



**mineral resources**

Department:  
Mineral Resources  
**REPUBLIC OF SOUTH AFRICA**

**PUBLIC REVIEW**

**INTEGRATED ENVIRONMENTAL IMPACT ASSESSMENT  
REPORT  
AND  
ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT  
FOR THE PROPOSED ELDERS COLLIERY PROJECT**

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](#)

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**FILE REFERENCE NUMBER SAMRAD:** [MP 30/5/1/2/3/2/1 \(10117\) EM](#)

## IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or Mining Right if among others the mining “will not result in unacceptable pollution, ecological degradation or damage to the environment”.

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

**It is therefore an instruction that** the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

**It is furthermore an instruction that** the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

## OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

- (a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;
- (b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;
- (c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;
- (d) determine the—
  - (i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and
  - (ii) degree to which these impacts—
    - (aa) can be reversed;
    - (bb) may cause irreplaceable loss of resources, and
    - (cc) can be avoided, managed or mitigated;
- (e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;
- (f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;
- (g) identify suitable measures to manage, avoid or mitigate identified impacts; and
- (h) identify residual risks that need to be managed and monitored.

# Executive Summary

## Part A: Environmental Impact Assessment (EIA) Report

The Elders Colliery Project is a proposed underground coal mine located approximately 25 km north of the town of Bethal, on the R35 provincial road in the Mpumalanga Province. Anglo Operations (Pty) Ltd (AOPL) submitted an environmental authorisation application to the Mpumalanga Department of Mineral Resources (DMR) (now known as the Department of Mineral Resources and Energy (DMRE)) for the proposed project on 16 July 2015 and subsequently a Scoping Report and Environmental Management Programme (EMPr) was submitted in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014. The EMPr was submitted for authority review on 25 January 2016.

Anglo submitted a Section 11 application in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) to the DMRE to transfer the Elders mining right from AOPL to Anglo American Inyosi Coal (Pty) Ltd (AAIC)<sup>1</sup>. The mining right and Deed of Cession was executed in July 2020. The Environmental Authorisation (EA) was issued on 29 July 2020. The registered Interested and Affected Parties (I&AP's) were notified of the environmental authorisation on 4 August 2020 via email and sms. Once the environmental authorisation was approved, no appeals were received.

It is important to note that no construction has commenced on the proposed Elders Colliery Project since the previous Environmental Authorisation was approved.

Note: All the activities approved as part of the previous environmental authorisation, which are not being amended, can commence with construction as long as the activities are within the approved area, the project description has not changed and the authorisation validity period is still in effect. The activities which are being amended and applied for as part of this application cannot commence with construction until the DMRE approves the activities.

### Project description

AAIC (now a member of Thungela Resources (Pty) Ltd) is proposing changes to the 2016 project description which includes a change in mine plan, block plan and an additional transport method for the mined coal. Coal mined from underground will be stored in a steel bin from where it will be loaded onto trucks and hauled to an existing processing facility. An interim coal loading area is planned for occasions when the bin overflows. The coal will be removed within 24 hours. In addition, the R35 needs to be widened at two points to create intersections to provide access to the proposed Elders Colliery Project. Coal mined from Elders is planned to be hauled to an existing processing facility.

The table below indicates the project description which was approved in 2016 as well as the proposed changes to the project scope:

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<sup>1</sup> Effective 4 June 2021, Thungela Resources Ltd has started trading, following Thungela's admission to the Johannesburg Stock Exchange, as a primary listing, a standard listing on the London Stock Exchange, which follows the completion of the demerger of Thungela from Anglo American plc. It is important to note that the legal name change from Anglo Operations (Pty) Ltd to Thungela Resources (Pty) Ltd will officially be effective later this year and at which point the change will be communicated to all relevant parties. It should be noted that the business address has changed to 25 Bath Avenue; Rosebank; 2196; South Africa.



2016 Approved Project Description	2021 Proposed Project Description
<ul style="list-style-type: none"> <li>Underground mining</li> <li>Mining No. 2 and 4 Seam by means of bord and pillar mining methods using Continuous Miners</li> <li>Box cut (7 ha) and associated surface infrastructure including the ventilation shaft within the box-cut.</li> <li>New overland conveyor belt (10 km) to Block 20</li> <li>Upgrading existing conveyor belt (8 km) from Block 20 to Goedehoop Colliery</li> </ul>	<ul style="list-style-type: none"> <li>Underground mining sequencing</li> <li>Mining No. 2 and 4 Seam by means of bord and pillar mining methods using continuous miners at a slower rate</li> <li>Changes to the mine plan and block plan including: <ul style="list-style-type: none"> <li>Smaller boxcut (5.0365ha);</li> <li>Ventilation shaft outside boxcut (but adjacent);</li> <li>Interim coal loading area (temporary loading periods)</li> <li>Road layout change to accommodate trucks; and</li> <li>132 kV power line layout change (main bulk supply from ESKOM)</li> </ul> </li> <li>Loading from stockpile and trucking of ore to an existing processing facility; and</li> <li>Widening of the R35 at intersections</li> </ul>

Due to the proposed changes, a Scoping and Environmental Impact Report Process and Regulation 31 Amendment process were triggered in terms of the NEMA EIA Regulation. Two applications were submitted to the DMRE in December 2020, one for the Scoping and Environment Impact Report (S&EIR) process and one for the Regulation 31 Amendment. Based on discussions with the DMRE in March 2021, the DMRE requested that the two processes be integrated into one S&EIR process. Thus, an integrated EA process will be followed and is presented in this report.

SRK Consulting (South Africa) Pty Ltd (SRK) was appointed by AAIC as the independent Environmental Assessment Practitioner (EAP) to facilitate the integrated environmental authorisation process and associated stakeholder engagement process for the proposed project changes to the Elders Colliery.

The Integrated Draft Scoping Report (DSR) had set out the proposed scope of the environmental authorisation process including the proposed changes to the existing approved EMP. The DSR was available for public comment for a period of 30 days from 19 May 2021 to 18 June 2021. The comments received by stakeholders during the review period were minor and have been captured in the Comments and Response Report of the Integrated Draft EIA Report (Section 13).

The final Scoping Report was approved by the DMRE on 19 August 2021.

## Environmental assessment practitioner

SRK were appointed by AAIC as the independent environmental assessment practitioner (EAP) to manage and facilitate the integrated EA and associated public participation process in accordance with NEMA, National Environmental Management: Waste Act (Act No. 36 of 1998) (NEM: WA), NWA and MPRDA.

## Environmental authorisation process

This Integrated Draft EIA Report has been compiled in terms of the provisions of Appendix 2 of the NEMA EIA Regulations of 2014, as amended (GNR 982) as well as the requirements of the EIA report template issued by the DMRE for listed activities associated with mining right and/or bulk sampling activities.

Prior to AAIC commencing with the development of the proposed Elders Colliery Project, a S&EIR process needs to be undertaken in terms of the following national legislation (see Section 5 for details on each legislative requirement for the project):

- The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA): For any amendments EMPr in accordance with Section 102 of the MPRDA
- The National Environmental Management Act (Act No. 107 of 1998) (NEMA): For any project-related listed activities stipulated in the NEMA Environmental Impact Assessment (EIA) Regulations of 2014, as amended in 2017
- The National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA): For any project-related waste management activities stipulated in GN R 921, promulgated under NEM:WA
- The National Water Act (Act No. 36 of 1998) (NWA): For any project related water uses stipulated under Section 21 of NWA

The authorisations in terms of NEMA, NEM:WA and MPRDA is being applied through the Mpumalanga Province's Department of Mineral Resources and Energy (DMRE) whilst authorisation in respect of the NWA will be applied for from the Department of Human Settlement, Water and Sanitation (DHSWS) situated within Bronkhorstpruit.

## Alternatives considered

The proposed Elders Colliery Project has been investigated and assessed since 2002. The following project and coal supply alternatives were considered throughout the years:

- **2002:** Resource offered to Eskom as part of the Kriel Power station supply, project includes open cast mining of entire area not overlain by wetlands;
- **2005:** Opencast and underground mining methods considered, supplying to Majuba Power station. It was planned to mine entire resource area not overlain by wetlands by means of open cast mining methods;
- **2007 and 2009:** Opencast and underground mining methods where considered by mining the entire area not overlain by wetland via open cast mining methods;
- **2011:** Use underground mining methods to access entire resource with an optional mini-pit on the western side - Primary and Secondary product;
- **2016:** Dual access boxcut development to access both the No. 2 and 4 Seams. Only underground mining methods proposed to access entire resource; and
- **2021:** The current preferred option includes using only underground mining methods to access the majority of the resource, mining the No. 2 and No. 4 seams.

Throughout the development of the proposed Elders Colliery Project the following alternatives were considered:

- Design and layout alternatives;
- Technology alternatives;
- Operational alternatives;
- No-Go Alternative; and

Refer to Section 11 for more detail.

## Public Participation Process

The relevant authority applicable to the environmental authorisation process for the proposed Elders Colliery Project is the DMRE, Mpumalanga. The relevant authority applicable to the WULA and amendment process is the DWS, Bronkhorstpruit.

### **Pre-announcement consultation**

The purpose of the pre-announcement consultation was to:

- Inform all I&APs of the additional activities to be included in the approved EMPr;
- Provide sufficient information and opportunity to stakeholders to comment on the revised scope;
- Provide information on the integrated environmental authorisation process going forward; and
- A background information document (BID) formed part of the pre-announcement consultation which has already been conducted.

