitive areas.
- iMpunzi is required to appoint a responsible person to audit the implementation of, and adherence to, this EMPr. This party will be an independent environmental practitioner; and
- The SHE Manager will bring to the attention of the General Manager any major environmental incident or breach of the conditions of the EMPr, within 24 hours of occurrence of such event. The General

Manager will notify the controlling authority within 48 hours of such an incident, if the environmental incident constitutes a breach of any permit or licence condition.

7.3.2 Responsibility of contractors

- All contracting companies will receive a copy of the EMPr at time of tender. Each contractor is to familiarise himself with the environmental management measures for the site and ensure that contracting prices allow for environmental costs;
- At appointment the contractors should have their copies of the EMPr on site. It is the responsibility of the contractors to ensure that all of their staff are aware of the measures applicable to their area of work; and
- It is the responsibility of the contractor to bring to the attention of the iMpunzi SHE Manager any environmental incident or breach of the conditions of the EMPr, within 24 hours of occurrence of such event through the company's Incident Reporting System.

7.4 Environmental performance monitoring

Table 7-1 lists the main environmental aspects that will be subjected to performance monitoring during all phases of the project. The monitoring requirements, frequencies and responsible parties are also listed.

Table 7-1: Environmental monitoring programme.

Source/ Activity causing various impacts requiring monitoring	Functional requirements for monitoring	Frequencies	Responsible person
Construction phase			
Surface Water			
Surface water quality could potentially be impacted on negatively through the spillage of fuels, lubricants and other chemicals.	Continuation of upstream and downstream monitoring of surface water resources	Continuous, reporting monthly	Environmental Manager
Erosion could be caused during construction through the clearance of vegetation.	Onsite, visual inspection of areas which have been cleared, (especially after rainfall events)	Ad-hoc, during vegetation clearing	Operations and Environmental Manager
Wetlands			
Loss and destruction of wetland habitat through construction and associated activities	iMpunzi, as part of the larger Glencore Coal operations on the Highveld, has developed a wetland management plan with specific requirements regarding wetland impact and monitoring. iMpunzi will incorporate the Office and Phoenix wetland impacts into the wetland management plan and then monitor the Office and Phoenix wetland impacts against the requirements set out in the management plan.	As required in wetland management plan	Environmental Manager
Increased sediment transport into wetland areas			
Water quality deterioration to wetland feed water			
Decreased water make to adjacent wetland areas			
Groundwater			
Impact on groundwater level	Expansion of current groundwater monitoring program at iMpunzi to include the Office and Phoenix Pit operations. A series of shallow boreholes will be drilled in order to confirm that water levels in vicinity of the pits are deeper than the proposed pit bottoms.	Monthly, once suitable boreholes have been established	Environmental Manager
Impact on groundwater quality			
Ecology			
Habitat destruction by the removal of vegetation and topsoil from the initial box cuts for the various pits. Dust will settle on vegetation, reducing its ability to photosynthesise and its palatability. Human presence and construction noise are likely to drive any remaining birds and wild animals away. Establishment and spread of alien invasive plant species. Sediment and contaminants such as diesel, lubricants, solvents and cement, could be carried into the wetlands and downstream watercourses.	Bio monitoring will be conducted during the wet and dry season annually at iMpunzi complex. The objectives of bio monitoring are to: • Classify the ecological integrity of each of the sites using selected indicators; • Identify trends in aquatic ecosystem health in the project area; and • Identify types and levels of threats to the ecosystem in question and indicate the need for management actions in order to amend possible undesirable conditions. iMpunzi will expand the current bio-monitoring strategy and plan, to incorporate the Office and Phoenix Pit operations. iMpunzi will monitor for declared weeds and invasive flora on the site.	Bi- annual (wet and dry season)	Environmental Manager
Air Quality			
Increased dust emissions due to entrainment of dust particles by the movement and operation of the construction and mining equipment. Furthermore, the construction and mining equipment may potentially lead to increased atmospheric greenhouse gas emissions	Expansion of current air quality monitoring program at iMpunzi to incorporate the Office and Phoenix operations. New dust buckets will be installed at the Office and Phoenix Pit areas.	Continuous, reporting monthly	Environmental Manager
Noise			
Increased noise levels through the site preparation with the use of earthmoving equipment, hauling of materials to and from the site; and blasting	Noise monitoring equipment and protocols to assess the noise impacts of the Office and Phoenix operations on the identified receptors	When noisy activities reach steady state, thereafter when complaints are received	Environmental Manager
Blasting and vibration			
The activities associated with the construction phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the construction of the site will be too small to affect any of the off-site receptors adversely.	Vibration and air over-pressure monitoring equipment. Corporate standards and blasting practices. Standards and procedures set out in the Mine Health and Safety Act, (Act No 29 of 1996)	During blasting events, upon receipt of complaints	Environmental Manager Community liaison officer

