REPORT

Environmental Impact Assessment Report for the Proposed Discard Facility at the Zibulo Colliery Opencast Operation

Anglo American Inyosi Coal (Pty) Ltd

Submitted to:

Department of Mineral Resources and Energy

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Department:
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REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

And

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

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

NAME OF APPLICANT: Anglo American Inyosi Coal (Pty) Limited: Zibulo Colliery

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EXECUTIVE SUMMARY

Anglo American Inyosi Coal (Pty) Ltd (AAIC) proposes to develop a discard facility at its opencast operations at Zibulo Colliery, situated near Ogies in the Mpumalanga Province. The proposed discard facility requires AAIC to submit an application for Environmental Authorisation (EA) and Waste Management Licence (WML) , supported by an environmental impact assessment (EIA) in terms of the 2014 EIA Regulations, as amended April 2017, to the competent authority the Department of Mineral Resources and Energy (DMRE).

As part of the EIA process, AAIC is required to submit a scoping report, an EIA report and an environmental management programme report (EMPr), which describe the environmental impacts of the proposed development and how they will be managed and mitigated.

Golder Associates, an independent environmental assessment practitioner, was appointed by AAIC to conduct the EIA and associated licensing processes.

During this process, the public was consulted on an ongoing basis, with issues and concerns being recorded and incorporated into the process for evaluation. The draft scoping report (DSR) was made available for public review from 02 November to 04 December 2020 and was updated into a final scoping report (FSR) which was submitted to the DMRE on 15 December 2020. The FSR was accepted by the DMRE on 18 March 2021.

The draft EIA report and supporting EMPr were compiled and made available for public comment from 21 April to 28 May 2021. The EIA report and EMPr have now been finalised and are ready for submission to the competent authority, the Department of Mineral Resources and Energy (DMRE).

Comments made by interested and Affected parties (I&APs) during the project announcement, scoping and impact assessment phases were captured in the Comment and Response Report (CRR), attached to this report.

Project description

It is proposed that a new discard facility be developed over the mined-out opencast pit at Zibulo Colliery. Golder has undertaken a design for the facility. The discard facility has been designed to accommodate 26 Mm^3 (36.7 million tonnes) of discard material, over 15 years. The proposed discard facility will be backfilled over the shaped and rehabilitated dragline spoil. The final height of the facility will be approximately 30 m. The facility will cover an area of approximately 140 ha.

The storm water management plan for the facility consists of clean water and dirty water channels to manage clean and dirty runoff from the corresponding sub-catchments separately. The channels were sized for the 1:50-year 24-hour storm event, in accordance with the GN 704 Regulations. The design for the facility provides for storm water to be free draining from the discard facility. It is proposed that the contaminated runoff from the discard facility be collected in an unlined, engineered, trapezoidal perimeter channel around the boundary of the facility and drained in the direction of the discard facility's surface topography, which is currently in the northern direction, towards a void in the pit.

Seepage / leachate from the discard facility will be managed as part of the current pit water management system. The operational water management currently practised at the Zibulo North and South Pits is to pump water collected in the pit sumps to the 40ML Dam. Water stored in this dam is used for dust suppression purposes; excess water is pumped to the eMalahleni Water Reclamation Plant (EWRP) for treatment.

A soil cover with an average thickness of 520 mm is proposed for the rehabilitation of the discard facility, based on available material stockpiled on site. A geotechnical investigation undertaken for the project

confirmed the suitability of the stockpiled material for use as cover material for the rehabilitation of the discard facility.

Form a stability perspective, geotechnical tests undertaken indicated that the facility will be safe for both short and long-term static loading conditions; however, further analysis has been recommended for seismic conditions.

The discard, generated at Phola Coal Processing Plant (PCPP), will be transported to the site via a new conveyor belt. It is proposed that the new conveyor follow the alignment of the existing conveyor linking the South32 Klipspruit extension project to the PCPP. The proposed new conveyor will lie to the immediate north of the existing conveyor and cross the R545 on a dedicated bridge crossing. Soon after the crossing of the R545 the conveyor will turn north to the opencast pit for final discard disposal. The entire extent of the conveyor route is confined to mine property belonging to either South32 or AAIC.

Key I&AP issues raised

The key issues raised by I&APs, relevant to the proposed discard facility project, can be summarised as follows:

- The potential impact of dust generated from the discard facility project on the local communities, particularly given the existing air pollution in the regional area; and
- The potential impact of the discard facility on local water resources, including secondary impacts on the biodiversity (fish and wildlife) associated with the water resources.

As part of the public consultation process, several issues were raised relating to environmental and social aspects associated with the current mining related activities at Zibulo Colliery. On 25 May 2021, AAIC held a meeting with various community representatives, in response to the request that was received from attendees to the focus group meeting on 04 May 2021. After the meeting on 25 May, an objection plea (letter, dated 25 May 2021) was issued by various community representatives to AAIC and the Golder PP Office.

Key outcomes of the impact assessment

The information that formed the basis of the impact assessment was sourced from:

- Previous specialist studies conducted for the site and adjacent collieries;
- Monitoring data for the site and general region; and
- Specialist studies conducted for this project (appended to this report):
  - Air Quality;
  - Hydrology and Hydrogeology;
  - Heritage;
  - Palaeontology;
  - Wetlands and Aquatic Ecology;
  - Socio-economic;
  - Visual;
  - Mineral Residue Risk Assessment;
  - Climate Change;

- Geotechnical; and
- Closure planning and costing.

It is important to note that the footprint area of the proposed discard facility has already been mined out and no pristine, unmined baseline environment exists within the proposed footprint area. Similarly, since the proposed discard conveyor belt will run along existing conveyor and road routes, the footprint associated with this facility is also disturbed.

The key outcomes of the impact assessment are as follows:

Air Quality

- Windblown dust and fine particulates associated with the discard handling and deposition activities will impact on the ambient air quality beyond the mine boundary. Dispersion modelling was conducted to predict the ambient air concentrations from pollutants emitted by the proposed discard project. The modelling results indicated the following:
  - In the absence of applying any mitigation measures, such as dust suppression, discard compaction, etc., the discard dump project is predicted (678 mg/m^2/day) to exceed the guideline limit of the Residential Dust Control Regulations of 600 mg/m^2/day, at only one locality, to the west of Zibulo, on the boundary of Klipspruit Colliery.
  - Sensitive receptors in Phola and Ogies are likely to experience a dust fallout rate of between 20 and 50 mg/m^2/day) from the discard dump project. From a cumulative impact perspective, based on a measured background dust fallout rate of 521 mg/m^2/day, dust fallout rates at all sensitive receptors are predicted to be below the Residential Dust Control Regulations.
  - From a cumulative perspective (i.e. including the existing background concentrations), PM_{10} concentrations at Phola and at various other sensitive receptors are likely to exceed the PM_{10} annual average standard. It must be noted that elevated PM_{10} concentrations are however representative of the current baseline conditions in the Highveld Priority Area (HPA), and hence is not only indicative of particulate matter (PM) contributions from Zibulo, but all the PM sources in the area, e.g., other mines, power stations, agricultural activities, etc.
- Based on the results of the dispersion modelling, it is anticipated that an impact of moderate significance could result in terms of impacts of the project on air quality, but, with the implementation of suitable mitigation measures, such as use of water sprays, the application of a soil cover, etc. the magnitude of the impact is anticipated to be reduced to low.

Climate change

- The handling, processing, and transportation of the coal discard will generate greenhouse gas emissions (GHGs), which will contribute to climate change. The in-situ GHG emissions from the handling, processing, and transportation of the coal discard deposited at the facility is estimated to range between 77.04 and 301.52 tCO_2e per annum, with total in-situ emissions ranging between 1 540.84 and 6 03.47 tCO_2e.
- The contribution of the project's GHG emissions are deemed to be insignificant, especially when considering that these emissions will occur regardless of whether or not the proposed facility is constructed (i.e. in the event that South32's discard facility is continued to be utilised).

Water

- Seepage from the discard into the pit will negatively impact on the pit water quality. Groundwater modelling indicated the following:
  - With the addition of the discard material to the pit, sulphate concentrations within the pit are expected to range between 4 000 and 4 500 mg/l (against a base case, i.e. with no discard placement into the pit, sulphate concentration ranging between 2 000 and 2 500 mg/l).
  - Should no mitigation measures be put in place, the pollution plume from the Zibulo discard facility will extend approximately 570 m and 800 m to the north of the site, for the 50-year and 100-year post-closure scenarios, respectively. The long-term decant rate is predicted to be approximately 818 m^3/d (against a base case of 540 m^3/d). This impact (unmitigated) will have an impact of high significance.
  - Should the facility be capped with a soil cover, the lower seepage rate into the pit will result in the pollution control plume extent will decrease to approximately 480 m and 700 m to the north of the site, for the 50-year and 100-year post-closure scenarios. Sulphate concentrations will remain the same.
  - Should the abstraction boreholes also be implemented, the water levels will be managed below the environmental critical level (ECL), which will cause the hydraulic gradients to mostly reverse inwards, and contain the plume within the pit, i.e. the plume will not extend beyond the boundary of the pit. Since the cone of dewatering ‘pulls’ additional water from the surrounding aquifer into the backfilled pit area, required dewatering rates will exceed predicted decant rates. A combined long-term abstraction rate of approximately 851 m^3/d from the four abstraction boreholes (up-gradient of the decant area) is predicted to be required for the mitigated scenario.
  - Should the above mitigation measures be implemented, the significance of impacts on groundwater is expected to be reduced to low.
- The results of water balance modelling indicated that the additional stormwater runoff from the discard facility reporting to the workings can be successfully managed in the current water management system on site.
- The approach to managing the excess mine water from the North and South Pits post closure is to pump water from the pits to maintain the pit water level below the ECL. The excess water will be pumped to the eMalahleni water reclamation plant (EWRP) via the 40ML Dam on site. The total volume that will need to be pumped to EWRP from the North and South Pits, post closure, is estimated to be 1 030 m^3/d. The total, if the Klipspruit Colliery 2 000 m^3/d is included, is 3030 m^3/d, which is in line with the capacity of the current water supply infrastructure from the 40 ML Dam to EWRP.
- The up and downstream tributaries of the Saalboomspruit (also occasionally referred to as the Saalklapspruit) are already highly contaminated with elevated electrical conductivity, total dissolved solids, calcium, magnesium, as well as aluminium, iron, and manganese. The 95-percentile data of historical data indicate values that will have an impact on ecological and human health.
- The discard facility will add additional load to the river if the stormwater management is not well designed and maintained. Increased load may impact the downstream domestic and agricultural users. The impact significance is rated as moderate, but can be reduced to low, should the storm water management plan for the project be implemented, to ensure clean and dirty water separation and hence assist in ensuring that only clean water from the eastern sub-catchment of the area drains to the Saalboomspruit.

Biodiversity

- The disposal of the discard into the opencast pit has the potential to add to the contaminant load of the already highly-contaminated Saalklapspruit through surface water runoff and seepage from the pit, and subsequently affect the extent/condition and survival/reproduction of downstream aquatic and wetland ecosystems and species, respectively. The potential impact is expected to be of high significance prior to mitigation. The application of the recommended water related mitigation measures, i.e. abstraction of seepage and treatment, however, reduces impact significance to low.
- The approved wetland rehabilitation strategy for Zibulo includes the recreation and/or establishment of a watercourse through the mined-out areas. Since the presence of the discard facility over the mined-out footprint will prevent the creation of a new watercourse over the rehabilitated pit, the wetland rehabilitation and management strategy will need to be revisited.

Visual

- The final height of the proposed discard facility will vary between 1 528 m and 1 579 m. The viewshed conduct for the project indicates that a facility of this height will be visible from a fairly large proportion of the study area, including several urban locales, such as inter alia, Phola, Ogies, Wilge and Kendal Village.
- Furthermore, during construction and operations, and especially during dry and windy conditions, it is expected that activities at the discard facility will result in airborne dust plumes, which may be visible over great distances.
- It is expected that the significance of the above impacts on the visual aesthetics of the area for the unmitigated scenario is moderate. However, with the application of the soil cover at closure, as well as the air quality related measures, impact significance is likely to be reduced to low.

Heritage

- The Zibulo discard facility footprint area has been extensively impacted by past and recent on-going mining operations. Prior to that, agricultural activities were also occurring on a large scale. The possibility of any sites, features, or material of any cultural heritage (archaeological and/or historical) origin or significance being present here is therefore highly unlikely. A heritage impact assessment conducted prior to commencement of mining found several cemeteries and grave sites in the larger area, but none were located close to the discard facility development area.

Palaeontology

- Although the proposed discard facility development footprint is underlain by the rocks of the Vryheid Formation, Permian age which has a very high Palaeontological Sensitivity, the development will take place on an already mined-out, disturbed and partially rehabilitated pit/opencast mining area, and will only consist of surface infrastructure, therefore, the impact will be of low significance.

Social

- It is anticipated that the project will result in several nuisance related impacts, i.e. dust, visual and noise pollution. These impacts are considered to be of moderate significance, but through the implementation of the recommended mitigation measures these impacts can be reduced to low.
- AAIC will continue using the current workforce to dispose of coal discard onto the discard facility during the operational phase. This aspect will result in improved job security for the current employees at Zibulo.

This impact is rated as a moderate positive impact, which could be increased by ensuring that current local employees are utilised for the project.

- The main water users in the area relate to the Town of Phola, located directly north of Zibulo Opencast. While most of the areas receive water from the local municipality, it is likely that informal dwellers use water directly from the river and small farm dams downstream of the mine. Further downstream water is used for irrigation. Should seepage from the discard facility not be adequately managed, impacts on water utilisation could materialise. This potential impact is considered to be of high significance.

  However, since the seepage will be abstracted along with the current pit water and re-used on site or sent to the EWRP for treatment, the development of the proposed discard facility on the opencast mine's surface should not have any additional material effect on neighbouring water users over that which would already have occurred due to the opencast mine itself. This impact can therefore be reduced to low. Any changes in surface or groundwater quality or related aspects that may have an off-site impact must however be communicated to the relevant institutional and community stakeholders urgently.

EAP Opinion on whether the activity should be authorised

Provided that all the environmental management measures described in the EMPr are applied diligently, it is expected that the proposed discard facility project will not result in any environmental impacts that cannot be mitigated to acceptable levels. Not granting this authorisation will result in the benefits of the project to AAIC - Zibulo Colliery and to local residents not being realised.

Accordingly, it is the opinion of the environmental assessment practitioner that the application for EA and WML to enable AAIC to undertake the activities described in this EIA/EMPr should be granted.

Conditions that must be included in the authorisation

General conditions

AAIC must:

- Implement all aspects of the EMPr in sections **Part B** of this document;
- Comply with all relevant legislation at all times;
- Undertake annual internal auditing of environmental performance; and
- Undertake external auditing of environmental performance and provide the DMRE with a copy of the audit report.

Site specific conditions

AAIC must:

- Prior to implementation:
  - Conduct additional geotechnical work, including site investigations, drilling, laboratory analyses and the required geotechnical modelling, to quantify the settlement characteristics of the underlying spoil to a higher resolution; and
  - Formulate an ongoing monitoring programme to ensure an observational methodology is applied, to monitor short-term and long-term settlement on the discard facility.
- Conduct field drilling and hydraulic tests on backfill material to confirm the number and drawdown volume of abstraction boreholes required for management of the decant level below the ECL;

- Should any previously unknown or invisible sites, features or material of cultural heritage (archaeological and/or historical) importance be uncovered during any development actions, then the relevant regulatory department should be notified, and an expert contacted to investigate and provide recommendations on the way forward. This could include previously unknown and unmarked graves, as well as fossil material;
- Update the wetland mitigation strategy to take into consideration the changes in the reinstatement of drainage lines over the backfilled pit due to the development of the proposed discard facility (over the backfilled pit);
- Continue investigations in support of the development of the post-closure water management strategy for the mine, which may include passive treatment options;
- During the operational phase, ensure availability of topsoil for any additional topsoil that may be required for cover remediation to accommodate any possible consolidation settlement that may occur after cover application. Any excessive settlements should not impact the free drainage of the facility and promote ponding;
- Perform a veneer stability analysis, to estimate the resistance of the cover material to sliding. This analysis should be done as part of the closure design of the facility;
- Follow an observational approach beyond closure, to monitor the settlement and cover movements;
- Monitor and maintain the facility (from a stability perspective) for a minimum of 10 years beyond closure;
- Execute remedial work on the cover post closure, when settlement occurs;
- Take any other appropriate remedial actions if deviations from expected environmental performance occurs; and
- Amend the EMPr as and when necessary to maintain acceptable environmental performance.

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TABLE OF ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AAIC	Anglo American Inyosi Coal
AQMP	Air Quality Management Plan
ARD	Acid Rock Drainage
CAPEX	Capital Expenditure
CBA	Critical Biodiversity Area
CBD	Central Business District
CRR	Comments and Response Report
CV	Curriculum Vitae
DEA	Department of Environmental Affairs
DEM	Digital Elevation model
DMRE	Department of Mineral Resources and Energy
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
ELM	eMalahleni Local Municipality
EMPr	Environmental Management Programme reports
FoS	Factor of Safety
FSR	Final Scoping Report
GHG	Greenhouse Gas
HPA	Highveld Priority Area
I&AP	Interested and Affected Party
IWUL	Integrated Water Use Licence
KPS	Klipspruit Colliery
LOM	Life of Mine
LTV	Level of Theoretical Visibility
MAR	Mean Annual Recharge
MASW	Multichannel Analysis of Surface Waves
MBSP	Mpumalanga Biodiversity Sector Plan

Acronym	Definition
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
MPRDA	Mineral and Petroleum Resources Development Act, 2002 (Act 28 of 2002)
NAAQS	National Ambient Air Quality Standards
NAG	Net Acid Generation
NDM	Nkangala District Municipality
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998)
NEMAQA	National Environmental Management: Air Quality Ac, 2004 (Act 39 of 2004)
NEMWA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NWA	National Water Act, 1998 (Act 36 of 1998)
OPEX	Operating Expenditure
PAG	Potentially Acid Generating
PCD	Pollution Control Dam
PCPP	Phola Coal Processing Plant
PES	Present Ecological State
QA/QC	Quality Assurance Quality Control
ROM	Run of Mine
SAHRA	South African Heritage Resources Agency
SANRAL	South African National Roads Agency
South32	South32 SA Coal Holdings (Pty) Ltd
SP	Significance Points
SPLP	Synthetic Precipitation Leaching Procedure
VAC	Visual Absorption Capacity
VOC	Volatile Organic Compounds
WMA	Water Management Area
WML	Waste Management Licence
WQPL	Water Quality Planning Limits
WUL	Water Use Licence

PART A
SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

1.0 INTRODUCTION AND BACKGROUND

Anglo American Inyosi Coal (Pty) Ltd (AAIC) proposes to develop a discard facility at its opencast operations at Zibulo Colliery, situated near Ogies in the Mpumalanga Province. Zibulo Colliery produces an annual eight million run of mine (ROM) tonnes of export thermal coal, with seven million tonnes per annum coming from its underground sections and the remaining one million tonnes from its opencast pit. Underground operations incorporate bord and pillar continuous miner methods while the contractor-run opencast pit utilises the truck and shovel mining method.

Currently, coal from the opencast operation (and underground operation further south) is transported to the Phola Coal Processing Plant (PCPP). The PCPP is a 50:50 joint venture between AAIC and South32 SA Coal Holdings (Pty) Ltd (South32). The coarse and fine discard produced by PCPP is currently stored in a surface discard facility at South32's Klipspruit Colliery. The facility is reaching capacity (110 ha) by 2021 and an alternative discard facility is required to service the discard requirement of Zibulo Colliery.

It is proposed that a new discard facility be developed over the mined-out opencast pit at Zibulo Colliery. The discard (generated at PCPP) will be transported to the site via a new discard conveyor belt.

The proposed discard facility will require a waste management licence (WML) in terms of the National Environmental Management Waste Act, 2008 (Act 59 of 2008) (as amended) (NEMWA), environmental authorisation (EA) in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (as amended) (NEMA), and water use licence (WUL) application in terms of the National Water Act, 1998 (Act 36 of 1998) (NWA) (as amended). The WML and EA application will need to be supported by a full environmental impact assessment (EIA) process in terms of the Environmental Impact Assessment Regulations, 2014 (as amended). The competent authority for the application is the Department of Mineral Resources and Energy (DMRE).

As part of the EIA process, this report (EIA and environmental management programme report) has been compiled, to document the outcomes of the specialist studies, key potential environmental impacts identified and proposed mitigation measures.

1.1 Content of this report

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

This document has been structured as follows to meet the requirements of Appendix 3 of the 2014 EIA Regulations, as amended in April 2017:

- **Introduction and overview** – Introduces the project and the project proponent, provides an overview of the project, provides the details of the environmental assessment practitioner (EAP), and explains the EIA process.
- **Project Motivation** – Motivates the need for and desirability of the project.
- **EIA Process** – Summarises the process being undertaken with respect to the EIA 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, discard 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 proposed project. This framework 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 Scoping process and to be undertaken as part of the EIA/EMPr process.
- **Next Steps in the Process** – Indicates what the next steps in the process are.
- **References** – Provides references to literature consulted.
- **Appendices** – Contains the technical material supporting the EIA report, including the Curricula Vitae (CV) of the EAP, stakeholder comments and supporting information, preliminary design report, specialist reports, and document limitations.

2.0 PROPONENT AND PRACTITIONER DETAILS

2.1 Details of the proponent

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

Table 1: Proponent's contact details

Proponent Contact Details	
Contact person	Lerato Mazibuko
Address	25 Bath Avenue, Rosebank, 2196
Telephone number	(011) 638 0106
E-mail	lerato.mazibuko@angloamerican.com

2.2 Details of environmental assessment practitioner

AAIC has appointed Golder Associates Africa (Pty) Ltd as an independent environmental assessment practitioner (EAP) to undertake the EIA that is required to support the WML and EA application for the proposed discard facility at Zibulo Colliery.

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 7 000 people who operate from more than 180 offices located throughout Africa, Asia, Australasia, Europe, North America and South America. Golder Associates Africa has offices in Midrand, Florida, Maputo and Accra. Golder has more than 200 skilled employees and can source additional professional skills and inputs from other Golder offices around the world.

Golder 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 Golder:

Table 2: Contact details of the environmental assessment practitioner

Contact persons:	Olivia Allen	Brian Magongoa
Purpose:	EIA	Public Participation
Address:	P.O. Box 6001 Halfway House 1685	P.O. Box 6001 Halfway House 1685
Telephone:	011 254 4875	011 254 4800
Fax:	086 582 1561	086 582 1561
E-mail:	oallen@golder.co.za	bmagongoa@golder.co.za

2.3 Expertise of environmental assessment practitioner

Qualifications of EAP

Education

- B.Sc. (cum laude) Zoology and Geography – University of the Free State (Bloemfontein);
- B.Sc. (Hons) (cum laude) Geography – University of the Free State (Bloemfontein); and
- M.Sc. Water Resource Management - University of Pretoria.

EAP Registration (Environmental Assessment Practitioners of South Africa - EAPASA)

- Registered EAP (Ref. No. 2019/1725)

Summary of experience

Olivia Allen has 16 years' experience in the discipline of Environmental Sciences. Olivia specialises in environmental assessment, regulatory compliance, waste planning and integrated project management.

As a senior consultant, Olivia has successfully led, or been part of, various projects in the mining sector of coal, gold, diamonds, copper and platinum, the petroleum sector of gas extraction, and steel, ferrochrome and electrolytic manganese dioxide industrial sectors. She has extensive experience in mine water treatment related projects and has exposure to mine closure and rehabilitation related projects.

In the past, Olivia has functioned in various roles within the Golder technical stream, including report writing; project management, such as facilitation of meetings, budget control, scheduling and invoicing; and working closely with engineering teams and regulatory authorities to ensure successful project integration and outcomes.

Her environmental technical competencies include the following:

- Conducting Environmental Impact Assessments and compiling Environmental Management Plans;
- Development of Integrated Waste Management Plans;
- Compiling Water Use and Waste Management Licence Applications;

- Stakeholder engagement, including Regulatory Authorities;
- Co-ordination of Integrated Regulatory Processes; and
- Environmental Compliance Assessment and Auditing.

3.0 DESCRIPTION OF THE PROPERTY

The proposed discard facility will be located within the mined-out footprint of the pit at Zibulo Colliery (opencast section). It is proposed that the new conveyor belt follow the alignment of the existing conveyor linking the South32 Klipspruit extension project to the PCPP. The proposed new conveyor route will lie to the immediate north of the existing conveyor belt and cross the R545 on a dedicated bridge crossing. Soon after the crossing of the R545 the conveyor route will turn north to the opencast pit for final discard disposal. The entire extent of the conveyor route is confined to mine property belonging to either South32 or AAIC.

The properties associated with the proposed activity are summarised in Table 3.

Table 3: Location of the activity

Farm Name:	Ogiesfontein 4 IS, Klipfontein 3 IS
Application area:	Discard facility: 147.12 ha Discard conveyor belt: 2-3 km
Magisterial district:	eMalahleni Magisterial district and Nkangala District Municipality
Distance and direction from nearest town:	2 km north of Ogies, 25 km south-west of eMalahleni
21-digit Surveyor General Code for each farm portion:	T0IS00000000000300012 T0IS00000000000300014 T0IS00000000000400039 T0IS00000000000400041 T0IS00000000000400055 T0IS00000000000400063 T0IS00000000000400064

3.1 Locality map

Zibulo Colliery (opencast operation) is situated approximately 25 km south-west of eMalahleni in the Mpumalanga Province (Figure 1). The mine falls within the Wilge River Catchment, which consists of quaternary sub-catchment B20G of the Limpopo-Olifants primary drainage region. The study area drains into Saalklapspruit via one of its tributaries, which in turn drains into the Wilge River. The N12 highway is situated directly north of the site, and the R545 runs along the western boundary of the site.

The locality of the proposed discard facility and proposed conveyor belt route, in relation to Zibulo Colliery (opencast section), the PCPP, and the existing discard facility at Klipspruit Colliery are indicated in Figure 2 below.

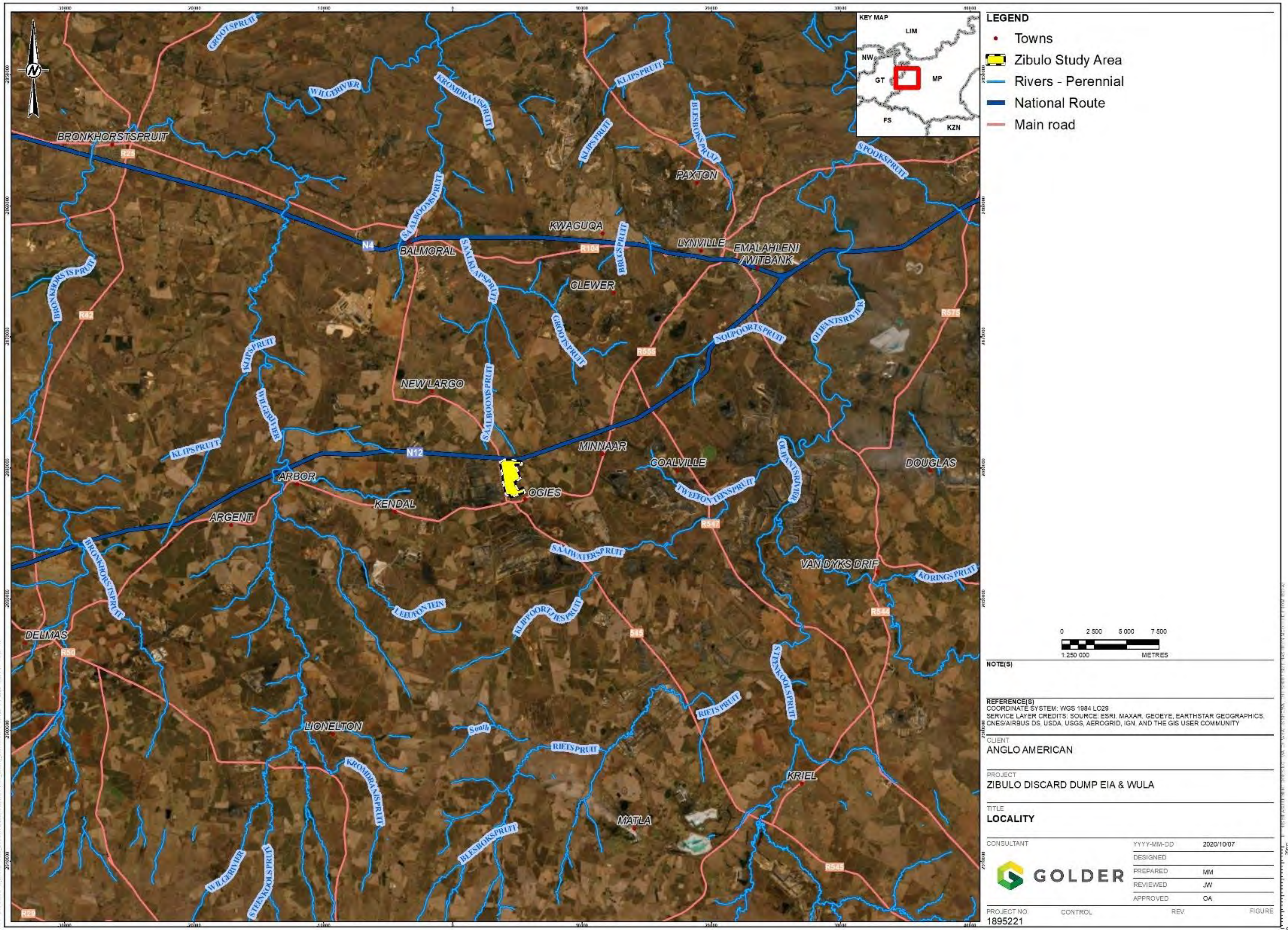


Figure 1: Locality map

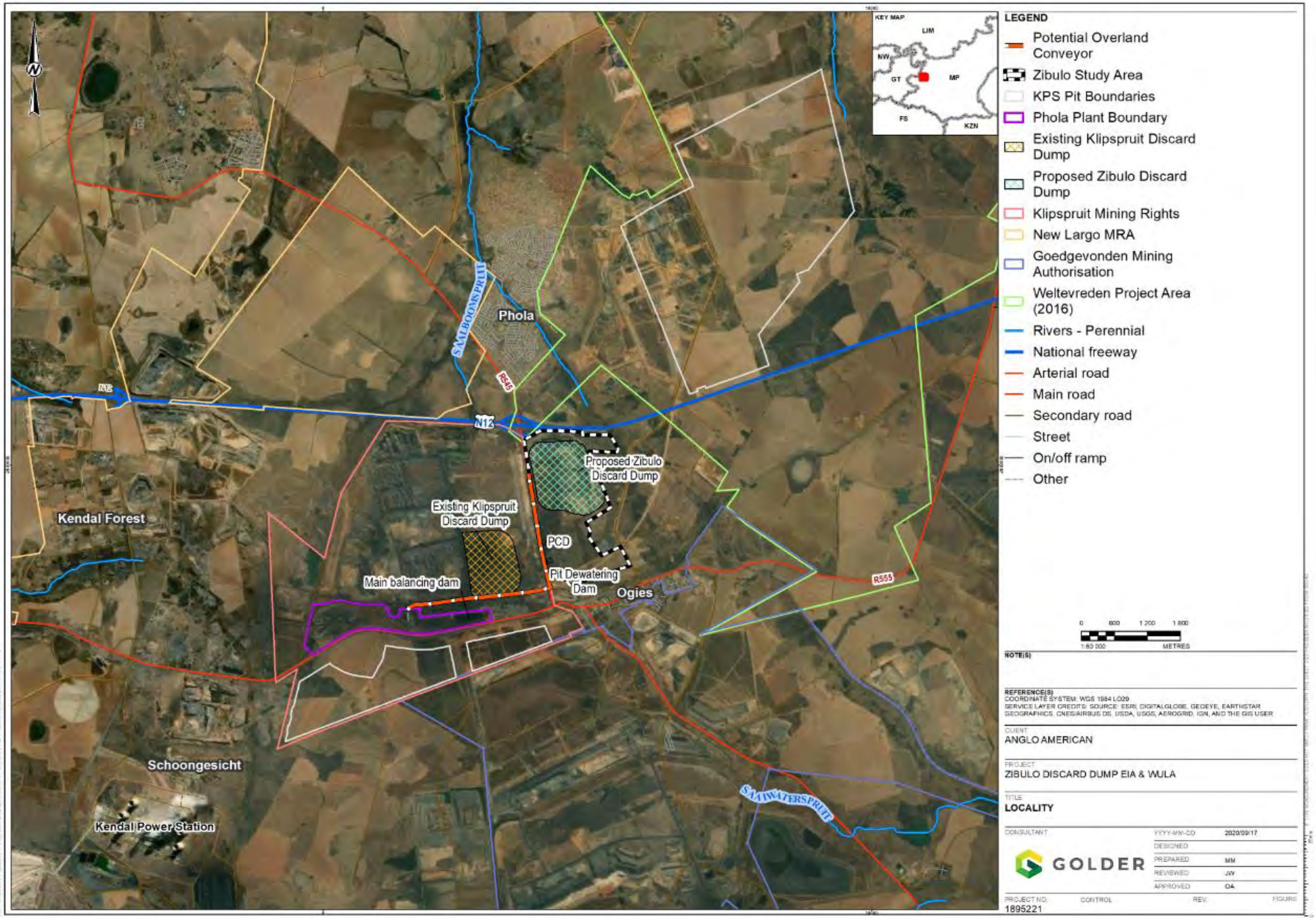


Figure 2: Locality of the of the proposed discard facility and proposed conveyor belt route

3.2 Surface right owners

The properties that are associated with the proposed discard facility are listed in Table 4, and illustrated in Figure 3.

Table 4: List of surface right owners associated with the footprints of the proposed discard facility and conveyor belt

Farm Name and Portion	Surface Right Owner	Property Area	Title Deed
Ogiesfontein 4 IS portion 41	Ingwe Surface Holdings Ltd	241.45 ha	T110152/2003
Ogiesfontein 4 IS portion 55	Anglo Operations Ltd	170.34 ha	T113451/2002
Klipfontein 3 IS portion 12	Ingwe Surface Holdings Ltd	0.026 ha	T21675/2004
Klipfontein 3 IS portion 14	Ingwe Surface Holdings Ltd	219.988 ha	T57867/2003

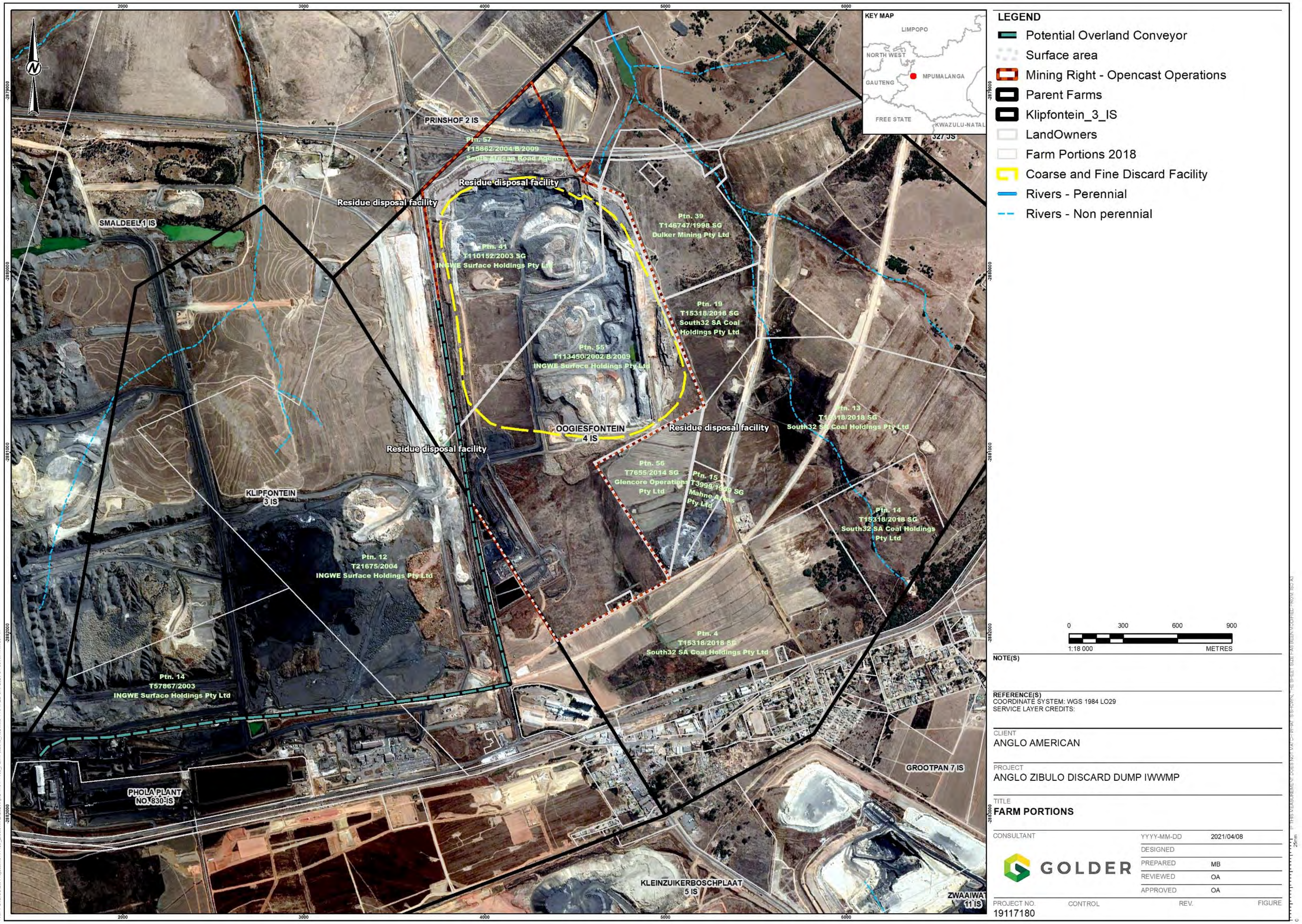


Figure 3: Land ownership

4.0 DESCRIPTION AND SCOPE OF THE PROPOSED OVERALL ACTIVITY

Zibulo Colliery consists of two parts, namely an underground development located approximately 25 km South West of Ogies and a small opencast section located immediately North West of Ogies. Zibulo Colliery produces an annual eight million run of mine (ROM) tonnes of export thermal coal, with seven million tonnes per annum coming from its underground sections and the remaining one million tonnes from its opencast pit. Underground operations incorporate bord and pillar continuous miner methods while the contractor-run pit utilises truck and shovel methods.

The Zibulo Colliery opencast operations consist of a single pit operation with a pit length of almost 1 km and is classified as a mini pit. Zibulo Colliery has two active mining cuts, namely the North and East cuts. The coal from the opencast operations is transported via truck to the PCPP for beneficiation, where it is washed together with the underground coal. Coal from the underground operation is transported to the Phola Coal Processing Plant via a 16 km conveyor belt.

The PCPP is a 50:50 joint venture between AAIC and South32 SA Coal Holdings (Pty) Ltd (South32), receiving ROM coal predominantly from AAIC's Zibulo operation and South32's Klipspruit operation. The coarse and fine discard produced from the PCPP is currently deposited onto a surface discard facility on South32's Klipspruit Colliery. The facility is reaching capacity and by 2021 an alternative discard facility is required to service the discard requirement of Zibulo Colliery.

4.1 Proposed activities

4.1.1 Discard facility

It is proposed that a new discard facility be developed over the mined-out opencast pit at Zibulo Colliery. Golder has undertaken a design for the facility (see APPENDIX I for the design report and drawings). The discard facility has been designed to accommodate 26 Mm^3 (36.7 million tonnes) of discard material, over 15 years. The proposed discard facility will be backfilled over the shaped and rehabilitated dragline spoil (Figure 4). The final height of the facility will be approximately 30 m.

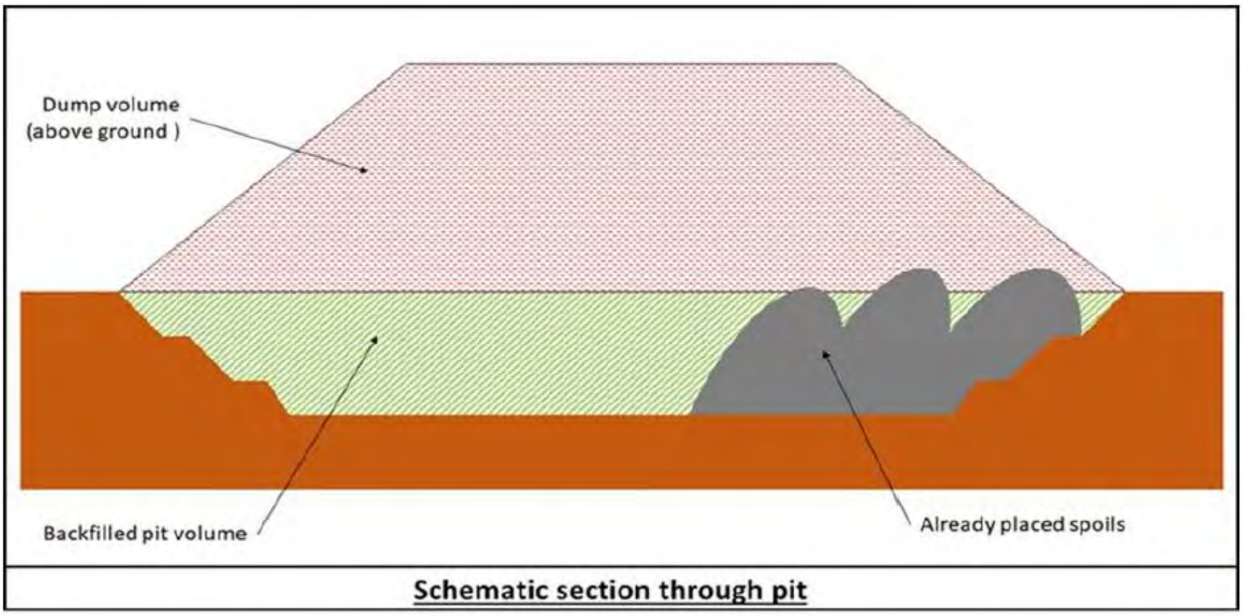


Figure 4: Proposed design of the Zibulo discard facility

Discard production

The coal discards earmarked for the proposed discard facility will be generated from the Zibulo underground and opencast mining operations. Figure 5 shows the expected discard material production volumes over 15 years. The total estimated discard volume that will be produced is 26 Mm^3. This volume will be produced at an average rate of 1.73 Mm^3/year (2.48 Mt/year) over the life of the facility which will reach full capacity in 2036. A contingency allowance of ~400 000 m^3 was made to allow for some additional storage capacity.