### **Announcement**

The project was announced to the public between **19 May 2021 and 18 June 2021**. I&APs were notified of the opportunity to comment on the proposed Elders Colliery Project and to register as an I&AP via various engagement methods.

### **Meetings with local authorities**

A pre-application meeting was organised on the 26 November 2020 with the following personnel:

- Mpumalanga DMRE
- AAIC
- SRK

### **Availability of the draft environmental impact assessment report and environmental management programme for public comment**

The Draft Integrated EIA/EMPr will be made available for public comment from **6 October 2021 to 11 November 2021**. The availability of the Draft Integrated EIA/EMPr and details relating to the public engagement meetings were announced as follows:

- Distribution of letters to registered I&APs to notify I&APs of the availability of the Draft Integrated EIA/EMPr and inviting registered I&APs to comment on the Draft Integrated EIA/EMPr
- Posting the Draft Integrated EIA/EMPr on the SRK website (<https://docs.srk.co.za/en/za-elder-colliery-iea>); and at the following public places -
  - Elders Colliery Proposed Access Road
  - Bethal Public Library
  - Kriel Public Library
  - Komati Paypoint and Library
  - Vlakkuielen Community
  - Middelkraal Community
  - Emalahleni Local Municipality - Kriel Offices
- Advertisements were published in the Ridge Times newspaper (English and Afrikaans)

### **Comment and response report**

All comments raised by I&APs throughout the process have been recorded and any additional comments received during the Integrated EIA Phase will be compiled into a Comments and response Report. Key project concerns raised to date relate to:

- Community upliftment
- Employment opportunities

### **Specialist studies**

As part of the initial scoping exercise in 2015, a specialist team of consultants were appointed to undertake various specialist investigations. The studies investigated the baseline environment,

potential impacts and provided management measures for the EIA/EMPr of the proposed Elders Colliery Project.

Findings from these studies will be incorporated into the 2021 EIA/EMPr and will include the input and recommendations provided from stakeholder engagement.

The majority of the specialist studies were undertaken in 2015 with some being updated in 2020. The specialist studies which were conducted in 2015 include: Air Quality; Soils and Land Capability Studies; Noise; Cultural Heritage; Biodiversity; Surface Water; Groundwater; Blasting; Socio-economic; and Closure Costing and Rehabilitation. In 2020, closure costing, groundwater, water balance and traffic studies were updated. In addition to this, a groundwater quality Tier 1 Simulation was conducted on BH7 and the wetland assessment was updated in 2021. Currently, the wetland assessment is being updated in order to inform the WULA which is being undertaken in conjunction with this application.

**Note:** *It is important to note that no additional specialist studies will be conducted for this project as the construction and operation of proposed Elders Colliery Project has not commenced and the area is still considered a Greenfield area. Thus, the existing specialist studies (including baseline environment, impact assessment, mitigation measures and monitoring) are still relevant.*

## **Environmental and social attributes**

### **Climate and meteorology**

The proposed Elders Colliery Project is located where the climate is warm to hot in the summer with an average daily high of approximately 27°C. Winters are mild too cold with an average daily maximum of approximately 15°C. Frost and mist are frequently experienced during the winter months on the Mpumalanga Highveld.

#### Rainfall and evaporation

Rainfall in the region is almost exclusively due to showers and thunderstorms and falls mainly in spring and summer months (October to March). The maximum rainfall occurs during the October to January period. Whereas spring and summer months receive about 85% of the rainfall, winter months are normally dry.

#### Site temperature

Temperatures range between -5.0 and 33.7 °C. The highest temperatures were recorded in October and February, and the lowest in May. During the day, temperatures increase to reach maximum at around 15:00 in the afternoon. Ambient air temperatures decrease to reach a minimum at around 07:00 i.e. just before sunrise.

### **Geology**

The geology underlying the proposed Elders Colliery Project boundary consists almost entirely of sedimentary lithological units of the Vryheid Formation. The Vryheid Formation forms part of the Ecca Group of the Karoo Super Group and consists predominantly of sandstone and shale layers. Alluvium and aeolian deposits are evident along the banks of the major surface water drainage bodies in the study area, namely the Vlakkuielen, Viskuille and Joubertsvei Spruit.

### **Soils, land use and land capability**

The soils mapped range from shallow sub-outcrop and outcrop of hard plinthite and parent materials (sediments and intrusive dolerite) to moderately deep sandy loams and sandy clay loams, all of which are associated with either a rocky outcrop of sedimentary parent rock, or ferricrete/laterite "C" horizon at differing depths. The saprolitic horizons are generally quite thin, with soil occurring on hard bedrock

in most instances mapped. The growth potential and the ability of these soils to return a cropping yield equal to or better than the national average, post mining is lacking. The land uses identified as part of the soils, land capability and land use study were:

- Arable land
- Grazing land
- Wilderness / conservation land
- Wetland (areas with wetland status soils)

### **Biodiversity**

The natural vegetation of the proposed Elders Colliery project area is associated with the Moist Sandy Highveld Grassland, of which less than one percent is officially conserved and approximately 55% transformed. In the recent regional vegetation assessment of South Africa Vegmap, this area was classified as belonging to the Eastern Highveld Grassland.

A total of 153 Red Data animals are known to occur in Mpumalanga (dragonflies, damselflies, butterflies, frogs, reptiles, birds and mammals). Eight red data species were recorded in the study area during the survey period (EcolInfo, 2015).

### **Surface Water**

The site is located within Catchment Management Unit 8 (CMU 8). All mining areas drain to the Olifants River. Much of the underground mining area underlies the Vlakkuielen and sections of the Viskuele Rivers and their floodplains. The mining area drains into Vlakkuielen and Viskuele River.

### **Groundwater**

The groundwater potential for the area is given as between 40% and 60%, which indicates the probability of drilling a successful borehole (yield > 0.1 l/s). The depth to groundwater levels are measured to be between 10 m and 20 m below the surface.

### **Wetlands**

Extensive wetland areas totalling more than 2 671 hectares in extent were identified and delineated within the study area. The wetlands cover roughly 46 % of the study area. In this case hillslope seepage wetlands make up more than 60% of the wetland area on site and covering over 28% of the surface area. In addition to the extensive hillslope seepage wetlands a number of large floodplain and valley bottom wetlands occur on site.

Six pan wetlands were located within the study area, with a further nine pans falling in close proximity to the study area boundary. The largest of these pans, located on the farm Vlakkuielen. It is important to note, there is extensive cultivation of the wetlands' catchments, with current the cultivation also extending into Seep wetlands. Due to this, the Present Ecological Status (PES) is moderately modified and seriously modified.

### **Air Quality**

All farmhouses and communities in the area were identified as sensitive receptors from an air quality perspective.

The average PM<sub>10</sub> concentration recorded at Elandsfontein is 38.5 µg/m<sup>3</sup>, with the annual concentrations ranging between 10 µg/m<sup>3</sup> in 2011 and 28.3 µg/m<sup>3</sup> in 2008.

The National Ambient Air Quality Standards (NAAQS) limit for hourly SO<sub>2</sub> (134 ppb – parts per billion) is exceeded on 19 occasions over the entire period (2006 to 2010, hourly), well below the allowed 88 exceedances per year (Airshed, 2015).

### **Noise**

The current ambient noise levels were dominated by natural sounds and farming related activities. In the absence of wind related noise and other activities, ambient noise levels were very low, i.e. below 40dBA and 30dBA during the day and night respectively (dBAcoustics, 2015).

### Heritage

A cultural heritage assessment was undertaken as part of the 2015/2016 environmental authorisation process. No sites, features or objects of cultural heritage significance were identified in the proposed mining area. (Van Schalkwyk, 2015).

### Traffic

The road network surrounding the proposed Elders Colliery project area enables excellent access to the site as they are all regional roads and connect to all surrounding major towns. The roads are in good condition and are all asphalt surfaced roads which are managed by the National Department of Transport. The Elders Colliery area and surrounding sites are currently not developed and do not generate any traffic at this time.

### Socio-Economic Structure

The primary zone of influence (Zol) of the proposed Elders Colliery project includes the 'footprints' of and areas immediately adjacent to the primary and service infrastructure of the mine. This includes the Vlakkuielen Community who are within the primary Zol.

The Vlakkuielen Community is located predominantly located on the southern portion of the Hirsaw Estate; two households are detached from the main community and reside on the northern side of the estate.

As is the case in many rural farming areas of South Africa, the Vlakkuielen and Middelkraal communities are characterised by high levels of unemployment.

### Anticipated impacts

The impact assessment as detailed in Section 18 assessed the types of impact, duration of impacts, likelihood of potential impacts occurring and the significance of impacts.