Visual			
The movement of earth moving and personnel vehicles along the local roads and the construction activities on the site will be visible to local residents and travellers. Activities may lead to visible plumes of dust. Visibility will increase during the construction period as the taller structures are erected (i.e. Topsoil and overburden stockpiles).	Expansion of current air quality monitoring program at iMpunzi to incorporate the Office and Phoenix Pit operations. This will include the installation of new weather stations, dust buckets and PM10 samplers at the Office and Phoenix areas.	Continuous, reporting monthly	Environmental Manager
Cultural and heritage			
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations.	NA	NA	NA
Socio-economics			
iMpunzi proposes to make use of mining contractors for the operations at the Office and Phoenix pit areas. It is thus possible that during construction, additional temporary jobs may be created for local contractors. Some local residents may be inconvenienced by noise, dust and increased traffic during the construction period.	Maintenance of communication and consultation with local residents and stakeholders.Maintenance of a complaints register	Quarterly	Environmental Manager
Operational Phase			
Surface Water			
Changes in surface water quality, due to poor quality runoff from mining activities.	Continuation of upstream and downstream monitoring of surface water resources	Continuous, reporting monthly	Environmental Manager
Erosion on site and surrounding areas due to mining of the pits.	Onsite, visual inspection of areas which have been cleared, (especially after rainfall events)	Ad-hoc, during vegetation clearing	
Wetlands			
Loss and disturbance of wetland habitat	iMpunzi, as part of the larger Glencore Coal operations on the Highveld, has developed a wetland management plan with specific requirements regarding wetland impact and monitoring. iMpunzi will incorporate the Office and Phoenix Pit wetland impacts into the wetland management plan and then monitor the Office and Phoenix Pit wetland impacts against the requirements set out in the management plan.	As required in wetland management plan	Environmental Manager
Increased sediment transport into wetlands			
Water quality deterioration			
Decreased water make to adjacent wetlands			
Discharge of storm water into wetlands			
Groundwater			
Impact on groundwater level	Sampling pumps and protocols	Monthly, quarterly reporting	Environmental Manager
Impact on groundwater quality			
Ecology			
The constant human presence and the noise generated on the site are likely to keep most fauna away. Without preventative measures, dirty storm water runoff could enter local drainage lines and migrate to downstream wetland areas and watercourses.	Monitoring for and control of declared weeds and invasive flora on the site. Execution of biomonitoring as per iMpunzi biomonitoring plan.	Bi- annual (wet and dry season)	Environmental Manager
Air Quality			
Increased dust emissions through the entrainment of dust particles by the movement and operations of mining equipment. Operation of mining equipment could lead to the generation and emission of greenhouse gases. Potential for dust emissions due to wind erosion during removal of topsoil, blasting, removal of overburden, as well as exposure of stockpiles to wind erosion.	Weather station, dust buckets and PM10 sampler.	Continuous, reporting monthly	Environmental Manager
Noise			
During the operational phase, it is expected that the blasting as part of the opencast mining will generate vibrations during the operation phase.	Monitoring equipment and protocols	When production reaches steady state, thereafter when complaints received	Environmental Manager
Blasting and vibration			