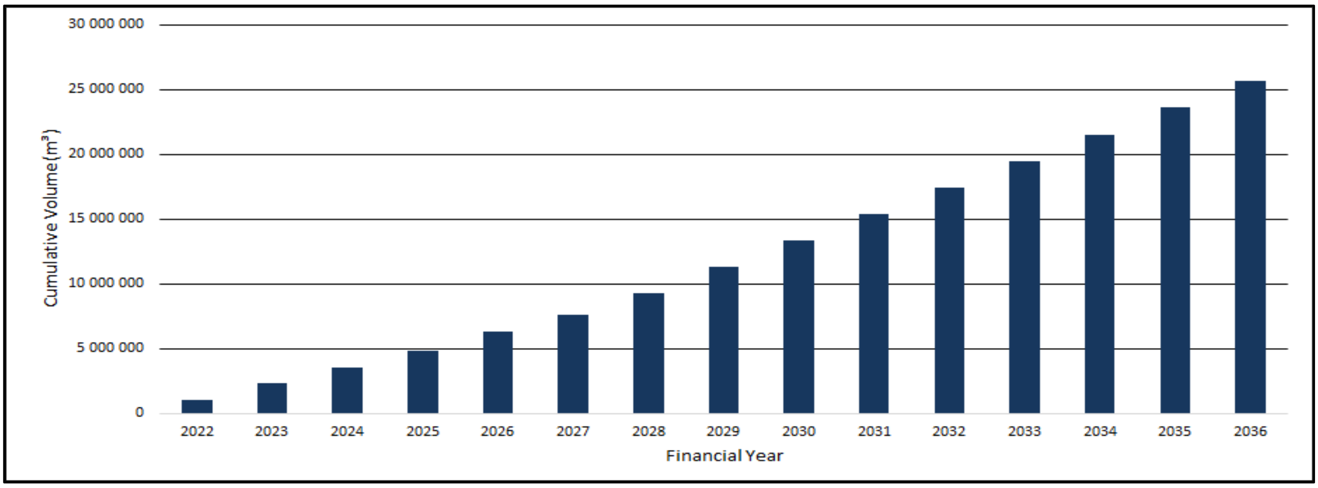


Figure 5 Predicted Zibulo production schedule over the LoM

Stage development

The discard facility will be developed in 5-meter operational lifts. A total number of six lifts will be constructed. The top area of each operational lift will be operated in the form of a "saucer". Operational sumps will be implemented at the lowest points from where excess water will be pumped to the collection sump at the toe of the facility. The final stage will be shaped in the form of a dome shape.

Progressive facility development

The proposed discard facility was designed to be implemented within a single phase, with the planned commencement in 2022. The mine will place spoil material in the final voids of the existing pit once open pit operations have ceased. According to AAIC the discard will be deposited as a single stream consisting of coarse discards and filtered fines. The filter cake is dewatered but is not dry, with an expected moisture content of 20 – 23%. The facility will therefore be a dry placed discard waste facility and not a hydraulically placed tailings storage facility. The discard facility will be placed in 5 m lifts on the footprint.

Discard material will also be deposited above the backfilled pit. The discard facility will have the following attributes:

- Covers an area of ~ 140 ha;
- Available airspace volume of 26 Mm^3;
- Planned commencement is 2022;
- Life of phase is approximately 15 years; and
- Completion date of phase should be 2036 based on the planned deposition rate.

Placement of discard material will primarily be on the backfilled soft and dump rock spoils (after being levelled), which will extend to cover the entire proposed footprint of the facility.

Once the discard facility has been completed and shaped to form the 1V:9H outside slope, the facility will have reached final capacity and will, as a result, be closed off to further placement of discard materials.

Storm water management

The water management plan consists of clean water and dirty water channels to manage clean and dirty runoff from the corresponding sub-catchments separately. The channels were sized for the 1:50-year 24-hour storm event, in accordance with the GN 704 Regulations.

The design provides for storm water to be free draining from the discard facility. It is proposed that the contaminated runoff from the discard facility be collected in an unlined, engineered, trapezoidal perimeter channel around the boundary of the facility and drained in the direction of the discard facility's surface topography, which is currently in the northern direction, towards a void in the pit. An estimated 90% of the length of the perimeter channel will be constructed over the void footprint, with the remainder constructed over unmined ground but near the pit boundary. Contaminated conveyances are required to be watertight. However, seepage from the perimeter channel will report to the pit and will be managed with pit water.

It is essential to note that the in-pit spoils are susceptible to differential settlement over time by means of a variety of mechanisms. Moreover, the spoils do not stand up to erosive forces imposed by flowing water. It will therefore be necessary to prepare a well-engineered pioneering layer to construct the channel on. This will consist of excavating the spoils from the pit edge inwards for a distance of at least 5 m beyond the furthest edge of the channel alignment. The depth of excavation will be determined by the geotechnical engineer. The excavated void will be levelled and compacted, following which the spoils will be constructed back into the excavation in well compacted layers. At least one layer of geogrid reinforcement will be included in the compacted spoils raft. The objective of the design will be to create a longitudinally stable profile and to ensure that there are no major threats to the stability of the discard facility. A layer of dump rock will be constructed over the compacted spoils and this layer will also be stabilised and strengthened by at least a single layer of geogrid reinforcement. The channel will then be constructed of imported soil compacted in layers, followed by topsoiling and seeding to ensure that a stable root matrix is established as soon as possible and will be sustainable. Riprap will need to be provided to protect the channel where shear forces exceed the vegetations' stabilising effect. Refer to the engineering drawings in APPENDIX I for typical details of the above design.

It must be noted that the above design will need to be monitored carefully and routinely during operation of the discard facility and that it is inevitable that settlements and erosion will still occur, therefore maintenance will be ongoing. The channel must also be operated proactively and is not a passive part of the infrastructure. Blockage and damage of the channel can lead to environmental incidents as well as localised failure of the placed discard, which will in turn lead to break out of the slope contour channels.

At capping and closure of the discard facility, the topsoil can be stripped from the channel, the channel can be backfilled using the material from the perimeter berm in compacted layers, and the cover material continued over the channel to ensure free drainage of clean runoff to the natural receiving catchment.

The perimeter channel would have two legs extending around the discard facility and would meet at the void, which is located north of the facility. Thus, all the contaminated runoff reports to the void, however, the void was not sized for the storm water assessment. This will be done once the detailed mine plan is available. A berm must be constructed on the outer end of the perimeter channel to prevent clean water from entering the channel from the clean catchment and to serve as an additional backstop to splashing spillage from the contaminated runoff channel.

A series of trapezoidal bench channels constructed with discard material on the side slopes of the discard facility are also recommended to be implemented at 45 m horizontal intervals (5 m vertical) along the side slopes of the facility with a berm on the outer side to avoid water spilling into the downslope strip. The bench channels would aid in a reduction of the catchment sizes, resulting in less runoff to the respective channels and fragmentation of energy and shear forces accumulating along the slopes that causes erosion. These channels slope in the southern direction and would join the perimeter channel. The channels will need to be monitored routinely as some erosion of the slope catchments can be expected, which will carry discard into the channels and reduce their capacity. Overtopping due to reduced capacity could have a detrimental knock-on / domino effect on successive contour berms.

Energy dissipation structures should be installed at the junction of the bench channels and perimeter channels, in addition to the discharge points leading to the voids, to lower the high incoming flow velocities and allow for change in flow direction. Sedimentation can be expected where the contour channels discharge runoff into the perimeter channel, and this will require regular maintenance to keep the system functional. Drop chutes and stilling basins are both recommended to lower the energy and flow velocities. Erosion protection, such as riprap, is required for the contour channels.

Rockfill berms are proposed for the facility's side slopes on the southern end for the runoff to attenuate resulting in lower flow velocities reporting into the perimeter channel. A cascading water filtering system is recommended through the berm's rockfill voids to increase the flow lag and flow length resulting in less energy from runoff at the southern end.

Currently, a diversion channel directs clean water away from the discard facility in the western direction. A berm is also proposed for the southwestern side of the facility to direct clean runoff from the clean sub-catchment away from the dirty water channels and collect in the existing clean diversion channel. The diversion channel should be re-routed and re-sized for planned mining southward of the discard facility.

Stability analysis

The discard facility was assessed for four sections on each side of the facility for both static and post-seismic loading conditions (Golder, 2021g). An acceptable factor of safety (FoS) has been achieved under long and short-term static aforementioned loading conditions, thereby deeming the facility safe for short and long-term static loading conditions. However, further analysis is required for seismic conditions. It should also be noted that the compaction of the discard surface impacts the stability of the facility since shallow localised failures may occur with a low FoS.

The design was thus benchmarked against the international standards of Anglo American for mine waste facilities. It should be noted that this is a dry waste facility, and that the facility risks are less than a wet tailings facility. The aspect of possible liquefaction was considered, and it was indicated that Anglo standards may require the design process to address the possible liquefaction of underlying spoils. Such a worst-case scenario may occur in the event of a rapid rise in the water table within the spoils despite the decant point being managed and controlled with excess water being pumped for treatment or re-use. On-going monitoring during the operations will be essential.

Further geotechnical studies are recommended (Golder, 2021g); these include site investigations, drilling, laboratory analyses and the required geotechnical modelling, to quantify the settlement characteristics of the underlying spoil to a higher resolution. It is also recommended that an ongoing monitoring programme be developed, to monitor short-term and long-term settlement on the discard facility, and that remedial work be executed on the cover post closure, when settlement occurs.

Settlement of discard material

Differential settlement of the dragline spoils may be caused by the following factors (Golder, 2021g):

- Since the coal discard material will be deposited on uncontrolled compacted dragline spoils causing non-uniform stiffness throughout the spoils;
- The thickness of the dragline spoils is expected to vary between 30 to 50 m (with an average of 40 m) based on the Multichannel Analysis of Surface Waves (MASW) survey conducted by Golder (2021g); and
- Variability of the spoil material being placed inside the open pit will also create differential settlement.

The differential settlement caused by these factors can pose a negative impact on the operation of the discard facility.

A total of 1.4 m of consolidation settlement of the spoils has been estimated over the life cycle of the facility. It should be noted that the estimated settlement is only indicative of potential situations that could occur on site since the nature of the spoils is shown to be highly variable in addition to the limitations in testing of coarse materials. Settlements are expected to be more within thicker layers of spoils.

Over and above the further geotechnical work recommended in the section above, it is recommended that:

- Topsoil stockpiles should be made readily available for any additional topsoil that may be required for cover remediation to accommodate any possible consolidation settlement that may occur after cover application. Any excessive settlements should not impact the free drainage of the facility and promote ponding;
- An observational approach beyond closure should be followed to monitor the settlement and cover movements; and
- The mine should monitor and maintain the facility for a minimum of 10 years beyond closure.

Seepage management

Seepage / leachate from the discard facility will be managed as part of the current pit water management system. The operational water management currently practised at the Zibulo North and South Pits is to pump water collected in the pit sumps to the 40ML Dam. Water stored in the dam can be released to the 9ML and 1ML dams for dust suppression water. The runoff from the crushing plant at the opencast section is collected in the 9ML Dam and can be released to 1ML Dam for use as dust suppression water. Excess water at the opencast is pumped from the 40ML Dam to the eMalahleni Water Reclamation Plant (EWRP) for treatment. South32's Klipspruit Colliery can send up to 2 ML/d to the 40ML Dam for transfer to the EWRP for treatment. The potable water for Zibulo Opencast is supplied from the EWRP via the PCPP.

Cover design

A soil cover with an average thickness of 519 mm is proposed for the rehabilitation of the discard facility, based on available material stockpiled on site. A geotechnical investigation undertaken for the project confirmed the suitability of the stockpiled material for use as cover material for the rehabilitation of the discard facility (Golder, 2021g).

4.1.2 Discard conveyor belt

The discard (generated at PCPP) will be transported to the site via a new conveyor belt. It is proposed that the new conveyor follow the alignment of the existing conveyor linking the South32 Klipspruit extension project to the PCPP. The proposed new conveyor will lie to the immediate north of the existing conveyor and cross the

R545 on a dedicated bridge crossing. Soon after the crossing of the R545 the conveyor will turn north to the opencast pit for final discard disposal. The entire extent of the conveyor route is confined to mine property belonging to either South32 or AAIC.

4.2 Listed and specific activities

Based upon the currently available information, the proposed project will trigger the following listed activities tabulated in Table 5 and Table 6.

Table 5: Waste management activity requiring waste licensing in terms of GN R. 921 (as amended by GN R. 633)

Listing Notice	Activity No	Activity No. Description	Proposed Activity Description
GN R.921 as amended by GN R. 633	Category B, Activity 11	*The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).*	The development of residue deposit (discard facility)

Table 6: Listed activity requiring environmental authorisation in terms of GN R. 327

Listing Notice	Activity No	Activity No. Description	Proposed Activity Description
GN R.327	Activity 12	(12) The development of – (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs – (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse…	The proposed discard facility will be constructed within the mined-out pit, which is located in close proximity to seepage wetland areas (see Figure 23).

4.2.1 Specific activities to be undertaken

The specific activities associated with the proposed project/activities will be:

- Construction and operation of the proposed discard conveyor belt;
- Stockpiling of discard material prior to placement onto the spoils;
- Deposition of discard onto the spoils (trucking, dozing and compaction);
- Construction and operation of a storm water control system to ensure clean and dirty water separation;
- Continuation of pit water abstraction system, to intercept seepage from the discard for re-use and/or treatment at the EWRP; and
- Application of soil cover during ongoing rehabilitation.

5.0 POLICY AND LEGISLATIVE CONTEXT

The following section provides a brief overview of the policy and legislative context within which the EIA process will be undertaken. This includes the following key legislation (Table 7):

Table 7: Policy and legislative context

Applicable Legislation and Guidelines used to compile the Report	How will this Development comply with and respond to the Legislation and Policy Context
2014 EIA Regulations (as amended) (GN R.326 of 2017), published under the NEMA	An application for Environmental Authorisation (EA) is being applied. See Table 6 for the relevant listed activity that is triggered. Furthermore, the Scoping Report, and this EIA/EMPr have been compiled in accordance with the requirements of the EIA Regulations, to support the application for a WML and EA. Screening tool assessment in terms of the 2014 EIA Regulations was conducted to determine environmental sensitivities associated with the proposed project (APPENDIX R).
National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004) (NEMAQA)	The proposed project will not require an atmospheric emission licence (AEL) in terms of Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 of the NEM:AQA. However, the NEM:AQA makes provision for the setting and formulation of national ambient air quality and emission standards upon which the air quality impact assessment for the project will be based.
GN R.921, published under the National Environmental Management Waste Act, 2008 (Act 59 of 2008) (as amended) (NEMWA), as amended by GN R.633	An application for a WML for the proposed discard facility is being applied for. See Table 5 for the relevant waste management activity that is triggered.
GN R. 632 of 2015, as amended in 2018, published under the NEMWA Waste Classification and Management Regulations (GN R.634, 2013), published under the NEMWA National Norms and Standards for the Assessment of Waste for Landfill Disposal (GN R. 635, 2013), published under the NEMWA National Norms and Standards for the Disposal of Waste to Landfill Disposal (GN R.636 of 2013), published under the NEMWA	The design of the pollution control barrier system for the proposed discard facility will be based on the risk based approach, as outlined in the Regulation GN R. 632. This approach is driven by a risk assessment based upon the geochemical hazard and toxicology of the waste material and the risk of the water resource and other receptors. Waste material requiring disposal will need to be assessed in terms of GN R.635 and depending on the waste type, will need to be disposed of in accordance with Regulations GN R.634 and 636.

Applicable Legislation and Guidelines used to compile the Report	How will this Development comply with and respond to the Legislation and Policy Context
National Water Act, 1998 (Act 36 of 1998)	An application for a water use licence (WUL) in terms of Section 21(g) of the NWA is being applied for the proposed discard facility.
Regulations GN R. 704 of 04 June 1999, published under the NWA	An application is also being submitted for exemption from the requirements of Regulation 4(a), (b) and (c) of Government Notice 704 of 04 June 1999, for in-pit discard disposal. The conceptual operational and post-closure storm water management plans have been developed in accordance with the requirements of GN 704.
Resource Quality Objectives (RQOs) and Water Quality Planning Limits (WQPL) have been gazetted for the Wilge River catchment.	Water quality limits for the project will be set based on the WQPL that have been gazetted for the Wilge River Catchment.
WHO Guidelines for Drinking Water Quality	Water quality limits contained in these guidelines will be set for this project, in the event of hydrocarbon contamination of surface water resources resulting from the project (earth-moving equipment).
Compliance with South African Water Quality Guidelines for Aquatic Ecosystems	Water quality limits contained in these guidelines will be set for this project, in the event that the project impacts on downstream wetlands.
SANS 10103 Code of Practice, Suburban Districts with Little Road Traffic	Noise levels associated with the proposed project will need to comply with the guidelines SANS 10103 Code of Practice, Suburban Districts with Little Road Traffic, including noise performance criteria set in terms of these guidelines.
National Heritage Resources Act, 1999 (Act 25 of 1999)	Although the proposed discard facility and discard conveyor belt will be located on disturbed land, an exemption from the requirements of this Act (to conduct full heritage and palaeontology impact assessments) have been compiled by the relevant specialists (see APPENDIX O).
National Road Traffic Act, 1996 (Act 93 of 1996)	The construction of the proposed conveyor belt will need to be in compliance with the safety requirements of this Act and the Regulations published thereunder.
Municipal By-laws	The proposed project will need to ensure adherence to the following: ■ eMalahleni Local Municipality Solid Waste Management By-laws, No 2632.13 January 2016; ■ eMalahleni Local Municipality Noise Control By-laws, No 2632.13 January 2016; ■ eMalahleni Local Municipality Air Quality Management By-laws, No 2632.13 January 2016;

Applicable Legislation and Guidelines used to compile the Report	How will this Development comply with and respond to the Legislation and Policy Context
	■ eMalahleni Local Municipality Spatial Development Framework; and ■ eMalahleni Land Use Scheme, 2020.

5.1 Natural Environmental Management Act

In terms of the NEMA, as amended (RSA, 1998a) and the EIA Regulations (RSA, 2014e), an application for EA for certain listed activities must be submitted to the provincial environmental authority or the national authority, the Department of Environmental Affairs (DEA), depending on the types of activities.

The current EIA regulations (GN R. 326) (RSA, 2014e), Listing Notice 1 (GN R.327) (RSA, 2014d), Listing Notice 2 (GN R.325) (RSA, 2014c) and Listing Notice 3 (GN R.324) (RSA, 2014b) promulgated in terms of Sections 24(5), 24M and 44 of the NEMA, and subsequent amendments, commenced on 04 December 2014 (RSA, 1998a).

Listing Notice 1 (RSA, 2014d) and Listing Notice 3 (RSA, 2014b) lists those activities for which a Basic Assessment process is required, while Listing Notice 2 (RSA, 2014c) lists the activities requiring a full Scoping and EIA process. The EIA Regulations of 2014 (RSA, 2014e) define the processes that must be undertaken to apply for EA.

The Listed Activity triggered by the proposed discard facility project is indicated in Table 6.

5.2 National Environmental Management: Air Quality Act

The main objectives of the National Environmental Management: Air Quality Act (Act 39 of 2004) (NEM: AQA) are to protect the environment by providing reasonable legislative and other measures to (RSA, 2004):

- 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 NEMA: AQA 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.

The NEMA: AQA makes provision for the setting and formulation of national ambient air quality and emission standards. If the need arises, these standards can be set more stringently on a provincial and local level.

The proposed project will not require an atmospheric emission licence (AEL) in terms of Listed Activities and Associated Minimum Emission Standards Identified in terms of Section 21 of the National Environmental Management: Air Quality Act 39 of 2004 (RSA, 2004).

5.3 National Environmental Management: Waste Act

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEMWA) was implemented on 01 July 2009 and section 20 of the Environment Conservation Act 73 of 1989, under which waste management was previously governed, was repealed. One of the main objectives of the NEMWA is to reform the law regulating waste management to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development and to provide for:

- National norms and standards for regulating the management of waste by all spheres of government;
- Specific waste management measures;
- The licensing and control of waste management activities;
- The remediation of contaminated land; to provide for the national waste information system; and
- Compliance and enforcement.

In terms of the NEMWA, certain waste management activities must be licensed and in terms of Section 44 of the Act, the licensing procedure must be integrated with an environmental impact assessment process in accordance with the EIA Regulations promulgated in terms of the NEMA.

Government Notice (GN) 921, published in the Government Gazette No. 37083 on 29 November 2013 (as amended), lists the waste management activities that require licensing. A distinction is made between Category A waste management activities, which require a Basic Assessment, Category B activities, which require a full EIA (Scoping followed by Impact Assessment) and Category C activities that require compliance with relevant requirements or standards determined by the Minister. The list of waste management activities was subsequently amended by GN R.633 in 2015, to include mining related waste / mineral residue.

Since the proposed project entails the development of a discard facility, which defines as a residue deposit in terms of GN R. 633, the following waste management activity will be triggered:

- Category B, Activity 11: The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002).

This activity requires an application for a WML supported by a Scoping and EIA process, undertaken in accordance with the EIA Regulations GN R.326 of 4 December 2014.

5.4 National Water Act

The National Water Act (Act 36 of 1998) (NWA) is the primary legislation regulating both the use of water and the pollution of water resources (RSA, National Water Act 36 of 1998, as amended, 1998b). It is applied and enforced by the Department of Water and Sanitation (DWS).

Section 19 of the NWA regulates pollution, which is defined as "*the direct or indirect alteration of the physical, chemical or biological properties of a water resource 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;
- Remedy the effects of any disturbance to the bed or banks of a watercourse;

The NWA states in Section 22(1) that a person may only use water;

- Without a licence –
  - if that water use is permissible under Schedule 1;
  - if that water use is permissible as a continuation of an existing lawful use; or
  - if that water use is permissible in terms of a general authorisation issued under section 39.
- If the water use is authorised by a licence under this Act; or
- If the responsible authority has dispensed with a licence requirement under subsection (3).

Water use is defined in Section 21 of the NWA (RSA, 1998a).

Water Use Licence Application

The proposed discard facility is regarded as a Section 21(g) water use, which is defined as "*disposing of waste in a manner which may detrimentally impact on a water resource*". An application for a water use licence (WUL) will be submitted to the DWS. An application will also be submitted for exemption from the requirements of Regulation 4(a), (b) and (c) of Government Notice 704 of 04 June 1999, for in-pit discard disposal.

5.5 Other applicable legislation

- National Heritage Resources Act, 1999 (Act 25 of 1999);
- National Road Traffic Act, 1996 (Act 93 of 1996); and
- Municipal By-laws.

6.0 NEED AND DESIRABILITY OF PROPOSED ACTIVITIES

Based on current production rates, the current discard dump (at Klipspruit Colliery) being used for the disposal of discard from Zibulo Colliery will run out of airspace in 2021. For the continuation of mining, an alternative discard placement option is required. One option is to include expansion of the existing facility at Klipspruit

Colliery; another option is the risk mitigating proposal by AAIC to seek authorisation for an alternative coal discard disposal facility to be developed at the Zibulo Colliery opencast operation (i.e. this application).

The development of a discard dump at Zibulo Colliery would remove the dependency on Klipspruit Colliery and ensure continued operations, which would in turn ensure continued contributions to the Gross Domestic Product (GDP) for South Africa through the generation of export revenues, by processing the coal from Zibulo Colliery, and being able to maintain the employment complement for Zibulo Colliery and the PCPP.

The proposed discard facility has been assessed for need and desirability against the Department of Environmental Affairs' Guideline on Need and Desirability (DEA, 2017b).

Energy Needs in South Africa

Coal is currently the most important energy source in the world after oil. It is also one of the cheapest and most abundant energy carriers. Despite environmental concerns and legislation restricting the use of coal in electricity generation and industrial processes, coal continues to be an important energy source across the globe (Chamber of Mines, 2018).

There is a growing demand for electricity and internationally, coal is the most widely used primary fuel. It is estimated that about 36 percent of the total fuel consumption for the world's electricity production is from coal. In South Africa, about 77 percent of the country's primary energy needs are provided by coal.

In addition to supplying the local economy, approximately 28 percent of South Africa's production is exported. The coal is exported mainly through the Richards Bay Coal Terminal, making South Africa the fourth-largest coal exporting country in the world.

Socio-economic Contributions to South Africa

The domestic and export markets for South African coal have developed over time, each with their own dynamics. In 2016, South Africa exported 28% (68.9Mt) of its coal by volume and sold 72% domestically. By value, exports were worth R50.5 billion (45% of the total) and domestic sales R61.5 billion (55%). The proposed activity will result in the job security for the current employees at Klipspruit. Expertise and products for this project will be sourced locally as far as possible and will also have a contributing factor to enhance the local economy.

In 2016, the coal industry employed 77 506 people, representing 17% of total employment in the mining sector. These employees earned R21 billion in wages and salaries. In the same year, the coal industry spent R60 billion on the procurement of goods and services, most of it locally. This contributed to creating and maintaining jobs in other industries. Indirectly, the coal industry created 173,093 jobs mainly in the transport and storage sector where almost 120 000 jobs were created representing 69% of all indirect jobs created by the coal industry. This highlights the importance of the coal sector in supporting the transport industry (Chamber of Mines, 2018).

7.0 MOTIVATION FOR THE PREFERRED DEVELOPMENT FOOTPRINT WITHIN THE APPROVED SITE INCLUDING A FULL DESCRIPTION OF THE PROCESS FOLLOWED TO REACH PREFERRED SITE ALTERNATIVE

Alternatives are defined in in terms of the NEMA, as "*different means of meeting the general purpose and requirements of the activity, which may include alternatives to –*

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

(b) the type of activity to be undertaken;

(c) the design or layout of the activity;

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

(e) the operational aspects of the activity."

The following sections describe the various alternatives that have been assessed as part of the proposed project.

7.1 Project alternatives

7.1.1 Discard facility options

The following discard facility options have been considered (Figure 6):

- Option 1: A greenfield site on land owned by AAIC:

  The first option considered the availability of a greenfield site within reasonable proximity to the PCPP. This narrowed the area of interest to land at the site of the Zibulo Colliery opencast or underground operations.

  While the opencast operation is close to the PCPP there is insufficient land available for development of a greenfield site as the property is constrained in its eastern extent by a wetland and drainage area, to the north by the N12 National highway and to the west by the R545 provincial road. The area to the south of the existing opencast contains additional coal reserves which form part of the pit life and which have been authorised for opencast mining. Consequently, there is no available greenfield site on non-mined land in the immediate proximity to the opencast operation.

  The Zibulo underground operation is located approximately 18 km due south of the Zibulo opencast operations. While there is land available in proximity to the existing infrastructure, the distance over which coal discard would need to be transported for disposal is considerable. Notwithstanding this, the possibility of a greenfield site in proximity to the Zibulo underground operation was taken forward into the options analysis for further consideration.

- Option 2: A brownfield site within the footprint of the existing Zibulo Colliery opencast pit:

  The second site option considered the disposal of coal discard onto a site contained within the footprint of the existing Zibulo opencast pit. Two options presented themselves, namely developing a discard facility on the surface of rehabilitated land or a scenario where discard disposal into available opencast void space would commence immediately and develop into an aboveground discard facility extending over rehabilitated areas as well. These two options are represented schematically in Figure 7 and Figure 8 respectively. In summary:

  - Option 2a: Placement of discard above the backfilled Zibulo pit only; and
  - Option 2b: Placement of discard as backfill in the void and above the backfilled Zibulo pit.

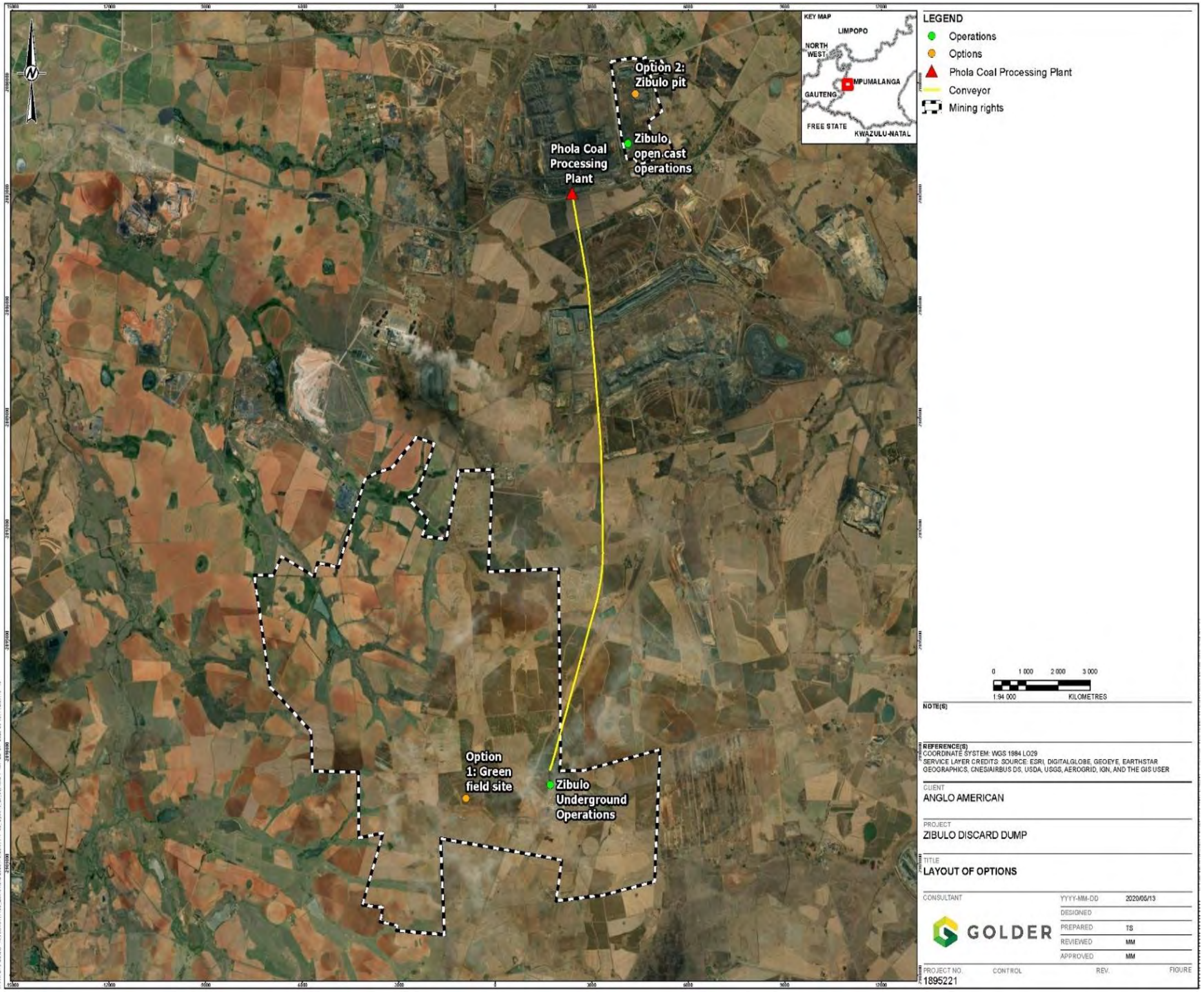


Figure 6: Alternative sites considered

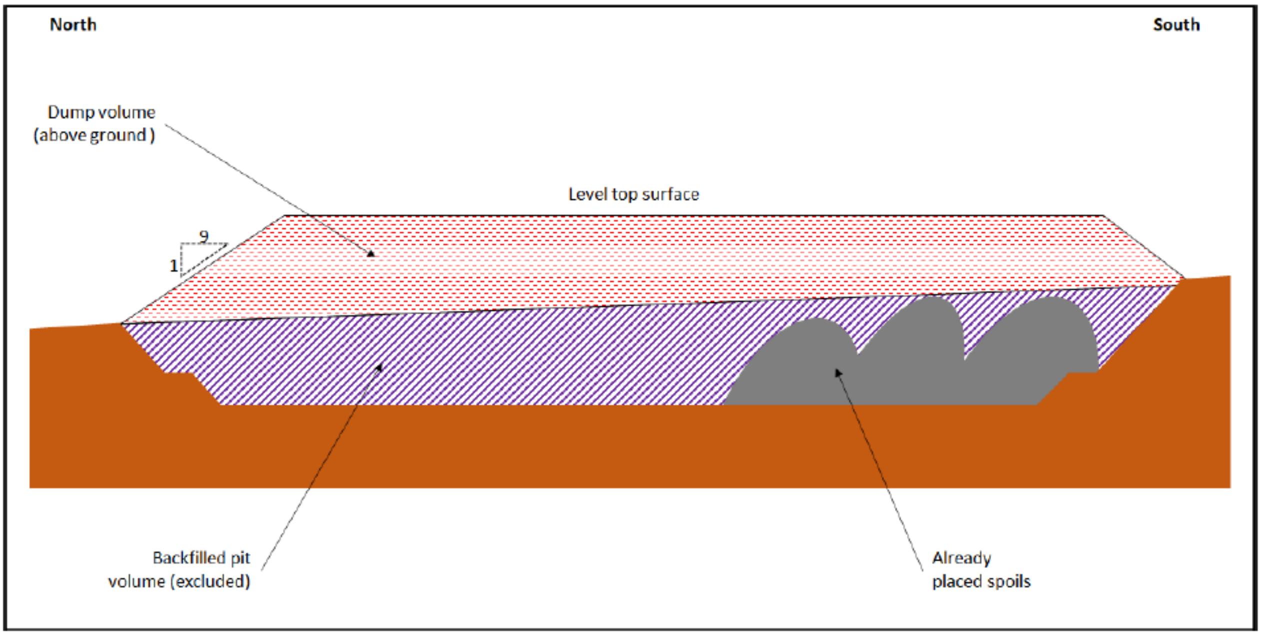


Figure 7: Option 2a schematic section showing discard placement on top of backfilled spoil

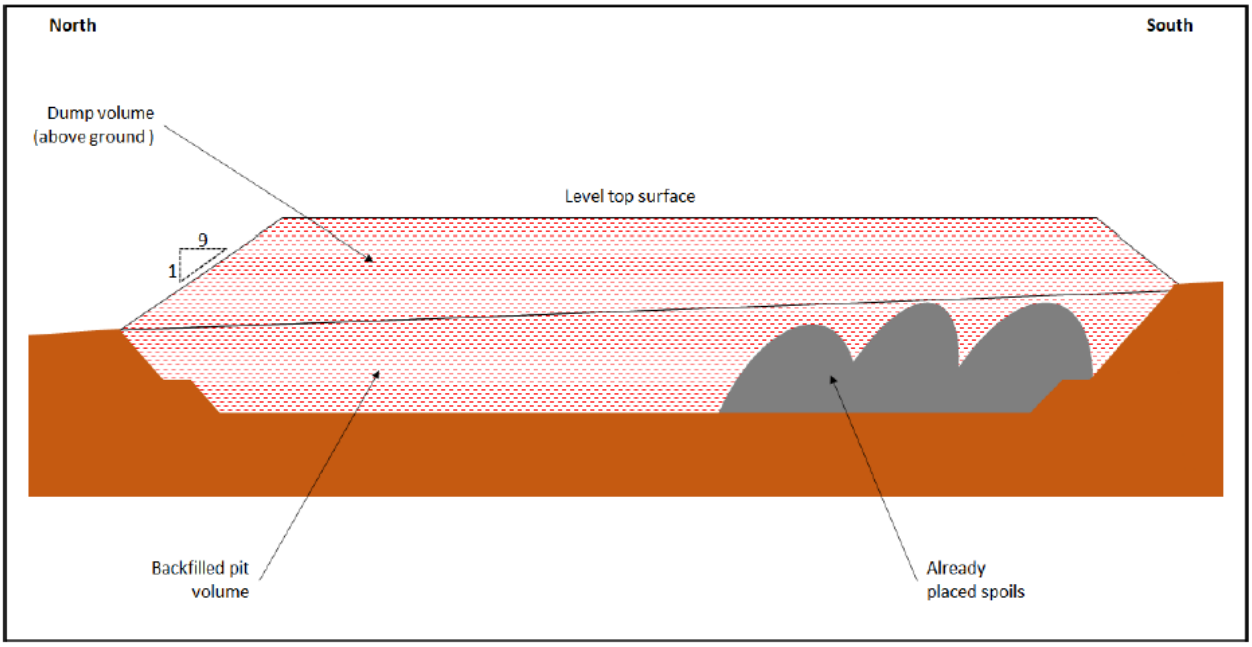


Figure 8: Option 2b schematic section showing discard placement as pit backfill and aboveground

A standard approach was followed in considering the three options (1, 2a and 2b). This entailed the evaluation of a suite of characteristics that relate to cost, engineering and technical aspects, environmental risk and/or benefit, social aspects and regulatory complexity, together with time considerations.

Evaluation was undertaken on the basis of expert opinion and options were qualitatively ranked and then a weighting was applied. The ranking system used is reflected in Table 8, and the weightings used are reflected in Table 9.

The options matrix is presented as Table 10.

Table 8: Scoring system for risk and impact ranking

Description	Scoring
Lowest negative risk/impact	1
Lower negative risk/impact	2
Medium risk/impact	3
Large negative risk/impact	4
Largest negative risk/impact	5

Table 9: Relative weightings

Aspect	Weighting
Economic	20
Engineering/ technical	30
Environmental	30
Social	10
Regulatory	10
Total	100

Table 10: Options matrix

	Option 1		Option 2a		Option 2b	
Description	Greenfield site located near the Zibulo underground operations		Placement of discard above the backfilled Zibulo pit		Placement of discard above the backfilled Zibulo pit and within void	
Aspect	**Component**	**Score**	**Component**	**Score**	**Component**	**Score**
Economic	Highest CAPEX as a new footprint needs to be prepared and lined with a geomembrane	5	Nominal CAPEX to prepare the dump footprint to allow for placement of discard. No barrier system foreseen for in-pit disposal as seepage would be contained inside the pit.	3	Nominal CAPEX to prepare the facility footprint to allow for placement of discard, but this can be offset by existing rehabilitation OPEX to the point that negligible CAPEX is required. No barrier system is foreseen for in-pit disposal as seepage would be contained inside the pit.	1
	CAPEX required to install a return conveyor line (i.e. north to south) adjacent to the existing south to north conveyor	5	Short length of conveyor required to connect the Phola Plant to the Zibulo pit	2	Short length of conveyor required to connect the PCPP to the Zibulo pit	2
	High OPEX operating the additional conveyor line	4	Much lower OPEX due to shorter conveyor line	1	Much lower OPEX due to shorter conveyor line	1
	OPEX required for additional water treatment due to new site	4	Negligible additional OPEX as treatment system is existing.	1	Negligible additional OPEX as treatment system is existing.	1
	Largest closure cost provision due to new standalone facility	4	Lower closure provision as the discard forms part of the existing disturbed pit area	2	Lower closure provision as the discard forms part of the existing disturbed pit area	2
Score		22		9		7
Weighted Score		4.4		1.8		1.4
Engineering/ technical	Possible footprint constraints	3	Adequate available airspace	1	Adequate available airspace	1

	Option 1		Option 2a		Option 2b	
Description	Greenfield site located near the Zibulo underground operations		Placement of discard above the backfilled Zibulo pit		Placement of discard above the backfilled Zibulo pit and within void	
Aspect	**Component**	**Score**	**Component**	**Score**	**Component**	**Score**
	High level of QA/QC required for the installation of the geomembrane system.	3	No geomembrane foreseen	1	No geomembrane foreseen	1
	Probable need for new PCD, water treatment and new stormwater management system	3	Possible to use existing stormwater management system	1	Possible to use existing stormwater management system	1
	More precise engineering design approach is possible	1	Unknown uncertainties due to variable nature of backfilled overburden	3	Unknown uncertainties due to variable nature of backfilled overburden	3
Score		10		6		6
Weighted Score		2.5		1.5		1.5
Environmental	New facility will have a significant impact in the sterilisation of a greenfield footprint area	5	Brown fields facility will have a zero impact in the sterilisation of new footprint areas	1	Brown fields facility will have a zero impact in the sterilisation of new footprint areas	1
	Lower risk of spontaneous combustion due to careful management of discard placement and application of cover	2	Lower risk of spontaneous combustion due to careful management of discard placement and application of cover	2	Lower risk of spontaneous combustion due to careful management of discard placement and application of cover	2
	A new facility will increase the risk of groundwater and surface water pollution during operations which will have to be mitigated	4	The proposed facility will be developed on an area where the ground water and surface water has been impacted. These additional impacts however not to a significantly higher risk	2	The proposed facility will be developed on an area where the ground water and surface water has been impacted. These additional impacts however not to a significantly higher risk	2
	Risk of disturbing wetlands	3	No wetland disturbance on brownfields site	1	No wetland disturbance on brownfields site	1

	Option 1		Option 2a		Option 2b	
Description	Greenfield site located near the Zibulo underground operations		Placement of discard above the backfilled Zibulo pit		Placement of discard above the backfilled Zibulo pit and within void	
Aspect	**Component**	**Score**	**Component**	**Score**	**Component**	**Score**
Score		14		6		6
Weighted Score		3.5		1.5		1.5
Social	Largest social impact in terms of social acceptance	5	Lower social impact and hence more likely to accept the facility	3	Lower social impact and hence more likely to accept the facility	3
	Significant visual interference	5	The new facility will blend in with already disturbed mining area landform and therefore lower visual interference	3	The new facility will blend in with already disturbed mining area landform and therefore lower visual interference	3
Score		10		6		6
Weighted Score		1.0		0.6		0.6
Regulatory	A rigorous permitting process associated with a new greenfield site	3	Less rigorous permitting process associated with a brownfield site option	2	Less rigorous permitting process associated with a brown field site option	2
	The assumption is that no additional land will be required as the new facility will be developed on Zibulo land	1	No additional land required	1	No additional land required	1
Score		4		3		3
Weighted Score		0.4		0.3		0.3
Time frame	Timeline requirements to implement project will be significant	4	Shorter permitting timeframe. A phased implementation is feasible because the discard footprint expansion is slower than the rate of backfilling	2	Shorter permitting timeframe. A phased implementation is feasible because the discard footprint expansion is slower than the rate of backfilling	2
Score		4		2		2
Weighted Score		0.4		0.2		0.2

	Option 1		Option 2a		Option 2b	
Description	Greenfield site located near the Zibulo underground operations		Placement of discard above the backfilled Zibulo pit		Placement of discard above the backfilled Zibulo pit and within void	
Aspect	**Component**	**Score**	**Component**	**Score**	**Component**	**Score**
Total Score		**64**		**32**		**30**
Total Weighted Score		**12.2**		**5.9**		**5.5**

The summarised ranking based on Table 10 is included as Table 11 below.

Table 11: Ranking of options

Option No.	Option name	Weighted Score	Ranking
1	Greenfield site	12.2	3
2a	Placement of discard above the backfilled Zibulo pit	5.9	2
2b	Placement of discard above the backfilled Zibulo pit and within void	5.5	1

From the evaluation of alternatives in relation to site it is clear that the two options that relate to development of a discard facility within the footprint of the existing opencast mine are clearly the better option from both an engineering/technical, financial and environmental perspective. This is largely due to proximity and the fact that no new land take is required. Separation between the two options on the opencast pit (Option 2a or 2b) is not large in relation to their weighted scores; either of the two options can be selected.

Subsequent to undertaking the options assessment, Option 2b was selected as the option to be taken forward into the engineering design phase. This option was selected largely due to the materials balance for the site and commitments in the EMPr relating to a free-draining landscape.

7.1.2 Discard transport options

The movement of discard from the PCPP to the Zibulo opencast site requires careful consideration. Three alternatives were considered at a high level and will require some refinement as project planning progresses beyond a prefeasibility stage. For completeness, however, they are discussed in this section and presented in Figure 9.

As mentioned previously the PCPP is a shared facility between AAIC and South32. This facility lies to the west of the provincial road R545 while the Zibulo opencast operation lies to the immediate east of the road. Furthermore, the R555 runs to the immediate south of the PCPP; it is developed on its northern side through to the junction with the R545. In Figure 9, the PCPP property boundary is indicated as a brown polygon and the position of the Zibulo Opencast pit is indicated in grey. One important additional site is highlighted in purple immediately north-east of the junction between the R545 and R555; this is the position of the local grain silo which attracts considerable traffic during the crop season with noticeable congestion of agricultural trucks and tractor wagon combinations entering and leaving the silo during harvest.

The three transport alternatives considered are indicated and discussed below.