The key impacts that relate to the proposed Elders Colliery Project and are rated as having a high significance prior to mitigation and a low to medium impact after mitigations have been implemented

Activity	Potential Impact	Aspects	Phase	Significance pre-mitigation	Significance post-mitigation
Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	The loss of utilisable resource (sterilisation and erosion), compaction and contamination or salinisation.	Soils	Construction	SI: High (-)	SI: Medium (-)
Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	Loss and disturbance of wetland habitat	Wetland	Construction	SI: High (-)	SI: Medium (-)

Activity	Potential Impact	Aspects	Phase	Significance pre-mitigation	Significance post-mitigation
Underground mining of No. 2 and No. 4 seams	Potential subsidence due to underground mining activities	Topography	Operations	SI: High (-)	SI: Low (-)
Discharge of mine water to the natural watercourses	Pollution of surface water resources due to discharge of mine water to natural watercourses	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of box-cut area and associated infrastructure	Pollution of surface water resources due to operation of box-cut and associated surface area	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of sewage treatment plant	Pollution of surface water resource	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of PCD – storage of contaminated water	Pollution of surface water resource	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of water treatment plant	Pollution of surface water resource	Surface water	Operations	SI: High (-)	SI: Low (-)
Handling and storing of brine and gypsum	Pollution of surface water	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of underground mine	Reduction in catchment yield	Surface water	Operations	SI: High (-)	SI: Medium (-)
Underground mining of the No.2 and No. 4 coal seams by means of bord and pillar mining methods	Influx of groundwater into the mine workings	Groundwater	Operations	SI: High (-)	SI: Medium (-)
Underground mining of the No.2 and No. 4 coal seams by means of bord and pillar mining methods	Loss of surface water to groundwater	Groundwater	Operations	SI: High (-)	SI: Low (-)
Operation of water treatment plant and sewage treatment plant	Water quality deterioration	Wetland/ Surface water	Operations	SI: High (-)	SI: Low (-)
Closure of underground mine	The formation of AMD in underground workings should this not be treated.	Groundwater	Closure	SI: High (-)	SI: High (-)
Closure of the underground mine	Surface decant of AMD	Surface water	Closure	SI: High (-)	SI: Low (-)
Closure of the underground mine	Loss of employment and enterprise	Socio-economic	Closure	SI: High (-)	SI: Medium (-)

Activity	Potential Impact	Aspects	Phase	Significance pre-mitigation	Significance post-mitigation
	development opportunities due to closure of mine				

## Financial Provision

The infrastructure and activities associated with the proposed Elders Colliery Project will increase the existing liability by an amount of R 45 258 786.77 (SRK, 2019).

Anglo Operations (Pty) Ltd will provide for the closure liability associated with the Proposed Elders Colliery Project either through a contribution to a Trust Fund or the purchase of a Bank Guarantee or a combination of the two methods as allowed by Regulation 527 of the MPRDA.

## Part B: Environmental Management Programme

### Sensitive areas

The broad placement of the surface infrastructure was informed by mapping the environmental sensitivities which considered the location of all known sensitive physical, social and environmental features within the mining rights and surface lease areas. The following environmental sensitivities were taken into account:

- Noise sensitive receptors
- Wetland
- Air Quality (dust sensitive receptors)
- Blasting

Refer to Section 28.1.3 for more information.

### Potential impact on water resources

Through the implementation of the management measures by the relevant responsible persons, any potential environmental impact associated with undertaking listed activities associated with the proposed project will be managed accordingly.

The sources which could potentially impact on water resources are outlined below:

- Construction Phase
  - General earthworks
  - Construction vehicles
  - Borrow pits
  - Box-cut
- Operations
  - Advancing mine workings
  - Pollution control dams and associated silt traps
  - Overburden stockpile
  - Dirty water conveyance system
  - Sewage treatment plant
  - Sludge drying beds at sewage treatment plant
  - Workshops



- Bulk oil storage facilities
  - Salvage yards
  - Coal transport from box-cut via existing roads
  - Water used for dust suppression
  - Discharge from water treatment plant and sewage treatment plant
  - Spill from PCD
- Closure Phase and post closure
  - Removal of infrastructure
  - Construction vehicles
  - Discharge from water treatment plant
  - Decant

## Potential risk of acid mine drainage

Based on a combined evaluation of the samples, the seven (7) tested material samples (excluding one duplicate analysis) were classified as follows with regard to their acid generating potential:

- Non-acid generating:
  - Carb. Sandstone (SS) 20-35m
  - Mud & Sandstone Mix 10-40m;
- Inconclusive, and potentially acid generating conditions if preferentially exposed:
  - Mudstone / Siltstone 5-15m;
  - Carb. Siltstone 30-40m
  - Carb. Sandstone (SS) 30-50m; and
- Potentially Acid generating (long term):
  - Coal Sample Nr. 1
  - Coal Sample Nr. 2.

### Waste classification

In addition to the ABA being conducted for the 7 samples a waste classification was also conducted for the samples.

No threshold was exceeded in the distilled water (1:20 ratio) leachable concentrations ( $LC < LCT_0$ ). The final waste classification (based on the exceedances above) and the theoretically required landfill design are given below:

Sample	TCT	LCT	Waste Type	Landfill design class
Coal 1	< TCT1	< LCT0	3	C
Coal 2	< TCT1	< LCT0	3	C
Carb. Sandstone (SS) 20-35m	< TCT1	< LCT0	3	C
Mudstone / Siltstone 5-15m	< TCT1	< LCT0	3	C
Carb. Siltstone 30-40m	< TCT1	< LCT0	3	C
Carb. Sandstone (SS) 30-50m	< TCT1	< LCT0	3	C
Mud & Sandstone Mix 10-40m	< TCT1	< LCT0	3	C

## Financial provision and closure plan

The information provided in this section is sourced from the closure plan developed for the proposed Elders Colliery Project.

The infrastructure and activities associated with the proposed Elders Colliery project will increase the existing liability by an amount of R 45 258 786.77 (SRK, 2019).

## Closure objectives

The overall closure objective for the proposed Elders Colliery Project area is to re-instate an area that is safe, stable, and non-polluting with the final landform not adversely affecting water resources.

The above overall goal is underpinned by the more specific objectives listed below:

- Decommissioning all surface infrastructure that has no beneficial post-closure use;
- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;
- Rehabilitate disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate disturbed land to a state that facilitates are in compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;
- Rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage; and
- Rehabilitate all disturbed land to a state where post-closure management is minimised.

## Rehabilitation action plan

The rehabilitation actions that the mine intends to undertake at the end of the life of the proposed Elders Colliery Project are described below. These actions are designed to comply with the requirements of this rehabilitation plan's objectives, as well as the requirements of Best Practice Guidelines (BPG). The following infrastructure will be rehabilitated:

- Infrastructure
- Boxcut
- Underground workings
- Roads and parking areas
- Pollution control dam
- Groundwater management
- Stormwater management
- Fuel storage and dispensing
- Fencing and walling

## Remediation of contaminated areas

Certain contaminated areas will be remediated. The following area will be remediated:

- Hydrocarbon contamination
- Chemical contamination
- Revegetation and wildlife

## Mechanisms for monitoring compliance

Internal and external environmental monitoring is undertaken on an ongoing basis at Elders Colliery as required. Details associated with the compliance monitoring is provided in the sections below.

## Specific environmental monitoring requirements

Elders Colliery will implement an ongoing monitoring programme for its proposed operations as recommended ensuring environmental requirements stipulated in this EMP are complied with. The following impacts and environmental components are being monitored:

- Blasting;
- Surface water;

- Groundwater;
- Terrestrial ecology;
- Air quality; and
- Noise.

### **Post-rehabilitation monitoring and maintenance**

The objective of the monitoring programme will be to track the recovery of the site towards the long-term post-closure land use goals, in accordance with the overall closure objectives. The monitoring programme will be designed to collect information to demonstrate that the Relinquishment criteria have been achieved. The anticipated monitoring will include:

- Surface water
- Groundwater
- Erosion monitoring
- Vegetation establishment
- Bio-monitoring
- Rehabilitation Performance Monitoring

The mine will undertake continuous maintenance on infrastructure that has the potential to affect the environment. This infrastructure includes pipelines, roads and infrastructure traversing watercourses. The maintenance is a result of planned inspections on these facilities where specific requirements for maintenance on the above infrastructure is required and is conducted in line with a maintenance schedule.

### **Environmental awareness plan**

Environmental conditions are included in any operational contracts, thereby making contractors aware of the potential environmental risks associated with the project and the necessity to prevent accidental spillages by the implementation of good housekeeping practices.

The following principles will apply to the Environmental Awareness Plan (safety, health and environmental (SHE) training):

- All personnel are as a minimum, undergo general SHE induction and awareness training;
- An Environmental Management Systems (EMS) coordinator has been appointed;
- The EMS coordinator will identify the SHE training requirements for all Thungela Resources personnel and contractors. The training requirements are recorded in a training needs matrix indicating particular training that must be undertaken by identified personnel and contractors. The training matrix is administered by the Environmental Co-ordinator;
- Development of Training Programme; and
- General Awareness Training.

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## Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Anglo Elders Colliery (Pty) Ltd. The opinions in this Report are provided in response to a specific request from Anglo to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

The Protection of Personal Information Act 4 of 2013 (POPIA), which aims to promote protection of personal information, came into effect on 1 July 2021. The EIA Regulations, 2014 require, inter alia, transparent disclosure of registered stakeholders and their comments. In terms of the EIA Regulations, 2014, stakeholders who submit comment, attend a meeting or request registration in writing are deemed registered stakeholders who must be added to the project stakeholder database. By registering, stakeholders are deemed to give their consent for relevant information (including contact details) to be processed and disclosed, in fulfilment of the requirements of the EIA Regulations, 2014 and the National Appeal Regulations, 2014.