During the operational phase, it is expected that blasting as part of the opencast mining activities; stockpile management; road maintenance; and transport and handling of material will generate vibrations during the operation phase.	Vibration and air over-pressure monitoring equipment. Corporate standards and blasting practices. Standards and procedures set out in the Mine Health and Safety Act, (Act No 29 of 1996)	Continuous, monthly reporting. During blasting events, upon receipt of complaints	Environmental Manager Community liaison officer
Visual			
The movement of mining and earth moving vehicles along the haul roads and the mining activities on the site will be visible to local residents and travellers along the R547. Activities may lead to visible plumes of dust. The continued removal of vegetation as mining progresses, will also contribute the visual impact of the operations.	Continued dust monitoring as per the air quality monitoring program	Continuous, reporting monthly	Environmental Manager
Cultural and heritage			
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations.	NA	NA	NA
Socio-economics			
The operational phase is expected to provide employment opportunities for 50-100 people. An influx of work seekers is possible, but the numbers are likely to be small, as contractors would be able to employ such additional staff as they might need from the local population. The positive socio-economic impact resulting from the employment opportunities and the cash injection into the local economy are balanced against the potential negative environmental impacts.	Maintenance of communication and consultation with local residents and stakeholders.Maintenance of a complaints register	Quarterly	Environmental Manager
Closure Phase			
Surface water			
Decommissioning may leave large barren areas that may increase erosion, which might increase the amount of suspended solids in downstream surface water reducing water quality.	Continuation of upstream and downstream monitoring of surface water resources	Continuous, reporting monthly	Environmental Manager
Wetlands			
Water quality deterioration	Continuation of upstream and downstream monitoring of surface water resources. Furthermore, iMpunzi as part of the larger Glencore Coal operations on the Highveld, has developed a wetland management plan with specific requirements regarding wetland impact and monitoring. iMpunzi will incorporate the Office and Phoenix wetland impacts into the wetland management plan and then monitor the Office and Phoenix wetland impacts against the requirements set out in the management plan.	As required in wetland management plan	Environmental Manager
Increased sediment transport into wetlands			
Increased alien vegetation			
Altered hydrology			
Groundwater			
Impact on groundwater level	Sampling pumps and protocols	Quarterly for at least 5 years after closure	Environmental Manager
Impact on groundwater quality			
Ecology			
If rehabilitation is not undertaken correctly, and if soil pollution occurs during closure, the disturbed soil is likely to be colonised by weeds and alien invader species, and runoff could transport sediment and contaminants into downstream wetland and watercourses.	Monitoring for and control of declared weeds and invasive flora on the site. Execution of biomonitoring as per iMpunzi biomonitoring plan.	Bi- annual (wet and dry season)	Environmental Manager
Air Quality			
Increased dust emissions through the entrainment of dust particles by the movement and operations of earth moving equipment. Operation of earth moving equipment could lead to the generation and emission of greenhouse gases. Potential for dust emissions due to wind erosion during placement of topsoil as well as exposure of stockpiles to wind erosion.	Weather station, dust buckets and PM10 sampler, use of light agricultural equipment to minimise the generation of dust.	Continuous, reporting monthly	Environmental Manager
Noise			
The main activities that are expected to generate noise during the rehabilitation phase are associated with the use of earth moving equipment and hauling of material to and from site.	Noise monitoring equipment and relevant protocols	Continuous, reporting monthly	Environmental Manager

Blasting and vibration			
The activities associated with the rehabilitation phase do not involve blasting and the vibration caused by the vehicles and other equipment used during the rehabilitation of the site will be too small to affect any of the off-site receptors adversely.	Vibration and air over-pressure monitoring equipment. Corporate standards and blasting practices. Standards and procedures set out in the Mine Health and Safety Act, (Act No 29 of 1996)	Continuous, monthly reporting. During blasting events, upon receipt of complaints	Environmental Manager Community liaison officer
Visual			
The movement of d earth moving vehicles along the haul roads will be visible to local residents and travellers along the R547. Activities may lead to visible plumes of dust.	Continued dust monitoring as per the air quality monitoring program	Continuous, reporting monthly	Environmental Manager
Cultural and heritage			
All necessary gravesite re-locations will be concluded during 2016, it is thus not envisaged that there will be any cultural or heritage impacted as part of the Office and Phoenix operations.	NA	NA	NA
Socio-economics			
The negative impact of the loss of jobs and the sharp reduction of local expenditure at mine closure will be countered over time by the rehabilitation of the site and its potential use for agricultural or other economic activities that could result in the creation of new jobs.	Local employment and procurement and sustainability of local economic development projects. Maintenance of a complaints register.	Quarterly, for at least 5 years	Human Resource Manager