7.1.3 New build conveyor between Phola Plant and Zibulo opencast

There is an existing conveyor linking the South32 Klipspruit extension project to the PCPP. This conveyor alignment is indicated in green in Figure 9. It includes a bridge crossing of the R545 and a point immediately north of the grain silo.

The proposal would be to develop a dedicated conveyor belt (indicated in red in Figure 9) that would follow the alignment of the existing conveyor. The proposed new conveyor would lie to the immediate north of the existing conveyor and cross the R545 on a dedicated bridge crossing. Soon after the crossing of the R545, the conveyor would then run north to the opencast pit for final disposal. Should there be any limitation through either time to commission or mechanical failure at any point in time the discards transport alternative to be considered as a backup would be to transport discard via mine roads limiting public contact with such vehicles to the existing crossing point of the R545 (see Section 7.1.4 below).

The advantage of the proposed conveyor route is that it is confined to mine property belonging to either South 32 or AAIC. In addition, the recent development of the incoming Klipspruit extension conveyor creates opportunity for infrastructure alignment, with minimal disruption to either mining operation. Some optimisation in engineering will be required as the project advances beyond prefeasibility to address the transfer point on the western side of the R545 as space is reasonably constrained between the existing conveyor (green) and Klipspruit extension access road lying to its immediate north.

7.1.4 Mine road between PCPP and Zibulo opencast operation

It is important to note that there is a reinforced road crossing at a point immediately to the north of the Klipspruit conveyor crossing of the R545. There is an established four-way intersection as this is the entrance to the extension project and allows transport across the R545 directly onto Klipspruit Colliery. This presents an opportunity.

Consequently, there is the potential to truck coal discard from the PCPP across the property of South32's Klipspruit Colliery to the existing crossing of the R545 and thereafter to deviate to the north-east onto the Zibulo property following an existing road to the south-western point of the opencast pit. Some optimisation of this route on the Zibulo property would be needed with time as a portion of the existing road would be lost as the opencast mine expands to the south. However, that is not deemed material to the consideration of this alternative as a potential route because the access road (yellow line east of R545) that will be affected by the mine will need to be relocated in any event as part of the Zibulo opencast expansion and consequently would continue to be available in its new position on the mine property for discard haulage.

The disadvantage of this option is that it will necessitate a long-term haulage across the property of a neighbouring mining house with associated complexities in relation to transportation and safety. It also has the disadvantage of necessitating regular crossing of the R545 with associated accident risk. Importantly, there is considerable congestion on the R545 during the crop season as agricultural vehicles (trucks and tractors and trailers) bringing grain to the existing silos. Queues of vehicles commonly form at the entrance to the grain silo rendering this portion of road highly congested during parts of the year.

7.1.5 Public road use

There is potential to make use of the existing public road network to transport discard from the PCPP to the opencast site. The route is indicated in white in Figure 9. It would exit the PCPP site at an existing exit and vehicles hauling discard to Zibulo opencast would move in an easterly direction on the existing R555 past the entrance to South32 Klipspruit Colliery to the junction between the R555 and R545. At this point trucks approaching the mine would turn to the north onto the R545 and access the opencast immediately adjacent to the pit at an entrance yet to be created. There is a short term alternative that could present itself which would see trucks turning onto the mine property to follow the mine road indicated in yellow.

There are a number of significant constraints associated with use of the public road network and these include the developed nature of the R555 between the possible entry point at PCPP and the junction with the R545. The junction itself is congested with considerable coal product haulage already taking place. Most importantly, during the cropping season the R545 is extremely congested as agricultural transport enters and exits the grain silos. In particular, it must be noted that this transport includes tractor drawn grain wagons which move at a slow pace on the roads.

This alternative is not favoured nor considered practical given the existing road constraints.

Figure 9: Map indicating conceptual alignment of proposed discard transport alternatives. A public road route in white, a proposed mine road crossing the South32 property in yellow and proposed new conveyor route in red. The alignment of an existing coal conveyor is indicated in green.

7.1.6 Preferred option

Mainly due to the congested nature of the existing roads, a dedicated conveyor to transport discard from the PCPP to the Zibulo opencast operation is deemed to be the preferred transport option.

7.1.7 No project option

The current planned LOM for the authorised mining activities at Zibulo Colliery is 2035.

The no project option for this project is not to develop a dedicated discard facility at Zibulo Colliery. The option of not going ahead with this project could potentially leave the mine with no discard disposal capacity beyond 2021 (when the current discard facility at Klipspruit Colliery reaches full capacity), which would ultimately affect production.

If mining operations at Zibulo Colliery are forced to stop prematurely due to waste facilities exceeding their capacity to store discard waste from the mine, the coal reserves will be left unmined and the economic benefits to AAIC and its employees, as well as the associated socio-economic benefits to the local communities and businesses, and South Africa as a whole would not materialise.

8.0 DETAILS OF THE PUBLIC PARTICIPATION PRCESS FOLLOWED

This section provides an overview of the public participation process to be undertaken during the EIA.

8.1 Objectives of public participation

The principles that determine communication with society at large are included in the principles of the National Environmental Management Act (NEMA) (Act No. 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."*

Opportunities for Comment

Documents are 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.

Public participation is an essential and regulatory requirement for an environmental authorisation process, and must be undertaken in terms of Regulations 39 to 44 of the Environmental Impact Assessment (EIA) Regulations GN R.326. 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 is designed to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner and:

During the Scoping Phase to enable them to:

- Raise issues of concern and suggestions for enhanced benefits;
- Verify that their issues have been recorded;
- Assist in identifying reasonable alternatives;
- Comment on the plan of study of specialist studies to be undertaken during the impact assessment phase; 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 have been considered in the environmental investigations; and
- Comment on the findings of the environmental assessments.

During the decision-making phase:

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

8.2 Pre-scoping phase capacity building

Zibulo Colliery is an existing operation which has been in operation for almost a decade. Apart from the fact that landowners and residents in the area have been exposed to mining developments in the area for years, AAIC holds regular meetings with adjacent landowners and affected communities. During these meetings, the various mining processes and associated impacts are discussed, and progress feedback is provided.

Furthermore, a focus group meeting was convened on 18 September 2020 for the local farmers in the area. The key purpose of the meeting was to share information about the proposed project and WML, EA and WUL application processes; and for I&APs to ask questions, raise issues of concern, contribute comments and suggestions for enhanced benefits.

The meeting invitation letter, presentation and attendance register are appended in APPENDIX F.

8.3 Identification of I&APs

I&APs were initially identified through a process of networking and referral, obtaining information from Zibulo Colliery's existing stakeholder database, and liaison with potentially affected parties within the project area. The I&AP database for the project is appended in APPENDIX C.

8.4 Register of I&APs

The NEMA Regulations distinguish between I&APs 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*."

A total of eighty-eight (88) I&APs registered for the project. See APPENDIX C for the list of registered I&APs.

As per the EIA Regulations, future consultation on the project will take place with registered I&APs.

8.5 Public participation during scoping

This section provides a summary of the public participation process that was followed during the scoping phase of the EIA.

8.5.1 Project announcement

The project was announced on 30 October 2020. Stakeholders were invited to participate in the EIA and public participation process and to pass on the information to friends/colleagues/neighbours who may be interested and to register as I&APs.

The proposed project was announced as follows:

- Distribution of the background information document, locality map and registration and comment sheet to all I&APs with email addresses. A bulk SMS was also sent to identified I&APs with mobile phone numbers. The announcement documents provided information about the EIA process, how I&APs could register and how to access the draft scoping report. Copies of the announcement documents are attached in APPENDIX D;
- The above-mentioned documents were also posted to the Golder website: www.golder.com/global-locations/africa/south-africa-public-documents;

- A newspaper advertisement was published in the Witbank News, on 30 October 2020 (see newspaper tear sheet in APPENDIX E); and
- Site notices were placed at the entrance to the proposed project site and at visible places at the boundary of the property. Photographic evidence and locations of site notices are attached in APPENDIX E.

8.5.2 Draft scoping report

The draft scoping report (DSR) was available for public review from 02 November until 04 December 2020. The report was available at the following public places and posted to the Golder website.

Table 12: Public places where copies of the draft scoping report were available

Name of Public Place	Address
Phola Police Station	2171 Mthimunye Street, Phola
Ogies Police Station	1 Main Road, Ogies
eMalahleni Main library	Corner Hofmeyer and Elizabeth Avenue, eMalahleni
Ogies Spar	61 Main Street, Ogies, 2230
Golder Associates Africa	Maxwell Office Park, Magwa Crescent West, Waterfall City, Midrand

A focus group meeting was convened with the eMalahleni Local Municipality on 01 December 2020. The key purpose of the meeting was to share information about the proposed project and WML, EA and WUL application processes; and for I&APs to ask questions, raise issues of concern, contribute comments and suggestions for enhanced benefits. The attendance register is appended in APPENDIX F.

8.5.3 Final scoping report

The DSR was updated into the final scoping report (FSR) after the expiry of the public review period, for submission to the DMRE. The comments received, and issues raised during the project announcement and scoping phases were captured in the Comment and Response Report (CRR), appended in APPENDIX G. The FSR was accepted by the DMRE on 18 March 2021.

8.6 Public participation during the impact assessment phase

Public participation during the impact assessment phase of the EIA entailed a review of the findings of the EIA, presented in the EIA/ EMPr, and the specialist studies. These reports were made available for public comment for a period of 30 days. A focus group meeting was also convened during the public comment period (which complied with the national COVID-19 Regulations).

8.6.1 Notification of interested and affected parties

All registered I&APs were notified on 21 April 2021 that the FSR had been accepted by the DMRE, and that the draft EIA/EMPr was available for public comment (see APPENDIX F for a copy of the notification letter). I&APs were notified via e-mail and bulk SMS that they could either download the document from Golder’s public website, request a copy from Golder’s Public Participation Office, or access a hard copy of the document at one of the public places listed below (Table 13). I&APs were encouraged to comment either in writing (mail or e-mail) or by telephone.

Table 13: Public places where copies of the draft EIA/EMPr were available

Name of Public Place	Address
Phola Police Station	2171 Mthimunye Street, Phola
Ogies Police Station	1 Main Road, Ogies
Klipfontein Public Library	Highland Square, Albertyn Street, Shop 10, Leraatsfontein, eMalahleni
Ogies Public Library	105 R555, Ogies, 2230
Golder Associates Africa	Maxwell Office Park, Magwa Crescent West, Waterfall City, Midrand

8.6.2 Draft EIA/EMPr

The draft EIA/EMPr (this report) was made available for public comment from 21 April to 21 May 2021. The findings of the EIA/EMPr were presented during a focus group meeting held on 04 May 2021. In order to ensure compliance with the National COVID-19 Regulations as well as the Anglo Coal public participation plan approved by DMRE, personal invites were sent to a list of identified key stakeholders (farmers and community leads), to keep meeting attendance to below 50 participants. See APPENDIX F for a copy of the invitation letter, and the agenda, presentation slides and minutes of the meeting. Subsequent to the meeting, the public comment period was extended to 28 May 2021, to allow for sufficient time for I&APs to meaningfully comment on the documents (see APPENDIX F for a copy of the email indicating the comment period extension).

Figure 10: Focus group meeting held on 04 May 2021

8.6.3 Final EIA/EMPr

All the issues, comments and suggestions raised during the comment period on the draft EIA/EMPr were added to the CRR that will accompany the Final EIA/EMPr. The Final EIA/EMPr will be submitted to the DMRE, and the DWS, for decision-making.

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.

8.7 Summary of issues raised by I&APs

The comments received, and issues raised during the project announcement, scoping and impact assessment phases are captured in the CRR, appended in APPENDIX G. The key issues raised by I&APs, relevant to the proposed discard facility project, can be summarised as follows:

- The potential impact of dust generated from the discard facility project on the local communities, particularly given the existing air pollution in the regional area; and
- The potential impact of the discard facility on local water resources, including secondary impacts on the biodiversity (fish and wildlife) associated with the water resources.

As part of the public consultation process, several issues were raised relating to environmental and social aspects associated with the current mining related activities at Zibulo Colliery. On 25 May 2021, AAIC held a meeting with various community representatives, in response to the request that was received from attendees to the focus group meeting on 04 May 2021. After the meeting on 25 May, an objection plea (letter, dated 25 May 2021) was issued by various community representatives to AAIC and the Golder PP Office. The letter is attached in APPENDIX G.

8.8 Lead authority's decision

Once the DMRE has taken a decision about the proposed project, the Public Participation Office will immediately notify I&APs of this decision and of the opportunity to appeal. This notification will be provided as follows:

- A letter will be sent, personally addressed to all registered I&APs, summarising the authority's decision and explaining how to lodge an appeal should they wish to.

9.0 ENVIRONMENTAL ATTRIBUTES AND DESCRIPTION OF THE BASELINE RECEIVING ENVIRONMENT

The current environmental characteristics of the project site are described in this section. The footprint area of the proposed discard facility has already been mined out and no pristine, unmined baseline environment exists within the proposed footprint area. Similarly, since the proposed discard conveyor belt will run along existing conveyor and road routes, the footprint associated with this facility is also disturbed.

The information elaborated upon in this section was sourced from:

- Previous specialist studies conducted for the site and adjacent collieries;
- Monitoring data for the site and general region; and
- Specialist studies conducted for this project (appended to this report):
  - Air Quality (Golder, 2021b);
  - Hydrology and Hydrogeology (Golder, 2021a);
  - Heritage (APAC cc, 2021);

- Palaeontology (Fourie H. , 2021);
- Wetlands and Aquatic Ecology (Golder, 2021c);
- Socio-economic (Golder, 2021d);
- Visual (Golder, 2020);
- Mineral Reside Risk Assessment (Golder, 2021e);
- Climate Change (Golder, 2021f); and
- Geotechnical (Golder, 2021g).

9.1 Topography

The Zibulo Colliery opencast operation is located on the northern side of the water shed between the Saalklapspruit and the Zaaiwaterspruit. The area mostly comprises gently undulating Highveld terrain. The site has an elevation between 1520 and 1580 mamsl (Licebo Environmental and Mining (Pty) Ltd, 2018). The site drains into the Saalklapspruit to the east of the site (SRK Consulting, 2009).

9.2 Climate

The Zibulo Colliery opencast operation is in the Highveld Coalfields, an area that experiences warm, temperate climate with maximum temperatures exceeding 27°C in the summer months and temperatures below 2°C during the winter months. The Highveld is a summer rainfall region with November, December and January experiencing the highest rainfall months, and little to no rain in the winter months.

The dry season occurs between May and September and receives less than 9% of the annual rainfall. The wet season occurs between October and April and receives more than 91% of the annual rainfall. On average, 74% of the annual rain falls within a period of 5 months (November to March and the wettest month is January with a median around 113 mm/month). The maximum monthly rainfall recorded is 265 mm/month.

Winds at Zibulo are predominantly from the northern and south-easterly sectors (Figure 11). Wind speeds are moderate, averaging ±3 to 5 m/s with a low percentage (±13%) of calm conditions (<1 m/s).

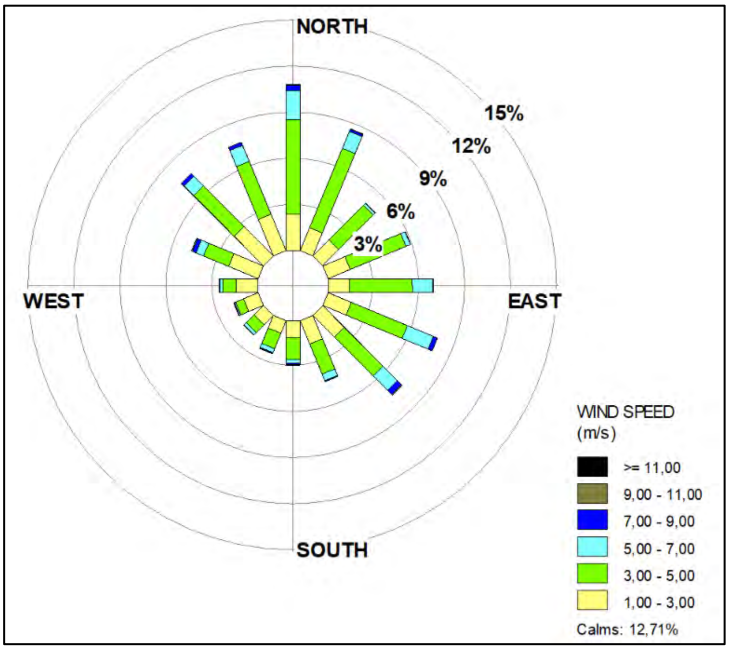


Figure 11: Modelled annual wind rose for Zibulo (2016-2018)

9.3 Geology

The following information is sourced from the hydrology and hydrogeology specialist report (Golder, 2021a) appended in APPENDIX K.

9.3.1 Regional geology

The Witbank Coalfield comprises six coal seams (numbered 1 through to 6 from the base upwards) contained in a 70 m thick succession comprised predominantly of sandstone with subordinate siltstone, mudstone, and shale (Vryheid Formation).

The distribution of the No. 1 and No. 2 Seams is largely determined by the pre-Karoo topography and the subcrops of all seams are controlled by the present-day erosion surface. Generally, the No. 1, 2, 4 and 5 Seams are considered economic based on seam thickness and quality. Intrusive dolerite dykes and sills are ubiquitous and devolatilization of the coal seams can be significant. The basement and Dwyka Group are unconformably overlain by coal bearing Vryheid Formation of the Ecca Group comprising the six recognised coal seams separated by sedimentary packages consisting mainly of sandstone and thinly laminated siltstone with subordinate mudstone and shale.

9.3.2 Geology in the area of Zibulo Opencast

Zibulo Colliery is located close to the north-western margin of the Witbank coalfield basin. The Zibulo Colliery coal seams are contained within the Vryheid Formation of the Karoo Supergroup. The sequence was deposited on paleo-highs, and areas that had been eroded, so not all the coal seams are always fully developed throughout the resource area. The stratigraphy of the Zibulo resource area is typical of the eMalahleni coalfield, with five main coal seams present i.e. No.1 seam (deepest), No. 2 seam, No. 3 seam, No. 4 seam and No. 5 seam (most shallow). The Zibulo resources are contained in the No. 2, No. 4 and No. 5 seams. Sediments of shale, siltstone and sandstone overlie and separate the various coal seams. The sequence is underlain by Pre-Karoo diamictite.

Figure 12 shows typical stratigraphic sequence at the opencast mine workings. No. 4 seam top is mostly weathered away in the north and north-east of the resource area, except in the lower portion of the resource area. The seam is a fairly thin sub-seam and comprises bright coal with pyrite lenses. Interburden between No. 4 seam and No. 3 seam comprises of fine-grained sandstone and is approximately 3m thick. The interburden between No. 3 seam and the top of No. 2 seam comprises inter-bedded shale and sandstone, with a thick carbonaceous mudstone occurring just above the contact of the No. 2 seam. The No. 2 seam is generally a bright coal underlain by fine-grained sandstone. The No.1 seam is a thin bright coal seam and is overlain by thin inter-bedded shale and sandstone parting.

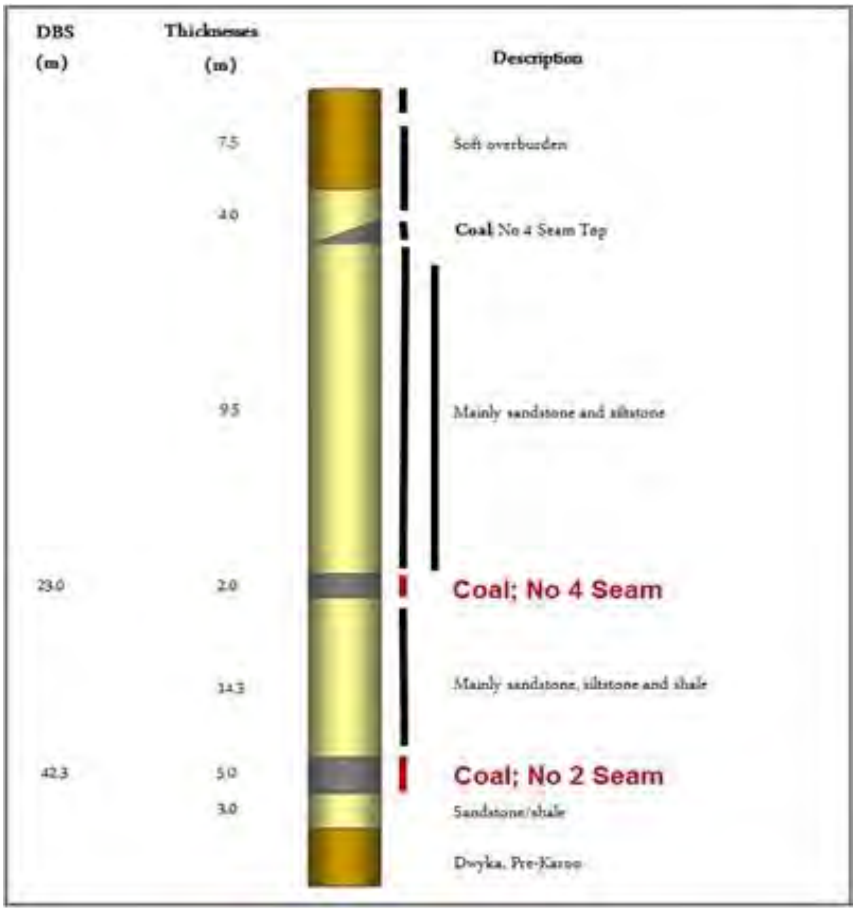


Figure 12: Zibulo Opencast resource stratigraphy

9.4 Groundwater

The following information is sourced from the hydrology and hydrogeology specialist report (Golder, 2021a) appended in APPENDIX K.

9.4.1 Aquifer characterisation

Three different aquifer types occur in the resource area shallow perched aquifers, shallow weathered zone Karoo aquifers, and deep fractured Karoo aquifers.

The shallow perched aquifers are essentially restricted to the soil horizon (soft overburden). The host rock types for the other two aquifer types are clastic sedimentary rock and the coal seams. A large range in grain size is evident for the argillaceous to arenaceous sediments, which will ultimately influence the hydraulic characteristics of the host rock. The coal seams are uniform in their hydraulic characteristics with the exception of their contact zones. The perched aquifer usually displays unconfined conditions; the shallow weathered zone aquifer displays unconfined to semi-unconfined conditions, while the deep aquifer predominantly displays confined conditions. Ground water flow in all three aquifer types is essentially horizontal. However, interconnection between the aquifer types can introduce vertical flow components.

Small dolerite intrusions and large sills are widely developed and may cause localised compartmentalisation. The presence of the dykes and sills may also influence the yielding capacity in some areas. The presence of the graben structure in the northern part of the reserve will allow enhanced water flow due to the discrete faults associated with the structure.

9.4.2 Groundwater levels

The latest borehole levels monitoring undertaken indicates that groundwater levels range from 3.5 mbgl (metres below ground level) to 24.2 mbgl. DeltaH (2020) (in: Golder, 2021d) also reports water levels collated from the Strategic Fuel Fund responsible for water level monitoring for the Ogies ‘old’ underground workings. Groundwater levels range from 2.8 mbgl to 8.39 mbgl within the shallow aquifer. Deeper groundwater levels of up to 68.9 mbgl are measured in the deeper piezometers representing the deeper fractured rock aquifer and the influence of the ‘old’ underground mine workings.

9.4.3 Groundwater quality

The borehole water quality data is set out in Table 13 of APPENDIX K; monitoring localities are indicated on Figure 13. On the whole, the water quality in all the boreholes complies to the specifications for drinking water (SANS 241: 2015) and the Zibulo Opencast IWUL limits. BSW04 shows non-compliance against the IWUL limits for pH and sulphate. Zibulo Colliery is implementing measures at the PCD to address further contamination emanating from this facility.

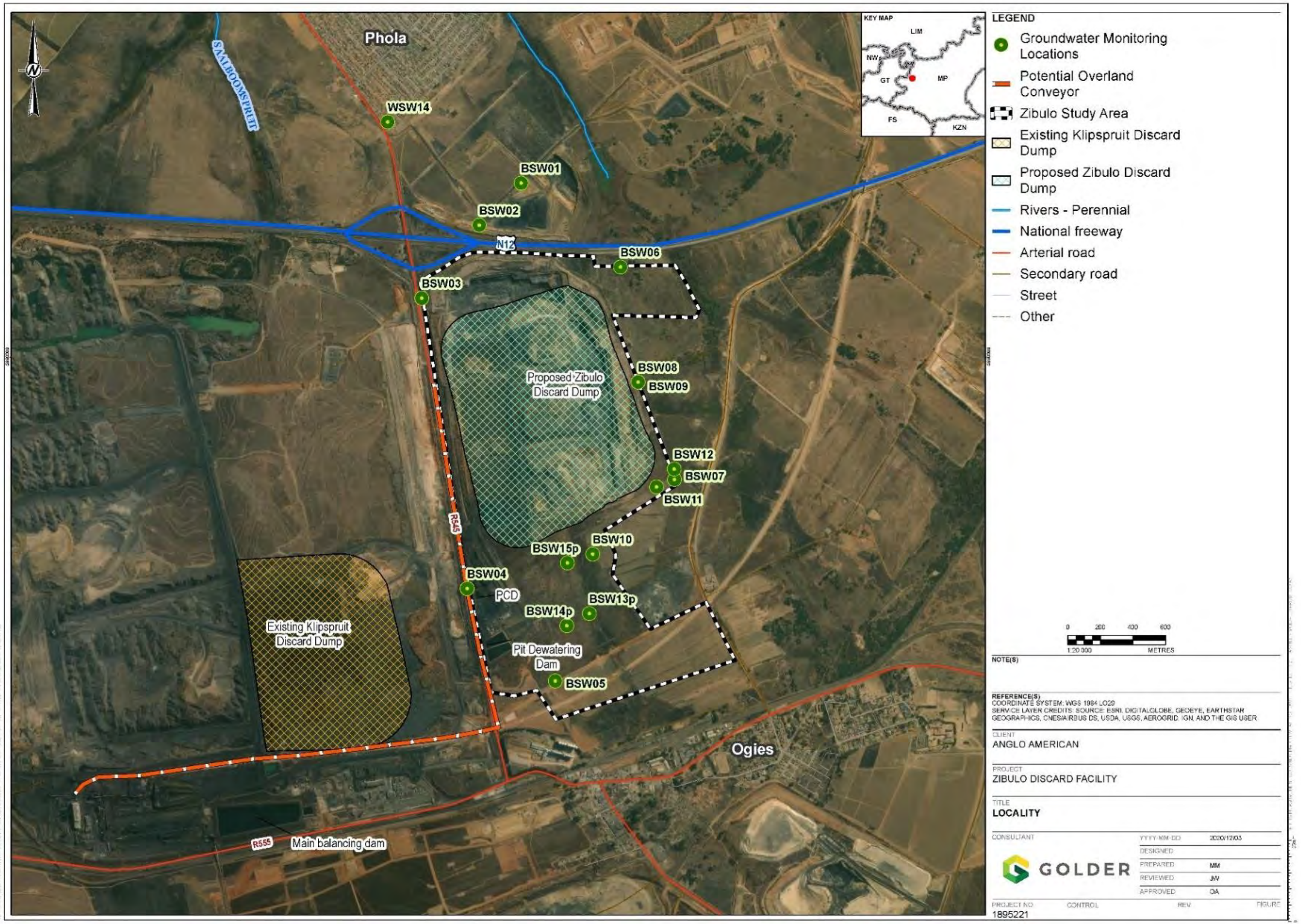


Figure 13: Borehole monitoring localities

9.5 Surface water

The following information is sourced from the hydrology and hydrogeology specialist report appended in APPENDIX K.

9.5.1 Surface water hydrology

Zibulo Opencast falls in the upper Olifants sub-catchment of the Olifants Water Management Area. The opencast workings fall within quaternary catchment B20G. The area drains to the Saalklapspruit/Saalboomspruit via an unnamed tributary.

There are several unnamed tributaries in and around the project site:

- Two tributaries flowing north from the Ogies railway siding to i) the western boundary of Zibulo Colliery where it is then diverted around the pit, and ii) along the eastern side of Zibulo Opencast and then through the township of Phola, and another downstream of the township of Phola to confluence with the Saalboomspruit just upstream of the Phola Wastewater Treatment Works.
- An unnamed tributary flowing north from Klipspruit Colliery to join the Saalboomspruit upstream of the R545 Road that passes the township of Phola.

The Saalboomspruit (sometimes also referred to as the Saalklapspruit) flows north from the N12, to confluence with the Wilge River approximately 40 km downstream, just outside the Ezemvelo Nature Reserve. The river starts just below the South32 Klipspruit mineral right area (MRA), north west of Zibulo Opencast (Figure 1).

The Saalboomspruit falls into the Wilge River Area which has been which has been classified as a Class II. This means that the rivers in the area are moderately used and are rivers in which the water resources condition have been moderately modified from its pre-development condition. While the Saalboomspruit at the confluence of the Wilge River has been categorised as a C ecological category, and it is unlikely that the river in the upper reaches of the quaternary catchment is in the same state, it is important that improvements to the river system and sustainable protection is implemented to maintain the C category, contribute to the category B Recommended Ecological Category (REC) at the Ecological Water Requirements site (EWR 4) in the Wilge River, about 17 km downstream of the Wilge/Saalboomspruit confluence.

9.5.2 Water resource protection

Classification of the water resources has been undertaken and Resource Quality Objectives (RQO) have been set for the Olifants WMA (Government Notice No 466, 22 April 2016, Government Gazette No 39943).

Water resources classification took place with the following principles at the forefront of implementation:

1) Maximising economic returns from the use of water resources;
2) Allocating and distributing the costs and benefits of utilising the water resource fairly; and
3) Promoting the sustainable use of water resources to meet social and economic goals without detrimentally impacting on the ecological integrity of the water resource.

The Saalboomspruit falls into the Wilge River Area which has been classified as a Class II. This means that the rivers in the area are moderately used and are rivers in which the water resources condition have been moderately modified from its pre-development condition. While the Saalboomspruit at the confluence of the Wilge River has been categorised as a C ecological category, and it is unlikely that the river in the upper reaches of the quaternary catchment is in the same state, it is important that improvements to the river system and sustainable protection is implemented to maintain the C category, contribute to the category B

Recommended Ecological Category (REC) at the Ecological Water Requirements site (EWR 4) in the Wilge River, about 17km downstream of the Wilge/ Saalboomspruit confluence.

The site at which Resource Quality Objectives (RQO) have been set is on the Wilge River (EWR4) (illustrated on Figure 16 of APPENDIX K). The RQOs relevant to B20G, are:

- Quantity: Low flows should be improved in order to maintain the river habitat for the ecosystem and ecotourism.
- Quality: The RQO water quality numerical limits set at EWR 4 are set out in Table 14.

Table 14: RQO Numerical Limits for Site EWR 4

Variable	Numerical Limit
Sulphate	≤ 200 mg/L
Fluoride	≤ 2.5 mg/L
Aluminium	≤ 0.105 mg/L
Arsenic	≤ 0.095 mg/L
Cadmium (hard)	≤ 0.003 mg/L
Hexavalent chromium	≤ 0.121 mg/L
Copper (hard)	≤ 0.006 mg/L
Mercury	≤ 0.00097 mg/L
Manganese	≤ 0.99 mg/L
Lead (hard)	≤ 0.0095 mg/L
Selenium	≤ 0.022 mg/L
Zinc	≤ 0.0252 mg/L
Chlorine (free chlorine)	≤ 0.0031 mg/L
Endosulfan	≤ 0.00013 mg/L
Atrazine	≤ 0.0785 mg/L

- Instream habitat and biota:
  - Instream habitat must be in a moderately modified or better condition to sustain instream biota.
  - Instream biota must be in a moderately modified or better condition and at sustainable levels.
  - Low and high flows must be suitable to maintain the river habitat and ecosystem condition.
  - Water quality:
    - Overall salt and sulphate concentrations must be at a level where it does not threaten the ecosystem or agricultural users; and
    - Toxics must not negatively impact on the ecosystem or agricultural users.
- River Riparian Zone habitat:
  - The riparian zone must be in a largely natural or better condition.

- Riparian vegetation must be in a moderately modified condition.
- Low flows must be in a moderately modified or better condition. High flows must be suitable to sustain the riparian zone habitat.

9.5.3 Water quality planning limits

The Olifants Water Management Area has been divided into Management Units that can comprise a quaternary catchment or several quaternary catchments, or even a portion of a quaternary catchment. This was done in order to manage the sub-catchments more easily and support the implementation of the Resource Directed Measures described above. Water Quality Planning Limits (WQPL) have been set for each management unit within the Upper Olifants sub-catchment (DWS, 2016; in (Golder, 2021a)). Zibulo Colliery falls within Management Unit 20 and the WQPLs are described in Table 15.

9.5.4 Integrated water use licence

Zibulo Opencast has an integrated water use licence (IWUL) No: 04/B20G/AGJ/809. The IWUL includes water resource limits for rivers and groundwater. These are included in Table 15.

Table 15: Water Quality Planning Limits for the Saalboomspruit in MU20 and IWUL Limits

Variable	Units	IWUL limits[1]	WQPL for Saalboomspruit
pH		6.5 to 8.4	6.5 to 8.4
Electrical Conductivity	mS/m	-	75
Total Dissolved Solids	mg/L	280	500
Calcium	mg/L	25	80
Magnesium	mg/L	20	50
Sodium	mg/L	20	70
Potassium	mg/L	-	25
Alkalinity	mg/L	-	120
Chloride	mg/L	20	45
Sulphate	mg/L	60	400
Nitrate	mg/L	6	0.5
Nitrite	mg/L	-	-
Fluoride	mg/L	-	0.75
Aluminium	mg/L	-	0.02
Iron	mg/L	-	0.1
Manganese	mg/L	-	0.02
Ammonium	mg/L	-	0.05
Acidity	mg/L	-	-
Total Hardness	mg/L	-	-
Orthophosphate as P	mg/L	-	0.025

9.5.5 Surface water quality

Surface water monitoring sites

The Zibulo Opencast surface water monitoring sites are described in Table 16 and illustrated in Figure 17. These sites are located to assess the water chemistry in all the streams around Zibulo Opencast, up and downstream of the sites.

[1] Note: some of the IWUL limits have recently been amended

Table 16: Surface water monitoring sites around Zibulo Opencast

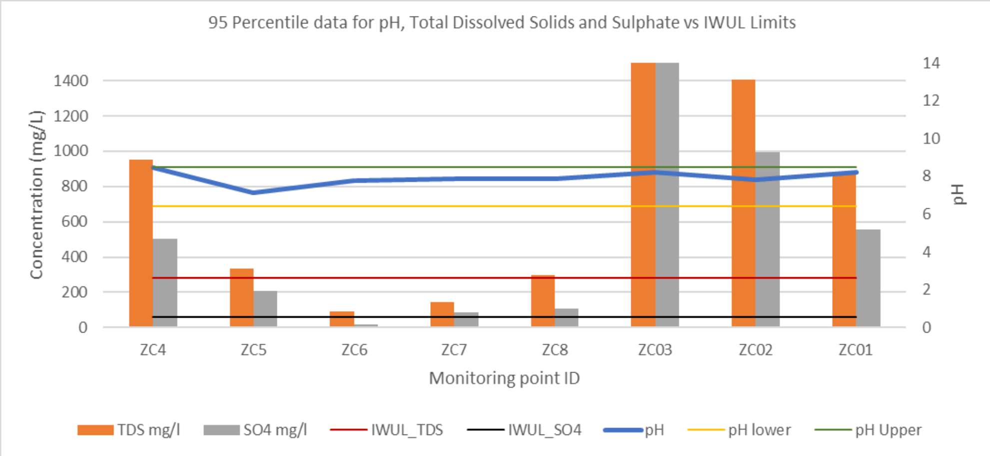
Site ID	Latitude	Longitude	Description
ZC1	-25.96756	29.02706	Most downstream point in Saalboomspruit downstream of Phola
ZC2	-26.005407	29.02587	Saalboomspruit on the R545 crossing near Phola
ZC3	-26.02106	29.02753	Small tributary downstream of Klipspruit Opencast on N12
ZC4	-26.04488	29.04836	Canal from Ogies to Zibulo Opencast (Upstream Locality)
ZC5	-26.0276717	29.05469167	Tributary east of Zibulo Opencast
ZC6	-26.0258767	29.05585	Tributary east of Zibulo Opencast at road crossing
ZC7	-26.02272	29.051617	Combined ZC5 and ZC6 tributaries downstream of Zibulo Opencast
ZC8	-26.022928	29.046566	Tributary draining north, downstream of Zibulo Opencast, to the unnamed tributary that flows through Phola to the Saalboomspruit

Surface water quality assessment

Statistics for the period July 2010 to August 2019 (large gaps for the years 2012 to 2016) are included in Table 8 and Table 9 of APPENDIX K. Figure 14 illustrates the 95 percentile data at the points in and around Zibulo Opencast comparing against the IWUL limits set, as well as against the WQPLs.

The following are noted:

- The unnamed tributaries east of Zibulo Opencast are the least contaminated.
- pH ranged from 5.72 to 6.33 for the lower limit (5 percentile data), and 7.15 to 8.44 for the upper limit (95 percentile data), so in most cases within or close to the IWUL limit and WQPL of 6.5 to 8.4.
- The canal from Ogies to Zibulo Opencast, the upstream site, shows average TDS of 774 mg/L (ranging from 249 to 1 288 mg/L) (Figure 15) and an average sulphate concentration of 345 mg/L (ranging from 42.3 to 673 mg/L). The trends illustrate the impact that the small stream draining from Klipspruit has on the downstream point ZC02 at Phola, and that the river improves by the time it reaches the point downstream of Phola, ZC01.



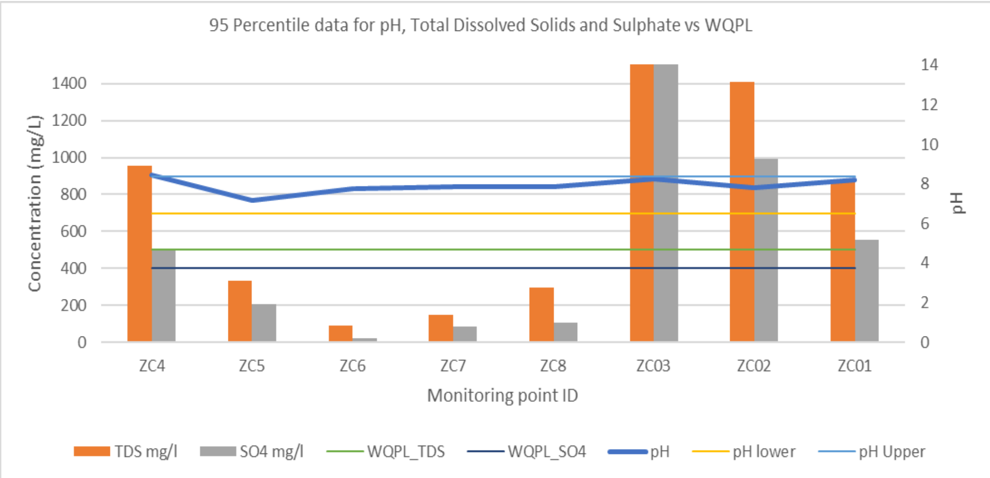


Figure 14: 95 Percentile data for TDS, pH and sulphate concentrations

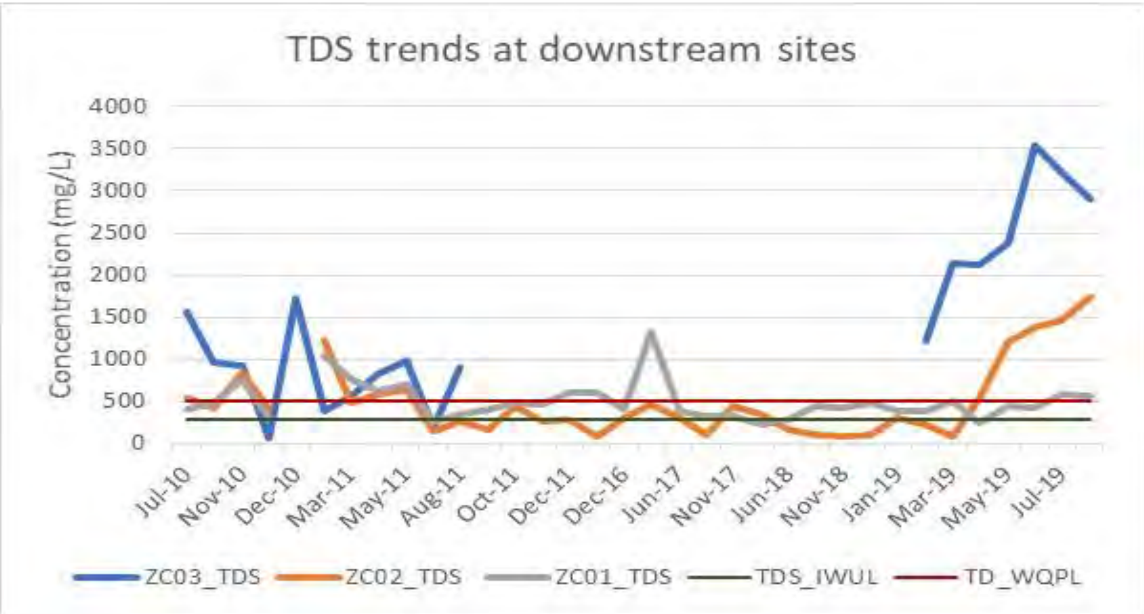


Figure 15: Trends for TDS at the downstream sites ZC03, ZC02 and ZC01

- Monitoring point ZC3 located on the unnamed tributary draining from Klipspruit Opencast near the N12, shows the highest level of contamination with an average TDS concentration of 1 092 mg/L (ranging from 60 to 3 532 mg/L) and an average sulphate concentration of 627 mg/L (ranging from 19.1 to 2 440 mg/L).
- Downstream monitoring points ZC2, on the Saalboomspruit on the R545 crossing near Phola, and most downstream point ZC1, on the Saalboomspruit downstream of Phola show slight improvements with average TDS concentrations of 331 mg/L (ranging from 75 to 1742 mg/L) and 433 mg/L (ranging from 224 to 1328 mg/L) respectively; and average sulphate concentrations of 143 mg/L (ranging from 9.14 to 1 224 mg/L) and 126 mg/L (ranging from 68 to 934 mg/L) respectively.
- The highest concentrations of metals were aluminium, 2.15 mg/L, iron, 2.03 mg/L and manganese, 5.37 mg/L at the downstream sites. Figure 16 illustrates the trends for manganese at the three downstream sites showing that site ZC03 draining from Klipspruit is highly impacted and impacts the lower site ZC02. The recovery of the river by ZC01 is important.
- 95 percentile data for calcium, chloride, sodium and potassium are exceeded at all monitoring points.