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## List of Abbreviations

AAIC	Anglo American Inyosi Coal (Pty) Ltd
AOPL	Anglo Operations (Pty) Ltd
BID	Background Information Documents
CVs	curricula vitae
CMU	Catchment Management Unit
CRR	Comment and response report
DEA	Department of Environmental Affairs
DEAT	Department of Environmental Affairs and Tourism
DHSWS	Department of Human Settlements, Water and Sanitation
DMR	Department of Mineral Resources
DMRE	Department of Mineral Resources and Energy
DWS	Department of Water and Sanitation
DSR	Draft Scoping Report
EAP	Environmental Assessment Practitioner
EA	Environmental Authorisation
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
FSR	Final Scoping Report
GNR	Government Notice Regulation
I&AP's	Interested and Affected Parties
IFC	International Finance Corporation
LoM	Life of Mine
MAE	Mean annual evaporation
MAP	Mean annual precipitation
MHSA	Mine Health Safety Act, 1996 (Act No. 29 of 1996)
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	National Environmental Management Air Quality Act (Act No. 39 of 2004)
NEM:BA	The National Environmental Management: Biodiversity Act (Act No.10 of 2004)
NEW:WA	National Environmental Management :Waste Act (Act No. 36 of 1998)
NHRA	National Heritage Resources Act 25 of 1999
NWA	National Water Act (Act 36 of 1998)
PS	Performance Standard
PM	Particulate matter
PES	Present Ecological Statues
PAIA	The Promotion of Access to Information Act, (Act No. 2 of 2000)
PAJA	The Promotion of Administrative Justice Act, (Act No. 3 of 2000)
PPP	Public Participation Process

SHE	Safety, Health and Environmental
SEAT	Anglo American Socio-economic Assessment Toolbox
S&EIR	Scoping and Environmental Impact Reporting
SANS	South African National Standard
SO <sub>2</sub>	Sulphur Dioxide
SO <sub>4</sub>	Sulfate
SPLUMA	Spatial Planning and Land Use Management Act, (Act No. 16 of 2013)
SRK	SRK Consulting (South Africa) Pty) Ltd ()
ToR	Terms of Reference
TDS	Total Dissolved Solids
WUL	Water Use Licence
WULA	Water Use Licence Application
ZoI	Zone of Influence

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**NOTE:** This Report comprises of **Part A:** The Environmental Impact Assessment (EIA) and **Part B:** the Environmental Management Programme (EMPr) of the proposed Elders Colliery Project. The Report has been compiled in terms of the provisions of Appendix 3 and Appendix 4 of the 2014 EIA Regulations (as amended) promulgated under the National Environmental Management Act, At 107 of 1998 (NEMA)

# 1 Part A: Environmental Impact Assessment (EIA) Report

## 1.1 Introduction, background and scope of the EIA

The Elders Colliery is a proposed a Scoping Report and Environmental Management Programme (EMPr) was submitted in terms underground coal mine located approximately 25 km north of the town of Bethal on the R35 provincial road in the Mpumalanga Province (Figure 1-1). Anglo Operations (Pty) Ltd (AOPL) submitted an environmental authorisation application to the Mpumalanga Department of Mineral Resources (DMR) (now known as the Department of Mineral Resources and Energy (DMRE) for the proposed project on 16 July 2015 and subsequently of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014. The EMPr was submitted for authority review on 25 January 2016.

The proposed Elders Colliery Project was previously owned by AOPL; however, the mining right was ceded to AAIC and executed in July 2020.

AOPL submitted a section 11 application in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) to the DMRE to transfer the Elders mining right from AOPL to Anglo American Inyosi Coal (Pty) Ltd (AAIC). The mining right and Deed of Cession was executed in July 2020. The Environmental Authorisation (EA) was issued on 29 July 2020. The registered Interested and Affected Parties (I&AP's) were notified of the environmental authorisation on 4 August 2020 via email and sms. No appeals were received.

AAIC (now a member of Thungela Resources) is proposing changes to the 2016 project description which includes a change in mine plan, block plan and an additional transport method for mined coal. Coal mined from underground will be stored in a steel bin from where it will be loaded onto trucks and hauled to an existing processing facility. An interim coal loading area is planned for occasions when the bin overflows. The coal will be removed within 24 hours. In addition, the R35 needs to be widened at two points to create intersections to provide access to the proposed Elders Colliery Project.

Figure 1-1 and Appendix A illustrates the locality and proposed infrastructure at Elders Colliery Project. Coal mined from Elders Colliery will be hauled to an existing processing facility within the area.

Table 1-1 indicates the project activities that were approved in 2016 as well as the proposed changes to the proposed Elders Colliery Project.

**Table 1-1: Project description changes**

2016 Approved Project Description	2021 Proposed Project Description
<ul style="list-style-type: none"> <li>Underground mining</li> <li>Mining No. 2 and 4 Seam by means of bord and pillar mining methods using Continuous Miners</li> <li>Box cut (7 ha) and associated surface infrastructure including the ventilation shaft within the box-cut.</li> </ul>	<ul style="list-style-type: none"> <li>Underground mining sequencing</li> <li>Mining No. 2 and 4 Seam by means of bord and pillar mining methods using continuous miners at a slower rate</li> <li>Changes to the mine plan and block plan including: <ul style="list-style-type: none"> <li>Smaller boxcut (5.0365ha);</li> <li>Ventilation shaft outside boxcut (but adjacent);</li> </ul> </li> </ul>

2016 Approved Project Description	2021 Proposed Project Description
<ul style="list-style-type: none"> <li>• New overland conveyor belt (10 km) to Block 20</li> <li>• Upgrading existing conveyor belt (8 km) from Block 20 to Goedehoop Colliery</li> </ul>	<ul style="list-style-type: none"> <li>○ Interim coal loading area (temporary loading periods);</li> <li>○ Road layout change to accommodate trucks; and</li> <li>○ 132 kV power line layout change (main bulk supply from ESKOM)</li> <li>• Loading from stockpile and trucking of ore to an existing processing facility; and</li> <li>• Widening of the R35 at intersections</li> </ul>

Due to the proposed project description changes, it was determined that in terms of the NEMA EIA Regulation that an Integrated Scoping and Environmental Impact Report (S&EIR) would be required as well as a Regulation 31 Amendment (refer to Section 5 for more information). An application Form was submitted to the DMRE in December 2020 for both processes where it was requested that the Regulation 31 Amendment process be integrated into the S&EIR process. Due to this, an Integrated S&EIR (this report) is being conducted for the proposed project description changes.

SRK Consulting (South Africa) Pty Ltd (SRK) was appointed by AAIC as the independent Environmental Assessment Practitioner (EAP) facilitate the integrated environmental authorisation process and associated stakeholder engagement process for the inclusion of the proposed changes to the project.

Table 1-2 indicates the structure of the Integrated Environmental Impact Assessment Report in line with the EIA Regulations. This Integrated EIA Report sets out the proposed scope of the EA process that will be undertaken to include the proposed changes in the project description.

Due to Covid-19, it is uncertain whether a public meeting will occur during the Integrated EIA phase of the project, however, stakeholder engagement will be undertaken in accordance with the Anglo Public Participation Plan which was agreed upon by Anglo and the DMRE for all Anglo Coal (now Thungela Resources) related projects.

The Draft Integrated EIA Report will be placed at the following locations:

- Elders Colliery Proposed Access Road
- Bethal Public Library
- Kriel Public Library
- Komati Paypoint and Library
- Vlakkuielen Community
- Middelkraal Community
- Emalahleni Local Municipality - Kriel Offices.

All comments received during the public commenting period will be addressed and incorporated in the Final Integrated EIA Report.