8.0 ENVIRONMENTAL AWARENESS PLAN

As stipulated in section 5.0 above, environmental conditions will be included in any operational contracts, thereby making contractors aware of the potential environmental risks associated with the project and the necessity of implementing good environmental and housekeeping practices.

The following principles and training will apply to the Environmental Awareness Plan and the Environmental Management System (EMS):

- All personnel, including contactors will as a minimum undergo general safety, health and environmental (SHE) induction and environmental management system (EMS) training;
- The Safety, Health, Environmental and Quality (SHE) Manager will identify the SHE training requirements for all iMpunzi personnel and contractors. The training requirements will be recorded in a training needs matrix indicating particular training that must be undertaken by identified personnel and contractors. The training matrix will be administered by iMpunzi's Human Resources Department (HRD); and
- Development of the Training Programme, which will include:
  - Job specific training – training for personnel performing tasks which could cause potentially significant environmental impacts;
  - Assessment of extent to which personnel are equipped to manage environmental impacts;
  - Basic environmental training;
  - EMS training;
  - Comprehensive training – on emergency response, spill management, etc.;
  - Specialised skills;
  - Training verification and record keeping; and
  - Periodic re-assessment of training needs, with specific reference to new developments, newly identified issues and impacts and associated mitigation measures.

8.1 General awareness training

The HRD Manager, together with the SHE Manager, will be responsible for the development of, or facilitating the development of, the required general SHE induction and awareness training. A general environmental awareness training module will be developed and integrated into the general induction programme. The general awareness training must include the Environmental Policy, a description of the environmental impacts and aspects and the importance of conformance to requirements, general responsibilities of iMpunzi personnel and contractors with regard to the environmental requirements and a review of the emergency procedures and corrective actions; and

A Training Practitioner or the Environmental Officer (EO) will conduct the general awareness training. The training presenter will keep a record of the details of all persons attending general awareness training. Such attendance registers shall indicate the names of attendants and their organisations, the date and the type of training received.

8.2 Specific environmental training

- Specific environmental training will be in line with the requirements identified in the training matrix; and
- Personnel whose work tasks can impact on the environment will be made aware of the requirements of appropriate procedures/work instructions. The SHE Manager will communicate training requirements to responsible supervisors to ensure that personnel and contractors are trained accordingly.

8.3 Training Evaluation and Re-training

- Effectiveness of the environmental training will be reflected by the degree of conformance to EMPr requirements, the result of internal audits and the general environmental performance achieved at iMpunzi;
- Incidents and non-conformances will be assessed through the Internal Incident Investigation and Reporting System, to determine the root cause, including the possible lack of awareness/training;
- Should it be evident that re-training is required, the SHE Manager will inform the Heads of Departments of the need and take the appropriate actions;
- General awareness training of all personnel shall be repeated annually; and
- The re-induction shall take into consideration changes made in the EMPr, changes in legislation, iMpunzi's current levels of environmental performance and areas of improvement.

8.4 Emergency Procedures

The following emergency procedures are relevant to the project:

- The SHE Manager shall define emergency reporting procedures for iMpunzi;
- All personnel shall be made aware of emergency reporting procedures and their responsibilities;
- Any spills will be cleaned up immediately in accordance with relevant legislation; and
- Telephone numbers of emergency services, including the local firefighting service, shall be conspicuously displayed.

9.0 UNDERTAKING

The environmental assessment practitioner hereby confirms:

- The correctness, to the best of his knowledge, of the information provided in the specialist reports and on information provided by iMpunzi. The information was accepted as being as reliable as information generated during an EIA and a feasibility study, and provided in good faith, can be;
- The inclusion of comments and inputs from stakeholders and I&APs;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

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