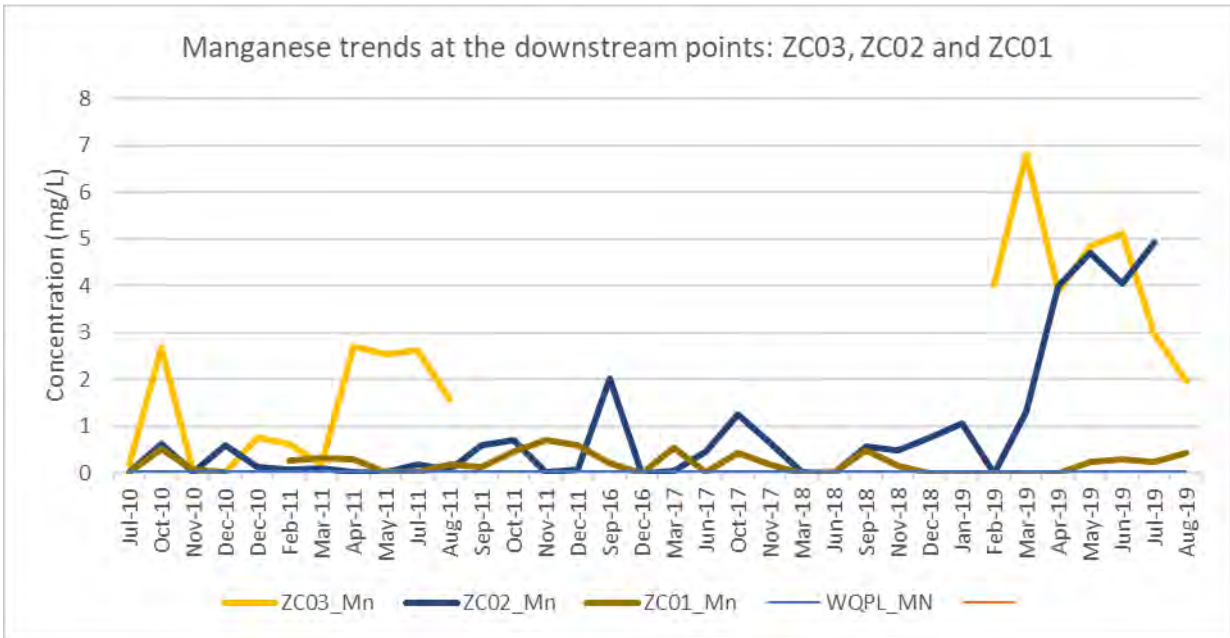


Figure 16: Manganese trends at the downstream points ZC03, ZC03 and ZC01

9.5.6 Water users

The Town of Phola is located directly north of Zibulo Opencast, where both formal and informal residential areas are located. While the majority of the areas receive water from the eMalahleni Local Municipality, it is likely that there are informal dwellers who do use water directly from the river and small farm dams downstream of the mine. Further downstream water is used for irrigation.

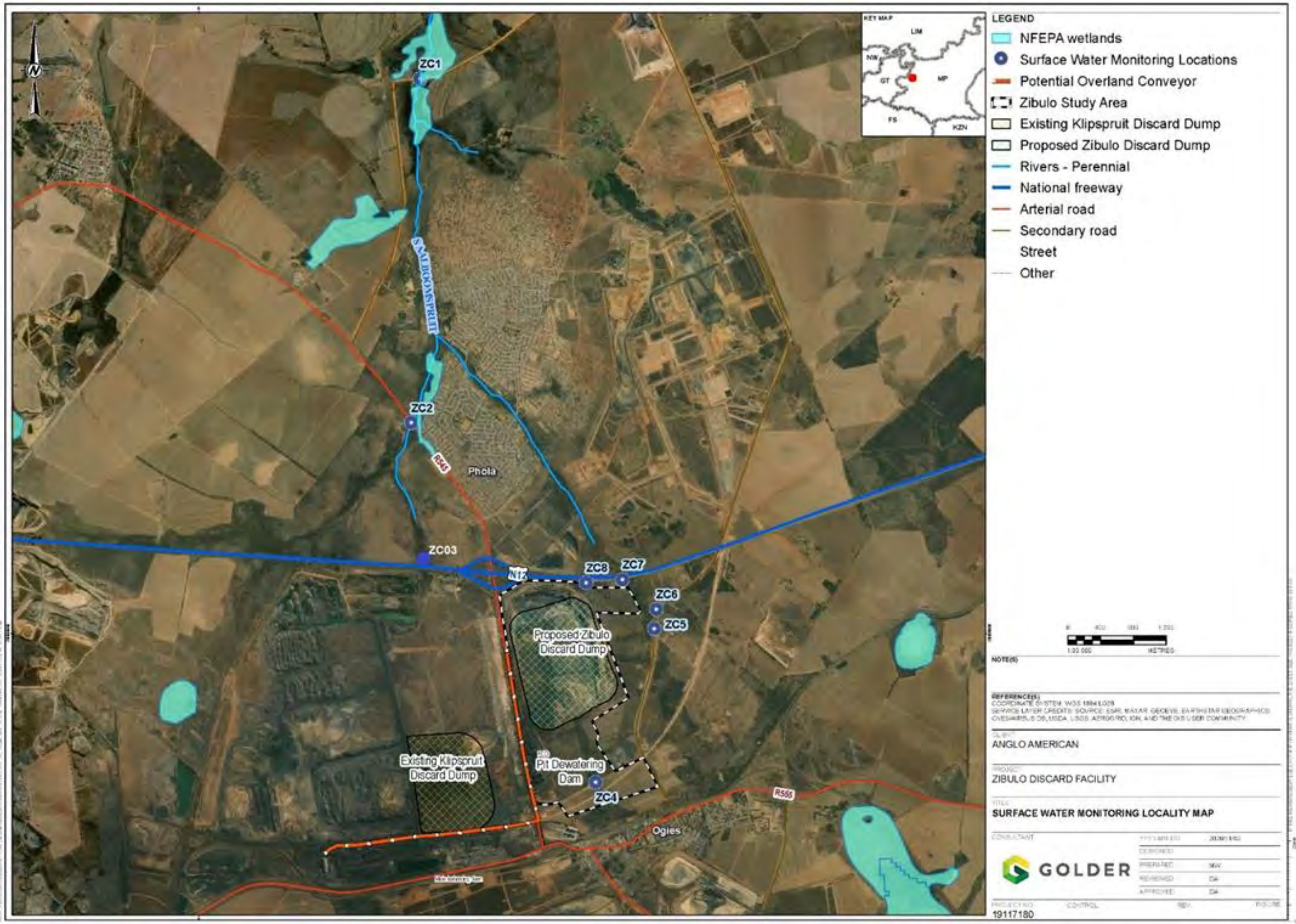


Figure 17: Surface water monitoring points

9.6 Air quality

9.6.1 Regional ambient air quality overview

Zibulo and the surrounding areas fall within the Highveld Priority Area (HPA) and are therefore subject to its Air Quality Management Plan (AQMP) (DEA, 2015, in: Golder, 2021b). This was put in place to help alleviate the large amounts of air pollution that the region was experiencing. Exceedances of fine particulate matter with an aerodynamic diameter ten microns (PM_{10}), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3) have often been recorded in the pollution hotspots of the eMalahleni, Kriel, Steve Tshwete, Ermelo, Secunda, Ekurhuleni, Lekwa, Balfour and Delmas areas (DEA, 2015, in: Golder, 2021b). Despite the implementation of the HPA AQMP there continue to be exceedances in:

- PM_{10} and fine particulate matter with an aerodynamic diameter 2.5 microns ($PM_{2.5}$) in particular, areas proximate to significant industrial operations as well as residential areas where domestic coal burning is occurring;
- SO_2 in eMalahleni, Middelburg, Secunda, Ermelo, Standerton, Balfour, and Komati due to a combination of emissions from the different industrial sectors, residential fuel burning, motor vehicle emissions, mining and cross-boundary transport of pollutants into the HPA adding to the base loading;
- NO_2 in the eMalahleni, Steve Tshwete and Ekurhuleni areas where anthropogenically induced and naturally occurring biomass fires occur throughout the HPA at all times of the year and contribute NO_2; and
- O_3 in Kendal, Witbank, Hendrina, Middelburg, Elandsfontein, Camden, Ermelo, Verkykkop and Balfour thought to be due to biomass burning.

9.6.2 Local ambient air quality overview

Potential sources of air pollution within vicinity of the Zibulo have been identified to include:

- Agricultural activities;
- Biomass burning;
- Domestic fuel burning;
- Mining activities;
- Vehicle emissions (tailpipe and entrained emissions); and
- Power generation.

9.6.2.1 Agricultural activities

Emissions from agricultural activities are difficult to control due to the seasonality of emissions and the large surface area producing emissions (USEPA, 1995). Most of the agricultural activities in the region appear to be the commercial farming dedicated to crops and to a smaller extent grazing, which is common in the region. Despite the large-scale presence of agricultural activities within the area, agricultural emissions are not expected to significantly influence the air quality in the area. This is due to HPA AQMP stating that industrial sources are by far the largest contributor of emissions, accounting for 89% of PM_{10}, 90% of Nitrogen Oxides (NO_x) and 99% of SO_2. Particulate emissions may increase during the frequent periods where the Highveld grasslands are subjected to wildfires.

9.6.2.2 Biomass burning

Biomass burning may be described as the incomplete combustion process of natural plant matter with Carbon Monoxide (CO), Methane (CH_4), NO_2 and PM_{10} being emitted during the process. During the combustion process, approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% remains in the ashes and it is assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds. In comparison to the nitrogen emissions, only small amount of SO_2 and sulphate aerosols are emitted. With all biomass burning, visible smoke plumes are typically generated. These plumes are created by the aerosol content of the emissions and are often visible for many kilometres from the actual source of origin.

The extent of emissions liberated from biomass burning is controlled by several factors, including:

- The type of biomass material;
- The quantity of material available for combustion;
- The quality of the material available for combustion;
- The fire temperature; and
- Rate of fire progression through the biomass body.

Crop-residue burning and general wildfires represent significant sources of combustion-related emissions associated with agricultural areas. Given that the region has significant agricultural activities rather, controlled burning related to the agricultural activities contribute to air quality.

9.6.2.3 Domestic fuel burning

Domestic fuel burning of coal emits a large amount of gaseous and particulate pollutants including sulphur dioxide, heavy metals, total and respirable particulates, inorganic ash, carbon monoxide, polycyclic aromatic hydrocarbons, and benzo(a) pyrene. Pollutants arising due to the combustion of wood include respirable particulates, nitrogen dioxide, carbon monoxide, polycyclic aromatic hydrocarbons, particulate benzo(a) pyrene and formaldehyde. The main pollutants emitted from the combustion of paraffin are nitrogen dioxide, particulates, carbon monoxide and polycyclic aromatic hydrocarbons.

The density of housing in the region is relatively low with most residential areas being confined to small local towns such as Phola, Wilge and Ogies. In addition to these small residential areas, individual farms/homesteads are scattered throughout the region and comprise of formal and informal residential structures. It is thus highly likely that certain households within the communities are likely to use coal, wood and paraffin for space heating and/or cooking purposes. Emissions from these communities and/or the individual residences/homesteads are not anticipated to have a significant impact on the regional air quality due to their low density and dispersed nature.

9.6.2.4 Vehicle emissions

Air pollution generated from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly to the atmosphere as tail-pile emissions, whereas secondary pollutants are formed in the atmosphere as a result of atmospheric chemical reactions, such as hydrolysis, oxidation, or photochemical reactions. The primary pollutants emitted typically include Carbon Dioxide (CO_2), CO hydrocarbons (including benzene, 1.2-butadiene, aldehydes and polycyclic aromatic hydrocarbons), SO_2, NO_x and particulates. Secondary pollutants formed in the atmosphere typically include NO_2, photochemical oxidants such as O_3, hydrocarbons, sulphur acid, sulphates, nitric acid, sulphates, nitric acid and nitrate aerosols.

The quantity of pollutants emitted by a vehicle depends on specific vehicle related factors such as vehicle weight, speed and age; fuel-related factors such as fuel type (petroleum or diesel), fuel formulation (oxygen, sulphur, benzene and lead replacement agents) and environmental factors such as altitude, humidity and temperature (Samaras and Sorensen, 1999).

Given the population density in the region, and the distribution of the mining activities, it is anticipated that vehicle exhaust emissions and their contribution to ambient air pollutant will be relatively insignificant.

9.6.2.5 Mining activities

Dust and fine particulate emissions associated with mining operations include wind erosion from waste rock dumps, tailings facilities, open mining pits, blasting emissions, ore processing and refining, sintering operations, unpaved mine access roads and other exposed areas. Factors which influence the rate of wind erosion include surface compaction, moisture content, vegetation, shape of storage pile, particle size distribution, wind speed and rain. Emissions from the mining activities are anticipated to be one of the dominant emissions influencing and impacting on the regional air quality.

Numerous significant mining operations are present in the region (I.e. Klipspruit Colliery, Mbali Colliery, Goedgevonden Mine, Khutala Colliery, Wescoal Khanyisa Colliery, Ogies Mine, Kendal Mine etc.). Mining, along with contributions from power stations, are likely to be the largest sources of particulates (PM_{10}, $PM_{2.5}$, Total Suspended Particulates - TSP) within the region, with smaller contributions from industry and biomass burning.

9.6.2.6 Power generation

South Africa mainly relies on its extensive coal reserves as its primary source of energy. A large amount of CO_2, CO, SO_2, sulphur trioxide (SO_3), NO_2 and nitric oxide (NO), some traces of heavy metals and particulates such as PM_{10} are released whenever coal is burned at the power stations (Munawer, 2017). These power stations are one of the key emission sources and contribute significantly to the level of air pollution within the region. Several coal fired power stations are in close proximity to Zibulo including Kendal, Kriel, Duvha and the Matla power station.

9.6.3 Local ambient air quality monitoring

Dust fallout and particulate matter-monitoring for Zibulo Colliery dates as far back as 2010. For the purpose of this study, reference has been made to the most current and available monitoring data, for the period 2019.

9.6.3.1 PM_{10} monitoring

Particulate matter at Zibulo is currently monitored at the Ogies School, using a Topaz monitor mounted on a solar-powered monitoring trailer. Particulate matter was historically monitored at the Zibulo opencast offices using an E-Sampler monitor. The E-sampler unit however was an old monitor with continuous faults, yielding low data recoveries. Subsequently, the E-sampler was decommissioned in June 2019.

Given the historically low data recovery rates from the E-sampler, the Topaz unit was used to determine the particulate matter annual averages. Data recovery for the monitoring period using the Topas was above the minimum requirement of 90% as stipulated by the SANAS, 2012 TR 07-03 standards.

For the period May to December 2019, the PM_{10} annual average (51 $\mu g/m^3$) was non-compliant with the annual average PM_{10} standard (40 $\mu g/m^3$), whilst the $PM_{2.5}$ annual average (16 $\mu g/m^3$) was compliant with the annual average $PM_{2.5}$ standard (20 $\mu g/m^3$) using the data from the Topas. Such concentrations are however representative of the current baseline conditions in the HPA.

9.6.3.2 Dust fallout monitoring

For the period May to December 2019, dust fallout monitoring at Zibulo was conducted at six monitoring locations, consisting of one directional (oil office monitoring location) bucket and six single buckets (oil office, WHBO office, offramp, west of opencast, Phola and Ogies School monitoring locations, of which only Phola an Ogies School are residential locations).

For the period January to December 2019 a 12-month residential and non-residential network average of 521 mg/m^2/day and 928 mg/m^2/day, respectively (below the Residential and Non-Residential Dust Control Regulations) was noted over the period.

9.6.4 Sensitive receptors

For the proposed discard facility project, sensitive receptors within close proximity of Zibulo Opencast were identified and are presented in in Table 17 and Figure 18.

Table 17: Sensitive receptors (SR) within a 10km radius of Zibulo

No.	Sensitive Receptor Name	Sensitive Receptor Type	GPS Location		Distance from Site Boundary (km)	Direction from Site
			East	South		
1	Residential	Residential	29.0489	-26.1207	8.18	South
2	Residential	Residential	29.0364	-26.1208	8.20	South
3	Residential	Residential	29.0971	-26.0210	4.78	East-north-east
4	Residential	Residential	29.0618	-25.9606	6.76	North
5	Residential	Residential	29.0238	-25.9626	6.53	North-north-west
6	Residential	Residential	29.0081	-25.9625	7.16	North-north-west
7	Residential	Residential	29.0001	-25.9624	7.58	North-north-west
8	Residential	Residential	28.9936	-25.9612	8.07	North-north-west
9	Residential	Residential	28.9861	-25.9762	7.35	North-north-west
10	Residential	Residential	28.9620	-26.0067	7.72	North-west
11	Residential	Residential	28.9622	-25.9884	8.45	North-west
12	Residential	Residential	28.9507	-26.0536	8.98	West-south-west
13	Residential	Residential	28.9500	-26.0567	9.11	West-south-west
14	Phola Clinic	Clinic	29.0358	-26.0081	1.40	North
15	Mabande Secondary School	School	29.0316	-26.0046	1.95	North
16	Mehlwana Secondary School	School	29.0388	-25.9945	2.75	North
17	Residential	Residential	29.0458	-26.0520	0.59	South
18	Residential	Residential	29.0478	-26.0542	0.89	South
19	Residential	Residential	29.0109	-25.9881	4.68	North-north-west
20	Residential	Residential	28.9957	-26.0141	4.25	North-west
21	Thembelihle Primary School	School	29.0454	-26.1110	7.09	South
22	Gekombineerde Skool Ogies	School	29.0683	-26.0489	1.90	East-south-east
23	Imbalenhle Primary School	School	28.9722	-26.0412	6.64	West
24	Thuthukani Primary School	School	29.0387	-26.0094	1.15	North
25	Hlanga Phala Primary School	School	29.0326	-26.0072	1.65	North
26	Ogies Clinic	Clinic	29.0559	-26.0502	0.90	South-east
27	Ogies District Surgeon	Surgeon	29.0568	-26.0498	0.93	South-east
28	Residential	Residential	29.0354	-26.0077	1.45	North

No.	Sensitive Receptor Name	Sensitive Receptor Type	GPS Location		Distance from Site Boundary (km)	Direction from Site
			East	South		
29	Residential	Residential	29.0841	-25.9771	6.24	North-north-east
30	Residential	Residential	29.0847	-25.9915	5.21	North-north-east
31	Residential	Residential	29.1066	-25.9923	6.92	North-east
32	Residential	Residential	29.0741	-26.0187	2.71	North-east
33	Residential	Residential	29.0718	-26.0235	2.31	East-north-east
34	Residential	Residential	29.0084	-26.0667	4.17	South-west
35	Residential	Residential	28.9694	-26.0611	7.36	West-south-west
36	Residential	Residential	28.9669	-26.0604	7.58	West-south-west
37	Residential	Residential	28.9583	-26.0590	8.36	West-south-west
38	Residential	Residential	29.0219	-26.1165	8.01	South-south-west
39	Residential	Residential	28.9755	-26.0794	7.71	South-west
40	Residential	Residential	28.9503	-26.0124	8.73	West-north-west
41	Residential	Residential	29.0366	-25.9741	5.02	North
42	Residential	Residential	29.0494	-25.9741	5.03	North
43	Residential	Residential	29.0770	-26.0487	2.74	East-south-east
44	Residential	Residential	28.9627	-26.0400	7.56	West
45	Residential	Residential	28.9955	-26.0816	6.18	South-west
46	Residential	Residential	29.0045	-26.0894	6.14	South-west
47	Residential	Residential	29.0587	-26.1185	8.05	South-south-east

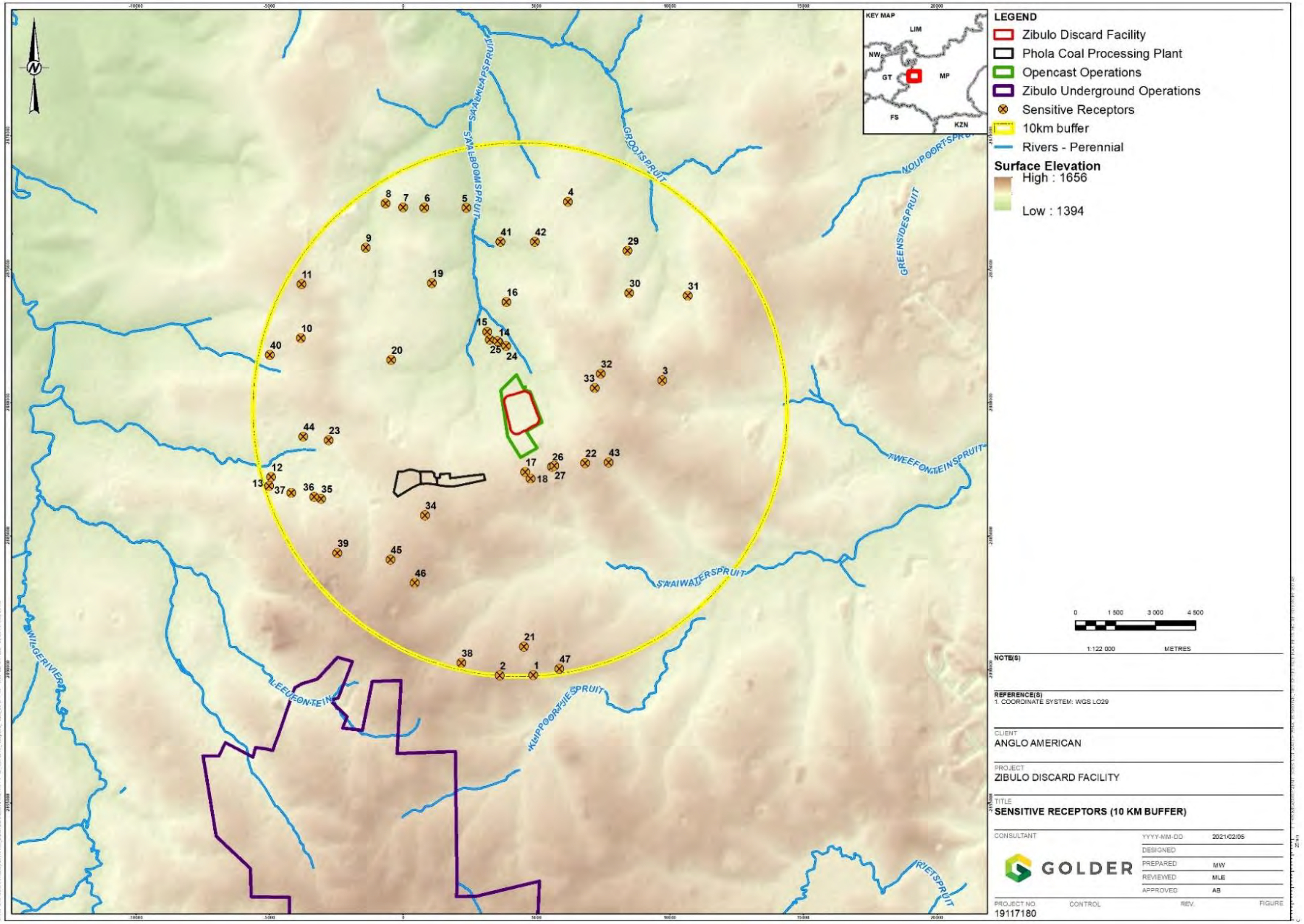


Figure 18: Local topography and sensitive receptors (10 km radius) of Zibulo

9.7 Noise

The noise in the area is largely characterized by the presence of mining and industrial activities. There are numerous roads crossing the area, which carry a large amount of traffic with a high percentage of heavy vehicles, especially those associated with the coal mining activities in the area (Licebo Environmental and Mining (Pty) Ltd, 2018). The N12 passes the northern border of the mine, and traffic on this highway is a major contributor to the ambient noise climate in the area (Licebo Environmental and Mining (Pty) Ltd, 2018). The countryside is characterised as gently undulating; thus the present topography is expected to provide little natural screening against noise propagated by the mine (Licebo Environmental and Mining (Pty) Ltd, 2018). Blasting at the opencast mining operations in the area result in some vibration (Licebo Environmental and Mining (Pty) Ltd, 2018).

9.8 Visual

Based on the results of the visual specialist study (Golder, 2020), the baseline visual aesthetics of the project site can be summarised as follows:

- The visual resource value of the study area is expected to be low, for the following reasons:
  - **Topography**: The natural landscape is generally flat to undulating, with low-lying areas and elevated sites associated with wetlands and pans, and small hills, respectively. However, the natural topographical features are mostly unobtrusive and do not form visual landmarks. By contrast, the mining stockpiles are prominent features in the landscape, and generally contrast dramatically and negatively with the natural topographical aesthetic:
    - The topographic value of the study area therefore has a low value.
  - **Hydrology**: Despite the presence of various rivers/streams and pans in the study area and these being of at least some visual appeal, none are particularly visually prominent, and are thus not highly significant features within the overall visual context:
    - The visual resource value of the study area's hydrology is therefore considered to be moderate.
  - **Vegetation cover**: Natural habitat across the majority of the study area has been transformed or severely modified by mining and agriculture. Stands of alien trees are present, and although they add complexity to the landscape visual character, they are listed as invasive and require removal:
    - The visual resource value of the study area's vegetation cover is therefore expected to be low;
  - **Land use**: Mining, agriculture and, to a lesser extent power generation, are the prevailing or most visually prominent land uses across the majority of the study area. Facilities associated with mining and power generation are optically intrusive and detract from the visual aesthetic of the landscape:
    - The visual resource value of the study area's land use is therefore considered to be low.
- The visual absorption capacity (VAC)[2] of the study area is rated high degree of landscape transformation within the surrounding landscape; and
- A high number of people are expected to be visually affected by the project (Figure 19), but the overall perceived landscape value is expected to be low.

[2] Defined as an "estimation of the capacity of the landscape to absorb development without creating a significant change in visual character or producing a reduction in scenic quality"

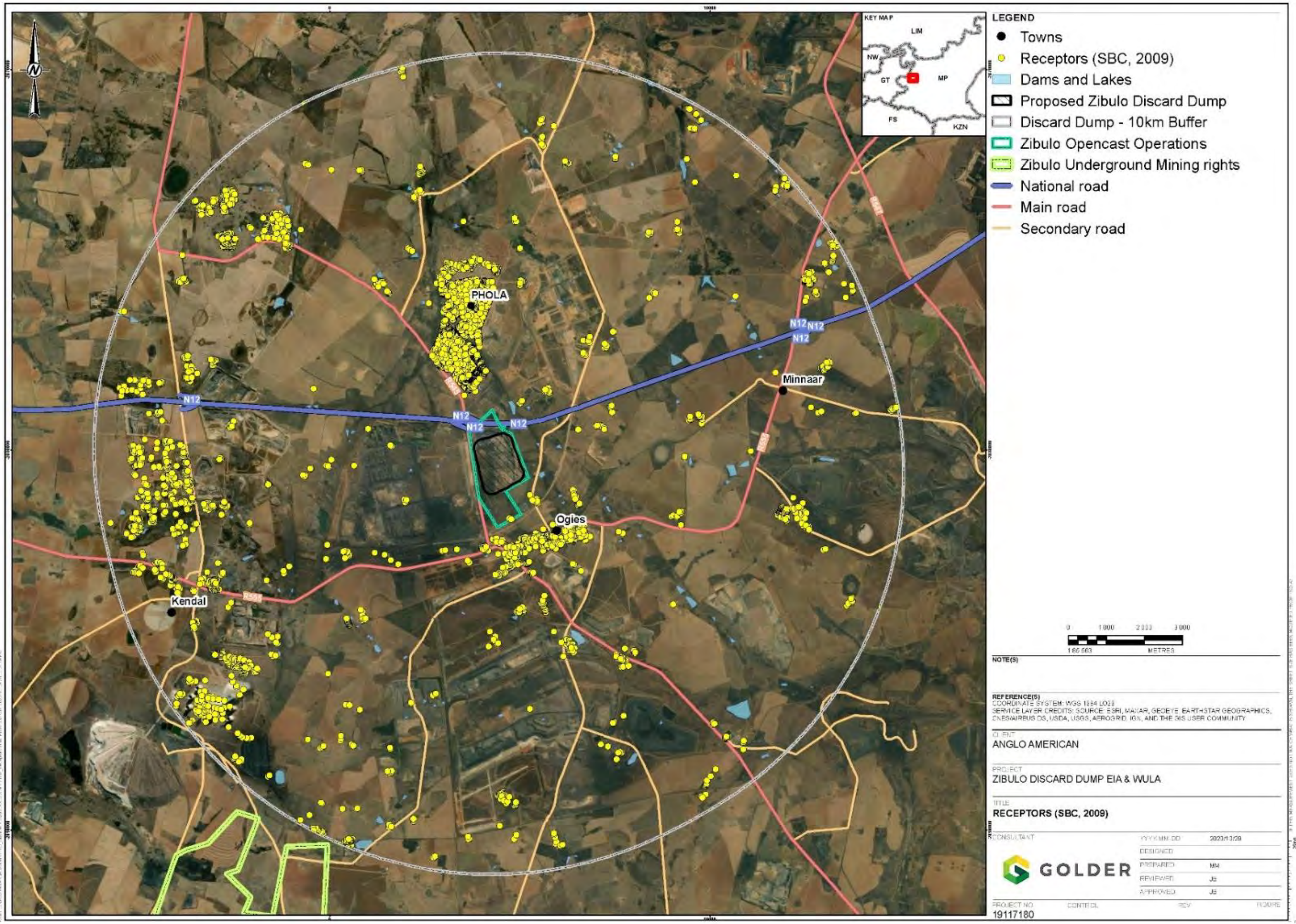


Figure 19: Visual receptors in the study area (10 km buffer around the proposed discard facility)

9.9 Soils, land use and land capability

No undisturbed soils are associated with the proposed discard facility footprint. The footprint area has already been mined and backfilled with spoils. The adjacent land use is dominated by agricultural activities (mainly maize), mixed commercial and residential (Ogies Town) and mining activities (operational and defunct mines). SSF bunkers are present on the eastern side of the mining area (Licebo Environmental and Mining (Pty) Ltd, 2018). A cut flower operation using hothouses occurs to the south of the area.

9.10 Terrestrial ecology

Since the site is an active opencast mining area, the vegetation was removed when mining commenced. The natural habitat in the area is considerably transformed by mining and agriculture within the surrounding area. From a faunal point of view, there are no natural habitats within the Zibulo opencast mining area. The watercourse to the east of the site provides a habitat for mammals, amphibians, avifauna and reptiles to occur (Licebo Environmental and Mining (Pty) Ltd, 2018).

9.11 Wetlands

9.11.1 Regional context

The National Wetland Map version 5 (NWM5) for South Africa and other data layers associated with the South African Inventory of Inland Aquatic Ecosystems (van Deventer et al., 2019, in: Golder, 2021c) indicates the presence of a channelled valley bottom wetland within the study area (Figure 20). The same dataset indicates that the present ecological state (PES) of that wetland is Largely to Severely/Critically Modified (Figure 21).

The Mpumalanga Biodiversity Sector Plan (MBSP) comprises two spatial components; maps of terrestrial and freshwater critical biodiversity areas (CBAs); and a set of land-use guidelines that are important for maintaining and supporting the inherent biodiversity values of these critical biodiversity areas. The Freshwater Assessment of the plan has categorized the wetlands within the study area as ‘other natural areas’ (Figure 22), that is, non-priority wetlands in terms of conservation management.

9.11.2 Site Context

The following information has been extracted from a study conducted by Wetland Consulting Services (Wetland Consulting Services, 2017).

The pre-mining extent of wetlands across the Zibulo Colliery opencast section’s catchment area was approximately 62.67 ha and consisted of hillslope seepage wetland habitat (Wetland Consulting Services, 2017). Due to recent opencast mining activities, a portion of this seepage wetland has been lost; the lost section of hillslope seepage wetland is identified as the relict wetland. Where the relict wetland area is shown in Figure 23, the extent shown is that delineated prior to loss of the wetland. Even prior to mining, the relict wetland system had been extensively transformed by the prior land use dominated by agricultural activities, did not offer a high level of ecological services to the landscape, and was of low ecological importance.

Presently, due to the progressive extent of mining activities on site, a section of the natural seepage wetland has been lost (relict wetland) and an artificial wetland has formed along the spoil stockpiles due to the fragmentation of the wetland system by mining activities on site and interruption of the natural flow patterns from the catchment. This artificial wetland forms a diversion of water along the stockpiles, which then discharges to the adjacent wetland within the Zibulo opencast mine. The current extent of wetland habitat on site (both natural and artificial) is shown in Figure 23.

The findings of the 2017 study (Wetland Consulting Services, 2017) indicated that:

- The present ecological state (PES) of the wetlands on site range from Moderately Modified (PES Category C: middle seepage area) to Largely Modified (PES Category D: northern and southern seepage areas), to Critically Modified (PES Category F, relict wetland area); and
- The wetlands within the study area are considered to be of moderate (C) to low/marginal (D) ecological importance and sensitivity.

It is important to note that Zibulo Colliery has an approved wetland rehabilitation strategy, which entails the following:

- Rehabilitating northern and southern seepage areas; and
- Recreation and/or establishment of a watercourse through the mined-out areas.

Zibulo Colliery has commenced with the implementation of this strategy.

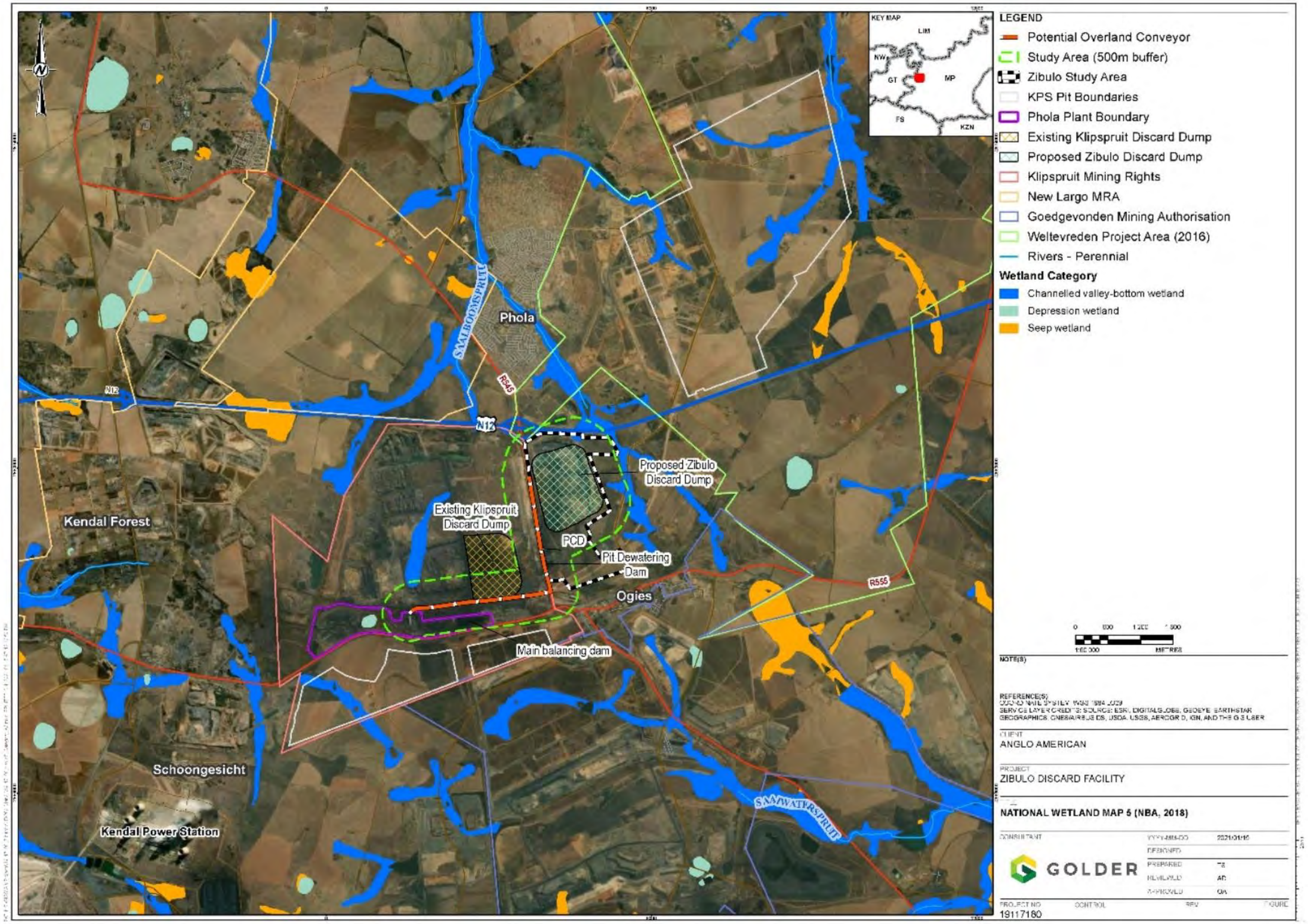


Figure 20: Channelled valley bottom wetlands within the study area

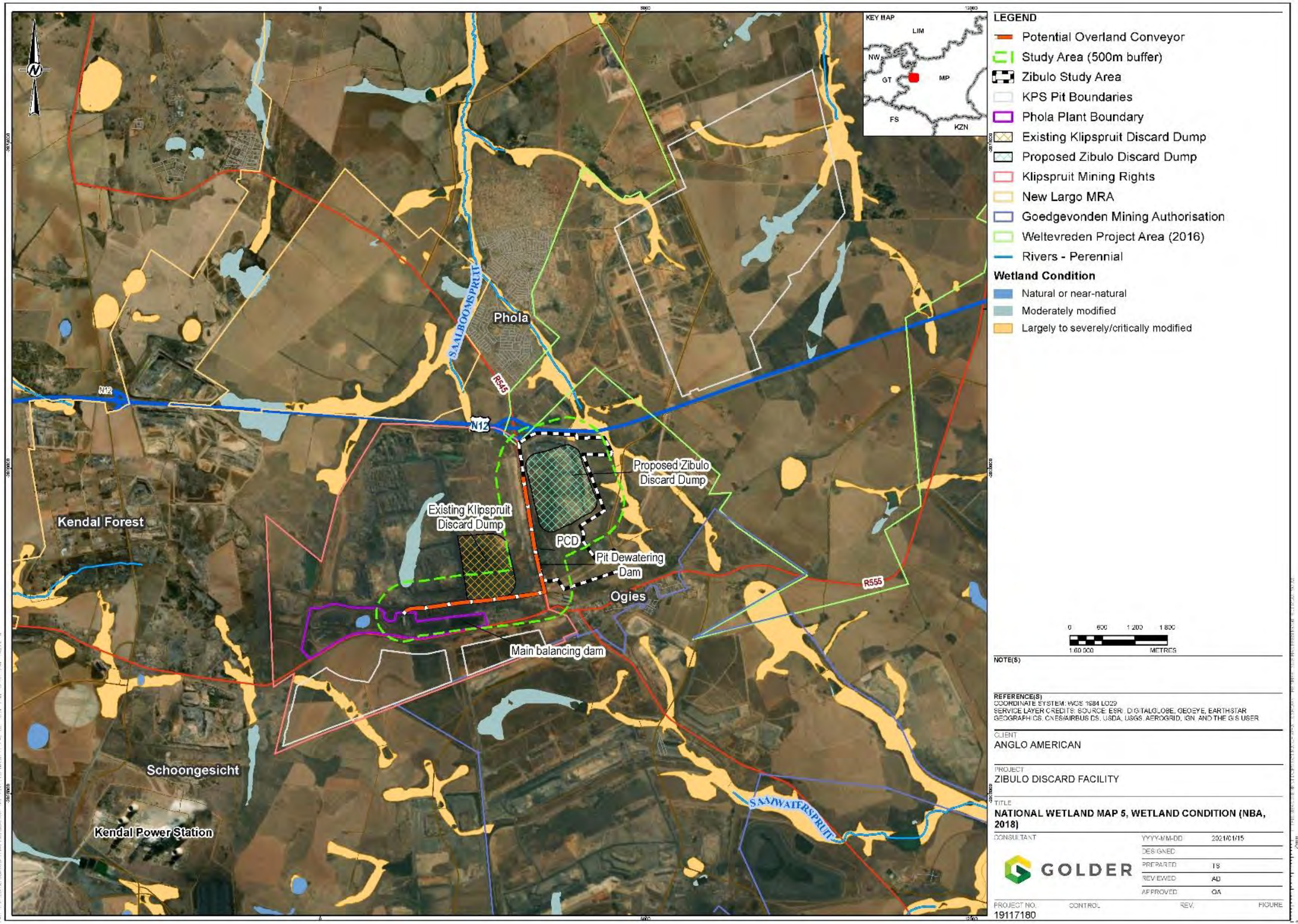


Figure 21: PES of wetlands within the study area (van Deventer et al., 2019, in: Golder, 2021c)

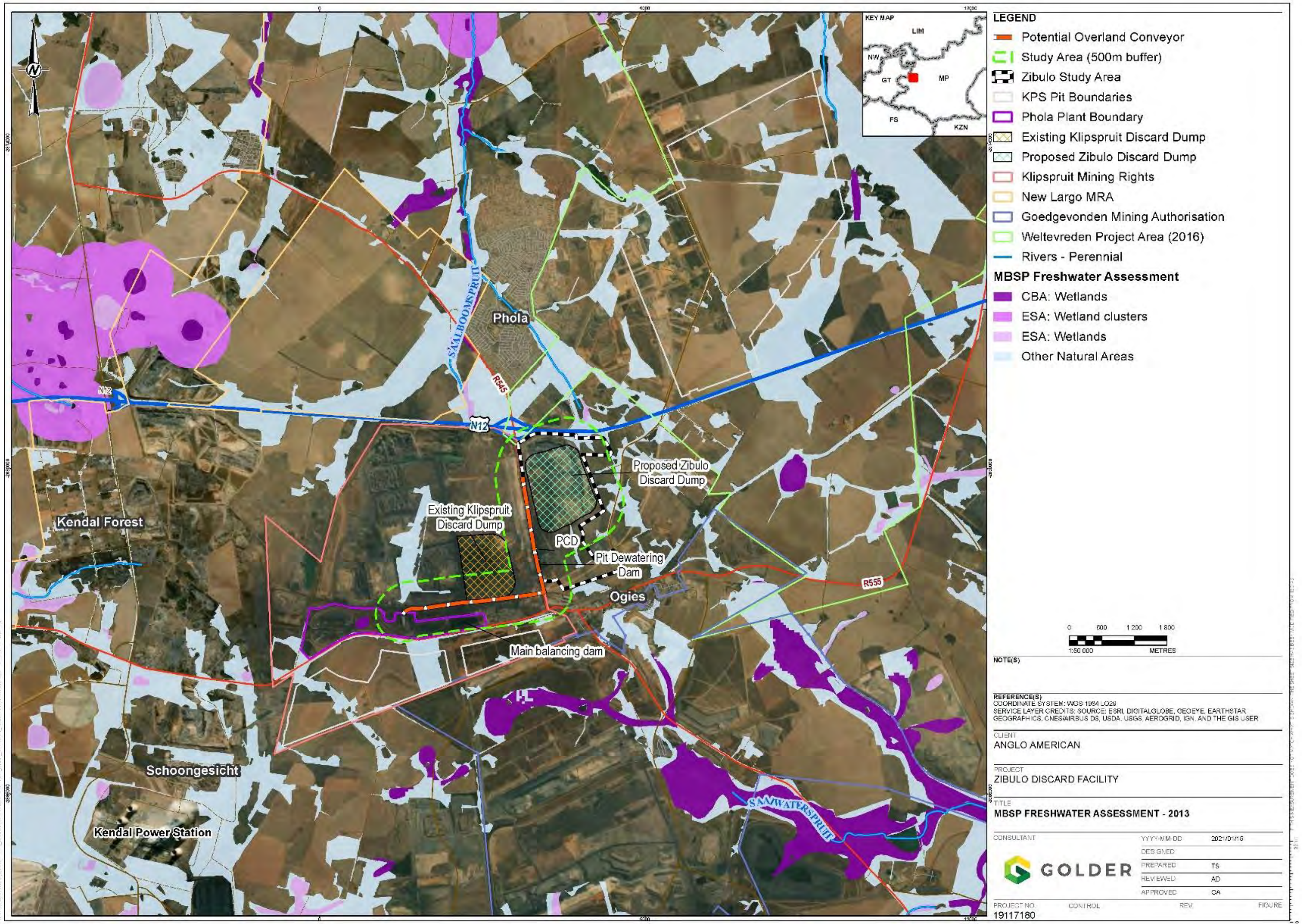


Figure 22: MBSP Freshwater Assessment of wetlands in the study area

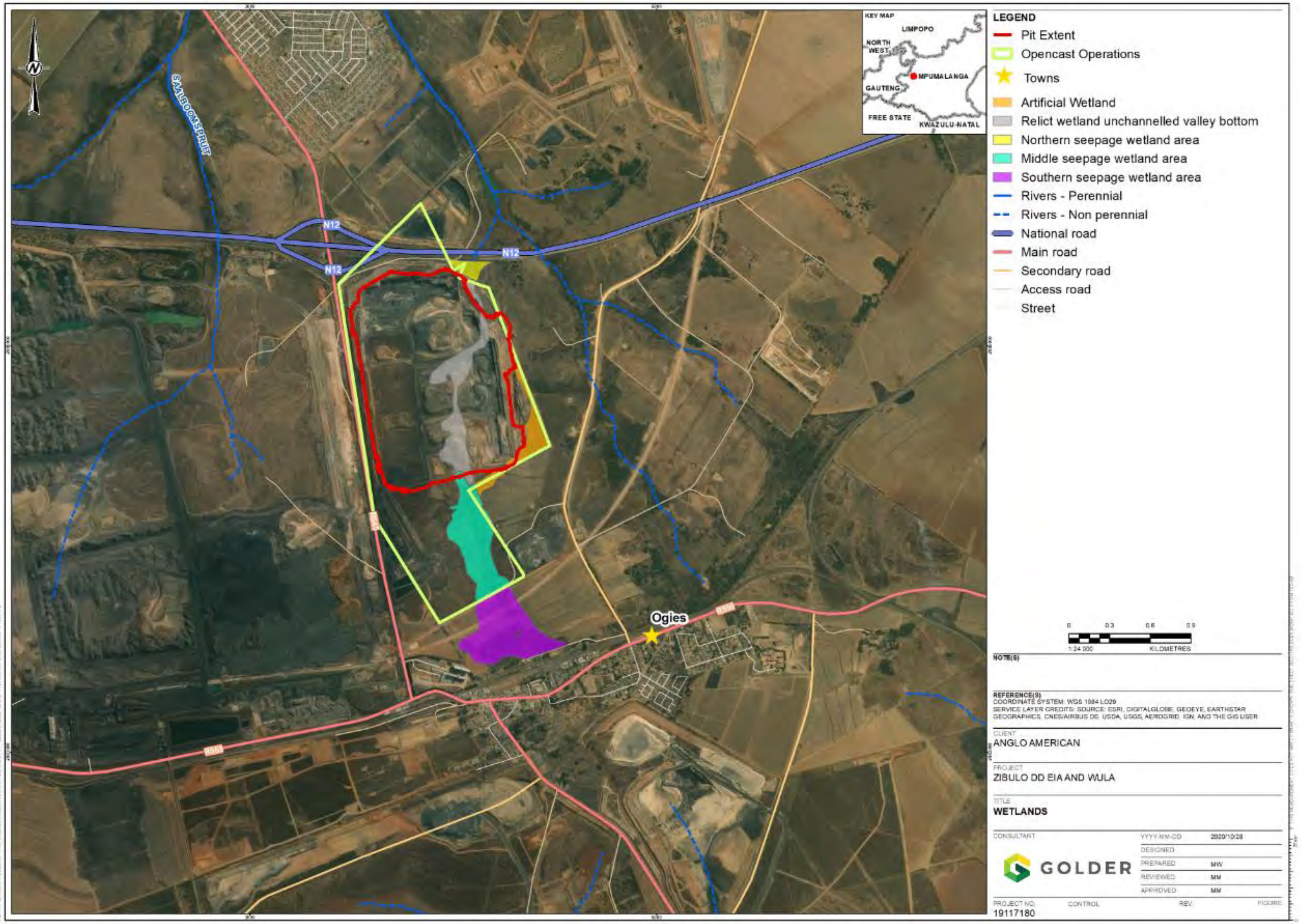


Figure 23: Remaining wetlands within the opencast operation limits (Wetland Consulting Services, 2017)

9.12 Aquatic Ecosystems

Zibulo Colliery falls under the Upper Olifants Catchment, Management Unit (MU) 20. The quaternary catchment in which the Colliery lies is B20G. Streams from the mining area drain to the Saalklapspruit which drains into the Wilge River which is a part of the Loskop Dam catchment.