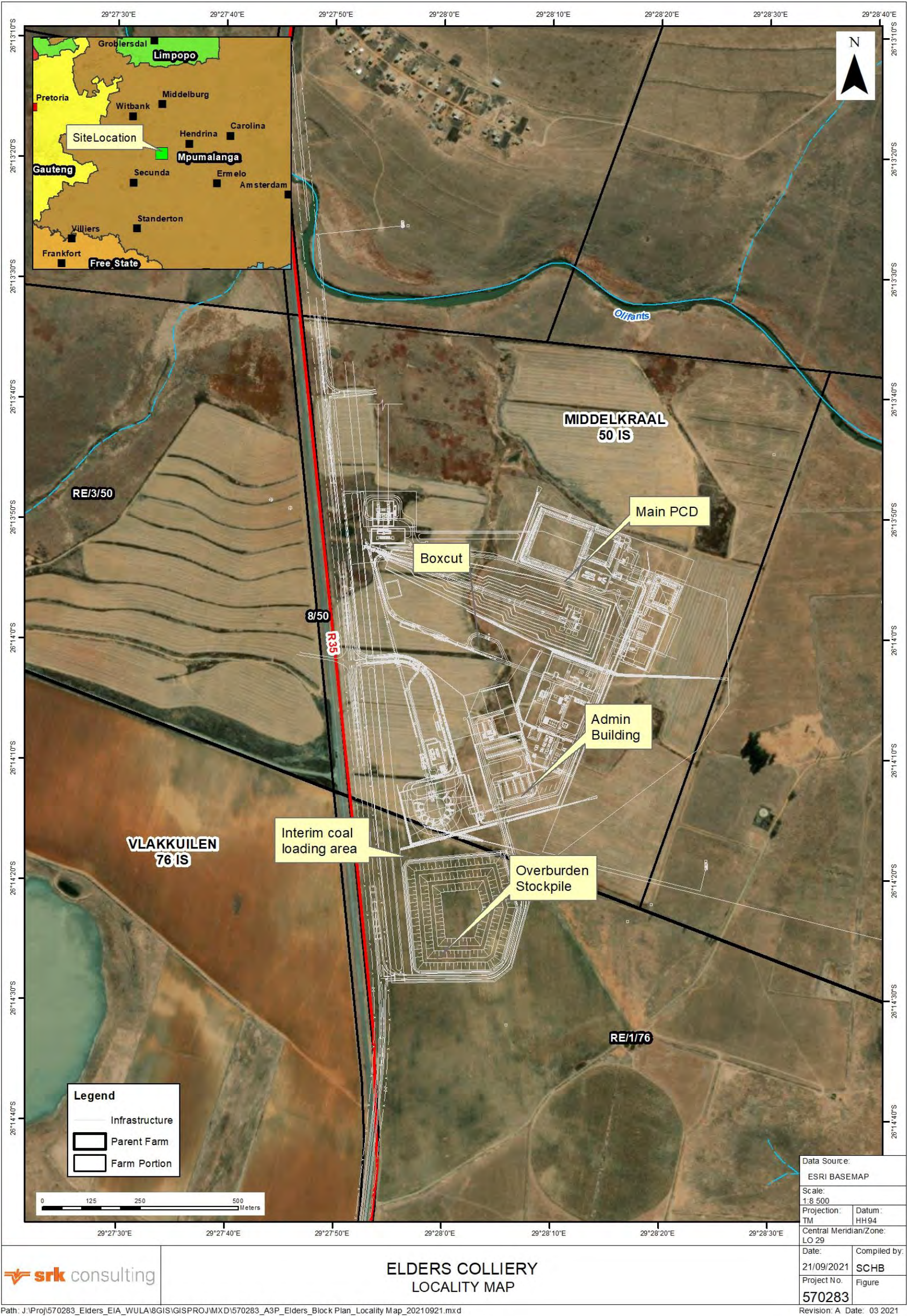


Figure 1-1: Regional locality of the proposed Elders Colliery Project



## 1.2 EMPr amendment and related permitting requirements

Prior to development of the Elders Colliery and associated infrastructure, an EA and amendments to existing authorisations need to be undertaken in terms of the following key national legislation (see Section 5 for details on each legislative requirement for the project):

- The Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA): For any amendments EMPr in accordance with Section 102 of the MPRDA
- The National Environmental Management Act (Act No. 107 of 1998) (NEMA): For any project-related listed activities stipulated in the NEMA Environmental Impact Assessment (EIA) Regulations of 2014, as amended in 2017
- The National Environmental Management: Waste Act (Act No. 59 of 2008) (NEM:WA): For any project-related waste management activities stipulated in GN R 921, promulgated under NEM:WA
- The National Water Act (Act No. 36 of 1998) (NWA): For any project related water uses stipulated under Section 21 of NWA

An integrated environmental authorisation process has been undertaken based on the above regulatory requirements. A schematic showing the integrated environmental authorisation process is provided in Figure 1-2. The authorisations in terms of NEMA, NEM:WA and MPRDA have been applied for from the Mpumalanga Province's Department of Mineral Resources and Energy (DMRE), whilst authorisation in respect of the NWA has been applied for from the Department of Human Settlements, Water and Sanitation (DHSWS) located in Bronkhorstpruit.

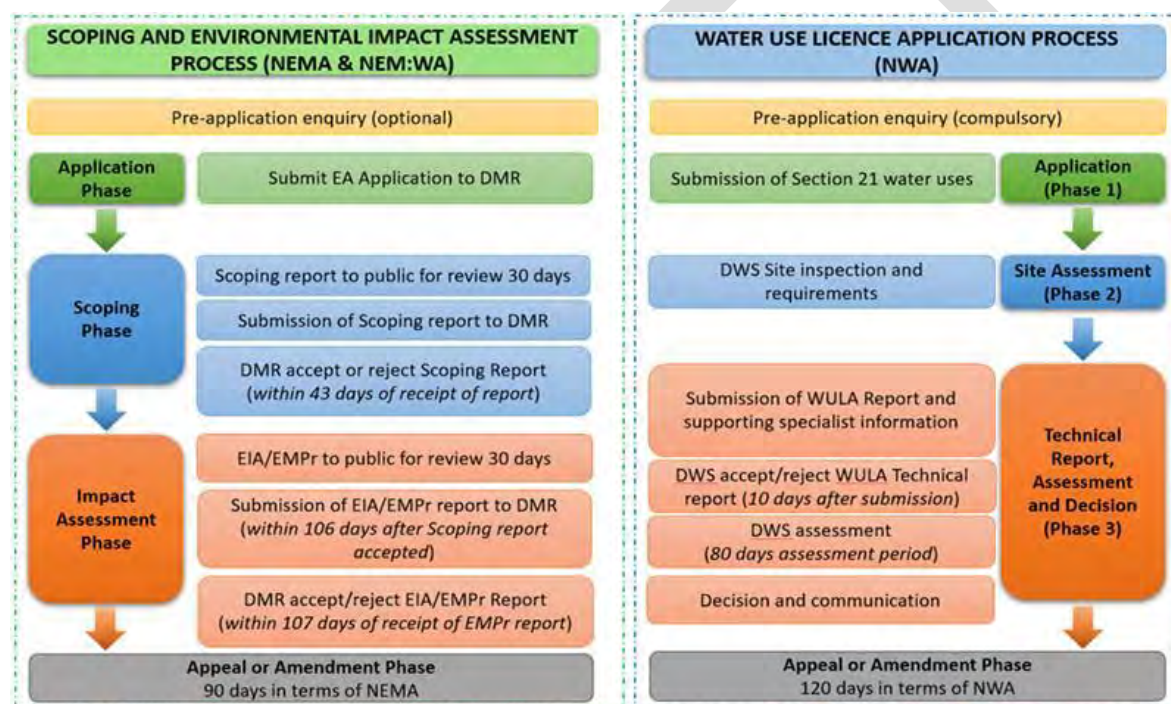


Figure 1-2: Integrated environmental authorisation process

## 1.3 Purpose and structure of this report

This Integrated EIA and Environmental Management Programme (EMPr) has been compiled in terms of the provisions of Appendix 3 and 4 of the NEMA EIA Regulations of 2014, as amended (GNR 982), as well as the requirements of the EIA/EMPr template issued by the DMRE. A summary of the requirements of an EIA/EMPr report including cross-references to sections in this report where these requirements have been addressed is provided in Table 1-2 for the Integrated EIA and Table 28-1 for the EMPr.

Prior to the EIA phase and the compilation of the Draft Integrated EIA/EMPr, all comments received during the review of the draft scoping report for public comment have been incorporated into the final scoping report which was submitted for approval to the DMRE. The DMRE have issued a letter of acceptance of the final scoping report on 19 August 2021 (Appendix D) and the requirements contained in that letter have been addressed in this report. Subsequent to receiving the acceptance letter, it was noted that two of the farm portions were not included in the property description as originally submitted in the application form. SRK has sent through a formal email to the case officer Ms Mashuda Mulengwe to amend the acceptance letter. To date no feedback has been received.

This report is titled Draft Integrated Environmental Impact Assessment Report and Environmental Management Programme (Draft Integrated EIA/EMPr) and fulfils the requirements for an Integrated EIA/EMPr as contemplated in the NEMA 2014 EIA Regulations, as amended.

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**Table 1-2: Structure of the Integrated EIA reporting in terms of Legislation Requirements as detailed in Appendix 3 (contents of an EIA report) of GNR 982**

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
(1)(a)	details of-	
	(i) the EAP who prepared the EMPr	Section 2.1
	(ii) the expertise of the EAP, including a curriculum vitae;	Section 2.2 and Appendix C
(1)(b)	The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:	Section 3 and
	(i) The 21-digit Surveyor General code of each cadastral land parcel	Section 3, Table 3-1
	(ii) where available, the physical address and farm name; and	Section 3, Table 3-1
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	N/A
(1)(c)	a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is -	Figure 1-1 and Appendix A & B
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken	N/A
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken.	N/A
(1)(d)	A description of the scope of the proposed activity, including	
	(i) a listed and specified activities triggered and being applied for; and	Section 6
	(ii) a description of the associated structures and infrastructure related to the development	Section 6.1 and Section 6.2 and Section 8
(1)(e)	A description of the policy and legislation context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context	Section 5
(1)(f)	A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report.	Section 7
(1)(g)	A motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report	Section 11
(1)(h)	A full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:	
	(i) details of the development footprint considered	Section 11



Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs	Section 13
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 13.9
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 14
	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts including the degree to which these impacts – (aa) can be reversed (bb) may cause irreplaceable loss of resources and (cc) can be avoided, managed or mitigated	Section 18
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of the potential environmental impacts and risks	Section 18.3
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	Section 18.4
	(viii) the possible mitigation measures that could be applied and the level of residual risk	Section 18.4
	(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Section 16
	(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report.	Section 17
(1)(i)	A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity including -	Section 18.1
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process, and	Section 18.2
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	Section 18.2
(1)(j)	An assessment of each identified potentially significant impact and risk, including -	Section 18.4 and Section 18.6
	(i) cumulative impacts	
	(ii) the nature, significance and consequences of the impact and risk	
	(iii) the extent and duration of the impact and risk	

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
	(iv) the probability of the impact and risk occurring	
	(v) the degree to which the impact and risk can be reversed	
	(vi) the degree to which the impact and risk may cause irreplaceable loss of resources	
	(vii) the degree to which the impact and risk can be mitigated	
(1)(k)	Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report.	Section 19
	An environmental impact statement which contains-	
	(i) a summary of the key findings of the environmental impact assessment	Section 20
(1)(l)	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided including buffers and	Figure 28-1 and Appendix H
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	Section 18.2
(1)(m)	Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact assessment outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorization	Section 18.2
(1)(n)	The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment	Section 21
(1)(o)	Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorization	Section 28
(1)(p)	A description of any assumptions, uncertainties and gaps in the knowledge which relate to the assessment and mitigation measures provided.	Section 21.3
(1)(q)	A reasoned opinion as to whether the proposed activity should or should not be authorized and if the opinion is that it should be authorized, any conditions that should be made in respect of that authorisation	Section 22
(1)(r)	Where the proposed activity does not include operational aspects, the period for which the environmental authorization is required and the date on which the activity will be conducted, and the post construction monitoring requirements finalized.	Section 22.1
	An undertaking under oath or affirmation by the EAP in relation to:	Section 30.9
	(i) the correctness of the information provided in the reports	
(1)(s)	(ii) the inclusion of comments and inputs from stakeholders and I&APs	
	(iii) the inclusion of inputs and recommendations from the specialists reports where relevant and	