9.12.1 Aquatic Biomonitoring

Biomonitoring and toxicity testing surveys of selected sites on the Saalklapspruit (Figure 24) have been conducted biannually (during the dry and wet seasons) from 2012 – 2018 by Clean Stream Biological Services for Zibulo Colliery. The results of the most recent survey are summarised in this report, to contextualise the baseline aquatic ecology situation of the Saalklapspruit within the Zibulo Colliery study area.

9.12.1.1 Overview

The eastern tributary of the Saalklapspruit most closely associated with the study area is non-perennial, associated with a valley bottom wetland system, and occurs at the top of the catchment, which reduces the usefulness of the conventional macroinvertebrate indices typically used to characterise riparian ecosystem quality, including the South African Scoring System, version 5 (SASS5) macro-invertebrate index (or Macro-invertebrate Response Assessment Index (MIRAI) invertebrate stressor-response index). In addition, fish sampling of the monitoring sites in the study area has been discontinued, due to the presence of limited available fish habitat in the wetland systems, resulting in a diversity of species that is simply too low for biomonitoring to be meaningful.

9.12.1.2 Diatoms

The results of diatom analyses of samples taken from monitoring sites on the eastern tributary of the Saalklapspruit indicate that organic pollution is the driving variable for biological water quality, with identified sources including sewage discharge from the town of Phola, which were linked to rapid water quality changes. Nevertheless, the diatom assemblage in 2018 was indicative of a low level of organic pollution, with the abundance of key indicator species associated with industry and sewage similar to the previous year, suggesting that the trends in related impacts remain stable.

9.12.1.3 Toxicity Testing

Toxicity testing is based on the exposure of biota (i.e. algae, fish and invertebrates) to water sampled from the selected biomonitoring locations in a laboratory environment, to assess the potential risk of the sampled waters to the biota/biological integrity of the receiving water bodies.

Water sampled from sites ZC-7A and ZC-7B during December 2019, upstream and downstream of the Zibulo open-cast mine respectively, were found to pose a Slight (Class II) toxicity hazard, and as such, there was a slight risk that the water was toxic to aquatic biota. However, since both upstream and downstream sites were equally affected, this was not conclusively linked to Zibulo activities, and may be linked to external influences such as agricultural activity.

9.12.1.4 Aquatic Macroinvertebrates

SASS5 scores for sites sampled on the eastern tributary of the Saalklapspruit during 2018 ranged between 44 and 55 upstream of the opencast operation and fell to 26 downstream of the opencast at ZC1, near Phola. Reduced scores compared to previous sampling events were linked to the construction of wetland crossings in the upstream section, and roadworks near Phola, however it was noted that since the system is non-perennial, SASS5 scores are not necessarily indicative of aquatic health; and expansion of the toxicity testing programme is likely to provide a more accurate reflection of aquatic health in relation to the potential effect of Zibulo opencast activities.

The MIRAI scores derived for the sites on the eastern tributary downstream of the Zibulo opencast categorised the invertebrate ecological category for the system as Largely to Seriously Modified (Category D to E).

9.13 Heritage

APAC cc was appointed to provide a Motivation from a Full Phase 1 heritage impact assessment (HIA) (APAC cc, 2021). The information provided below is sourced from this report (see APPENDIX O):

- The closest known Stone Age occurrences are Late Stone Age sites at Carolina and Badplaas, and rock painting sites close to Machadodorp, Badplaas and Carolina. Rock art is also found close to the Olifants River and at the Rietspruit near Witbank (eMalahleni) (Bergh 1999: 4-5, in: APAC cc, 2021).
- Based on Tom Huffman's research of iron age sites, features or material that could be present in the larger area will be related to the Ntsuanatsatsi facies of the Urewe Tradition, dating to between AD1450 and AD1650 (Huffman 2007: 167, in: APAC cc, 2021) or the Makgwareng facies of the same dating to between AD1700 & AD1820 (Huffman 2007: 179, in: APAC cc, 2021). According to De Jong no Iron Age sites or features were identified during an assessment of the Goedgevonden Mining area that is situated in close proximity to the Zibulo study area and if any did exist here in the past recent farming and mining activities would have disturbed or destroyed any traces (De Jong 2007: 20, in: APAC cc, 2021). Again, during their 2000 Phase HIA for Duiker Mining, Matakoma & CRM Africa did identify some remnants of LIA sites in the general area (2000: p.4, in: APAC cc, 2021).
- A 2002 HIA by Dr. Johnny van Schalkwyk (for the Zondgasfontein Mining Development as part of the original Zibulo Mine EIA) found a number of cemeteries and grave sites in the larger area (Van Schalkwyk 2002:7; 10-12, in: APAC cc, 2021), but none were located close to the Zibulo discard facility development area.
- The proposed the Zibulo discard facility development area has been extensively impacted by on-going mining operations. Prior to that, agricultural activities were occurring on site on a large scale. This is clear from older aerial images of the area. The possibility of any sites, features or material of any cultural heritage (archaeological and/or historical) origin or significance being present on site is therefore highly unlikely.

9.14 Paleontology

Dr Heidi Fourie was appointed to provide a Motivation from a Full Phase 1 palaeontology impact assessment (PIA) (Fourie H. , 2021). The information provided below is sourced from this report (see APPENDIX O):

The mine is situated on the Vryheid Formation. The Vryheid Formation is named after the area of Vryheid-Volksrust. In the north-eastern part of the basin the Vryheid Formation thins and eventually wedges out towards the south, southwest and west with increasing distance from its source area to the east and northeast (Johnson 2009). The Vryheid Formation consists essentially of sandstone, shale, and subordinate coal beds, and has a maximum total thickness of 500 m. It forms part of the Middle Ecca (Kent 1980). This formation has the largest coal reserves in South Africa. The pro-delta sediments are characterised by trace and plants fossils (Snyman 1996).

The Glossopteris flora is thought to have been the major contributor to the coal beds of the Ecca. These are found in Karoo-age rocks across Africa, South America, Antarctica, Australia and India. This was one of the early clues to the theory of a former unified Gondwana landmass (Norman and Whitfield 2006). Rocks of Permian age in South Africa are particularly rich in fossil plants (Rayner and Coventry 1985). The fossils are present in the grey shale interlayered with the coal seams. The fossils are not very rare and occur also in other parts of the Karoo stratigraphy. It is often difficult to spot the greyish fossils as they are the same colour as the grey shale in which they are present as these coalified compressions have been weathered to leave surface replicas on the enclosing shale matrix. The pollen of the Greenside Colliery near Witbank also on the Vryheid Formation was the focus of a PhD study. A locality close to Ermelo, also Vryheid Formation, has yielded *Scutum, Glossopteris* leaves, *Neoggerathiopsis* leaves, the lycopod *Cyclodendron leslii,* and various seeds and scale leaves (Prevec 2011).

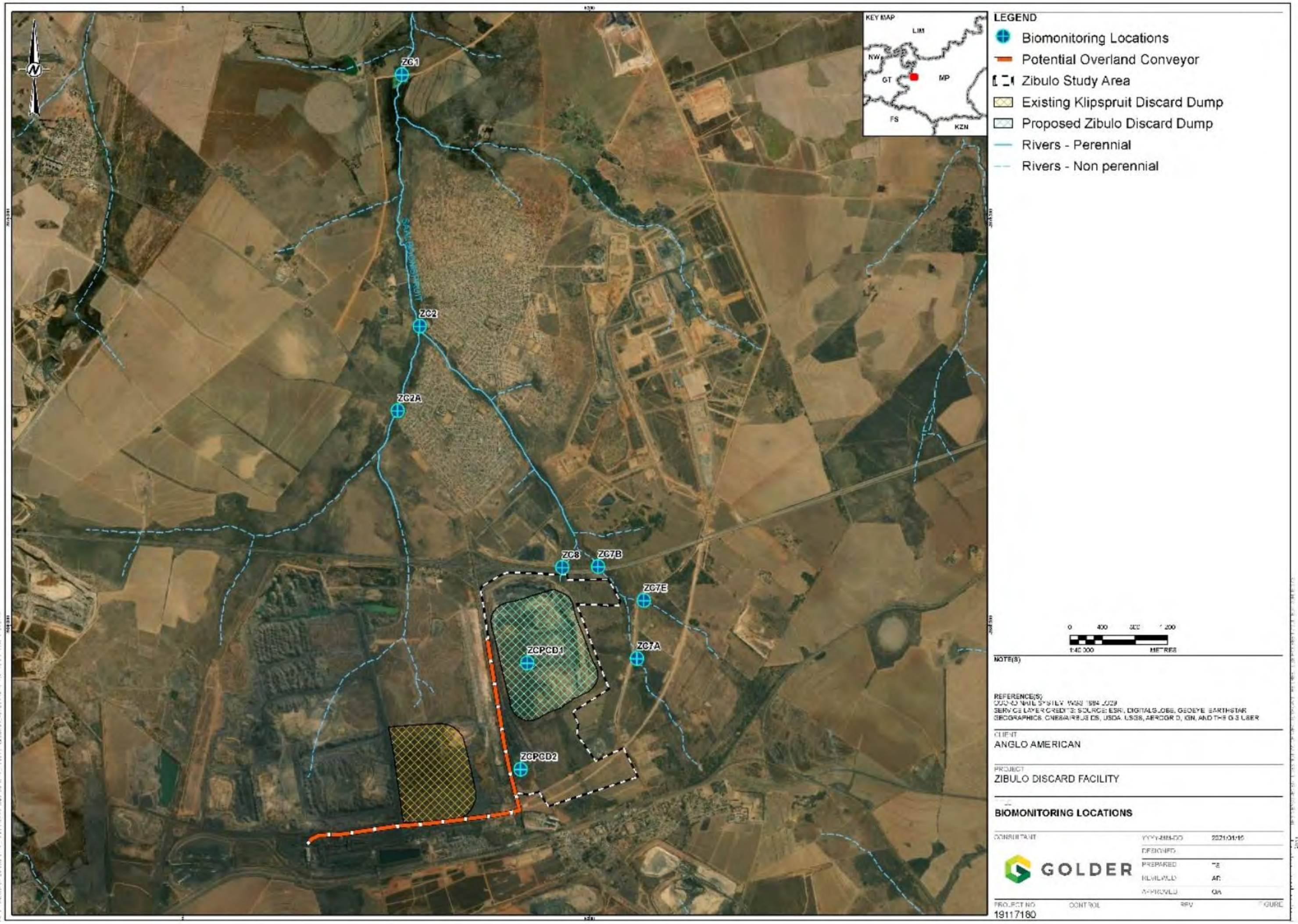


Figure 24: Aquatic biomonitoring locations

9.15 Social

This section summarises the district and local level social-economic environment of the area in which Zibulo Colliery is located. Please refer to Appendix C of APPENDIX P for more information on the social baseline.

9.15.1 Nkangala District Municipality[3]

In 2016, Nkangala district municipality (NDM) was the most populous district municipality with a total population of 1.4 million. The NDM had an annual growth rate of 2.27% between 2011 and 2016. The 2016 population density was 84.9 people per km^2, growing by 2.16% per annum. The NDM had 404 000 households in 2016.

The number of people within matric only increased from 161 000 to 271 000. The number of people with matric and a certificate/diploma increased by an average annual rate of 5.38%, with the number of people with matric and a bachelor's degree increasing by an average annual rate of 7.55%. Overall improvement in education level is visible with an increase in the number of people with matric or higher education.

The NDM's economy is made up of various industries. In 2016, the mining sector was reported to be the largest within NDM, accounting for R 41.1 billion (37.3%) of the total Gross Value Added[4] in the district municipality's economy. Of interest is that the agriculture sector is the smallest contributor at R 2.18 billion or 1.98% of the total GVA.

In 2016, 38.44% of households had piped water inside the dwelling, 41.80% had piped water inside the yard, and 7.86% had no formal piped water. NDM was reported to have a total number of 221 000 flush toilets (54.65% of total households), 56 400 Ventilation Improved Pit (VIP) (13.96% of total households) and 114 000 pit latrines (28.16% of total households). Some 49.33% of households had access to weekly refuse removal services, 2.2% had their refuse removed less often than weekly, and 37.70% did not have access to formal refuse removal services.

Some 86.3% of households had electricity for lighting and other purposes. The rest (11.60%) did not have access to electricity.

9.15.2 eMalahleni Local Municipality[5]

Zibulo Colliery falls within the ELM. The proposed discard facility is within the footprint of the Zibulo Colliery.

In 2016, the ELM had an estimated population of 455 228 people. From 2011 to 2016, the population of ELM increased by 3.2%. The total number of ELM households has increased from 119 874 in 2011 to 150 420 in 2016.

The male gender in ELM constitutes approximately 53% of the total population, while the female gender constitutes 47%. Over 65% of the population belonging to the Black African group and the most spoken language is isiZulu and Southern Ndebele.

The number of grade 12 graduates improved from 117 021 in 2011 to 146 952, increasing 25.6% over the relevant period.

In 2011, 138548 people in ELM were employed either by the formal and informal sector. Apart from the formal and informal sector as the channels for sourcing income, other income sources within the ELM include social services grants.

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[3] (Statistics South Africa 2018; Nkangala District Municipality 2020)

[4] The GRA provides a sector breakdown, where each sector is measured in terms of its value added produced in the local economy.

[5] (Statistics South Africa 2018; eMalahleni Local Municipality 2021b)

In 2016, the ELM contributed 20.9% to the Mpumalanga economy. From 1996 to 2016, ELM demonstrated an average annual economic growth of 2.4%. Mining is a very significant economic sector for the ELM. Mining has also caused a major spatial development constraint due to shallow undermining, especially in the central, northern, and southern portions of eMalahleni. There are various industrial areas in the ELM, mostly situated within or around eMalahleni.

The freeways that converge on eMalahleni town include the N4 and the N12. The N12 starts at eMalahleni, and the N4 proceeds to Nelspruit and Maputo. Running parallel to the N4 is a rail line that connects Gauteng through eMalahleni to Maputo. This significant rail and road infrastructure have been identified as part of a Southern African initiative to connect Walvis Bay (on the west coast of Africa) and Maputo (on the east coast of Africa) called the Maputo Corridor.

More than 90% of the households in the ELM has access to piped water inside the dwellings. The ELM functions as a water service authority and water service provider. The department is responsible for providing potable water and supplying raw water to all industrial areas within the municipality. The water network has 950km of pipelines, with large components still asbestos pipes.

ELM was reported to be the municipality with the highest number of flush toilets within the NDM. ELM is also the municipality with the highest number of households served by formal weekly refuse removal services.

The number of households without electricity in ELM has increased over the years from 2011 to 2016.

Crime is evident in ELM, and it is on the increase. Vandalism and "strip"-mining of metals and copper are also causing concern.

The project area is close to the town of Ogies, with the highest maize production in the maize triangle. The Ogies station handles a substantial portion of the country's freight. The town also functions as a service centre for farmers, with several service industries and cooperatives focusing specifically on the agricultural sector. The township of Phola is located north Ogies. Most of the residents of Ogies and Phola are employed at the mines and the Kendal Power Station. Ogies has developed in a linear pattern along two main roads and a railway line, namely the P29-1 and adjacent railway line and the R545. The general maintenance of the public spaces (road reserves, open spaces, roads etc.) in the town is very poor. ELM is the point of entry into Mpumalanga from Gauteng.

10.0 ENVIRONMENTAL IMPACT ASSESSMENT

10.1 Impact assessment methodology

The overall process and methodology that was followed during the EIA process was based on best practice guidelines and the requirements of South African legislation (specifically the NEMA).

10.1.1 Scoping methodology

The scoping phase included the following activities:

- Gap analysis of existing information against the project compliance criteria;
- Screening (legal and process review) – review of all applicable compliance criteria inclusive of South African legal and administrative requirements;
- Conducting screening tool assessment – to confirm specialist studies required for the project (see APPENDIX R);

- EIA scoping (identification of key issues and development of a plan of study for carrying out the impact assessment). The scoping report was made available to the public for comment and to the relevant government departments for a decision on whether the scope proposed for the EIA is appropriate;
- Environmental and social baseline information review – carrying out desktop assessment, and where required, field assessment, to review the existing baseline conditions of the environment that could be affected by the proposed project; and
- Stakeholder engagement – was undertaken during the scoping phase to record issues and comments received from the public. These issues and comments have been integrated into the process and will be considered in the impact assessment phase of the EIA.

10.1.2 Impact assessment methodology

The following activities have been/will be undertaken during the impact assessment phase of the EIA:

- Impact Assessment *via* specialist studies – evaluation of potential impacts and benefits of the project utilising qualitative and quantitative evaluation on environmental aspects and issues identified during the scoping phase. The specialist studies that have been conducted are listed in Table 20;
- Preparation of an EIA report – documenting all processes and presenting the findings of the impact assessment. The EIA report will be presented to the public for comment and to the relevant government departments for a decision on whether the project may proceed, and if so, under what conditions; and
- Stakeholder engagement – will continue throughout the remainder of the EIA process to record issues and comments received from I&APs. All issues and comments will be integrated into the process and considered during the EIA.

The overarching principles that guide the EIA include:

- **Sustainability** – development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.
- **Mitigation hierarchy** – The mitigation hierarchy describes a step-wise approach that illustrates the preferred approach to mitigating adverse impacts as follows (the governing principle is to achieve no net loss and preferably a net positive impact on people and the environment as a result of the project):
  - The preferred mitigation measure is **avoidance;**
  - Then **minimisation;**
  - Then r**ehabilitation** or **restoration**; and
  - Finally, **offsetting** residual unavoidable impacts.
- Duty of care towards the environment and affected people.

The assessment of the impacts of the proposed activities was conducted within the context provided by these principles and objectives.

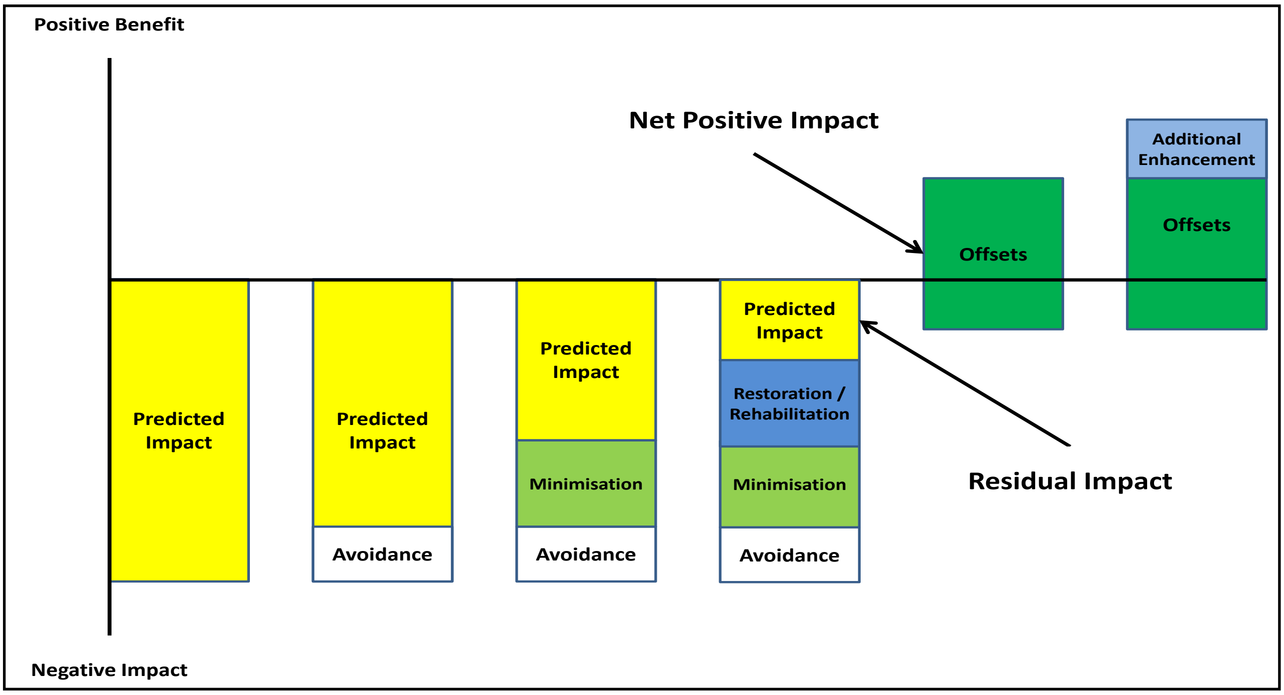

Figure 25: Mitigation Hierarchy Adapted from BBOP, 2009

10.1.3 Impact significance rating

The impact assessment was undertaken using a matrix selection process, the most used methodology, for determining the significance of potential environmental impacts/risks. This methodology incorporates two aspects for assessing the potential significance of impacts, namely severity and probability of occurrence, which are further sub-divided as follows (Table 18).

Table 18: Impact assessment factors

Severity			Probability
Magnitude of impact	Duration of impact	Scale/extent of impact	Probability of occurrence

To assess these factors for each impact, the following four ranking scales are used (Table 19):

Table 19: Impact assessment scoring methodology

Value	Description
Magnitude	
10	Very high/unknown (of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt).
8	High
6	Moderate (impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and easily possible. Social, cultural, and economic activities of communities are

Value	Description
	changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required).
4	Low (impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural, and economic activities of communities can continue unchanged.)
2	Minor
Duration	
5	Permanent (Permanent or beyond closure)
4	Long term (more than 15 years)
3	Medium-term (5 to 15 years)
2	Short-term (1 to 5 years)
1	Immediate (less than 1 year)
Scale	
5	International
4	National
3	Regional
2	Local
1	Site only
0	None
Probability	
5	Definite/unknown (impact will definitely occur)
4	Highly probable (most likely, 60% to 90% chance)
3	Medium probability (40% to 60% chance)
2	Low probability (5% to 40% chance)
1	Improbable (less than 5% chance)
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 was then rated as follows:

SP>75	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 - 75	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	Low environmental significance	Impacts with little real effect and which will not have an influence on or require modification of the project design.
+	Positive impact	An impact that is likely to result in positive consequences/effects.

For the methodology outlined above, the following definitions were used:

- **Magnitude** is a measure of the degree of change in a measurement or analysis (e.g., the severity of an impact on human health, well-being, and the environment), and is classified as none/negligible, low, moderate, high, or very high/unknown
- **Scale/Geographic** extent refers to the area that could be affected by the impact and is classified as site, local, regional, national, or international;
- **Duration** refers to the length of time over which an environmental impact may occur i.e. immediate/transient, short-term, medium term, long-term, or permanent; and
- **Probability** of occurrence is a description of the probability of the impact occurring as improbable, low probability, medium probability, highly probable or definite.

10.2 Summary of specialist reports

A summary of the specialist reports that informed the impact assessment is listed in Table 20.

Table 20: Summary of Specialist reports

Specialist Studies Undertaken	Specialist recommendations that have been included in the EIA Report *(Mark with an X where applicable)*
Wetlands and aquatic ecology assessment	X
Hydrology and hydrogeological assessment	X
Geotechnical assessment	X
Waste characterisation and risk assessment	X
Air quality assessment	X
Climate change assessment	X
Visual assessment	X
Heritage assessment	X
Palaeontology assessment	X
Social assessment	X
Closure cost assessment	X

10.3 Project phases and activities

The environmental impacts of the project were assessed for the:

- Construction phase;
- Operational phase; and
- Decommissioning and closure phase.

Further details on the project activities assessed are described in Section 4.1. Potential cumulative impacts were also identified and assessed, where applicable (see Sections 10.4 and 11.1).

10.4 Assessment of potential impacts and risks

The key findings of the specialist studies are summarised in this section. The complete specialist reports are attached as appendices to this report. The specialists' findings were used to assess the potential project impacts and risks during the respective project phases.

10.4.1 Air quality

Dispersion modelling

Dispersion modelling was conducted to predict the ambient air concentrations from pollutants emitted by the proposed discard facility (Golder, 2021b). Only one scenario was modelled for the proposed Zibulo discard facility project, including conveyor operations, using the worst case, maximum production profile throughput that will be achieved in the life of the facility. Modelling was conducted for the operational phase of the proposed Zibulo discard facility for dust fallout, PM_{10} and $PM_{2.5}$ concentrations. Concentration results at specified sensitive receptors are presented in tabular format in APPENDIX M, while concentration isopleths are presented graphically below to indicate the dispersion of pollutants. Comparison of the predicted dust fallout and PM_{10} and $PM_{2.5}$ concentrations was made with the relevant National Ambient Air Quality Standard (NAAQS) or limits to determine compliance. Isopleths presented in this section are from the proposed discard facility operations only (i.e. not the cumulative operations). Cumulative impacts have however been assessed and are presented in the tables in APPENDIX M, and discussed below.

Dust fallout

Predicted and cumulative dust fallout concentrations associated with the proposed discard facility (including conveyor operations) for the highest offsite concentration and at each sensitive receptor are presented in Table 15 of APPENDIX M. Figure 26 shows the plume isopleths for the predicted dust fallout concentrations only.

- Predicted modelled concentrations:
  - The maximum predicted offsite dust fallout rate of 678 mg/m^2/day is above the NEM: AQA Residential Dust Control Regulations of 600 mg/m^2/day. This exceedance is approximately 195 m north-east of the site boundary. However, there are no sensitive receptors located in this area; and
  - Predicted dust fallout rates are well below the NEM: AQA Residential Dust Control Regulations at all sensitive receptors.
- Cumulative concentrations:
  - The measured background dust fallout rate of 521 mg/m^2/day was assumed to be representative of the existing residential background dust fallout rate in the area and has therefore been used to assess the cumulative impacts from the proposed discard facility;
  - The maximum cumulative offsite dust fallout (1200 mg/m^2/day) is above the NEM: AQA Residential Dust Control Regulations of 600 mg/m^2/day;

  - It must be noted that this is a result of the maximum predicted offsite dust fallout rate of 678 mg/m^2/day which is already above the NEM: AQA Residential Dust Control Regulations; and
  - Cumulative dust fallout rates at all sensitive receptors are however, below the NEM: AQA Residential Dust Control Regulations.

Particulate matter (PM_{10}) concentrations

Predicted and cumulative P99 24-hour average and annual average PM_{10} concentrations associated with the proposed discard operations for the highest offsite concentration and at each sensitive receptor are presented in Table 16 of APPENDIX M. Figure 27 and Figure 28 shows the plume isopleths for the predicted PM_{10} concentrations only.

- Predicted modelled concentrations:
  - The highest predicted offsite PM_{10} concentrations are compliant with the NAAQS for PM_{10} for all assessment periods; and
  - Predicted PM_{10} concentrations are well below the NAAQS for PM_{10} at all sensitive receptors for all assessment periods.
- Cumulative concentrations:
  - The measured background PM_{10} concentration of 51 µg/m^3, for the annual average was assumed to be representative of the existing background PM_{10} concentrations in the area and has therefore been used to assess the cumulative impacts from the proposed discard facility;
  - Cumulative annual average PM_{10} concentrations are expected to be non-compliant with the annual average NAAQS for PM_{10} at all sensitive receptors; and
  - It must be noted that this is a result of the high existing PM_{10} background concentrations and is not a result of the proposed discard facility operations. Additionally, the PM_{10} concentrations at each of the sensitive receptors contribute marginally to the overall cumulative concentrations.

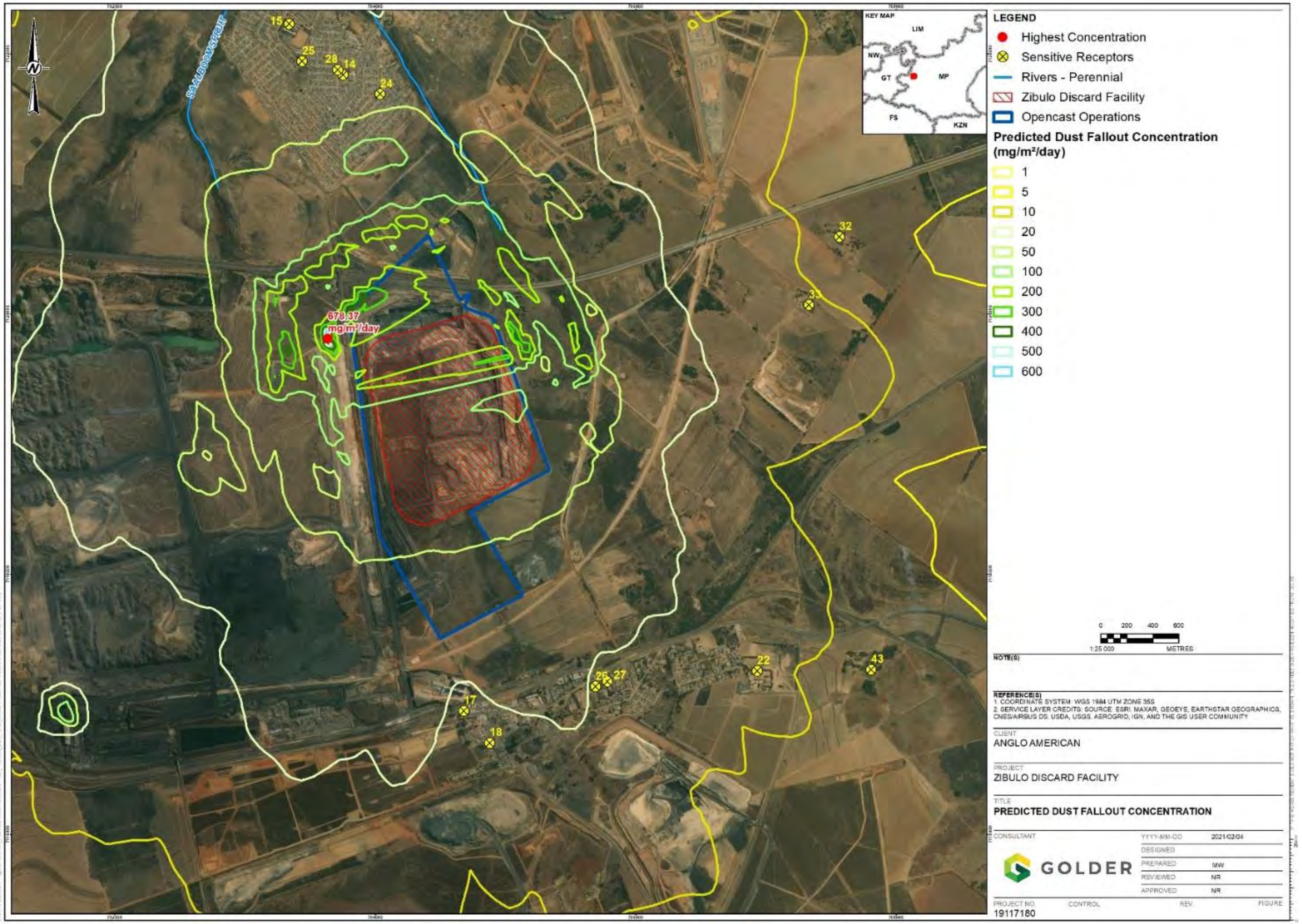

Figure 26: Predicted dust fallout from the proposed discard facility operations (mg/m2/day)

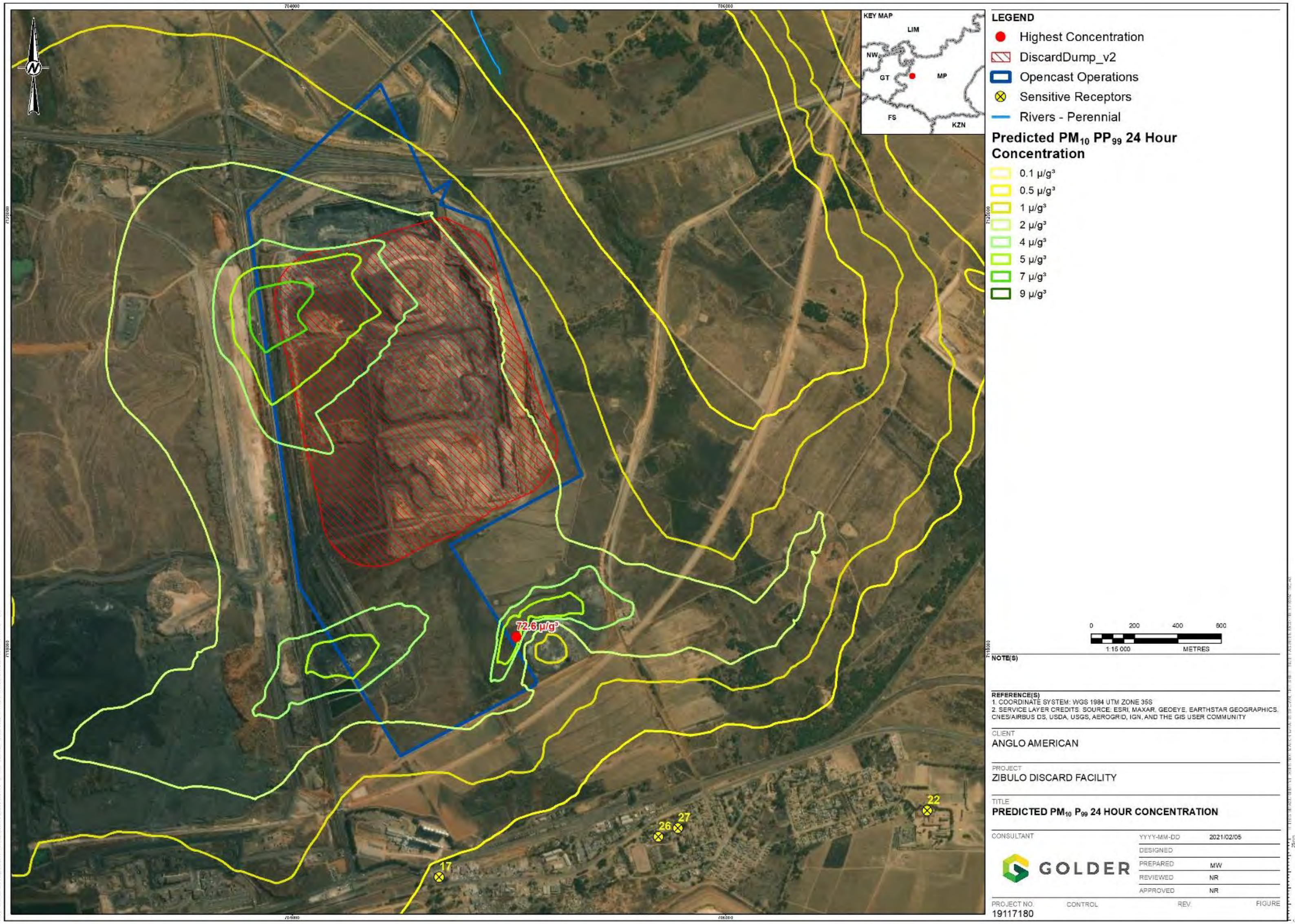

Figure 27: Predicted P99 24-hour average PM_{10} concentrations from the proposed discard facility (µg/m³)

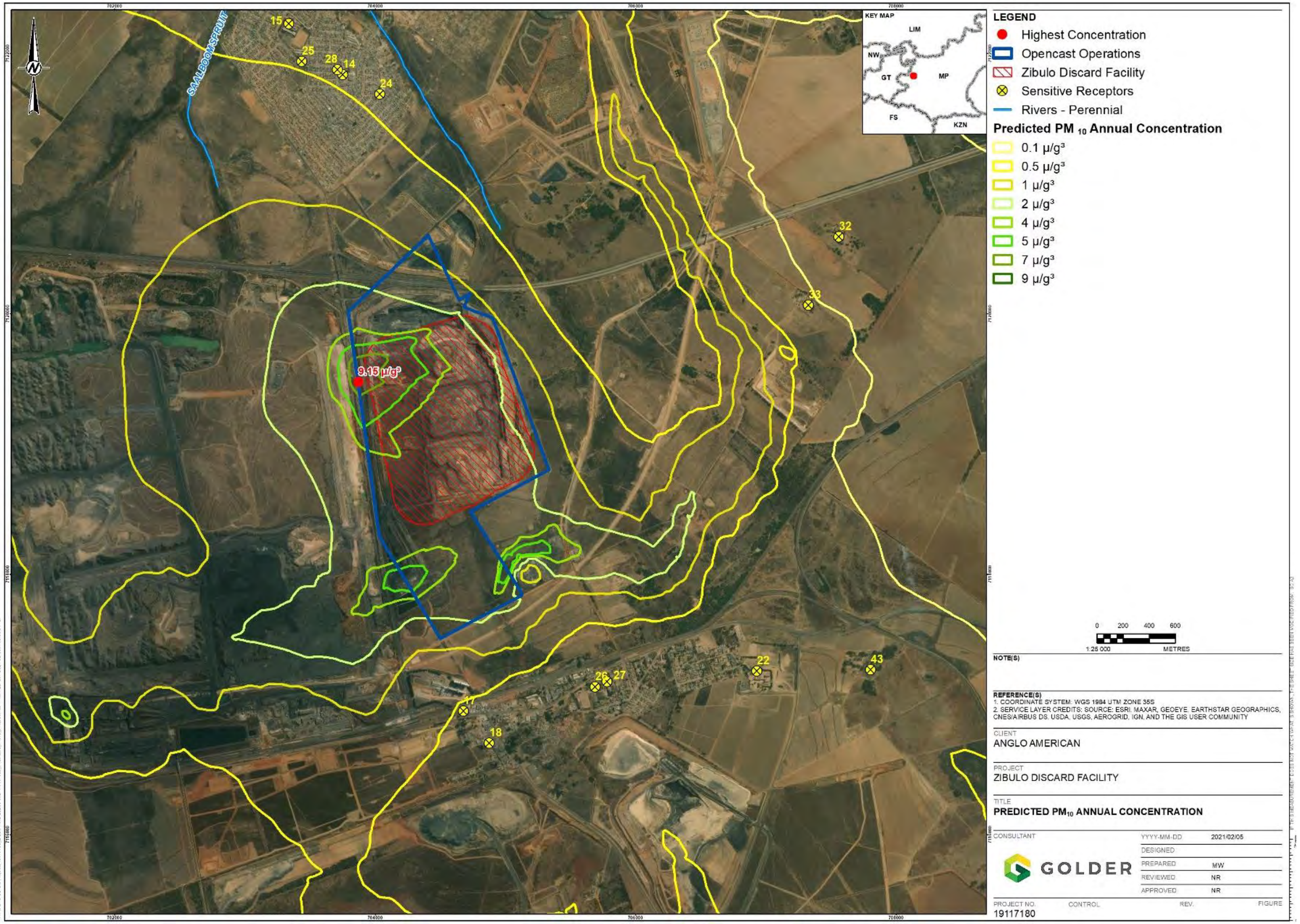

Figure 28: Predicted annual average PM_{10} concentrations from the proposed discard facility (µg/m³)

Particulate matter ($PM_{2.5}$) concentrations

Predicted and cumulative P99 24-hour average and annual average $PM_{2.5}$ concentrations associated with the proposed discard operations for the highest offsite concentration and at each sensitive receptor are presented in Table 17 of APPENDIX M. Figure 29 and Figure 30 shows the plume isopleths for the predicted PM_{10} concentrations only.