Appendix 3	Legislated requirements as per the NEMA GNR 982 in Appendix 3	Relevant Report Section
	(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties	
(1)(t)	Where applicable, details of any financial provisions for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts	Section 29
(1)(u)	An indication of any deviation from the approved Scoping Report, including the plan of study, including-	Section 24
	(i) and deviation from the methodology used in determining the significance of potential environmental impacts and risks, and	N/A
	(ii) a motivation for the deviation	N/A
(1)(v)	Any specific information that may be required by the competent authority; and	Acceptance of the Scoping Report by DMR – refer to Appendix D
(1)(w)	Any other matters required in terms of section (24)(4)(a) and (b) of the Act	N/A
(2)	Where a government notice gazette by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.	N/A

## 2 Contact person and correspondence address

SRK were appointed by Elders Colliery as the independent environmental assessment practitioner (EAP) to manage and facilitate the integrated EA and associated public participation process in accordance with NEMA, NEM:WA, NWA and MPRDA. Below are the details of the EAP, Elders Colliery contact person, specialist, provincial authorities, municipal and ward contacts.

### 2.1 Details of EAP who prepared the report

The EAPs involved in the compilation of this amended EMPs and associated environmental authorisation (EA) and their contact details are provided in Table 2-1.

**Table 2-1: EAP contact details**

Name	Contact Number	Fax Number	Email Address
Darryll Kilian	011 441 1297	086 506 1737	<a href="mailto:dkilian@srk.co.za">dkilian@srk.co.za</a>
Natasha Anamuthoo	011 441 1174	086 503 2498	<a href="mailto:nanamuthoo@srk.co.za">nanamuthoo@srk.co.za</a>
Michelle Miles	011 441 1111	086 503 2498	<a href="mailto:mmiles@srk.co.za">mmiles@srk.co.za</a>

### 2.2 Expertise of the EAP

The section below provides the qualifications of the EAP, summary of EAP project experience and Elders Colliery contact details.

#### 2.2.1 Qualifications of the EAP

The qualifications of the EAPs are provided for in Table 2-2 and copies of the qualifications are provided in Appendix C.

**Table 2-2: EAP Qualifications**

Name	Qualifications	Professional registration	Years' Experience
Darryll Kilian	MA (Environmental and Geographical Science)	CEAPSA	27
Natasha Anamuthoo	BSoc Sc (Hons), (Geography and Environmental Management)	EAPASA	14
Michelle Miles	BSc (Hon) (Environmental Water Management)	EAPASA	5

#### 2.2.2 Summary of EAPs past experience

The EAPs' expertise is provided in Table 2-3. Detailed curricula vitae of the project team are provided in Appendix Appendix C.

**Table 2-3: EAP expertise**

EAP Name	Expertise
Darryll Kilian	<p>Darryll Kilian has been involved in the field of environmental management, consulting and research work in Africa for the past 27 years. His expertise includes:</p> <ul style="list-style-type: none"> <li>• Environmental and social impact assessment</li> <li>• Due diligence reviews</li> <li>• Project performance monitoring and review</li> <li>• Environmental reporting</li> <li>• Strategy and policy development</li> <li>• Environmental and social research</li> <li>• Stakeholder engagement.</li> </ul>
Natasha Anamuthoo	<p>Natasha Anamuthoo is a senior environmental scientist at SRK Consulting South Africa. She holds a BSoc Sc (Geography and Environmental Management) and BSoc Sc (Hons) (Environmental Management) from University of KwaZulu-Natal, Howard College. Natasha has over 14 years of experience in the environmental science and management field. She has successfully completed training in Project Management and Internal Auditing of Environmental Management System (EMS). Natasha is a Registered Environmental Assessment Practitioner of South Africa and is also a member of the Golden Key Society, the International Association of Impact Assessments and the Society for Human Geographers of South Africa.</p> <p>Natasha has been involved in numerous mining, petroleum and industrial environmental impact assessments throughout South Africa and the Africa (DRC, Sierra Leone and Guinea). She has also been involved in large-scale mining, energy and cement related projects for various clients such as Anglo-American Platinum, Anglo Gold Ashanti, Anglo Thermal Coal, ENRC, NYA, PPC Cement, Southern African Development Groundwater Management Institute (SADC GMI) and the South African Power Pool (SAPP). Most recently Natasha has been involved on the development of the Environmental, Social Management Framework (ESMF) tool for the SAPP. Natasha has also been project managing a large scale environmental, social and health baseline study throughout Southern Africa.</p> <p>Natasha has extensive experience in drafting management plans, undertaking stakeholder engagement, implementation processes for various petroleum, industrial and mining projects. She has also been involved in environmental control officer, auditing and due diligence work within the industrial, petrochemical, mining, motor industry and linear related projects. Natasha has written articles that have been published in various mining and engineering publications.</p>
Michelle Miles	<p>Michelle has 5 years' experience within the environmental science and management field. She has been involved in various aspects of projects ranging from concept studies all the way through to environmental construction management.</p> <p>Michelle has experience in conducting environmental legal reviews as well as environmental permitting processes such as Environmental Impact Assessments and Basic Assessments.</p> <p>Her experience include:</p> <ul style="list-style-type: none"> <li>• Environmental authorisations such as Basic Assessments and Environmental Impact Assessments as well as other associated environmental permits</li> <li>• Environmental Baseline Assessments</li> <li>• Environmental design criteria as well as permitting strategies</li> <li>• Construction environmental management plans</li> <li>• Independent weekly audit report for construction</li> <li>• Legislative reviews of various countries</li> <li>• Geographical information systems (GIS) analyses</li> <li>• Waste management plans</li> <li>• Water monitoring sampling and analysis</li> <li>• Environmental Compliance Auditing.</li> </ul>

## 2.3 Elders Colliery details

The physical and postal address of the proposed Elders Colliery Project is provided in Table 2-4 and details of the responsible persons at the Elders Colliery are presented in Table 2-5.

**Table 2-4: Physical and postal address for Elders Colliery**

Address	Details
Physical address:	25 Bath Avenue, Rosebank, Johannesburg, 2196 South Africa
Postal address:	PO Box 61587 Marshalltown Johannesburg 2017

**Table 2-5: Elders Colliery responsible persons<sup>2</sup>**

Name	Designation
Kobus Bergh	Project Manager
Liezel Louw	Environmental Specialist
Leonore van Wyk	Head of Mineral, Property Rights and Permitting
Cecil Sibeko	Stakeholder Engagement

## 2.4 Details of specialists

The majority of the specialist studies were conducted in 2015 with some of the studies being updated between 2019 and 2021.

Table 2-6 lists the specialist studies undertaken in 2015 which will inform the Integrated Scoping and Impact Assessment.

**Table 2-6: Specialist studies conducted in 2015 and the specialist who undertook the study**

Specialist Study	Specialist
Air Quality	Airshed Planning Professionals: Hanlie Liebenberg-Enslin
Soils and Land Capability Studies	Earth Science Solutions: Ian Jones
Noise	FMAC: Francois Malherbe
Cultural Heritage	Private: Johnny van Schalkwyk
Biodiversity	Ekolnfo: Willem de Frey
Surface Water	Jones and Wagner: Mike Palmer
Groundwater	JMA Consulting: Jasper Muller
Blasting	Blast Management and Consulting: Danie Zeeman
Socio-economic	SRK Consulting: Adel Malebana
Wetlands	Wetland Consulting Services: Dieter Kassier
Closure Costing and Rehabilitation	SRK Consulting: James Lake

<sup>2</sup> Due to the POPI Act, no contact details can be provided

Based on a change in project description, it was determined that some of the specialist studies would require an update. The specialist studies identified in Table 2-7 indicate the specialist studies which were updated and the specialist who undertook the update.

**Table 2-7: Updated specialist studies conducted**

Specialist Study	Specialist
Closure Costing (Updated in 2019)	SRK Consulting, James Lake
Traffic (Updated 2019)	Aurecon, Mike Van Tonder
Groundwater (Updated in 2020)	Delta H, Kai Witthueser
Water Balance (Updated in 2020)	Jones and Wagener, Caroline Bladen
Wetland Assessment (Updated in 2021)	Wetland Consulting Services; Dieter Kassier
Tier 1 simulation (groundwater quality) (Conducted 2021)	University of Pretoria, John Annandale

It is important to note that no additional specialist studies will be conducted for this project as the construction and operation of proposed Elders Colliery Project has not commenced and the area is still considered a Greenfield area. Thus, the existing specialist studies are still relevant and within the five-year validity period.

## 2.5 Provincial authorities' details

Environmental authorisation for the proposed Elders Colliery Project is required from the DMRE whose details is provided in Table 2-8.

**Table 2-8: Competent authority details**

Department	Contact Person
DMRE, Mpumalanga	Mashudu Mutengwe

## 2.6 Municipality and ward details

The proposed Elders Colliery Project is situated within the Govan Mbeki Local Municipality, which forms part of the greater Gert Sibande District Municipality in the Mpumalanga Province. Details of the relevant municipalities and wards are provided Table 2-9.

**Table 2-9: Local and district municipality details**

Municipality	Contact Person	Designation
Govan Mbeki Local Municipality	CIlr Nhlakanipho G Zuma	Executive Mayor
Govan Mbeki Local Municipality	CIlr TY Ngxonono	MMC for Planning and Development
Govan Mbeki Local Municipality	CIlr MJ Mtsweni	Ward councillor (Ward 15)
Govan Mbeki Local Municipality	CIlr BB Ndaba	Ward councillor (Ward 22)
Govan Mbeki Local Municipality	CIlr KD Mazibuko	Ward Councillor (Ward 24)
Govan Mbeki Local Municipality	CIlr C Jordaan	Ward councillor (Ward 25)
Govan Mbeki Local Municipality	CIlr BD Mokoena	Ward councillor (Ward 26)
Govan Mbeki Local Municipality	CIlr NG Malaza	Ward councillor (Ward 27)
Gert Sibande District Municipality	Mr Cijimpi Absenia Habile	Municipal Manager

### 3 Description of property

The properties, owner and mining and surface rights information associated with the proposed Elders Colliery Project mining right and lease area are shown in Table 3-1 and Figure 3-1. Land ownership has been provided by AAIC (now a member of Thungela Resources (Pty) Ltd) .

The infrastructure and activities associated with the proposed Elders Colliery Project will take place on the following farms and associated farm portions:

- Portion 3 and 10 of the farm Elandsfontein 75 IS;
- Portion 1 and 2 of the farm Geluk 226 IS;
- Portion RE/2, RE/3, portion of portion 4, 12/3 and 13/3 of the farm Halfgewonnen 190 IS;
- Portion 5/1, 6/1, 7/1, 16/5 and 17/5 of the farm Legdaar 78 IS;
- Portion RE, RE/3, 5 and 6/3, 8/3 of the farm Middelkraal 50 IS;
- Portion RE/7, 12/5, 13/5, 14/6, 22/10, RE/26, 27/26 and 28/26 of the farm Schurvekop 227 IS; and
- Portion RE of the farm Vlakkuijen 76 IS.

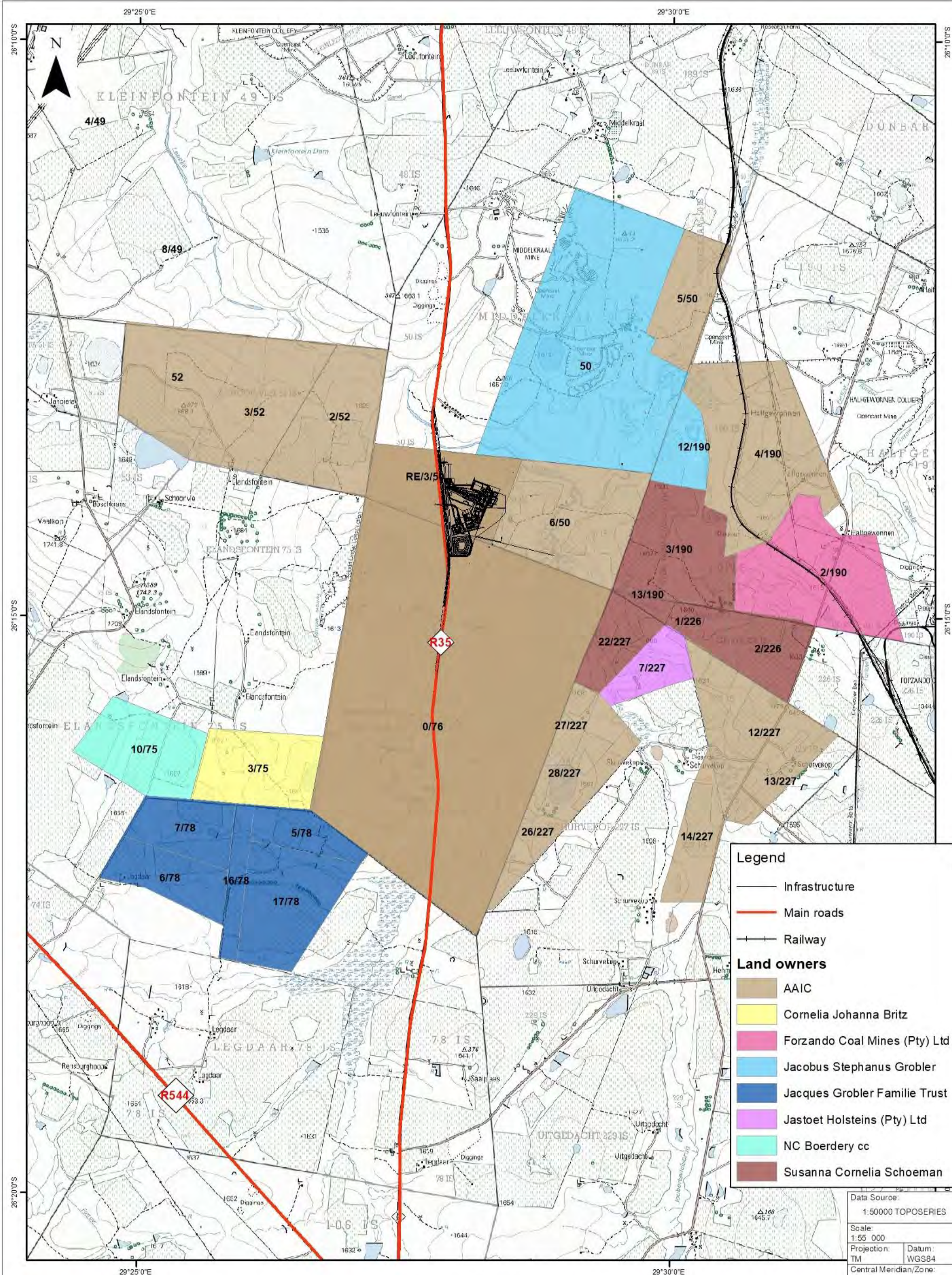
The property and ownership information pertaining to the proposed Elders Colliery Project (i.e. portion numbers, areas and title deed numbers) are presented in Table 3-2.



**Table 3-1: Properties associated with the proposed Elders Colliery Project areas**

Mining Right	LPI Code	Farm Name	Ptn	Portion applied for	Area (ha)	Area Applied (ha)	Title Deed	Registered Owner / Company
Elders 10117MR	TOIS0000000007500003	Elandsfontein 75 IS	3	3	216.9596	216.9596	T8712/2006	Hammelkop Eiendomme cc
Elders 10117MR	TOIS0000000007500010	Elandsfontein 75 IS	10	10	216.9553	216.9553	T32759/2007	N C Boerdery cc
Elders 10117MR	TOIS0000000022600001	Geluk 226 IS	1	1	77.6061	77.6061	T71125/1994	Schoeman Susanna Comelia
Elders 10117MR	TOIS0000000022600002	Geluk 226 IS	2	Area applied over a ptn of ptn 2	129.2949	37.6819	T71125/1994	Schoeman Susanna Comelia
Elders 10117MR	TOIS0000000019000002	Halfgewonnen 190 IS	RE/2	Area applied over a ptn of RE of ptn 2	371.6053	42.3966	T7604/2019	Overlooked Colliery Pty Ltd
Elders 10117MR	TOIS0000000019000003	Halfgewonnen 190 IS	RE/3	RE/3	270.6641	270.6641	T71125/1994	Schoeman Susanna Comelia
Elders 10117MR	TOIS0000000019000004	Halfgewonnen 190 IS	4	Area applied over a ptn of ptn 4	471.0926	163.0226	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000019000012	Halfgewonnen 190 IS	12/3	12/3	85.6532	85.6532	T9231/2019	Umcebo Prop Pty Ltd
Elders 10117MR	TOIS0000000019000013	Halfgewonnen 190 IS	13/3	13/3	4.2827	4.2827	T71125/1994	Schoeman Susanna Comelia
Elders 10117MR	TOIS0000000007800005	Legdaar 78 IS	RE/5/1	RE/5/1	95.6929	95.6929	T10390/2013	Vosbreet Boerdery Pty Ltd
Elders 10117MR	TOIS0000000007800006	Legdaar 78 IS	6/1	6/1	141.0610	141.0610	T44121/2004	Jacques Grobler Familie Trust
Elders 10117MR	TOIS0000000007800007	Legdaar 78 IS	7/1	7/1	141.0610	141.0610	T44121/2004	Jacques Grobler Familie Trust
Elders 10117MR	TOIS0000000007800016	Legdaar 78 IS	16/5	16/5	70.5302	70.5302	T10390/2013	Vosbreet Boerdery Pty Ltd
Elders 10117MR	TOIS0000000007800017	Legdaar 78 IS	17/5	Area applied over a ptn of ptn 17/5	256.9596	165.0000	T10390/2013	Vosbreet Boerdery Pty Ltd
Elders 10117MR	TOIS0000000005000000	Middelkraal 50 IS	RE	Area applied over a ptn of RE	941.5442	500.0000	T9231/2019	Umcebo Prop Pty Ltd
Elders 10117MR	TOIS0000000005000003	Middelkraal 50 IS	RE/3	RE/3	252.4993	252.4993	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000005000005	Middelkraal 50 IS	5	5	169.5933	169.5933	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000005000006	Middelkraal 50 IS	6/3	6/3	342.6128	342.6128	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000005000008	Middelkraal 50 IS	8/3	8/3	4.4603	4.4603	T7181/2011	South African National Roads Agency Ltd
Elders 10117MR	TOIS0000000022700007	Schurvekop 227 IS	RE/7	RE/7	95.3549	95.3549	T51646/2000	Jastoet Holsteins (Pty) Ltd
Elders 10117MR	TOIS0000000022700012	Schurvekop 227 IS	12/5	Area applied over a ptn of ptn 12	286.9382	199.6355	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000022700013	Schurvekop 227 IS	13/5	Area applied over a ptn of ptn 13	51.3919	22.9540	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000022700014	Schurvekop 227 IS	14/6	14/6	130.1929	130.1929	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000022700022	Schurvekop 227 IS	22/10	22/10	106.1757	106.1757	T71125/1994	Schoeman Susanna Comelia
Elders 10117MR	TOIS0000000022700026	Schurvekop 227 IS	RE/26	RE/26	137.6225	137.6225	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000022700027	Schurvekop 227 IS	27/26	27/26	55.0205	55.0205	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000022700028	Schurvekop 227 IS	28/26	28/26	82.6021	82.6021	T7182/2011	Anglo American Inyosi Coal Pty Ltd
Elders 10117MR	TOIS0000000007600000	Vlakkuijen 76 IS	RE	RE	1950.2505	1950.2505	T7182/2011	Anglo American Inyosi Coal Pty Ltd