- Predicted modelled concentrations:
  - The highest predicted offsite $PM_{2.5}$ concentrations are compliant with the NAAQS for $PM_{2.5}$ for all assessment periods; and
  - Predicted $PM_{2.5}$ concentrations are well below the NAAQS for $PM_{2.5}$ at all sensitive receptors for all assessment periods.
- Cumulative concentrations:
  - The measured background $PM_{2.5}$ concentration of 16 µg/m^3, for the annual average was assumed to be representative of the existing background $PM_{2.5}$ concentrations in the area and has therefore been used to assess the cumulative impacts from the proposed discard facility;
  - The maximum cumulative annual average $PM_{2.5}$ concentration is expected to be slightly above the annual average NAAQS for $PM_{2.5}$; and
  - Cumulative annual average $PM_{2.5}$ concentrations are expected to be compliant with the annual average NAAQS for $PM_{2.5}$ at all sensitive receptors.

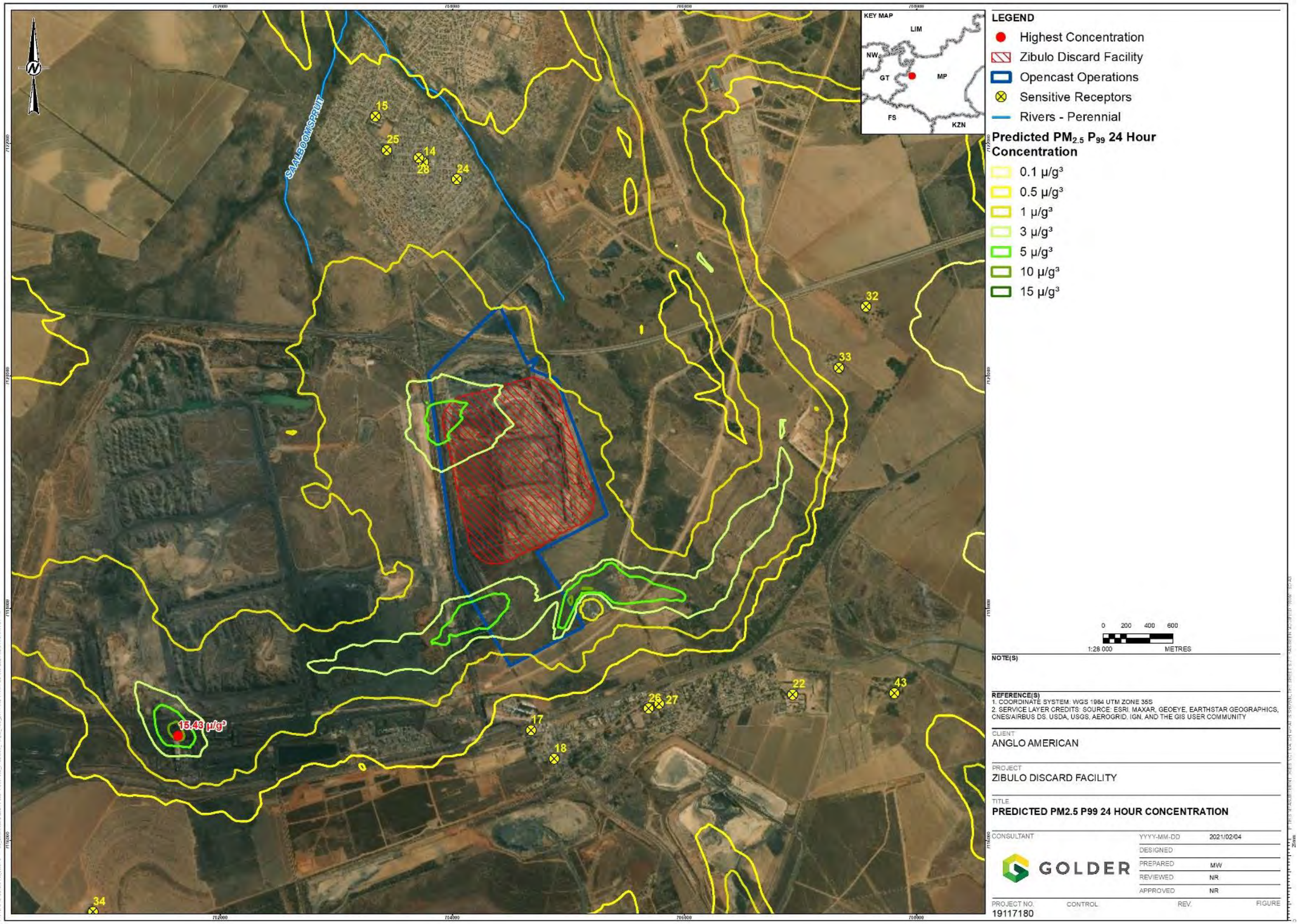

Figure 29: Predicted P99 24-hour average $PM_{2.5}$ concentrations from the proposed discard facility (µg/m³)

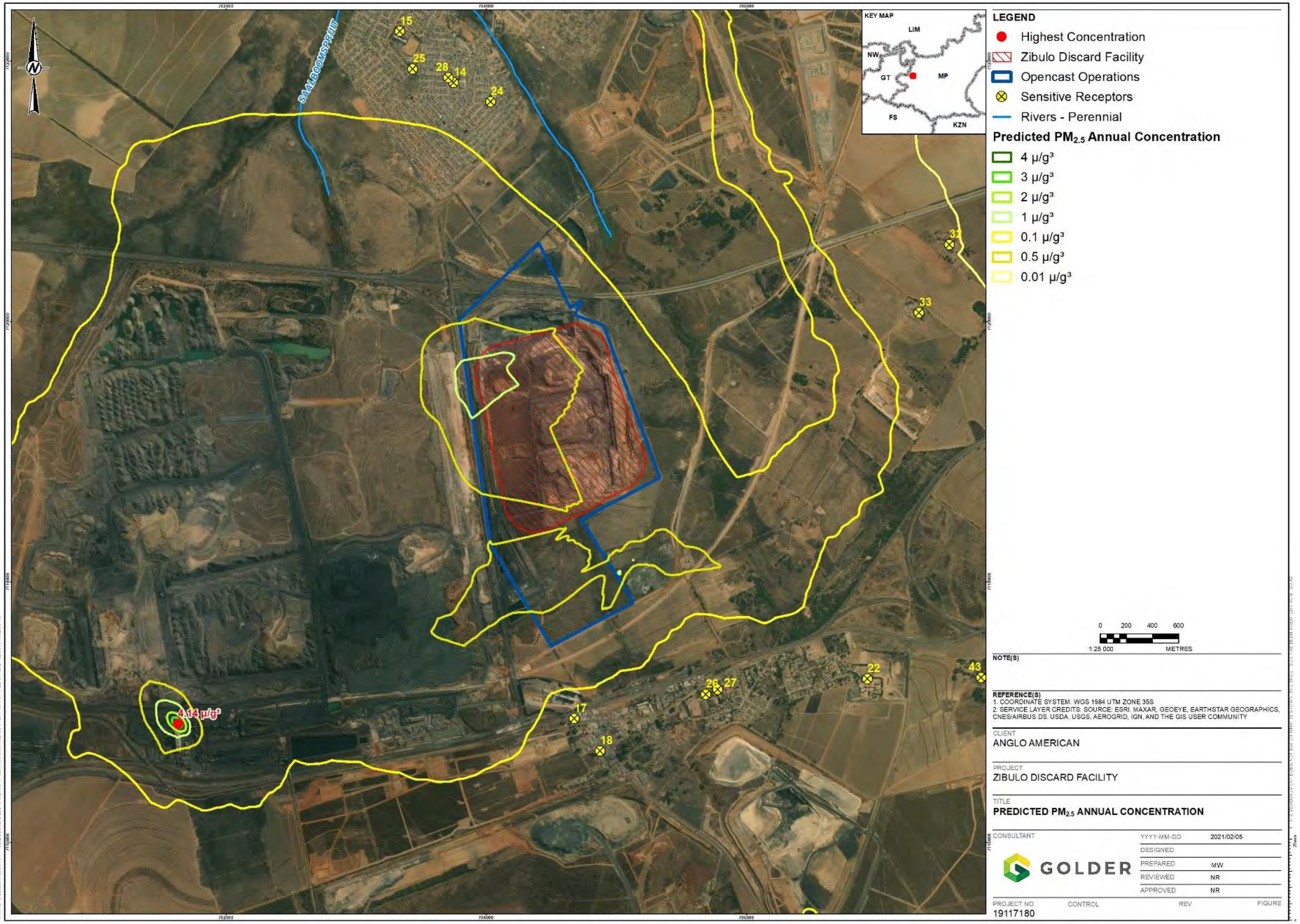

Figure 30: Predicted annual average $PM_{2.5}$ concentrations from the proposed discard facility (µg/m³)

Impact assessment

Construction

None anticipated. The proposed discard facility (including conveyor belt) does not require any footprint preparations as part of a formal construction phase. As such, the construction phase air quality impacts are not applicable.

Operational phase

The degeneration of the ambient air quality due to increased dust and fine particulate levels from the proposed discard facility may occur. Daily emissions will vary according to the level of activity, the type of operation and the meteorological conditions at the time.

Dust is anticipated to fall out rapidly with distance from the source. PM_{10} and $PM_{2.5}$ are predicted to disperse further and can therefore have a negative impact on ambient air quality beyond the mine boundary. Without mitigation, the magnitude of the air quality impact is anticipated to exacerbate and as such, will likely be moderate. The impact is expected to be medium-term in duration (as the operations are expected to last for 15 years) and could reach a regional capacity. It is expected that an impact of moderate significance could result.

With the implementation of mitigation measures, such as water sprays, the magnitude of the impact is anticipated to be low, with a low probability of occurrence. This is further substantiated by the fact that the short-term and long-term PM_{10} and $PM_{2.5}$ concentrations and dust fallout rate, as discussed within the predicted modelling results section, are predicted to be below the relevant NAAQS and NEM: AQA Residential Dust Control Regulations at all sensitive receptors. The impact duration is expected to be the same (medium-term in duration) but is likely to be limited to a local extent, resulting in a low significance.

Combustion emissions associated with spontaneous combustion were not quantitatively assessed as no suitable site-specific emission factors are available. Qualitatively, the combustion emissions from spontaneous combustion onsite are anticipated to have a negative impact on the ambient air quality. The occurrence of spontaneous combustion onsite will need to be managed carefully (through e.g., concurrent rehabilitation) to ensure the operations are compliant with the NEM: AQA ambient air quality standards.

Without mitigation, the magnitude of spontaneous combustion is anticipated to be moderate. The impact is expected to be medium-term in duration (as the operations are expected to last for 15 years) but is likely to be limited to a local extent, as the volume of the discard can be considered as low to moderate in comparison to the bigger usage of the colliery. Additionally, a medium probability of occurrence is predicted, resulting in an overall impact of moderate significance.

With the implementation of mitigation measures, the magnitude of the impact is anticipated to be low, with a low probability of occurrence. The impact duration is expected to remain the same, but is likely to be limited to site only, resulting in a low significance.

Decommissioning and closure phase

Final rehabilitation will result in dust and fine particulate emissions associated with shaping the final discard facility to a fairly flat outer slope of probably 1:9, with the main remaining rehabilitation being the placement of the final cover.

Without mitigation, the magnitude of the air quality impact is anticipated to be low. The impact is expected to be short-term in duration (as the impact will cease once the activity ceases) and is likely to be limited to a local capacity. Additionally, a low probability of occurrence is predicted, resulting in a low significance.

With the implementation of mitigation measures, the magnitude of the impact is anticipated to be minor and is likely to be improbable. The impact of the duration is expected to remain the same, but is likely to be limited to site only, resulting in a low significance.

10.4.2 Climate change / GHG emissions

It is projected that there will be changes in climate at the proposed Zibulo Colliery discard facility in the medium term and long term. The impacts of these changes have been assessed (Golder, 2021f), and are summarised below.

Construction phase

Given that construction is likely to start in the very near future, it is expected that the climatic conditions at the time will be very similar to the baseline climatic conditions. The potential impacts of climate change during the construction phase have therefore not been considered in this assessment as these changes are only likely to manifest in the medium-term and long-term.

Operational phase

- With climate change, average annual temperatures are projected to increase by 0.92°C to 1.14°C in the medium term (2020-2039) and by 1.5°C to 2°C in the in the long term (2040-2059). Increases in monthly average temperatures range from 0.8°C to 1.28°C in the medium term and 1.34°C to 2.5°C in the long term. The number of hot days, where temperatures exceed 35°C, are projected to increase by 4 days in the medium term and by 9 to 12 days in the long term. Marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions, and the risk of the coal discard igniting or burning. Spontaneous combustion of the coal discards poses a risk to the safety of workers. The burning coal discards will also produce smoke which can negatively affect ambient air quality. This impact is considered to be an impact of moderate significance, but can be reduced to low, should mitigation measures, such as discard compaction, and progressive rehabilitation, be implemented.

- It is projected that the percentage of rainfall from very wet days will increase by 8% to 26% in the medium term (2020 to 2039) and by 6% to 19% in the long term (2040 to 2059). Geochemical characterisation of samples from the Zibulo underground mine workings indicates that the coal discards have acid generation potential due to the measurable sulphur contents and insufficient neutralisation potentials. Precipitation coming into direct contact with the coal discards, may therefore become highly acidic. With an increase in the percentage of rainfall from very wet days, there will be an increase in accelerated runoff from the coal discards, which if not properly managed, can potentially contaminate soil, surface water, and groundwater resources.

  Without mitigation, the significance of this impact is likely to be low. The magnitude of this impact is expected to be high (significant impact on environment), with medium-term duration, local extent, and low probability of occurrence. With the implementation of diversion channels around the facility to prevent ‘dirty’ stormwater runoff from entering the environment, the significance of this impact will be reduced even further, due to a decrease in the probability of occurrence from low to improbable.

- It is projected that there will be a decrease in average annual rainfall by 13 mm (2% change) to 34 mm (5% change) in the medium term (2020 to 2039), and by 14 mm (2% change) to 51 mm (7% change) in the long term (2040 to 2059). It is also projected that average annual temperatures will increase by 0.92°C to 1.14°C in the medium term and 1.5°C to 2°C in the long term, thereby increasing evaporation rates. A decrease in average annual precipitation, coupled with an increase in average monthly temperatures and evaporation rates, will increase the dust coming off the facility, which can impact negatively on human health, well-being, and the environment.

Without mitigation, the significance of this impact is likely to be moderate. The magnitude of this impact is expected to be moderate, with medium-term duration, regional extent, and medium probability of occurrence. With mitigation, such as implementation of dust suppression measures, the significance of this impact is likely to be reduced to low due to a decrease in the probability of occurrence from medium to low.

- The handling, processing, and transportation of the coal discard will generate greenhouse gas emissions (GHGs), which will contribute to climate change. The in-situ GHG emissions from the handling, processing, and transportation of the coal discard deposited at the facility is estimated to range between 77.04 and 301.52 tCO_2e per annum, with total in-situ emissions ranging between 1 540.84 and 6 03.47 tCO_2e (Golder, 2021f).
- The contribution of the project's GHG emissions are therefore deemed to be insignificant, especially when considering that these emissions will occur regardless of whether or not the proposed facility is constructed (i.e. in the event that South32's discard facility is continued to be utilised).

Decommissioning and closure phase

As with the operational phase, marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions and the risk of the coal discards igniting or burning. As mentioned previously, the rate of exothermic reactions is directly related to the temperature, where each 10°C rise in temperature leads to an almost doubling of the oxidation process. Spontaneous combustion of the coal discards poses a risk to the safety of workers during the closure phase, and users of the site post-closure. The burning discards will also produce smoke which can negatively affect ambient air quality. Note that the rate of exothermic reactions is also a function of the exposed surface area (internal surface area for exothermic reactions), oxygen levels, and moisture (removes oxidised products on internal surfaces, thereby re-exposing the surfaces for oxidation), which is the reason that coal discard facilities are required to be capped at closure.

Without mitigation, the significance of this impact is likely to be moderate. The magnitude of this impact is expected to be high (can be life threatening), with long-term duration (extends post-closure), extent limited to the site only, and medium probability of occurrence. With mitigation, such as the application of the soil cover, the significance of this impact is likely to be reduced to low, due to a decrease in the probability of occurrence from medium to low.

10.4.3 Groundwater

Groundwater modelling

Groundwater modelling was undertaken for the following scenarios (Golder, 2021a):

- The base case – no discard facility; and
- Discard facility developed over backfilled pit. For this scenario, the following post-closure transport model sub-scenarios were considered:
  - An 'uncapped' scenario, which assumed no soil cover would be applied to the facility upon closure of the facility;
  - A 'capped' scenario, which assumed that a soil cover approximately 600 mm thick would be applied to the facility upon closure; and
  - A mitigated scenario which included the 'capped' scenario and four abstraction boreholes, to manage the backfill water levels below the environmental critical level (ECL) to prevent surface and diffuse decant. For this scenario, the boreholes were implemented in the model as constant head boundary conditions with heads iteratively adjusted until plume containment was achieved. The required

number and drawdown of such abstraction boreholes will have to be confirmed based on field drilling and hydraulic test results for the backfill material.

The results of the modelling indicated the following:

- For the base case scenario:
  - The pollution plume from the Zibulo opencast spoils extends 50 years post-closure approximately 400 m north north-east towards the surface water drainage line (Figure 31). Smaller plume extents are predicted towards the north northwest. After 100 years the plume has migrated approximately 650 m north north-east (Figure 31). Only a limited spreading of leachate from the backfilled pit into the weathered aquifer is expected for its western, southern, and eastern edges.
  - Surface decant is expected to occur at the most north north-eastern edge of the pit. Long-term (base case) decant rates is estimated at around 540 m^3/d (or ~0.54 ML/d). Based on the current mine plan, the preliminary critical level to prevent surface decant is 1 527 mamsl, while the ECL to prevent diffuse decant into the shallow weathered aquifer will be at a lower level and depends on the actual weathering depth from the pit walls (assumed to be 15 m for the model simulations).
  - Sulphate concentrations within the pit are expected to range between 2 000 and 2 500 mg/l.
- For the uncapped scenario:
  - The pollution plume from the Zibulo discard facility extends 50 years and 100 years post closure approximately 570 m and 800 m north, respectively (Figure 32). With the addition of the discard material to the pit, sulphate concentrations within the pit are expected to range between 4 000 and 4 500 mg/l.
- For the capped scenario:
  - The pollution plume for the capped scenario, with an assumed lower seepage rate (but with a similar sulphate concentration compared with the uncapped scenario) is expectedly smaller and extends 50 years and 100 years post closure approximately 480 m and 700 m (Figure 33).
- Since the estimated recharge rate of the discard facility (see Table 15 of APPENDIX K) is higher than the rate estimated for rehabilitated spoils (Table 12 of APPENDIX K), the long-term decant rates for the uncapped and capped scenarios are higher than for the base case, and are estimated at approximately:
  - 818 m^3/d (or ~0.82 ML/d) for the uncapped scenario, and
  - 620 m^3/d (or ~0.62 ML/d) for the capped scenario.
- For the mitigated scenario:
  - Once the water levels are managed below ECL, hydraulic gradients are mostly reversed inwards and plume migration (Figure 34) contained. Since the cone of dewatering 'pulls' additional water from the surrounding aquifer into the backfilled pit area, required dewatering rates will exceed predicted decant rates. A combined long-term abstraction rate of approximately 851 m^3/d (or ~0.85 ML/d) from the four abstraction boreholes (up-gradient of the decant area) is predicted for the capped scenario (in comparison to a base case predicted decant rate of 540 m^3/d).

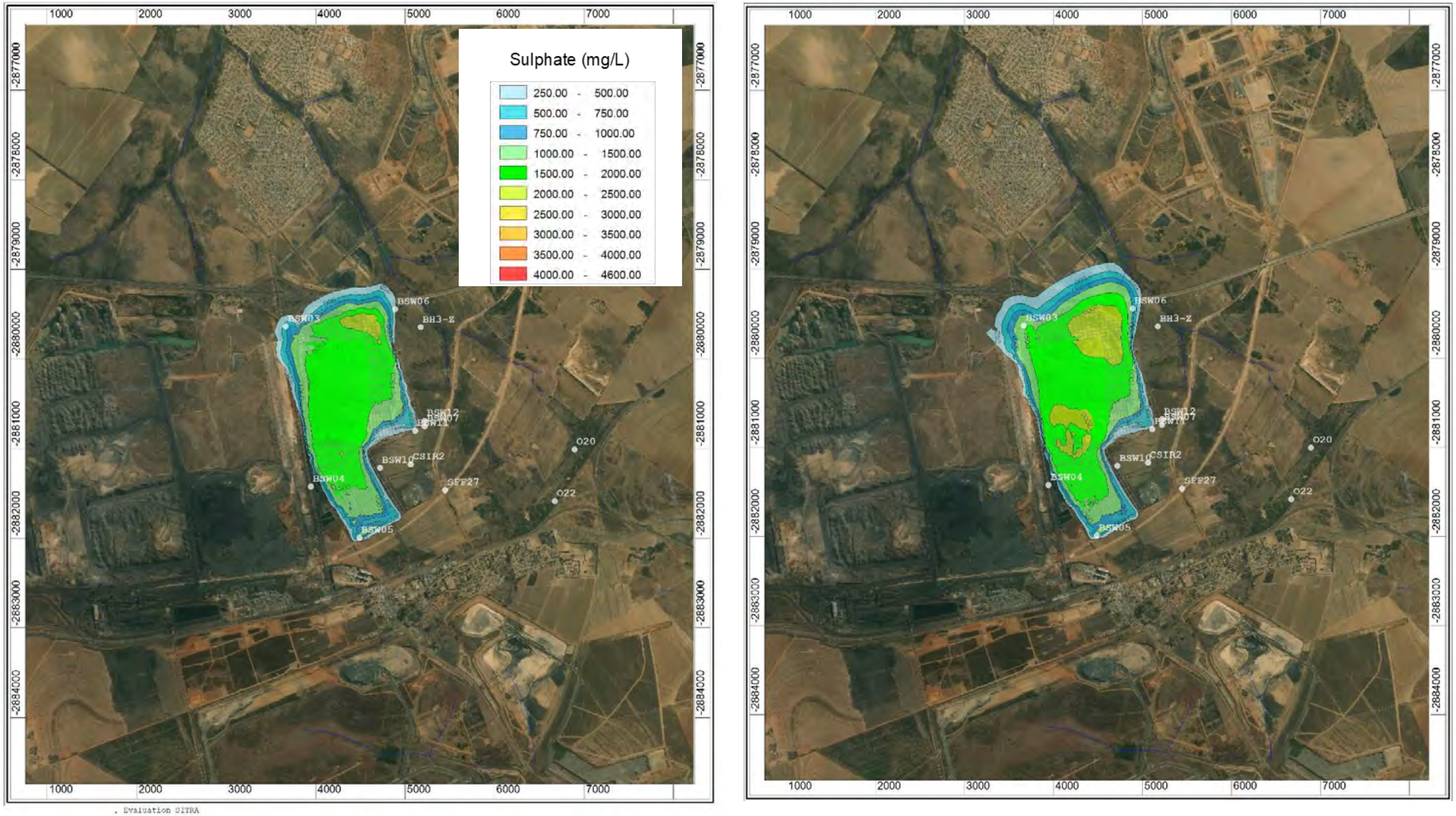

Figure 31: Simulated sulphate concentrations for the base case (no discard) scenario after 50- and 100-years post-closure (Delta H, 2020; in: Golder, 2021a)

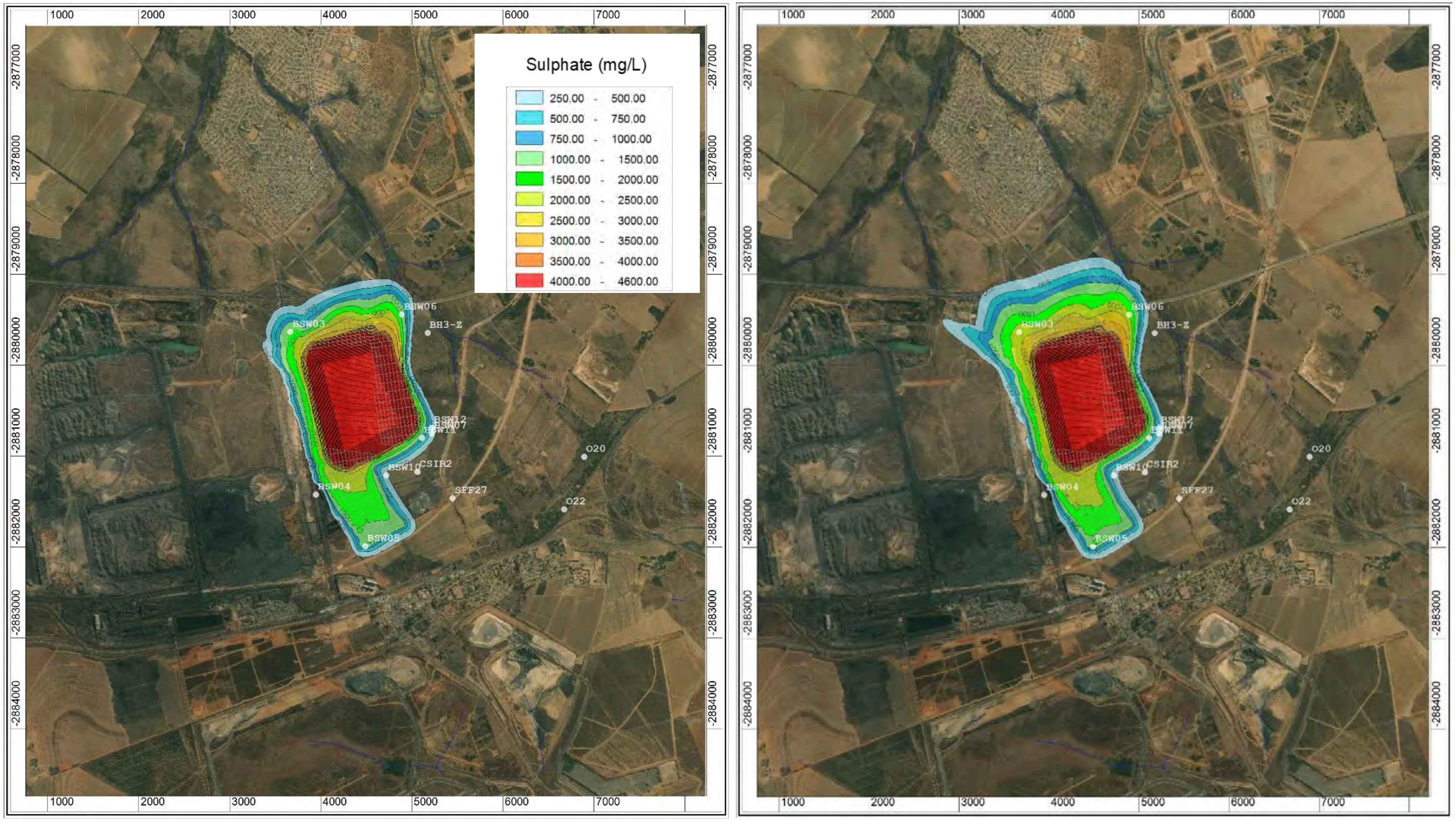

Figure 32: Simulated sulphate concentrations for the uncapped scenario after 50- and 100-years post-closure (Delta, 2020, in: Golder, 2021a)

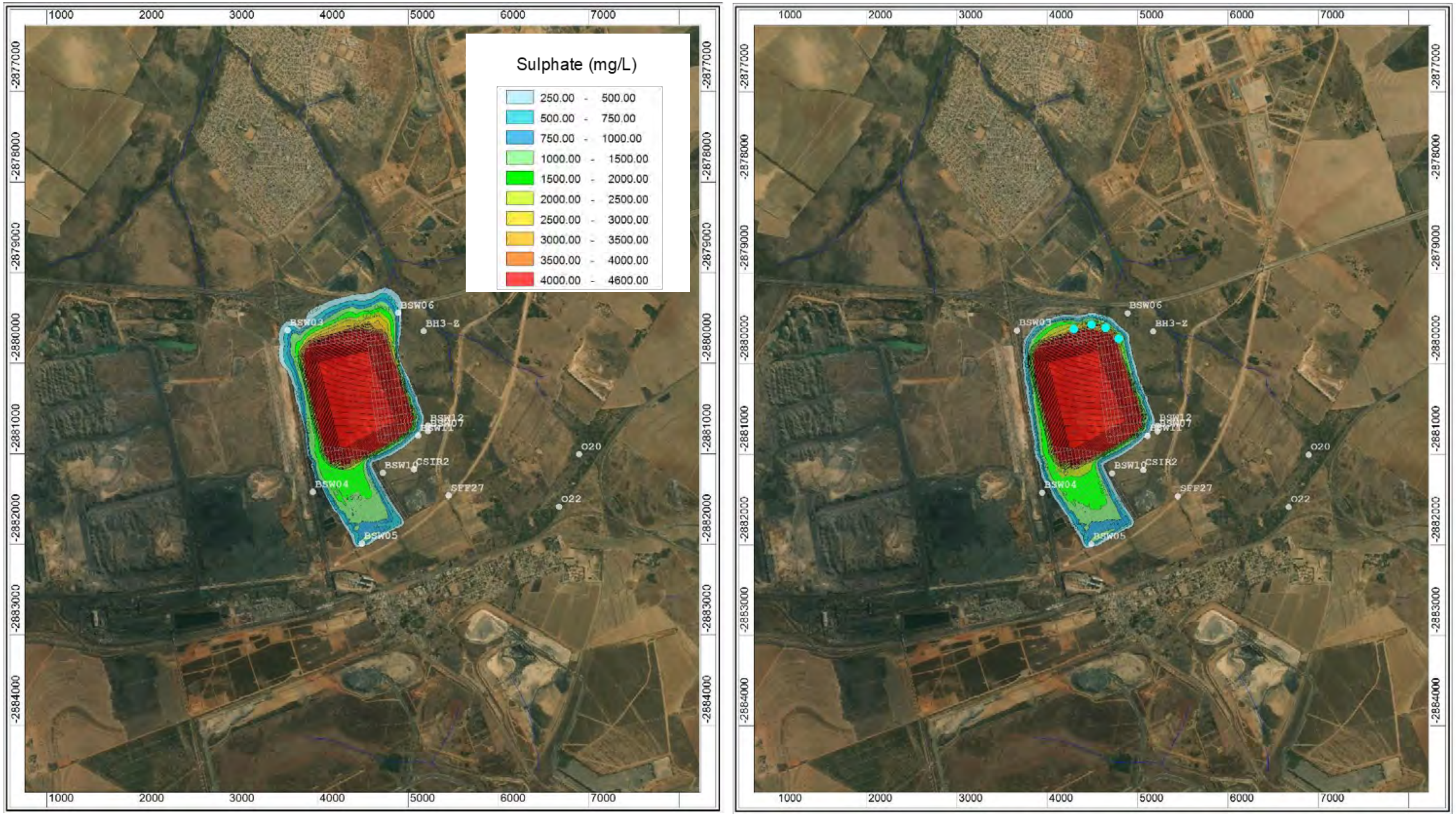

Figure 33: Simulated sulphate concentrations for the capped scenario after 50- and 100-years post-closure (Delta, 2020, in: Golder, 2021a)

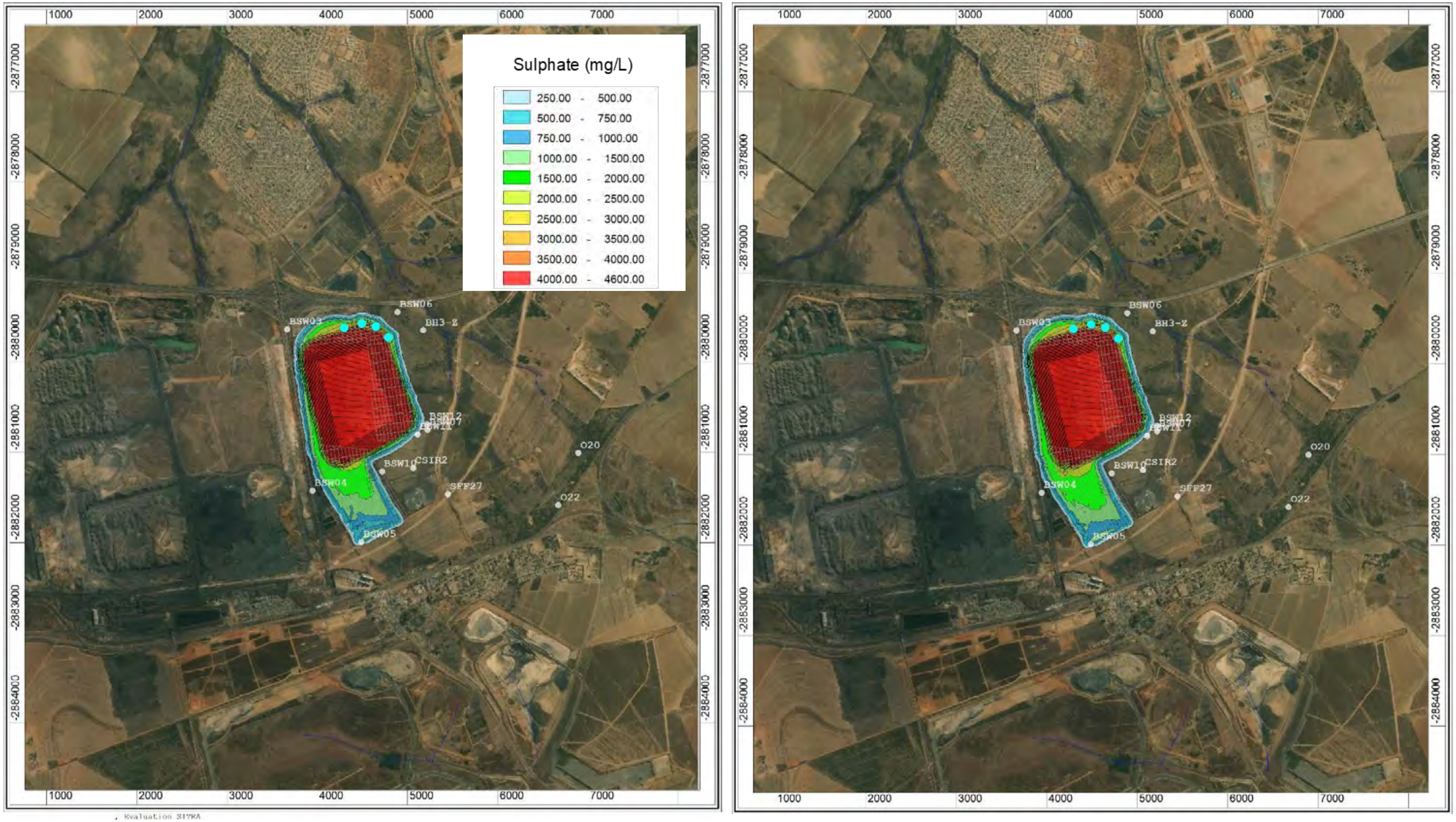

Figure 34: Simulated sulphate concentrations for the capped (and pumping) scenario after 50- and 100-years post-closure (light blue dots showing abstraction borehole positions) (Delta, 2020, in: Golder, 2021a)

Geochemical characterisation of the discard

Geochemical characterisation was undertaken on 14 discrete samples collected from the existing Klipspruit discard facility during 2015 (spatially distributed to capture any compositional variability), as well as one composite filter cake sample from the filter press and one composite coarse discard sample from PCPP (on a day when only Zibulo run of mine (ROM) coal was being processed to determine whether discard from Zibulo was materially different from the 2015 samples).

Chemical properties

Sulphide content of discard materials varied between 0.76% and 3.6%. The least sulphide content was measured in fine discard sample from the PCPP. Sulphate sulphur (0.04%-0.51%) and organic sulphur (0.38%-1.4%) were also present (Table 21). The relatively higher sulphate levels in discard from the Klipspruit discard facility (0.04-0.51%) than in the coarse and fine discard from the PCPP (0.04%–0.05 %) suggests that samples from the discard facility were oxidised before analyses, due to exposure to air and water in the discard facility. Sulphate precipitates were observed on surfaces on old sections of the discard facility.

Bulk NP varied between 11 kg $CaCO_3$ eqv t^{-1} and 25 kg $CaCO_3$ eqv t^{-1} and was lower than CaNP (12 kg $CaCO_3$ eqv t^{-1} to 384 kg $CaCO_3$ eqv t^{-1}) in five of the six samples suggesting that siderite is the dominant carbonate mineral. The Bulk NP was similar to CaNP in the fine discard sample from the PCPP indicating that calcite and dolomite are the dominant sources of NP in this sample. The paste pH was near-neutral to slightly alkaline indicating sufficient reactive NP to buffer acidity generated by the initial oxidation of sulphides during the testing procedure. There is generally insufficient buffering capacity in discard materials as Bulk NP is exceeded by SAP in all the discard samples. (*See notes after Table 21 for abbreviations*)

Table 21: Discard acid base accounting results (Golder 2015)

Parameter	Units	Plant	KPS Discard dump					
		Fine Discard	Coarse Discard					
		KPSPFD	KPSPCD	KPCDFC1	KPCDFC2	KPCDFC3	KPCDFC4	KPS - HC1♯
Paste pH	s.u	7.6	6.5	6.6	6.8	6.8	7.3	7.0
Total- S	%	1.2	4.6	3.5	2.8	5.7	3.2	2.8
Sulphide-S		0.8	3.6	2.2	1.7	3.9	2.3	2.1
Sulphate-S		0.039	0.052	0.47	0.51	0.47	0.053	0.52
Organic-S		0.38	0.97	0.77	0.61	1.42	0.85	0.22
C-Total		53	23	42	34	32	29	37
C-Inorganic		0.15	0.49	4.6	4.0	3.8	3.1	36
C-Organic		53	22	37	30	29	26	0.90
Bulk NP*	kg $CaCO_3t^{-1}$	15	11	21	21	25	14	30
CaNP*		12	41	384	335	318	262	75
SAP**		24	112	70	54	120	72	64
SNNP***		-8.8	-101	-49	-33	-95	-58	-34
SNPR‡	no units	0.63	0.10	0.30	0.39	0.21	0.19	0.47
Classification based on SNPR		PAG‡‡	PAG	PAG	PAG	PAG	PAG	PAG

**Bulk NP is NP measured by Sobek titration, CaNP is NP calculated on the basis of inorganic carbon LECO analysis. Measured NP is used for the NPR calculation*

***SAP - acid potential based on sulphide sulphur; TAP - acid potential based on the total sulphur content*

****SNNP - the difference between bulk NP and SAP; TNNP - the difference between bulk NP and TAP*

‡SNPR - Ratio of SAP and bulk NP; TNPR - Ratio of TAP and bulk NP

‡‡PAG – Potentially acid generating; Non-PAG – not potentially acid generating

♯ Humidity cell composite sample

Classification of acid rock drainage (ARD) potential per the guidelines of Morin and Hutt (2007) (in: Golder, 2021a) and MEND (2009) (in: Golder, 2021a) (see Figure 44 of APPENDIX K) shows that all the discard samples are potentially acid-generating (PAG). Classification using the guidelines of Price et al. (1997) (in: Golder, 2021a) and Soregaloli and Lawrence (1997) (in: Golder, 2021a) also shows the discard materials have a potential to generate ARD due to high total sulphur content. The NAG pH and SNPR also classifies the samples as PAG.

Chemical composition of the leachate

Synthetic precipitation leaching procedure (SPLP) and net acid generation (NAG) leach tests were carried out (Golder, 2015, in: Golder, 2021a). These are short-term leach tests that measure readily soluble components of geological materials but do not predict long term water quality. Water-rock interactions often develop over periods of time that are much greater than can be represented in an 18 to 24-hour extraction test (INAP, 2010, in: Golder, 2021a).

Leachate generated by net acid generation (NAG) leach tests represents complete and instantaneous oxidation and leaching of all reactive minerals. These tests were done to assess the maximum (worst case) quality of drainage from the discard co-disposal facility. Under field conditions, sulphide oxidation and release of elements will occur gradually and concentrations in mine drainage are expected to be lower than NAG leachate chemistry at any given time. The results indicate that the discard materials are likely to produce near-neutral, saline drainage with low concentration of metals upon exposure to rainfall. The SPLP leachate results show that the following analytes are likely to be elevated in drainage from the discard facility (Golder, 2015, in: Golder, 2021a):

- Electrical conductivity, total dissolved solids, manganese, sulphate, calcium, magnesium, and fluoride.

The NAG results indicated that when exposed to oxidation conditions for a long period of time, the discard materials will produce ARD drainage with elevated levels of metals. The following elements are likely to be elevated (Golder, 2015, in: Golder, 2021a):

- pH (acidic), electrical conductivity, total dissolved solids, sulphate, sodium, nitrate, phosphate, magnesium, aluminium, cobalt, iron, molybdenum, manganese, calcium, vanadium and sodium absorption ratio (SAR).

Mineral residue risk assessment

The results of the risk assessment (Golder, 2021e) done for the Zibulo discard, as required by Regulation 5 of GN R. 632 of 2015, as amended 21 September 2018, are indicated in Table 22 below.

Table 22: Zibulo Discard Risk Assessment

Aspect	Properties	Risk
Chemical	Acid-base accounting	Likely acid generating based on SNPR <1 and Sulphide S of 3.3 to 6.0%
	Chemical composition of leachate (short-term)	Leachate likely to contain elevated levels of chloride, aluminium and sodium.
	Chemical composition of leachate (long-term)	Long-term oxidation is likely to result in acidic leachate.
	Propensity for spontaneous combustion	Likely (Coal discard from the eMalahleni coalfield is known to have a risk of spontaneous combustion) but not tested
	Propensity to oxidise and decompose, stability and reactivity	The sulphide-containing discard materials react with oxygen and water in the process of ARD generation
	Concentration of volatile organics	Not applicable

Aspect	Properties	Risk
Mineralogy	Acid-forming minerals	The pyrite content of Zibulo discard subsamples varied between 4.1 wt% and 8.1 wt%
	Acid-neutralising minerals	Calcite and dolomite were rare to accessory phases
Waste	Physical hazards	Often flammable, not explosive, generally oxidising and does not release toxic gases when in contact with water or acid
	Health hazards	Total concentration of multiple parameters exceeded 1% but none of these parameters exceed 1% in leachate[6]
	Environmental hazard	Total concentration of multiple parameters 1% but none of these parameters exceed 1% in leachate However, acidic seepage is expected
	Classification	Potentially hazardous (in terms of SAN10234) to the environment in medium to long term due to acidic seepage generated under oxidising conditions
	Total concentrations	TCT0 < TC (As,Ba,Cu,Hg,Pb) < TCT1
	Leachable concentrations	LCT0 ≤ LC
	Assessment	Type 3, although risk from leachable parameters is low
Toxicity		Not acute toxicity
Physical Properties		The material is sand to gravel-sized and has a high infiltration rate (3.7 m/day)
Vulnerability of the water resource		Decant from the pit would immediately impact the Saalklapspruit River
Prevention of pollution in order to satisfactorily mitigate the impact on groundwater and surface water and on biodiversity		■ Decreasing seepage through the use of a cover; ■ Interception of seepage by means of a pressure barrier created in groundwater by pumping wells, which prevents decant from the pit; and ■ Treatment of the intercepted pit water.

Impact assessment

Construction phase

None anticipated.

Operational phase

Groundwater quality within the backfilled opencast areas, including the overlying discard facility, is expected to deteriorate due to acid mine drainage and other chemical interactions between the geological and the groundwater regime. The resulting groundwater pollution plume will migrate along the new local and regional hydraulic gradients as the water table rebounds. Based on the topographic setting of the mine and the post-closure topography including the discard facility, the rebounding water table will lead to surface decant of mine

[6] 1% is 10 000 mg/L and 0.1% is 1,000 mg/L

water of approximately 620 m^3/d (0.62 ML/d). Based on the current mine plan, the expected critical level to prevent surface decant is estimated at 1 527 mamsl, while the Environmental Critical Level (ECL) to prevent diffuse decant will be at a lower level and depends on the actual weathering depth around the pit perimeter (assumed to be 15 m for the model simulations).

While a limited spreading of leachate from the backfilled pit (with or without the discard facility) into the weathered aquifer is expected for its western, southern, and eastern edges, the migration of the plume towards the north is significant and may trigger potential off-site migration. This impact is considered to be of moderate significance.

Should the seepage from the discard facility be reduced by the application of a well-maintained soil cover, and the remainder intercepted and sent to the EWRP for treatment, this impact could be reduced to low.

Decommissioning and closure phase

Same as for operational phase.

10.4.4 Surface water

Operational water balance

An operational water balance model was developed, to assess the ability of the water management system to manage the additional runoff water from the facility (Golder, 2021a). The following conclusions were made as a result of the model simulations (Golder, 2021a):

- The simulation results shows that the 40ML Dam had one year in which a spill occurred in the 1500 years simulated and meets the Regulation GN 704 requirement of 1 spill in 50 years. The additional stormwater runoff from the discard facility reporting to the workings can be successfully managed in the current system.
- The simulation showed that the South Pit will not have filled by the time the life of the discard facility has been reached.
- The probability that the North Pit will fill by 2037 is small. Only one of the 100 realizations resulted in the pit filling before the end of the life of the discard facility. For this realization, the water was pumped from the pit to the 40 ML Dam to maintain the pit water level below the ECL.
- Zibulo Colliery is expanding the monitoring system to include the monitoring of water volumes in the pits to action the in-pit pumping systems when the water level reaches the ECL.
- The operational water management system only has to manage the water pumped from the South Pit while the pit is being mined. The North Pit will be filling while the South Pit is being mined and will not contribute to the water balance. Once mining of the South Pit is completed, the only water that will have to be managed is the water pumped from Klipspruit Colliery to the 40 ML Dam.

The average water balance for the opencast operation was calculated over the simulation period using the model results. The average balance is shown in Figure 35.

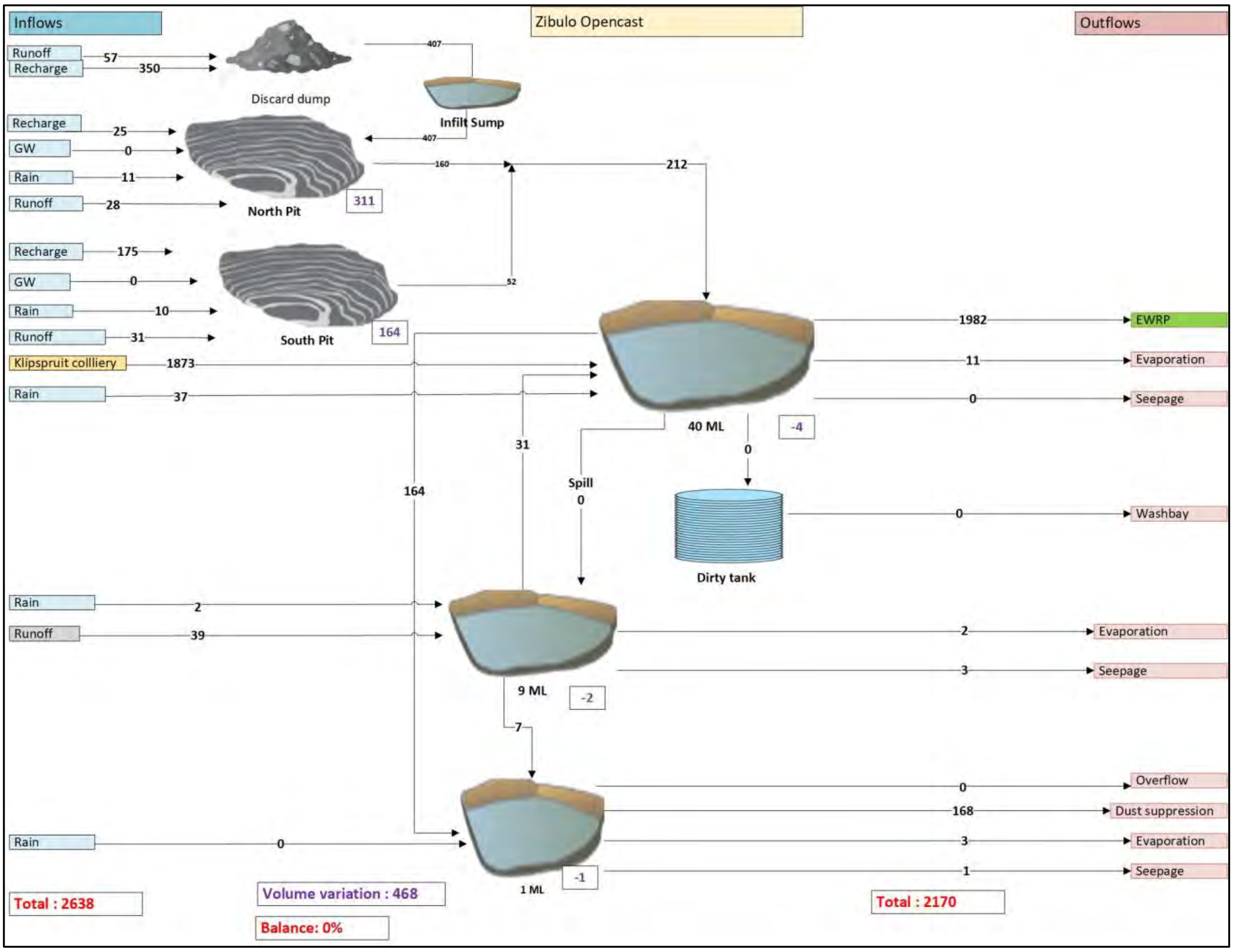

Figure 35: Average daily water balance for Zibulo Opencast

Post closure water balance

The approach to managing the excess mine water from the North and South Pits post closure is to pump water from the pits to maintain the pit water level below the ECL. The excess water will be pumped to the EWRP via the 40ML Dam. The average water volumes that will need to be managed post closure is given in Table 23. The total volume that will need to be pumped to EWRP from the North and South Pits is estimated to be 1 030 m^3/d. The total if the Klipspruit Colliery 2 000 m^3/d is included, is 3030 m^3/d which is in line with the capacity of the current water supply infrastructure from the 40 ML Dam to EWRP.

Table 23: Average water volumes to be managed Post Closure

Water Source	Volume (m^3/d)
North Pit	851 – as per groundwater model
South Pit	179
Total Pits	**1030**
Klipspruit Colliery	2000
Total	**3030**

Impact assessment

Construction phase

None anticipated.

Operational phase

The up and downstream tributaries of the Saalboomspruit (also occasionally referred to as the Saalklapspruit) are already highly contaminated with elevated electrical conductivity, total dissolved solids, calcium, magnesium, as well as aluminium, iron, and manganese. The 95-percentile data of historical data indicate values that will have an impact on ecological and human health.

The discard facility will add additional load to the river if the stormwater management is not well designed and maintained. Increased load may impact the downstream domestic and agricultural users. The impact significance is rated as moderate, but can be reduced to low, should the storm water management system described in Section 4.1.1 be implemented, to ensure clean and dirty water separation and hence assist in ensuring that only clean water from the eastern sub-catchment of the area drains to the Saalboomspruit.

Decommissioning and closure phase

At closure, the groundwater quality, specifically sulphate concentrations, in the pit area is expected to have deteriorated significantly to concentrations > 4 000 mg/L, and the pollution plume at 50 and 100 years is expected to extend 480 m and 700 m respectively. Decant is expected to be at an estimated rate of 620 m^3/d.

In this respect the decant could add significant contaminant load to the surface water resources and is therefore rated as having a high impact significance. To prevent the decant, boreholes will be pumped, and the contaminated water treated at the EWRP. This mitigation will ensure that the impact significance is reduced to low.

10.4.5 Wetlands and aquatic ecology

Impact assessment

Construction phase

The proposed discard facility will be located within the existing opencast mine pit, and as such does not require any require any footprint preparations as part of a formal construction phase as the discard will simply be deposited within the proposed discard facility footprint. The proposed new conveyor belt will be constructed in alignment with the existing conveyor, in an area already heavily impacted by mining. Assessment of construction phase impacts on wetlands or aquatic ecosystems is thus not applicable.

Operational phase

The disposal of the discard – which is classified as potential acid generating (Golder, 2021a) - in the opencast pit has the potential to add to the contaminant load of the already highly-contaminated Saalklapspruit through surface water runoff and seepage from the pit, and subsequently affect the extent/condition and survival/reproduction of downstream aquatic and wetland ecosystems and species, respectively. Seepage from the discard will be managed by the existing pit water management system in place for the mine. Excess mine water make intercepted at the pit is currently sent to the EWRP (via the 40 ML PCD) for treatment. Should the stormwater management system not be well maintained, contamination of the Saalklapspruit could result in negative impacts on the aquatic ecosystem downstream of the facility. The potential impact is expected to be of high significance prior to mitigation. The application of the recommended mitigation measures reduces both the potential magnitude of the impact and the probability of the impact occurring, resulting in the same low level of significance, with a lower overall significance score.

Decommissioning and closure phase

Rehabilitation of the discard facility will require the construction of a cover that will be installed during ongoing rehabilitation. The cover will utilise a growth medium suitable for the establishment of vegetation to limit erosion and rainwater ingress/seepage into the discard facility. The earthworks involved in rehabilitation of the discard facility have the potential to contribute to increased sediment loading to downstream aquatic habitats. The impact is expected to be short-term in duration with a moderate probability of occurrence, resulting in a localised impact of moderate significance prior to mitigation. Provided that the recommended mitigation measures are adhered to, the magnitude and probability of the impact can be decreased, reducing the potential impact to one of low significance.

The approved wetland rehabilitation strategy for Zibulo includes the rehabilitation of the northern and southern seepage areas; and recreation and/or establishment of a watercourse through the mined-out areas. Rehabilitation of the northern and southern seepage systems presents an opportunity for a positive impact on the extent and condition of wetlands within the Zibulo mining right area. However, since the presence of the discard facility over the mined-out footprint will prevent the creation of a new watercourse over the rehabilitated pit, the wetland rehabilitation and management strategy will need to be revisited.

Although decant of contaminated groundwater from the pit to surface water systems is predicted for both the capped and uncapped scenarios (Golder, 2021a), resulting in an impact of potentially high environmental significance on aquatic ecosystems, interception boreholes will be installed and the contaminated water will be abstracted and treated at the EWRP, resulting in a residual impact of low significance.

10.4.6 Visual

Impact identification

The following potential visual impacts that may occur during the construction, operational and decommissioning/closure phases of the project have been identified. For the purposes of this assessment, potential impacts during the construction and operational phases have been grouped together, as they are expected to be largely similar in nature, although potentially of varying magnitude.

Construction and operational phases

- Reduction in visual resource value due to presence of the discard facility; and
- Formation of dust plumes as a result of construction and operational activities.

Decommissioning and closure phase

- Permanent alteration of site topographical and visual character of due to presence of the discard facility; and
- Visible dust plumes during rehabilitation.

Impact magnitude criteria

The magnitude of a visual impact is determined by considering the visual resource value and VAC of the landscape in which the project will take place, the receptors potentially affected by it, together with the level of visibility of the project components, their degree of visual intrusion and the potential visual exposure of receptors to the project, as further elaborated on below:

Theoretical visibility

The level of theoretical visibility (LTV) is defined as the sections of the study area from which the proposed discard facility may be visible. This was determined by conducting a viewshed analysis and using Geographic Information System software with three-dimensional topographical modelling capabilities.

The basis of a viewshed analysis is a Digital Elevation Model (DEM). The DEM for this viewshed analysis was derived from 5 m contour lines. A 10 km study area surrounding the site was used for the analysis.

The viewshed was developed for the proposed discard facility using contours for the dump that range from 1 528 m to 1 579 m with observer points set around and on top of the dump. The LTV based on the results of the viewshed analysis was then rated according to Table 24. We highlight that ongoing mining activities are causing continuing, and in some cases substantial modification to local-scale topography. Artificial landforms, such as berms and stockpiles, and indeed tall vegetation (particularly alien tree windrows and plantations) are not reflected in the DEM, yet these may act to visually screen the proposed infrastructure. The results of the viewshed analysis are thus considered conservative within the context of the study area.

The viewshed was modelled on the above-mentioned DEM, adjusted to include the proposed site layout, using Esri ArcGIS for Desktop software, 3D Analysist Extension. The results are presented in Figure 36.

Table 24: Level of visibility rating

Level of theoretical visibility of project element	Visibility rating
Less than a quarter of the total project study area	Low (1)
Between a quarter and half of the study area	Moderate (2)
More than half of the study area	High (3)

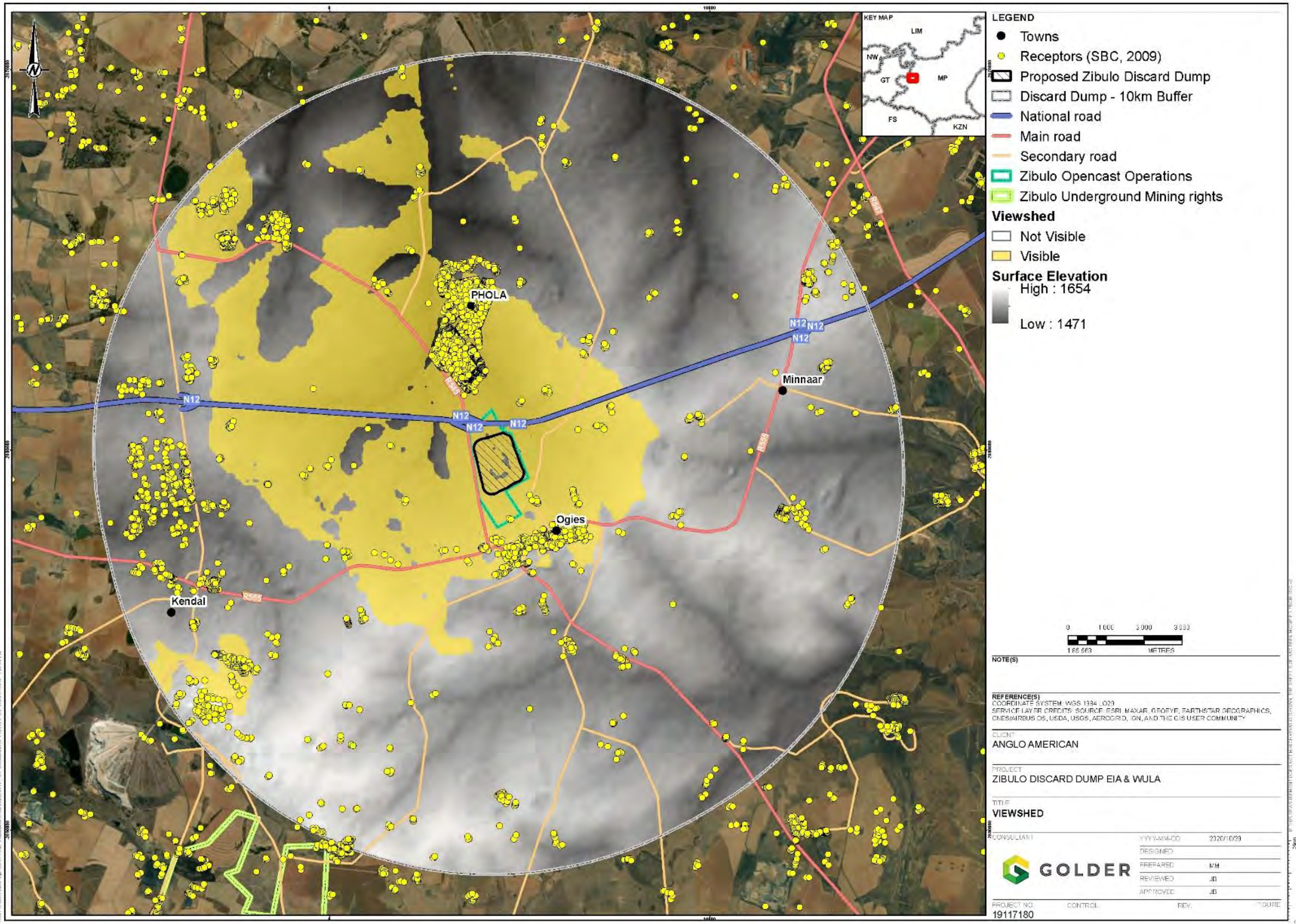

Figure 36: Viewshed from proposed discard facility

Construction and operational phase impacts

- **Presence of the discard facility:** The final height of the proposed discard facility will vary between 1 528 m and 1 579 m. The viewshed indicates a facility of this height will be visible from a fairly large proportion of the study area - Figure 36, including several urban locales, such as *inter alia*, Phola, Ogies, Wilge and Kendal Village. Amongst other mediating factors that cannot be incorporated into the Viewshed analysis, yet are likely to influence the LTV we note that:
  - A large earthen berm runs parallel to the N12 highway for much of the length of the Zibulo opencast operations. This is likely to screen the proposed discard facility from locales to the north of the N12, including the Phola residential area; and
  - Similarly, a series of pine tree windrows surround the grain silos at Ogies. These along with other features such as the silos themselves, are also likely to screen the discard facility from receptors in the town.
- Based on the viewshed and the above considerations, the LTV of the discard facility is conservatively rated at MODERATE (2), in line with the criteria set out in Table 24
- **Formation of dust plumes:** During construction and operations, and especially during dry and windy conditions, it is expected that activities at the discard facility will result in airborne dust plumes, which may be visible over great distances. For this reason, the level of visibility of dust plumes associated with mining construction and operations is also expected to be MODERATE (2).

Decommissioning and closure phase impacts

- **Permanent alteration of topography as a result of the discard facility:** At final closure, the discard facility will remain in place, but it will be shaped and revegetated. It will still however, be visible across those areas of the landscape where it was visible during operations. The LTV thus remains moderate during this phase; and
- **Formation of dust plumes:** Initial rehabilitation activities are expected to cause dust entrainment. However, the frequency will reduce as revegetation progresses. The visibility of this impact is therefore expected to be low in the study area during this phase.

Visual intrusion

Visual intrusion deals with how well the project components fit into the ecological and cultural aesthetic of the landscape as a whole. An object will have a greater negative impact on scenes considered to have a high visual quality than on scenes of low quality because the most scenic areas have the "most to lose".

The visual impact of a proposed landscape alteration also decreases as the complexity of the context within which it takes place, increases. If the existing visual context of the site is relatively simple and uniform any alterations or the addition of human-made elements tend to be very noticeable, whereas the same alterations in a visually complex and varied context do not attract as much attention. Especially as distance increases, the object becomes less of a focal point because there is more visual distraction, and the observer's attention is diverted by the complexity of the scene (Hull and Bishop, 1998, in: Golder, 2020). The expected level of visual intrusion of each of the project components is assessed below.

Construction and operational phase impacts

- **Presence of the discard facility:** Despite the stark contradistinction between the height and geometric shape of the discard facility and the natural setting, the study area and surrounding landscape are currently highly modified and thus already visually complex. The discard facility is therefore expected to have a LOW (1) intrusive value; and

- **Formation of dust plumes:** Dust plumes are often one of the more socially objectionable impacts associated with opencast mining, due to the associated potential health risks, nuisance factor and degradation of the visual amenity value of the surrounding landscape. Existing operations at Klipspruit Colliery and many of the surrounding mining operations currently generate large volumes of dust. Considering this baseline, dust impact has a LOW (1) intrusive value from a visual perspective.

Decommissioning and closure phase impacts

- **Presence of the discard facility:** At final closure, the discard facility will remain in place, but it will be shaped and revegetated. It will thus have a low intrusive value at this stage during this phase; and
- **Formation of dust plumes:** Initial rehabilitation activities are expected to cause dust entrainment from the project site. However, the frequency will reduce as revegetation progresses. The intrusion of dust will therefore remain low in the study area during this phase.

Visual exposure

The visual impact of a development diminishes at an exponential rate as the distance between the observer and the object increases – refer to Figure 37. Relative humidity and fog in the area directly influence the effect. Increased humidity causes the air to appear greyer, diminishing detail. Thus, the impact at 1 000 m would be 25% of the impact as viewed from 500 m. At 2 000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (Hull and Bishop, 1998, in Golder, 2020) and was used as important criteria for this study.

Thus, visual exposure is an expression of how close receptors are expected to get to the proposed interventions on a regular basis. For the purposes of this assessment, close range views (equating to a high level of visual exposure) are views over a distance of 500 m or less, medium-range views (equating to a moderate/medium level of visual exposure) are views of 500 m to 2 km, and long range views are over distances greater than 2 km (low levels of visual exposure).

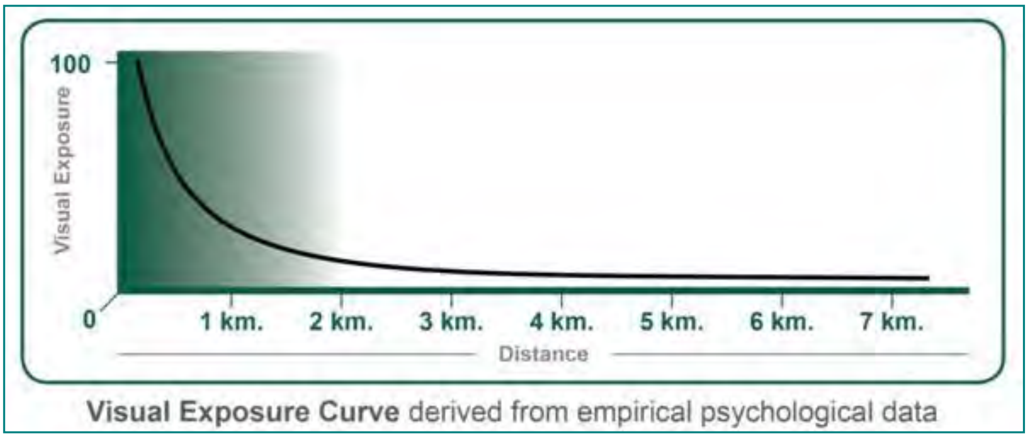

Figure 37: Visual exposure graph

Construction and operational phase impacts

- **All identified impacts:** Few receptors are located in close proximity to the project site - the outskirts of Phola and Ogies, which constitutes the closest prominent urban areas, are located about 1.4 km and 1.6 km from the project site, respectively. Although most of these potential vantage points will at least be partially screened from view by the earthen embankment located directly south of the N12, the majority of the visual receptors are located within medium-range view of the proposed dump. Accordingly, a notable number of views of the proposed discard facility and associated impacts which includes the N12 highway and R549 road will be from short-to medium range positions, and thus have MODERATE (2) levels of visual exposure.

Decommissioning and closure phase impacts

- **All identified impacts:** As is the case with the construction and operations phase impacts, most visual receptors are located beyond 2 km of the project site and visual exposure to the rehabilitation/closure related impacts is therefore rated as low.

Impact magnitude methodology

The expected impact magnitude of the proposed project was rated, based on the above assessment of the visual resource value of the site, as well as level of visibility, visual intrusion, visual exposure and receptor sensitivity as visual impact criteria. The process is summarised below.

- *Magnitude* = [(*Visual quality of the site x VAC factor*) *x* (*Visibility + Visual Intrusion + Visual Exposure*)] *x Receptor sensitivity factor*.

  Thus: [(*1 x Factor 1.0*) *x* (*1 + 1 + 1*)] *x Factor 1 = 3.*

From the above equation the maximum magnitude point (MP) score is 38.9 points. The possible range of MP scores is then categorised as indicated in Table 25.

Table 25: Impact magnitude point score range

MP Score	Magnitude rating
20.1≤	High
13.1 - 20.0	Moderate
6.1 - 13.0	Low
≤6.0	Negligible

Impact magnitude determination

Based on the visual resource, VAC, receptor sensitivity and impact assessment criteria assessed in the preceding sections, the magnitude of the various impacts identified for each phase of the project was determined as being negligible.

10.4.7 Heritage

The heritage assessment made the following conclusions regarding potential impacts of the proposed discard facility on heritage resources (APAC cc, 2021):

- The Zibulo discard facility footprint area has been extensively impacted by past and recent on-going mining operations. Prior to that, agricultural activities were also occurring on a large scale. This is clear from older aerial images of the areas showing the impact of these activities. The possibility of any sites, features, or material of any cultural heritage (archaeological and/or historical) origin or significance being present here is therefore highly unlikely. A heritage impact assessment conducted prior to commencement of mining found a number of cemeteries and grave sites in the larger area, but none were located close to the discard facility development area.
- However, the subterranean nature of cultural heritage (archaeological and/or historical) resources must always be kept in mind. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward. This could include previously unknown and unmarked graves, as well as fossil material.

10.4.8 Palaeontology

The palaeontology assessment made the following conclusion regarding potential impacts of the proposed discard facility on palaeontology resources (Fourie D. H., 2020):

- Although the proposed discard facility development footprint is underlain by the rocks of the Vryheid Formation, Permian age which has a very high Palaeontological Sensitivity (Groenewald and Groenewald, 2014, in: Fourie, 2020), the development will take place on an already mined-out, disturbed and partially rehabilitated pit/opencast mining area, and will only consist of surface infrastructure, therefore, the impact will be of low significance.
- It may be possible that palaeontological resources have been missed in the project area as outcrops are not always present or visible on geological maps, while others may lie below the overburden of earth, and hence may only be present once development commences. It is therefore recommended that a chance finds procedure be implemented. Should a fossil be unearthed during development of the project, the relevant department should be notified and a suitably qualified specialist requested to further investigate.

10.4.9 Social

Impact assessment

Construction / operational phases

Nuisance impacts

It is anticipated that the project will result in several nuisance related impacts. The nuisance impacts should be recorded in the grievance mechanism and addressed as per the grievance mechanism procedure. The following nuisance impacts are anticipated:

- Dust pollution:

  Discard activities, heavy machinery and construction activities are typically dust-generating activities. Dust is anticipated to fall out rapidly with distance from the source. PM_{10} and $PM_{2.5}$ are predicted to disperse further and can negatively impact ambient air quality beyond the boundary. This impact is considered to be of moderate significance, but through the implementation of mitigation measures, such as those recommended in the air quality specialist report (Golder, 2021b), this impact can be reduced to low.

- Visual pollution:

  The final height of the discard facility will be just under 30 m. The facility will be visible to the surrounding roads and from the southern portions of Phola. There will be limited on-site lighting to satisfy immediate operating requirements, and some low-level impact may result from this. The formation of dust plumes will also have an adverse visual impact. This impact is considered to be of moderate significance, but through the implementation of mitigation measures such as those recommended in the visual specialist report (Golder, 2020), this impact can be reduced to low.

- Noise pollution:

  Noise pollution during the day and night-time resulting from materials handling activities, vehicle noise during discard hauling, and heavy vehicle/machinery noise. This impact is considered to be of moderate significance, but through the implementation of mitigation measures such as those recommended in the mine's existing EMPrs (Licebo Environmental and Mining (Pty) Ltd, 2018) and (SRK Consulting, 2009), and continuing to conduct noise monitoring, this impact can be reduced to low.

Job security

The opencast pit is approaching the end of its life. There is an expansion project to the south. The discard facility will be built over the footprint of the opencast and will continue for the operational life of the underground mine. AAIC will continue using the current workforce to dispose of coal discard onto the discard facility during the operational phase. This aspect will result in improved job security for the current employees at Zibulo. This impact is rated as a moderate positive impact, which could be increased by ensuring that current local employees are utilised for the project.

Potential impact on water users

The main water users in the area relate to the Town of Phola, located directly north of Zibulo Opencast. While most of the areas receive water from the ELM, it is likely that informal dwellers use water directly from the river and small farm dams downstream of the mine. Further downstream water is used for irrigation.[7] Should seepage from the discard facility not be adequately managed, impacts on water utilisation could materialise. This potential impact is considered to be of high significance.

However, since the seepage will be abstracted along with the current pit water, and re-used on site or sent to the EWRP for treatment, the development of the proposed discard facility on the opencast mine's surface should not have any additional material effect on neighbouring water users over that which would already have occurred due to the opencast mine itself. This impact can therefore be reduced to low. Any changes in surface or groundwater quality or related aspects that may have an off-site impact must however be communicated to the relevant institutional and community stakeholders urgently.

Decommissioning and closure phase

During this phase, various nuisance implications are anticipated, such as:

- Low visibility due to dust plumes formation as a result of the initial rehabilitation activities; and
- Noise pollution as a result of rehabilitation activities.

This impact is considered to be of moderate significance, but through the implementation of appropriate dust and noise control measures. This impact can be reduced to low.

10.5 Positive and negative impacts of preferred approach and alternatives

See Section 7.0 of this report for a discussion on the alternatives considered and their positive and negative impacts.

10.6 Possible mitigation measures and levels of risk

For each identified impact described in the sections above, possible mitigation measures and post-mitigation impact significance ratings have been provided – refer to Sections 10.4 and 17.0.

10.7 Motivation for not considering alternative sites

Not applicable. Refer to Section 7.1.1.

10.8 Summary of environmental impacts

Table 26 below summarises the potential impacts of various environmental aspects applicable to the construction, operation and decommissioning and closure phases of the proposed discard facility project.

[7] (Golder Associates 2020)

Table 26: Assessment of each identified potentially significant impact and risk

ACTIVITY **Whether listed or not listed** *(e.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)*	**POTENTIAL IMPACT** *(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.)*	**PHASE** **In which impact is anticipated** *(e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)*	**SIGNIFICANCE** **(If not mitigated)**	**MITIGATION TYPE** **Modify, remedy, control or stop** *(e.g. Modify through alternative method; Control through noise control; Control through management and monitoring; Remedy through rehabilitation*	**SIGNIFICANCE** **(If mitigated)**
Air Quality					
Material handling and wind erosion from the proposed discard facility	Dust and fine particulate mobilization on sensitive receptors	Operational phase	Moderate	Minimise and control through impact management and monitoring	Low
Spontaneous combustion	Combustion gas mobilization on sensitive receptors	Operational phase	Moderate	Minimise and control through impact management and monitoring	Low
Shaping the final discard facility to a fairly flat outer slope of probably 1:9.	Dust and fine particulate mobilization on sensitive receptors	Decommissioning and closure phase	Low	Remedy	Low
Climate Change					
Rising Temperatures Increase Risk of Spontaneous Combustion	Marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions, and the risk of the coal discard igniting or burning	Operational phase	Moderate	Control through impact management	Low
Increased Risk of Contaminated Runoff	With an increase in the percentage of rainfall from very wet days, there will be an increase in accelerated runoff from the coal discard, which if not properly managed, can potentially contaminate soil, surface water, and groundwater resources	Operational phase	Low	Control through impact management	Low
Decreasing Precipitation Increases Likelihood of Dust	A decrease in average annual precipitation, coupled with an increase in average monthly temperatures and evaporation rates, will increase the dust coming off the facility, which can impact negatively on human health, well-being, and the environment	Operational phase	Moderate	Control through impact management	Low
Rising Temperatures Increase Risk of Spontaneous Combustion	Marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions, and the risk of the coal discard igniting or burning	Decommissioning and closure phase	Moderate	Control through impact management	Low
Visual					
Disposal of discard	Presence of the discard facility	Construction and operational phase	Moderate	Minimise and control through impact management and monitoring	Low
Wind erosion and material handling activities	Formation of dust plumes	Construction and operational phase	Moderate	Minimise and control through impact management and monitoring	Low

ACTIVITY **Whether listed or not listed** *(e.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)*	**POTENTIAL IMPACT** *(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.)*	**PHASE** **In which impact is anticipated** *(e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)*	**SIGNIFICANCE** **(If not mitigated)**	**MITIGATION TYPE** **Modify, remedy, control or stop** *(e.g. Modify through alternative method; Control through noise control; Control through management and monitoring; Remedy through rehabilitation*	**SIGNIFICANCE** **(If mitigated)**
Disposal of discard	Presence of the discard facility	Decommissioning and closure phase	Moderate	Minimise and control through impact management and monitoring	Low
Wind erosion and material handling activities	Formation of dust plumes	Decommissioning and closure phase	Low	Minimise and control through impact management and monitoring	Low
Hydrology					
Disposal of discard	Contaminated stormwater runoff to receiving watercourses	Operational phase	Moderate	Minimise and control through impact management and monitoring	Low
Discard facility closure	Contaminated recharge to the groundwater and subsequent decant to the surface water	Decommissioning and closure phase	High	Minimise and control through impact management and monitoring	Low
Hydrogeology					
Disposal of discard	Contaminated recharge to the groundwater	Operational phase, decommissioning and closure phase	Moderate	Minimise and control through impact management and monitoring	Low
Wetlands and Aquatic Ecology					
Seepage arising from pit, poorly maintained stormwater management systems	Entry of contaminated pit water and/or stormwater to downstream rivers and wetlands	Operational phase	High	Control, remedy, modify	Low
Earthworks involved in the rehabilitation of discard facility	Sediment mobilisation to aquatic ecosystems	Decommissioning and closure phase	Moderate	Control, remedy, modify	Low
Wetland rehabilitation	Improved wetland functioning	Decommissioning and closure phase	+Positive	N/A	+Positive
Decant of contaminated groundwater	Entry of contaminated groundwater to downstream rivers and wetlands	Decommissioning and closure phase	High	Control, remedy, modify	Low
Social					
Dust pollution	Discard activities, heavy machinery and construction activities are typically dust generating activities. Such activities have the potential to cause respiratory and associated problems over the long term	Construction, operational and closure (rehabilitation) phase	Moderate	Control, remedy and modify	Low
Light pollution	The introduction of artificial lightning can have an adverse impact on communities particularly where the light spills outside of the site	Construction, operational phase	Moderate	Control, remedy and modify	Low
Noise Pollution	Noise pollution during the day and night-time resulting from materials handling	Construction, operational and closure (rehabilitation)	Moderate	Control, remedy and modify	Low

ACTIVITY **Whether listed or not listed** *(e.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc.)*	**POTENTIAL IMPACT** *(e.g. dust, noise, drainage surface disturbance, fly rock, surface water contamination, groundwater contamination, air pollution etc.)*	**PHASE** **In which impact is anticipated** *(e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)*	**SIGNIFICANCE** **(If not mitigated)**	**MITIGATION TYPE** **Modify, remedy, control or stop** *(e.g. Modify through alternative method; Control through noise control; Control through management and monitoring; Remedy through rehabilitation*	**SIGNIFICANCE** **(If mitigated)**
	activities, vehicle noise during discard hauling, and heavy vehicle/machinery noise				
Prolonged employment - positive impact	During the operational phase, AAIC will continue using the current workforce for the development of the coal discard facility	Construction and operational phase	Moderate	Enhance	Moderate
Access to water supply of adequate quality and quantity	In the event that no controls are put in place, there will be decant of mine-affected water once mining and operational dewatering cease, and the pit fills up, potentially impacting water resources, and consequently affecting community livelihood resources	Operational, closure and post closure phase	High	Remedy and control	Low

11.0 ENVIRONMENTAL IMPACT STATEMENT

11.1 Key findings: potential cumulative impacts

The following potential cumulative impacts were identified and assessed:

11.1.1 Air quality

The addition of dust fallout and particulate matter, as a result of the proposed discard facility and conveyor operations, is likely to contribute to the current negative impact on ambient air quality. The concentrations from the proposed operations only, at each of the sensitive receptors, contribute marginally to the overall cumulative concentrations.

11.1.2 Wetlands and aquatics

Since the discard facility will be located within an existing opencast pit, and the proposed conveyor belt will be aligned adjacent to an existing conveyor in an already transformed landscape, no significant cumulative impacts on aquatic ecosystems or wetlands are anticipated.

11.1.3 Groundwater

The existing groundwater at Zibulo Opencast and in the general area is heavily impacted by mining activities. The additional disposal of acid-generating discard above the water table in the pit will nearly double the current sulphate concentration in the pit (Golder, 2021a). It is therefore critical that the additional contaminant load associated with the proposed discard facility is contained within the bounds of the pit through operation of abstraction boreholes, followed by re-use and/or treatment of the water.

11.1.4 Surface water

Water quality monitoring data indicates that the surface water resources associated with the catchment in which Zibulo Opencast is located is significantly impacted by mining and industrial activities, sewage discharges, etc. In the event that no/inadequate controls are put in place to manage contaminated storm water runoff from the discard facility, and the decant from the pit, this will result in an unacceptable impact on the receiving water resources. Construction of the additional storm water management infrastructure described in Section 4.1.1 must be implemented for the discard facility development. Pit water levels must also be managed to prevent decant. The intercepted pit water must be re-used or treated at the EWRP.

11.1.5 Visual

The region was predominantly an agricultural landscape that has been substantially transformed by mining over the recent years. The cumulative impact associated with the existing visual impacts from the existing mine infrastructure and facilities, coupled with the anticipated visual impacts from the proposed discard facility may negatively affect the general visual aesthetics of the broader region. We note that various infrastructure and facilities associated with these mines will be removed during decommissioning and closure, and the footprints rehabilitated. Other facilities however, such as the discard facility, will remain permanent visible features of the landscape even following rehabilitation and revegetation. The levels for cumulative impacts are considered the same for the project impacts ratings as provided in the previous sections.

11.1.6 Socio-economic

Communities in the receiving environment are exposed to high rates of unemployment and generally do not have access to adequate social services and infrastructure. The development of the discard facility will ensure that AAIC is able to continue production. Consequently, this will ensure local economic growth in ELM and ensure the continuation of job opportunities for employees at Zibulo Colliery, including the transfer of technical skills.

11.2 Final site maps

See Figure 2 for the layout showing the position of the proposed discard dump expansion footprint.

11.3 Summary of Positive and Negative Implications and Risks of Proposed Activity and Alternatives

Positive

Processing of local raw material into a higher value product, and prolongation of current employment and skills transfer at Zibulo which in turn will lessen the financial burden on the Government. Indirectly this project will lead to the generation of electricity and will reduce the energy demand in the local area.

Negative

- Potential negative impact on ambient air quality as a result of spontaneous combustion and increased nuisance dust and fine particulate levels, likely to occur as a result of materials handling activities (tipping, loading and offloading), vehicle entrainment of dust on unpaved roads, and wind erosion from open/ exposed areas;
- Potential negative impact on visual aesthetics of the broader region, particularly since the discard facility will remain a permanent visible feature of the landscape;
- Potential negative impact on pit water quality due to the additional acid-generating discard that will be placed on top of the pit, and subsequent decant of mine affected water once mining and operational dewatering ceases and the pit fills up, impacting on downstream water resources (Saalboomspruit);
- Potential negative impact on the quality of downstream water resources resulting from spillage of contaminated storm water runoff emanating from the discard facility;
- Potential negative impact on downstream aquatic ecosystems and wetlands resulting from the above-mentioned impacts on water quality; and
- Potential negative impact on quality of water supply of local water users.

Alternatives

Locating the development elsewhere (on or off site) would be disadvantageous in terms of environmental impacts, materials handling, visibility and cost. Furthermore, the current Opencast section is constrained in terms of available space. The preferred location of the proposed discard footprint is on disturbed land, i.e. over the mined-out area. Similarly, the preferred alignment for the conveyor belt is to run along the existing conveyor linking the South32 Klipspruit extension project to the PCPP.

11.4 Impact management objectives and outcomes for inclusion in the EMPr

The impact management objectives and outcomes for the proposed discard facility project are to:

- Develop capacity for disposal of discard, to allow continued processing of a local material (coal) into a saleable product of higher value, while enhancing the existing positive socio-economic impact of the mine on the region; and
- Achieving the above without causing:
  - Safety risks to mine employees and local communities;
  - Exceedances of air quality standards at any receptors;

- Pollution of local surface water and groundwater resources that would render such resources unfit for continuation of current uses;
- Negative impacts on aquatic ecosystems and wetlands downstream of the proposed discard facility and conveyor belt sites;
- Exceedances of noise standards at any receptors; or
- Visual impacts that are unacceptable to local residents.

11.5 Assumptions, uncertainties, gaps in knowledge

The EIA was limited to the scope of the assessments described in Sections 9.0 to 16.0.

Every effort has been made to engage stakeholders to the extent possible to date, 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 AAIC project team.

11.5.1 Visual

- Determining the value, quality and significance of a visual resource or the significance of the visual impact that any activity may have on it, in absolute terms, is not achievable. The value of a visual resource is partly determined by the viewer and is influenced by that person's socio-economic, cultural and specific family background, and is even subject to fluctuating and intangible factors, such as emotional mood and appreciation of 'sense of place'.
- This situation is compounded by the fact that the conditions under which the visual resource is viewed can change dramatically due to natural phenomena, such as weather, climatic conditions and seasonal change. Visual impact cannot therefore be measured simply and reliably, as is for instance the case with water, noise or air pollution; and
- It is therefore not possible to conduct a visual assessment without relying to some extent on the expert opinion of a qualified consultant, which is inherently subjective. The subjective opinion of the visual consultant is however unlikely to materially influence the findings and recommendations of this study, as a wide body of scientific knowledge exists in the industry of VIA, on which findings are based.

11.5.2 Air quality

- Due to the proximity of the Ogies weather station to Zibulo, the meteorological conditions experienced at this station are anticipated to be almost identical to that experienced at Zibulo, and was used for this assessment, in the absence of data from Zibulo at the time of the assessment;
- A mean wind speed of 3.4 m/s and a material moisture content of 2.5%, as per the average recommended by USEPA AP-42 (USEPA, 2006), was used for the material handling activities. A control measure of 70% was applied to the offloading activities as per the recommended NPI (NPI, 2012) mitigation control techniques;
- For wind erosion, $PM_{2.5}$ emissions were assumed to equal 15% of TSP (USEPA, 2006) in the absence of a $PM_{2.5}$ emission factor. A 50% control efficiency was applied as an environmentally conservative approach (NPI, 2012) for water sprays; and
- No available site-specific emission factors for the Zibulo Colliery are available regarding spontaneous combustion and as such, has not been determined in this assessment.

11.5.3 Wetlands and aquatics

The baseline ecological assessment of the study area was based on previously conducted aquatic and wetland assessments, and no new field surveys were conducted by Golder to inform this report. Both the wet and dry seasons are well represented in the data used for the assessment.

The available site-level information, together with up-to-date desktop data including the MBSP (2019) assessment and the National Wetland Map 5 (van Deventer, 2019) was considered sufficient to inform the current study, particularly given that the proposed discard facility will be located within an existing, mined out opencast pit.

11.5.4 Climate change / GHG emissions

The nature of the work undertaken is stochastic with substantial inherent uncertainly around any given data points. Also, the uncertainty associated with any projections or forecasts is increased with the duration of the projected period and is subject to future developments or intervening acts which may manifest in the interim period.

11.6 Opinion on whether the activity should be authorised

Provided that all the environmental management measures described in the EMPr are applied diligently, it is expected that the proposed discard facility project will not result in any environmental impacts that cannot be mitigated to acceptable levels.

Not granting this authorisation will result in the benefits of the project to AAIC - Zibulo Colliery and to local residents not being realised.

Accordingly, it is the opinion of the environmental assessment practitioner that the application for Environmental Authorisation and Waste Management Licence to enable AAIC to undertake the activities described in this EIA/EMPr should be granted.

11.7 Conditions that must be included in the authorisation

11.7.1 General conditions

AAIC must:

- Implement all aspects of the EMPr in sections **Part B** of this document;
- Comply with all relevant legislation at all times;
- Undertake annual internal auditing of environmental performance; and
- Undertake external auditing of environmental performance and provide the DMRE with a copy of the audit report.

11.7.2 Site specific conditions

AAIC must:

- Prior to implementation:
  - Conduct additional geotechnical work, including site investigations, drilling, laboratory analyses and the required geotechnical modelling, to quantify the settlement characteristics of the underlying spoil to a higher resolution; and
  - Formulate an ongoing monitoring programme to ensure an observational methodology is applied, to monitor short-term and long-term settlement on the discard facility.

- Conduct field drilling and hydraulic tests on backfill material to confirm the number and drawdown volume of abstraction boreholes required for management of the decant level below the ECL;
- Should any previously unknown or invisible sites, features or material of cultural heritage (archaeological and/or historical) importance be uncovered during any development actions, then the relevant regulatory department should be notified, and an expert contacted to investigate and provide recommendations on the way forward. This could include previously unknown and unmarked graves, as well as fossil material;
- Update the wetland mitigation strategy to take into consideration the changes in the reinstatement of drainage lines over the backfilled pit due to the development of the proposed discard facility (over the backfilled pit);
- Continue investigations in support of the development of the post-closure water management strategy for the mine, which may include passive treatment options;
- During the operational phase, ensure availability of topsoil for any additional topsoil that may be required for cover remediation to accommodate any possible consolidation settlement that may occur after cover application. Any excessive settlements should not impact the free drainage of the facility and promote ponding;
- Perform a veneer stability analysis, to estimate the resistance of the cover material to sliding. This analysis should be done as part of the closure design of the facility;
- Follow an observational approach beyond closure, to monitor the settlement and cover movements;
- Monitor and maintain the facility (from a stability perspective) for a minimum of 10 years beyond closure;
- Execute remedial work on the cover post closure, when settlement occurs;
- Take any other appropriate remedial actions if deviations from expected environmental performance occurs; and
- Amend the EMPr as and when necessary to maintain acceptable environmental performance.

11.8 Period for which environmental authorisation is required

It is estimated that the development of the discard facility at Zibulo Colliery will take place over a period of approximately 15 years. The dump will then be formally decommissioned and rehabilitated afterwards until the vegetation has been demonstrated to be self-sustaining and capable of maintaining the stability of the cover for roughly 10 years.

The discard facility operation is expected to continue for about 15 years and it is requested that this authorisation remain in effect for at least **25 years**.

12.0 OTHER INFORMATION REQUIRED BY COMPETENT AUTHORITY

12.1.1 Impact on socio-economic conditions of any directly affected persons

The potential impacts on the socio-economic conditions of the adjacent landowners and local communities are described in detail in Section 10.4.9 of this report.

12.1.2 Impact on any national estate

It is highly unlikely that any cultural/heritage resources will be impacted by the proposed activities. However, the possibility of chance finds during construction cannot be ruled out.

13.0 OTHER MATTERS REQUIRED IN TERMS OF SECTION 24(4)(A) AND (B) OF THE NEMA

- Section 24(4)(a) (iii) requires that a description of the environment likely to be significantly affected by the proposed activity be provided. The description of the environment is provided in Section 9.0 of this report;
- Section 24(4)(a) (iv) requires an investigation of the potential consequences for or impacts on the environment as a result of the activity and assessment of the significance of those potential consequences or impacts. See Section 10.4 of this report, where potential impacts were assessed; and
- Section 24(4)(a) (v) references public information and participation procedures, which have been dealt with in Section 8.0 of this report.
- 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;"

The above requirements are dealt with comprehensively in Sections 4.0 to 8.0 of this EIA/EMPr.

14.0 UNDERTAKING

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

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

15.0 ENVIRONMENTAL MANAGEMENT PROGRAMME

15.1 Details of the environmental assessment practitioner

The required details have been supplied in PART A, Section 2.0 of this report.

15.2 Description of the aspects of the activity

See Section 4.0 of this report.

15.3 Composite map

Refer to Figure 38 for an illustration of the preferred infrastructure layout and the identified environmental features in the project area and its surrounding areas.

15.4 Impact management objectives and statements

15.4.1 Environmental quality and managing environmental impacts

By committing to the implementation of the management measures described in the EMPr and the conditions stipulated in the EA, WML and the WUL, AAIC intends to ensure that the local environmental quality are not adversely affected by the construction, operation and decommissioning and closure of the proposed discard facility and conveyor belt and that the positive impacts will be enhanced as far as practicable.

15.4.2 Construction phase

The predicted impacts, recommended mitigation measures and expected outcomes are dealt with in Section 17.0 (Table 27).

15.4.3 Operational phase: discard facility development

The predicted impacts, recommended mitigation measures and expected outcomes are dealt with in Section 17.0 (Table 27).

15.4.4 Decommissioning and closure phase

The predicted impacts, recommended mitigation measures and expected outcomes are dealt with in Section 17.0 (Table 27).

15.5 Water use licence

The proposed discard facility is regarded as a Section 21(g) water use, which is defined as "*disposing of waste in a manner which may detrimentally impact on a water resource*". An application for a WUL will be submitted to the DWS. An application will also be submitted for exemption from the requirements of Regulation 4(a), (b) and (c) of Government Notice 704 of 04 June 1999, for in-pit discard disposal.

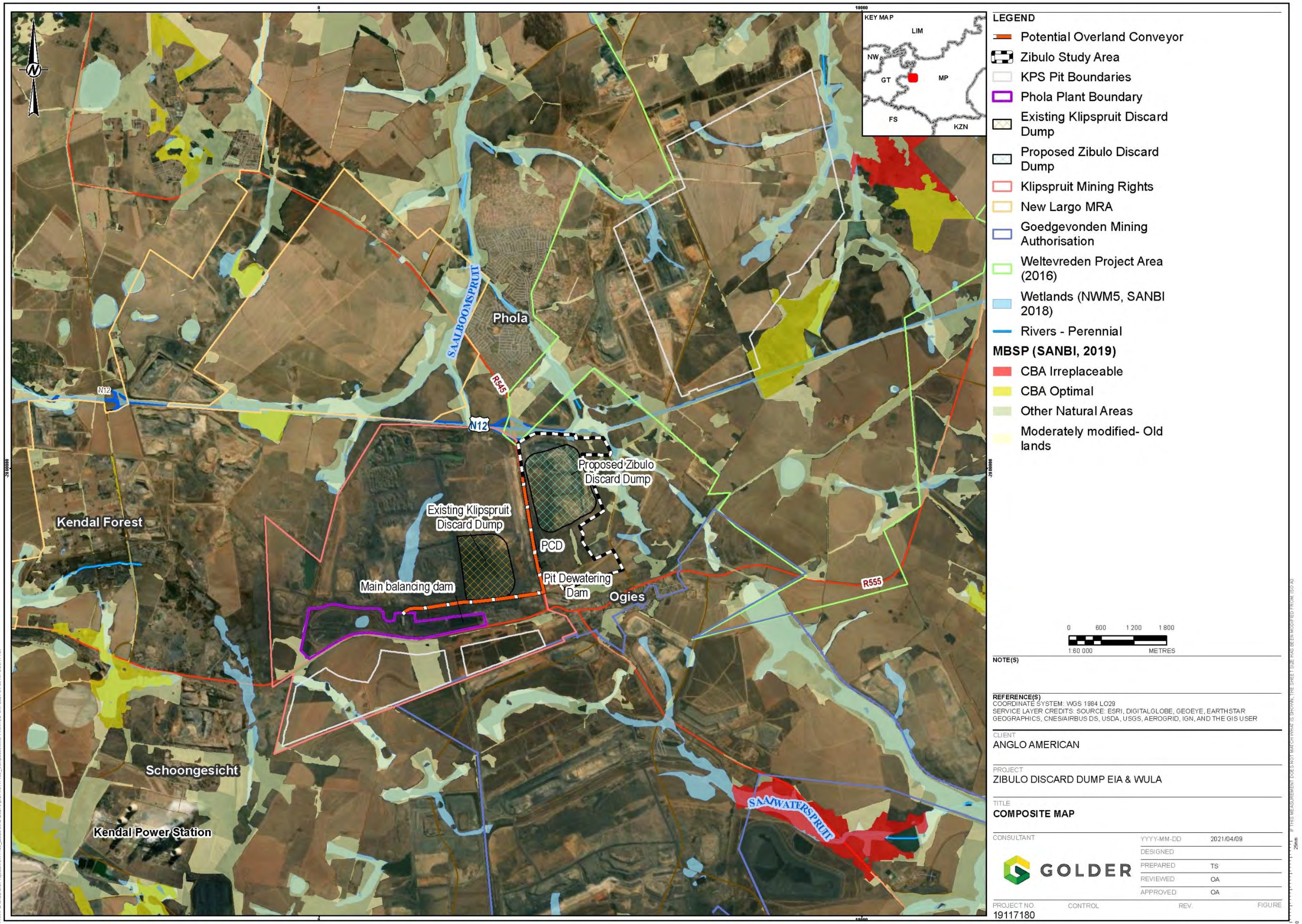

Figure 38: Composite Map

16.0 POTENTIAL IMPACTS TO BE MITIGATED

The potential impacts to be mitigated were described in detail in Section 11.0 of this EIA/EMPr. These impacts can be summarised as follows:

- Potential negative impact on ambient air quality as a result of increased nuisance dust and fine particulate levels, likely to occur as a result of materials handling activities (tipping, loading and offloading), vehicle entrainment of dust on unpaved roads, and wind erosion from open/ exposed areas;
- Spontaneous combustion on the discard facility resulting in:
  - Increased levels of fugitive emissions (i.e. air pollution) and non-compliance with the NEM: AQA when the ambient air quality standards are exceeded;
  - Increased occupational exposures to the combustion gasses;
  - Instability within the discard facility and an increased risk of collapses due to voids being formed as the discard burns within the facility; and
  - Increased risk of occupational injuries and/or losses of equipment due to burns, smoke inhalation, and/or collapse.
- Potential negative impact on visual aesthetics of the broader region, particularly since the discard facility will remain a permanent visible feature of the landscape;
- Potential negative impact on pit water quality due to the additional acid-generating discard that will be placed on top of the pit, and subsequent decant of mine affected water once mining and operational dewatering ceases and the pit fills up, impacting on downstream water resources;
- Potential negative impact on the quality of downstream water resources resulting from spillage of contaminated storm water runoff emanating from the discard facility;
- Potential negative impact on pit water quality and acceptability for treatment at EWRP;
- Potential impact on volume of contaminated mine affected water requiring management/treatment;
- Potential negative impact on downstream wetlands and aquatic ecosystems resulting from the above-mentioned impacts on water quality;
- Potential negative impact on the current wetland offset strategy for the site; and
- Potential positive impact on employment safety of permanent employees, continued skills transfer, and local economic development.

17.0 SUMMARY OF MITIGATION AND MONITORING MEASURES

This section summarises the potential impacts of various aspects of the proposed discard facility project in all its stages, from construction, through operations to eventual decommissioning and closure, together with the appropriate mitigation and monitoring measures to manage the identified impacts (Table 27 and Table 28).

Impact management actions as well as impact management outcomes are provided in the below tables Responsibilities for implementing the mitigation measures are identified and the frequencies with which the results of the various measures are to be monitored are also set out in the tables listed above.

Table 27: Impacts to be mitigated, impact outcomes, impact actions, and responsibilities during the construction, operational and decommissioning and closure phases

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Air Quality								
Material handling and wind erosion from the proposed discard facility	Dust and fine particulate mobilisation on sensitive receptors	Operational phase	■ Prevent exceedances of air quality standards at any receptors	■ Loading, unloading and transfer activities: ▪ Modify or cease loading activities during dry and windy conditions ▪ Avoid double handling of material where possible ▪ Minimise the drop height of the material from truck loads/transfer points ▪ Use water carts with boom sprayers or wet suppression systems when loading, unloading and transfer activities occur ▪ If possible, make use of sweepers around transfer points to remove and collect any spilled materials which may lead to fugitive dust generation ■ Conveyor belts: ▪ For low lying/flat conveyors that are not enclosed, fit these conveyors with wind guards ▪ Clean conveyor belts on a regular basis through the use of belt scrapers, washers, and or both ▪ If possible, wet conveyor belts to improve airborne dust concentrations around conveyors ▪ Use water sprayers at transfer points should they not be sufficiently enclosed ■ Wind erosion: ▪ Where re-vegetation is not feasible, mitigate areas of concern with the use of water sprays	Minimise and control through impact management and monitoring	As required, during the operation phase	■ Dust fallout and PM standards as per NAAQS	■ Environmental specialist ■ Production manager ■ Operations/ Metallurgy
Spontaneous combustion	Combustion gas mobilisation on sensitive receptors	Operational phase	■ Prevent exceedances of air quality standards at any receptors	■ Compact the discard to limit oxygen ingress, in particular on the windward sides where forced ventilation through prevailing winds takes place ■ If possible, undertake progressive rehabilitation to limit areas exposed to oxygen and rainfall ■ Extinguish all areas of spontaneous combustion Implement mitigation actions within 48 hours of detection	Minimise and control through impact management and monitoring	As required, during the operational phase	■ Compliance with NAAQS at the mine boundary	■ Environmental specialist ■ Production manager ■ Operations/ Metallurgy
Shaping the final discard facility to a fairly flat outer	Dust and fine particulate mobilisation on sensitive receptors	Decommissioning and closure phase	■ Prevent exceedances of air quality standards at any receptors	■ Undertake final rehabilitation and re-vegetation once the discard facility reaches final height	Remedy	As required, during the decommissioning	■ Dust fallout and PM standards as per NAAQS	■ Environmental specialist

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
slope of probably 1:9.						and closure phase		■ Production manager ■ Operations
Climate Change								
Rising Temperatures Increase Risk of Spontaneous Combustion	Marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions, and the risk of the coal discard igniting or burning	Operational phase	■ Prevent exceedances of air quality standards at any receptors ■ Reduce safety risks to mine employees and local communities	■ Compact the discard to limit oxygen ingress, in particular on the windward sides where forced ventilation through prevailing winds takes place ■ If possible, undertake progressive rehabilitation to limit areas exposed to oxygen and rainfall	Control through impact management	As required, during the operational phase	■ Compliance with NAAQS at the mine boundary ■ Classification, Design Criteria, and Surveillance Requirements for Mineral Residue Facilities and Water Management Structures Specification (Anglo, 2016)	■ Environmental specialist ■ Production manager ■ Operations/ Metallurgy
Rising Temperatures Increase Risk of Spontaneous Combustion	Marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions, and the risk of the coal discard igniting or burning	Operational phase	■ Prevent exceedances of air quality standards at any receptors ■ Reduce safety risks to mine employees and local communities	■ Undertake a thermographic survey of the facility to identify potential 'hotspots. Survey must be undertaken during the warmest months (November to February), following several consecutive hot days (>35°C)	Control through monitoring	Annually, during the operational phase	■ Compliance with NAAQS at the mine boundary	■ Environmental specialist ■ Production manager ■ Operations
Increased Risk of Contaminated Runoff	With an increase in the percentage of rainfall from very wet days, there will be an increase in accelerated runoff from the coal discard, which if not properly managed, can potentially contaminate soil, surface water, and groundwater resources	Operational phase	■ Prevent pollution of local surface water and groundwater resources that would render such resources unfit for continuation of current uses	■ Ensure that the design and implementation of the stormwater management system takes into consideration the projected increases in the percentage of rainfall from very wet days	Modify	Prior to construction, and, as required, during the operational phase	■ Regulation GN 704 ■ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	■ Engineering ■ Environmental specialist ■ Production manager ■ Operations
				■ Construct and maintain diversion channels around the facility to prevent mixing of 'clean' and 'dirty' stormwater runoff	Control through impact management	As required, during the operational phase		

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Decreasing Precipitation Increases Likelihood of Dust	A decrease in average annual precipitation, coupled with an increase in average monthly temperatures and evaporation rates, will increase the dust coming off the facility, which can impact negatively on human health, well-being, and the environment	Operational phase	■ Prevent exceedances of air quality standards at any receptors	■ Same as for Air Quality in terms of management of dust and fine particulate mobilisation on sensitive receptors				
Rising Temperatures Increase Risk of Spontaneous Combustion	Marked increases in daily or seasonal temperatures will increase the rate of oxidation, thereby increasing exothermic reactions, and the risk of the coal discard igniting or burning	Decommissioning and closure phase	■ Prevent exceedances of air quality standards at any receptors ■ Reduce safety risks to mine employees and local communities	■ Cover the facility with minimum layer of 500 mm of soil, in order to minimise the exposed surface area for exothermic reactions, and to prevent the ingress of oxygen and moisture	Control through impact management	As required, during the decommissioning and closure phase	■ Compliance with NAAQS at the mine boundary ■ Classification, Design Criteria, and Surveillance Requirements for Mineral Residue Facilities and Water Management Structures Specification (Anglo, 2016)	■ Environmental specialist ■ Production manager ■ Operations/ Metallurgy
				■ Conduct thermographic surveys of the facility to identify 'hotspots'	Control through monitoring	Annually, for minimum five years post closure		■ Environmental specialist ■ Production manager ■ Operations/ Metallurgy
Visual								
Disposal of discard	Presence of the discard facility	Construction and operational phase	■ Avoid visual impacts that are unacceptable to local residents	■ If possible, implement progressive rehabilitation of the discard facility to reduce the visual intrusion, including: ▪ Shaping the dump side slopes and crest to pre-determined maximum gradient/s which will prevent erosion and allow for adequate vegetation growth; and ▪ Placing a growth medium to a suitable depth and re-vegetate using a suitable mix of indigenous grass species.	Minimise and control through impact management and monitoring	As required, during the construction and operational phases	N/A	■ Environmental specialist ■ Production manager ■ Operations

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Wind erosion and material handling activities	Formation of dust plumes	Construction and operational phases	■ Prevent exceedances of air quality standards at any receptors	■ Same as for Air Quality in terms of management of dust and fine particulate mobilisation on sensitive receptors				
Disposal of discard	Presence of the discard facility	Decommissioning and closure phases	■ Avoid visual impacts that are unacceptable to local residents	■ Shape the discard facility to be as natural in appearance as possible ■ Establish a vigorous and self-sustaining vegetation cover	Minimise and control through impact management	Once-off	N/A	■ Environmental specialist ■ Production manager ■ Operations
				■ Conduct on-going monitoring and maintenance of the rehabilitated areas to ensure that vegetation establishes successfully, and that erosion does not occur ■ Employ ongoing control measures to eradicate weedy and alien invader plant species	Minimise and control through impact management and monitoring	As required, during the decommissioning and closure phase		
Wind erosion and material handling activities	Formation of dust plumes	Decommissioning and closure phase	■ Prevent exceedances of air quality standards at any receptors	■ Same as for Air Quality in terms of management of dust and fine particulate mobilisation on sensitive receptors				
Surface Water								
Disposal of discard	Contaminated stormwater runoff reporting to receiving watercourses	Operational phase	■ Prevent pollution of local surface water and groundwater resources that would render such resources unfit for continuation of current uses	■ Ensure stormwater system is designed to meet GN704 to limit contaminated water entering the tributaries and diverting clean water on the eastern side of the pit to the Saalboomspruit	Minimise and control through impact management and monitoring	■ Once off, prior to construction	■ Regulation GN 704 ■ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	■ Engineering ■ Environmental specialist ■ Production manager
Discard facility closure	Contaminated recharge to the groundwater and subsequent decant to the surface water	Operational phase	■ Prevent pollution of local surface water and groundwater resources that would render such resources unfit for continuation of current uses	■ Continue investigations in support of the development of the post-closure water management strategy for the mine, which may include passive treatment options	Minimise and control through impact management	As required, during the operational phase	■ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	■ Environmental specialist ■ Engineering ■ Operations

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Discard facility closure	Contaminated recharge to the groundwater and subsequent decant to the surface water	Decommissioning and closure phase	▪ Prevent pollution of local surface water that would render such resources unfit for continuation of current uses	▪ To prevent the decant, abstract excess mine water from boreholes and send to the EWRP for treatment	Minimise and control through impact management	As required, during the decommissioning and closure phase	▪ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	▪ Environmental specialist ▪ Production manager ▪ Operations
Groundwater								
Disposal of discard	Contaminated recharge to the groundwater	Operational phase	▪ Prevent pollution of local surface water and groundwater resources that would render such resources unfit for continuation of current uses	▪ Intercept excess mine water from the pit and re-use on site or send to the EWRP for treatment	Minimise and control through impact management	As required, during the operational phase	▪ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	▪ Engineering ▪ Environmental specialist ▪ Production manager ▪ Operations
Discard facility closure	Contaminated recharge to the groundwater	Decommissioning and closure phase	▪ Prevent pollution of local groundwater resources that would render such resources unfit for continuation of current uses	▪ To prevent the decant, abstract excess mine water from boreholes and send to the EWRP for treatment	Minimise and control through impact management	As required, during the decommissioning and closure phase	▪ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	▪ Environmental specialist ▪ Production manager ▪ Operations

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Wetlands and Aquatic Ecology								
Disposal of discard	Seepage arising from pit, poorly maintained stormwater management systems, resulting in entry of contaminated pit water and/or stormwater to downstream rivers and wetlands	Operational phase	■ Prevent negative impacts on aquatic ecosystems and wetlands downstream of the proposed discard facility and conveyor sites	■ Design stormwater management system to meet GN 704 requirements of separating clean and dirty water, to ensure that only clean water from the eastern sub-catchment drains to the Saalklapspruit and ultimately will help to achieve the ecological water quality requirements of receiving watercourses ■ Reintroduce clean water intercepted and diverted around the discard facility into the downstream watercourses in a manner which does not create erosion and aids in diffuse dispersion of flow across most of the width of the downstream wetlands ■ If possible, implement concurrent rehabilitation of the discard facility ■ Seed rehabilitated sections of the discard facility and encourage early vegetation establishment ■ Prioritise the use of indigenous and/or fast-growing stoloniferous grasses for vegetation establishment, to protect the soils from erosion and reduced the likelihood of sedimentation of downstream aquatic systems ■ To prevent the decant, abstract excess mine water from boreholes and re-use the contaminated water on site or send to the EWRP for treatment	Control, remedy, modify	As required, during the operational phase	■ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	■ Engineering ■ Environmental specialist ■ Production manager ■ Operations
Wetland rehabilitation	Improved wetland functioning	Decommissioning and closure phase	■ Prevent negative impacts on aquatic ecosystems and wetlands downstream of the proposed discard facility and conveyor sites	■ Revise the approved wetland rehabilitation plan to develop an alternative solution to the originally proposed creation of a watercourse through the pit footprint, which is no longer feasible.	Remedy	As required, prior to mine closure	■ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	■ Engineering ■ Environmental specialist ■ Production manager ■ Operations

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Decant of contaminated groundwater	Entry of contaminated groundwater to downstream rivers and wetlands	Decommissioning and closure phase	▪ Prevent negative impacts on aquatic ecosystems and wetlands downstream of the proposed discard facility and conveyor sites	▪ To prevent the decant, abstract excess mine water from boreholes and re-use the contaminated water on site or send to the EWRP for treatment	Control through impact management	As required, during the decommissioning and closure phase	▪ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	▪ Engineering ▪ Environmental specialist ▪ Production manager ▪ Operations
Social								
Discard disposal activities, heavy machinery and construction activities	Dust pollution	Construction, operational and decommissioning and closure phases	▪ Prevent exceedances of air quality standards at any receptors	Same as for Air Quality in terms of management of dust and fine particulate mobilisation on sensitive receptors				
The introduction of artificial lightning can have an adverse impact on communities particularly where the light spills outside of the site	Light pollution	Construction and operational phases	▪ Prevent visual impacts that are unacceptable to local residents	▪ Consider the location and intensity of lighting ▪ Ensure the lighting designs focus from the boundary inwards to the activity area to minimise light spill over outside the operational area ▪ Effective barricading of the operational area can also minimise light pollution	Control, remedy and modify	As required, during the construction and operational phases	N/A	▪ Environmental specialist ▪ Production manager ▪ Operations
Materials handling activities, vehicle noise during discard hauling, and heavy vehicle/machinery noise	Noise pollution	Construction, operational and decommissioning and closure phases	▪ Prevent exceedances of noise standards at any receptors	▪ Ensure that plant and equipment are well maintained, and fitted with functional silencers and engine speed governors ▪ The construction and operational period should consider noise sensitive scheduling (e.g. day time working hours) ▪ All equipment operators should be trained on load hauling and dump operations ▪ Implement rigorous speed control to reduce the noise from vehicle traffic ▪ Strictly adhere to the vehicular speed requirements	Control, remedy and modify	Construction and operational phase	SANS 10103 Code of Practice, Suburban districts with little road traffic	▪ Environmental specialist ▪ Production manager ▪ Operations
Discard disposal activities, heavy machinery and construction activities	Prolonged employment - positive impact	Construction, operational and decommissioning and closure phases	▪ Enhance the existing positive socio-economic impact of the mine on the region	▪ Ensure that current local employees are utilised	Control, remedy and modify	Ongoing, until the discard facility is closed	N/A	▪ Human Resources Manager

Activity	Potential Impact	Phase	Impact Management Outcomes / Objectives	Impact Mitigation Actions	Mitigation Type (Modify, Remedy, Control or Stop)	Frequency / timeframe for implementation	Standards to Be Achieve	Responsible Person
Discard disposal	In the event that no controls are put in place, there will be decant of mine-affected water once mining and operational dewatering cease, and the pit fills up, potentially impacting the Saalboomspruit, and consequently affecting community livelihood resources	Operational and decommissioning and closure phases	■ Prevent pollution of local surface water and groundwater resources that would render such resources unfit for continuation of current uses	■ Changes in surface or groundwater quality or related aspects that may have an offsite impact must be communicated the relevant institutional and community stakeholders urgently	Remedy and control	Ongoing, continuing post closure	■ Compliance with Water Quality Planning Limits of Management Units in the Wilge River	■ Engineering ■ Environmental specialist ■ Production manager ■ Operations

Table 28: Summary of monitoring measures

Phase	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
Operational	Air quality	Continued dust fallout monitoring using single direction dust buckets Continued PM_{10} and $PM_{2.5}$ monitoring	Duration of operational phase	Monthly	Dust fallout monitoring and continuous PM_{10} monitoring at the current location is deemed sufficient. Monthly reporting should be used to identify problem areas/ activities to target mitigation.	Environmental specialist
Decommissioning and closure phase	Air quality	Continued dust fallout monitoring using single direction dust buckets Continued PM_{10} and $PM_{2.5}$ monitoring	Duration of decommissioning phase (when final rehabilitation activities are being undertaken)	Monthly	Dust fallout monitoring and continuous PM_{10} monitoring at the current location is deemed sufficient. Monthly reporting should be used to identify problem areas/ activities to target mitigation.	Environmental specialist
Operational and decommissioning and closure phase	Air quality	Continued meteorological monitoring	Duration of operational and closure phase	Monthly	It is recommended that the meteorological station remains fully functional to aid in mitigating further dust releases. Monthly reporting of meteorological data within the ambient monitoring reports (dust fallout and PM monitoring) should be used to identify problem areas/activities to target mitigation.	Environmental specialist
Operational and decommissioning and closure phase	Air quality	Spontaneous combustion.	Duration of operational and decommissioning and closure phases	Biannually	Biannual monitoring should be undertaken to identify the presence of spontaneous combustion on site. If spontaneous combustion occurs more frequently, the frequency of monitoring should be increased to quarterly and so forth. If spontaneous combustion commonly occurs on site, trace gas monitoring of the combustion emissions must be undertaken to determine the impact on the ambient air quality.	Environmental specialist
Operational and decommissioning and closure phases	Groundwater	■ Monthly borehole level monitoring, and ■ Quarterly water quality analyses. Borehole monitoring localities are indicated in Table 24 of APPENDIX K. Parameters to be measured include: **Variable** — **Units** pH — Electrical Conductivity — mS/m Total Dissolved Solids — mg/L Calcium — mg/L Magnesium — mg/L Sodium — mg/L Potassium — mg/L	Duration of operational and decommissioning and closure phases	Monthly level monitoring, quarterly water quality monitoring	As per the mine's WUL.	Environmental specialist

Phase	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
		Alkalinity mg/L Chloride mg/L Sulphate mg/L Nitrate mg/L Nitrite mg/L Fluoride mg/L Aluminium mg/L Iron mg/L Manganese mg/L Ammonium mg/L Acidity mg/L Total Hardness mg/L Orthophosphate as P mg/L				
Operational phase	Surface water	■ Continue conducting surface water quality monitoring, as per the mine's current monitoring programme (WUL). Monitoring locality points are indicated on Figure 17. Parameters to be measured include the same as for groundwater (see table above). ■ In addition to the above-mentioned parameters, the Upper Olifants Integrated Water Quality Management Plan (DWS, 2016a) proposes that the following key pollutants also be measured. It is therefore proposed that these parameters be measured quarterly for the surface water sites: ▪ Antimony ▪ Lead ▪ Arsenic ▪ Mercury ▪ Barium ▪ Nickel ▪ Beryllium ▪ Selenium ▪ Bromide ▪ Thallium ▪ Cadmium ▪ Uranium ▪ Cobalt ▪ Vanadium	Duration of operational phase	Monthly	As per the mine's WUL.	Environmental specialist

Phase	Category	Method for monitoring	Time period	Frequency of monitoring	Mechanism for monitoring compliance	Responsible person
Decommissioning and closure phase	Surface water	■ Conduct surface water quality monitoring as for operational phase	Duration decommissioning and closure phase	Quarterly	As per the mine's WUL.	Environmental specialist
Operational and decommissioning and closure phases	Surface water	■ Inspection of storm water channels; and ■ Conduct on-going monitoring and maintenance of the rehabilitated areas to ensure that vegetation establishes successfully, and that erosion does not occur.	Duration of operational and decommissioning and closure phases	Ongoing	Site observations, captured in an annual report.	Environmental specialist Production manager
Operational and decommissioning and closure phases	Biodiversity (aquatic ecology and wetlands)	■ Continue conducting aquatic biomonitoring during the wet and dry seasons, as per the mine's current monitoring programme.	Duration of operational and decommissioning and closure phases	Biannually	As per the mine's existing biomonitoring programme.	Environmental specialist
Decommissioning and closure phase	Biodiversity (aquatic ecology and wetlands)	■ Once rehabilitation activities have commenced, fixed point photography monitoring should be conducted to provide a record of vegetation establishment and to monitor erosion.	Duration of decommissioning and closure phase (this only needs to occur during the earthworks involved when rehabilitating the discard dump)	Monthly	Site observations, captured in a monthly report.	Environmental specialist
Operational and decommissioning and closure phases	Visual	■ Monitor complaints register held at security gate or administration office for complaints about visual impacts.	Duration of operational and decommissioning and closure phases	As and when required (notified immediately of complaint being lodged)	Complaint and actions taken to address complaint about visual impacts recorded in complaints register	Stakeholder Specialist
Operational phase	Noise	■ Conduct noise monitoring for the proposed discard facility and conveyor belt and wider Zibulo operations. ■ Monitor complaints register held at security gate or administration office for complaints about noise impacts.	Duration of operational phase	Monitoring to be conducted annually (if noise complaints are registered, the frequency of monitoring should be increased to quarterly)	■ Monitoring must be undertaken in terms of SANS 10103:2008. ■ Any noise complaints should be directed to the site management. Complaints and any actions arising from a complaint must be recorded in a complaint's register to be maintained by site management. An investigation should be undertaken to determine the specific activities and or equipment / machinery which is generating the nuisance noise resulting in the noise complaints.	Environmental specialist Stakeholder Specialist
Decommissioning and closure phase	Noise		Duration of decommissioning phase (when final rehabilitation activities are being undertaken)			

18.0 CLOSURE PLANNING AND FINANCIAL PROVISION

18.1 Rehabilitation criteria

The following rehabilitation criteria have been set-out for the discard facility (Golder, 2021h):

- Ensure that water draining off the surface of the discard facility is clean and channelled into the clean water systems;
- Contain seepage from the discard facility areas in a dirty water management system and send to the EWRP for treatment;
- Ensure that runoff is not kept on the discard facility, but allowed to be free-draining;
- Rehabilitate the discard facility to ensure structural stability and mitigate surface water, groundwater or air pollution to nearby catchments;
- Cover the discard facility with a growth medium suitable for the establishment of vegetation to limit erosion;
- Divert all surface water, which is considered to be clean water after vegetation has established itself, past the dirty water management system;
- Re-vegetate all areas, including the discard facility and water control structures and to maintain these areas in the normal way for a period of three to five years after decommissioning activities have ceased; and
- Monitor groundwater, surface water, vegetation and settlement for a minimum ten-year period after operations cease or until the residual risk of the discard facility is understood.

18.2 Final land use

The site-wide closure concept is expected to provide a landscape that can be integrated into the surrounding land use context, albeit to a lesser extent than at pre-mining conditions. The adjacent land use is dominated by agricultural activities (mainly open grasslands), mixed commercial and residential (Ogies Town) and mining activities (operational and defunct mines).

The closure plan indicates that the land will be returned to grazing after opencast mining and where feasible arable after underground mining (Shangoni, 2019, in (Golder, 2021h)). Considering the above, it is recommended that the discard facility be rehabilitated to grazing final land use capacity.

18.3 Environmental risk assessment

To ensure that the discard facility rehabilitation is considered within the site context, a screening level environmental risk assessment (ERA) was undertaken as part of the closure assessment. The ERA is qualitative in nature and compiled through the identification risks, risk drivers and the resulting impacts. The following key closure related risks were identified:

- Post mining landform gradients too steep;
- Insufficient topsoil quantity;
- Insufficient revegetation due to poor rehabilitated soil quality (heavy compaction);
- Rehabilitated areas not free draining into the natural catchment;
- The rehabilitated discard facility is not part of a coherent overarching rehabilitation and closure plan for the whole mine;

- Non-alignment with mine wide closure goals and objectives;
- Compaction and decline in topsoil structure during stripping, stockpiling and topsoil re-placement;
- Ineffective soil amelioration resulting in poor vegetation establishment;
- Loss of topsoil through erosion at stockpiles, pit edges and rehabilitated areas;
- Lack of rehabilitation-related post closure monitoring to support site relinquishment;
- Extensive unvegetated areas, resulting in excessive dust generation (nuisance dust) with unwanted impacts on surrounding environment, agriculture, and neighbours;
- Loss of biodiversity due to proliferation of alien invasive species;
- Soil contamination resulting in reduced soil fertility and land capability and potential contamination of surface water runoff; and
- Surface and groundwater contamination and associated health and safety concerns for groundwater users (surrounding communities).

18.4 Closure cost determination

This section provides details on the proposed discard facility closure costs. Only the rehabilitation costs for the scheduled closure of the facility have been determined. These will have to be incorporated into the overall site wide closure plan and costing.

18.4.1 Unit rates

The unit rates for general rehabilitation and closure measures and activities were obtained from Golder’s existing database in consultation with demolition and earthworks contractors, as well as with rehabilitation practitioners. Golder undertakes a thorough review of its unit rate database, as follows:

- Minor unit rates are adjusted with standard inflation, with confirmation generally occurring annually;
- Key rates for the dismantling of infrastructure are benchmarked by a specialised demolition contractor, to ensure that it remains market-related and take account of the latest dismantling and demolition techniques;
- Earthworks rates are benchmarked against recent tenders available to Golder as well as benchmarking in discussions with contractors; and
- Aggregated rates dependent on base infrastructure or earthworks related rates are recalculated given the latest base rates.

The unit rates applied in the closure cost estimate were updated as at March 2021 at a 3.3% escalation from March 2020. The ripping rate applied for haul roads was supplied by AAIC through BBT mining and it was assumed that ripping will be done through a grader.

18.4.2 Closure measures

The closure measures as per the GN R.1147 Regulations, where applicable, are reflected in Table 29.

Table 29: Closure measures as per the GN R. 1147 regulation (where applicable)

Aspect	Closure Measures
Infrastructural areas	
Steel structures, reinforced concrete structures, buildings and related structures and infrastructure	**Concrete channels** ■ Will be left behind to transport any seepage from discard facility into the sump/final void
Roads	**Service road next to conveyor and surrounding discard facility** ■ Rip to alleviate compaction and shape footprint area to be free-draining, aligned to site-wide routing ■ Establish vegetation by applying suitable seed mix
Conveyor belt	■ Dismantle overland conveyor belt infrastructure and salvage scrap metal where possible ■ Demolish concrete plinths and dispose of in discard dump runoff channel prior to rehabilitation ■ Safely dispose of rubber belts at appropriate facility ■ Remove carbonaceous veneer and dispose of on discard dump prior to rehabilitation ■ Rip to alleviate compaction ■ Establish vegetation by applying suitable seed mix
Fences	■ Not applicable
Demolition waste	
Disposal of demolition waste	**Concrete demolition waste** ■ Crush 50% of concrete demolition waste ■ Backfill previously excavated material dozed over **Steel** ■ Recycle waste that can be recycled/salvaged (e.g. steel) after decontamination **Hazardous waste** ■ Transport hazardous waste to Holfontein hazardous waste disposal facility
Mining areas	
Rehabilitation of final voids and ramps	■ Not applicable
Sealing of shafts, adits and inclines	■ Not applicable

Aspect	Closure Measures
Rehabilitation of processing waste deposits and evaporation ponds (polluting potential)	**Discard facility** ■ Remove concrete channels ■ Shape the top surface to be free draining ■ Apply soil cover/capping material to a depth of 520 mm ■ Establish vegetation on the entire surface of landform
Rehabilitation of dirty water impoundments	**Final void (Sump)** ■ Remove 300 mm deep coal contaminated sediment and dispose of in the discard facility ■ Remove 300 mm coal contaminated subsoils ■ Backfill basin and shape area to be free draining ■ Topsoil placement to 500 mm over rehabilitated area ■ Rip to alleviate compaction ■ Establish vegetation by applying suitable seed mix
General surface rehabilitation	
General surface rehabilitation	**Rehabilitated and reshaped areas** ■ Restore land to the agreed land capability by reinstating a free-draining surface topography and placing sufficient soil/growth medium and revegetate **Vegetation** ■ Establish vegetation by applying suitable seed mix; and continue with alien plant eradication programme by cutting and/or use of herbicides
Water management	
Re-instatement of drainage lines	■ No measures applied as it has been assumed general surface rehabilitation shaping will account for the drainage lines and free draining
River diversion	■ Not applicable (assumed included in site-wide closure plan and costs)
Pre-site relinquishment monitoring and aftercare	
From year 1 until year 10 post closure (discard facility rehabilitated and cover installed)	
Rehabilitation monitoring	■ Conduct rehabilitation monitoring for a period of 10 years post-closure (or until site relinquishment criteria have been met)
Care and maintenance	■ Undertake maintenance and aftercare for 10 years after final rehabilitation of discard facility, by: ▪ Applying fertilizer annually over rehabilitated areas ▪ Controlling alien plants ▪ Undertaking general maintenance, including rehabilitation of cracks and subsidence

Aspect	Closure Measures
Settlement monitoring	■ Survey the decommissioned discard facility using a drone/similar technology to monitor settlement twice a year
Stability evaluation	■ Undertake a walk over inspection by a qualified engineer to evaluate stability every second year
Surface water monitoring	■ Monitor surface water for a period of 10 years post-closure (or until site relinquishment criteria have been met)
Groundwater monitoring	■ Monitor groundwater for a period of 10 years post-closure (or until site relinquishment criteria have been met)
From year 11 until 30 post closure	
Settlement monitoring	■ Survey the decommissioned discard facility using a drone/similar technology to monitor settlement annually
Stability evaluation	■ Engage with a qualified engineer to design repair work where significant settlement has occurred and implement repairs to the cover and drainage, on an annual basis
Groundwater quality monitoring	■ Undertake groundwater monitoring of decant and phreatic surface within rehabilitated spoils (as per groundwater monitoring programme)
Additional allowances	
Preliminary and general	■ Additional allowance of 25% P&Gs and 10% contingencies were applied to Subtotal 1

18.4.3 Rehabilitation and closure costs

The scheduled closure costs for the proposed discard dump and associated support infrastructure, as at March 2021, amount to approximately **R 92.5 million** (including P&Gs and contingencies, and excluding VAT), as summarised in Table 30.

Table 30: Scheduled closure costs summary for the discard facility and associated infrastructure at Zibulo

Zibulo Colliery Discard Facility Closure Costs, as at March 2021			
Closure components		**Scheduled Closure**	
1	Infrastructural aspects	R	3,157,732
2	Mining aspects	R	41,583,977
3	General surface rehabilitation	R	8,114,313
	Sub-Total 1	**R**	**52,856,022**
5	**Post-Closure Aspects**		
From year 1 until year 10 post closure (Discard facility rehabilitated and cover installed)			
5.1	Rehabilitation monitoring of rehabilitated areas	R	761,852
5.2	Care and maintenance of rehabilitated areas	R	10,977,839
5.3	Care and maintenance of rehabilitated areas	R	1,025,110
5.4	Settlement monitoring	R	2,000,000
5.5	Stability evaluation	R	259,000
5.6	Surface water monitoring	R	972,311
5.7	Groundwater monitoring	R	733,914
From year 11 until year 30 post closure			
5.8	Settlement monitoring	R	2,000,000
5.9	Stability evaluation	R	1,036,000
5.10	Groundwater quality monitoring	R	1,467,827
	Sub-Total 2	**R**	**21,203,852**
6	**Additional Allowances**		
6.1	Preliminary and general	R	13,214,006
6.2	Contingencies	R	5,285,602
	Sub-Total 3	**R**	**18,499,608**
	Grand Total **Excl. VAT. (Sub-total 1 +2 +3)**	**R**	**92,559,483**

18.4.4 Post-closure water treatment costs

The long-term costs for pumping and treating extraneous groundwater have not been determined in this assessment as it is assumed that these have been included in the Zibulo site-wide closure costs.

18.5 Recommendations

The following recommendations have been made to improve the resolution of the closure planning and costing:

- Update the proposed land preparation, soil amelioration and hydroseeding rates based on site specific soil sampling and analysis;
- Update the wetland mitigation strategy to take into consideration the changes in the reinstatement of drainage lines due to the development of the proposed discard facility over the backfilled pit; and
- Incorporate the planned discard facility into the mine wide closure planning and costing to ensure the alignment of end land use planning and closure objectives.

19.0 ENVIRONMENTAL AWARENESS PLAN

Zibulo achieved its ISO 14001 accreditation in 2011. The ISO 14001 system requirements make provision for general environmental awareness and training on relevant procedures for all employees working at the operation. The environmental training and awareness programme includes the following: general induction; job specific training; general awareness training through industrial theatre; and briefing sessions hosted by the mine.

19.1 Emergency preparedness and response plan

Zibulo's Emergency Preparedness and Response chart gives a complete step-by-step instruction list on how to deal with an emergency, who to contact first, who to notify and who is responsible for various contingency plans. This chart has been developed in order to facilitate all levels of staff so that any emergency can be dealt with in a simple, efficient manner. The chart is also laid out in a user-friendly way so that it is clear and easy to follow the instructions in case of an emergency.

20.0 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I, Olivia Allen, herewith undertake that the information provided in the foregoing report is correct and that the comments and inputs from stakeholders and I&APs have been correctly recorded in this report.

Date: 01 July 2021

21.0 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I, Olivia Allen, herewith undertake that the information provided in the foregoing report is correct and that the level of agreement with I&APs and stakeholders has been correctly recorded and reported herein.

Date: 01 July 2021

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APPENDIX A

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APPENDIX B

CV of Environmental Assessment Practitioner (EAP)

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Stakeholder Database & Registered I&APs

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