### 3.1 Adjacent properties associated with proposed Elders Colliery Project

Numerous coal mining operations exist in the vicinity of Elders. Mining operations directly adjacent to the Elders mining right area includes the Halfgewonnen Colliery owned by Sudor Coal (Pty) Ltd and Forzando Coal mines owned by Exxaro Coal Central (Pty) Ltd. Table 3-2 provides the farm names and portions adjacent to the proposed Elders Colliery Project.

**Table 3-2: Adjacent properties to the proposed Elders Colliery Project**

Farm name	Farm portion
Elandsfontein 75 IS	2, RE/1 and 7
Middelkraal 50 IS	RE
Legdaar 78 IS	RE/1, 17 and 4
Schurvekop 227 IS	RE, 8, 16, RE/6, 9, 18, 20, RE/4, RE/5 and 12
Geluk 226 IS	2
Halfgewonnen 190 IS	2, 4 and 8

### 3.2 Details of the closest towns to the proposed Elders Colliery Project

Table 3-3 includes the distance of the mine to the closest major towns in the area as measured from the proposed Elders Colliery Project area. Refer to Section 14.12 for further information relating to the communities in close proximity to the proposed infrastructure associated with the proposed Elders Colliery Project.

**Table 3-3: Project area in relation to adjacent towns**

Major town	Approximate Distance and Direction to major towns in relation to the project
Bethal	25km South
Kriel	20km South-West

## **4 Background and overview of the proposed Elders Colliery Project**

### **4.1 Project background**

The Elders Colliery Project is a proposed underground coal mine located approximately 25 km north of the town of Bethal, on the R35 provincial road within the Gert Sibande District Municipality and Govan Mbeki Local Municipality, in the Mpumalanga Province.

AOPL submitted an environmental authorisation application to the Mpumalanga DMR (now known as the DMRE) for the proposed project on 16 July 2015 and subsequently a Scoping Report and EMPr was submitted in terms of the NEMA EIA Regulations of 2014. The EMPr was submitted for authority review on 25 January 2016.

Anglo submitted a Section 11 application in terms of the MPRDA to the DMR to transfer the Elders mining right from AOPL to AAIC. The mining right and Deed of Cession was executed in July 2020. The EA was issued on 29 July 2020. The registered Interested and Affected Parties (I&AP's) were notified of the environmental authorisation on 4 August 2020 via email and sms. Once the environmental authorisation was approved, no appeals were received.

In 2021, AAIC demerged and started trading under Thungela Resources Ltd following Thungela's admission to the Johannesburg Stock Exchange, as a primary listing, a standard listing on the London Stock Exchange. It is important to note that the legal name change from Anglo Operations (Pty) Ltd to Thungela Resources (Pty) Ltd will officially be effective later in 2021 and at which point the change will be communicated to all relevant parties.

### **4.2 Overview of the approved activities and infrastructure at the proposed Elders Colliery Project**

AAIC (now a member of Thungela Resources (Pty) Ltd) is proposing changes to the 2016 project description which includes a change in mine plan, block plan and an additional transport method for mined coal.

The project entails the development of a box-cut (Figure 4-1) to gain access to the coal resources and will mine the No. 2 and No. 4 coal seams by means of bord and pillar underground mining methods, making use of continuous miners and shuttle cars. The planned Life of Mine (LoM) is approximately 18 years.

Coal mined from underground will be stored in a steel bin from where it will be loaded onto trucks and hauled to an existing processing facility. An interim coal loading area is planned for occasions when the bin overflows. The coal will be removed within 24 hours. In addition, the R35 needs to be widened at two points to create intersections to provide access to the proposed Elders Colliery Project.

The project will take place in three phases. The proposed schedule for the phases are between 3 and 5 years to construct which included powerlines which can take up to 4.5 years to construct. Operations are expected to be over a timeframe of 14 years. Closure is expected to take 2 years and post-closure will take 5 years.

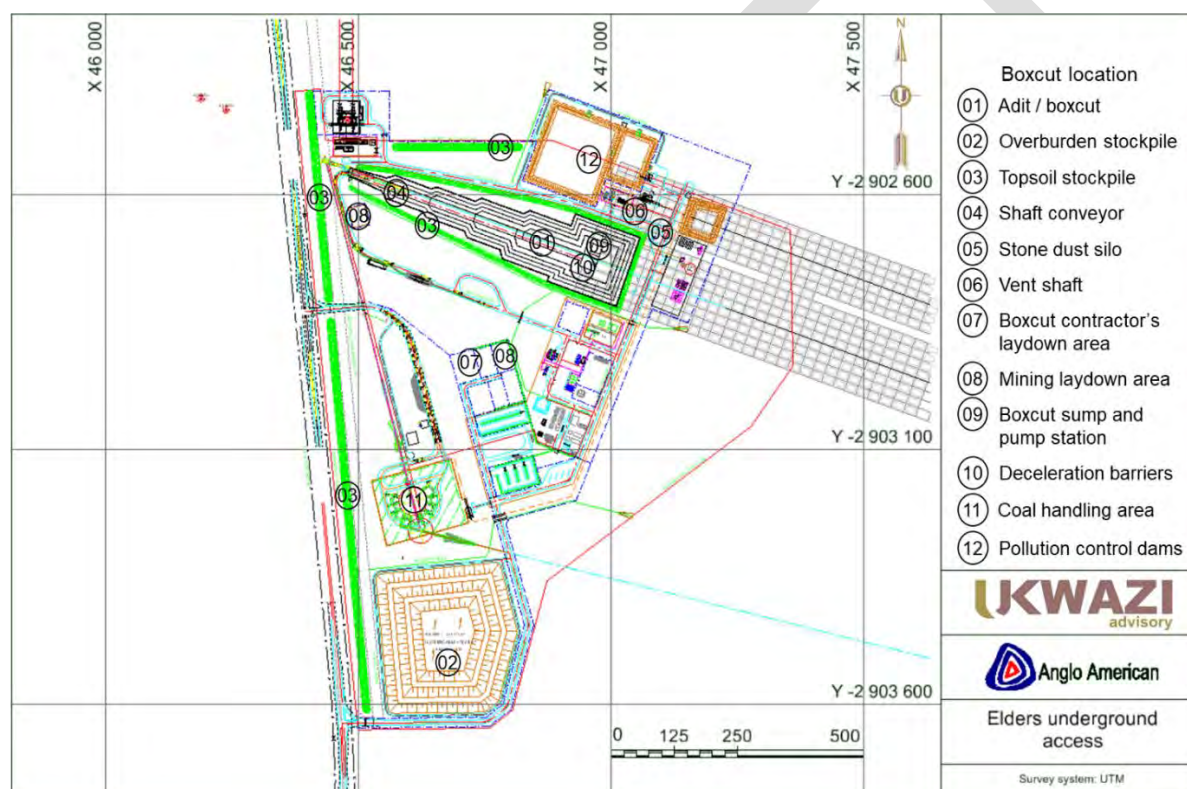
Table 4-1 below indicates the project activities which were approved in 2016 as well as the proposed changes to the project scope.

Due to the proposed changes, a Scoping and Environmental Impact Report Process and Regulation 31 Amendment process were triggered in terms of the NEMA EIA Regulation. Two applications were submitted to the DMRE in December 2020, one for the S&EIR process and one for the Regulation 31

Amendment. Based on discussions with the DMRE in March 2021, the DMRE requested that the two processes be integrated into one S&EIR process. Thus, an Integrated S&EIR process will be conducted.

**Table 4-1: Proposed project description change**

2016 Approved Project Description	2021 Proposed Project Description
<ul style="list-style-type: none"> <li>Underground mining</li> <li>Mining No. 2 and 4 Seam by means of bord and pillar mining methods using Continuous Miners</li> <li>Box cut (7 ha) and associated surface infrastructure including the ventilation shaft within the box-cut.</li> <li>New overland conveyor belt (10 km) to Block 20</li> <li>Upgrading existing conveyor belt (8 km) from Block 20 to Goedehoop Colliery</li> </ul>	<ul style="list-style-type: none"> <li>Underground mining sequencing</li> <li>Mining No. 2 and 4 Seam by means of bord and pillar mining methods using continuous miners at a slower rate</li> <li>Changes to the mine plan and block plan including: <ul style="list-style-type: none"> <li>Smaller boxcut (5.0365ha);</li> <li>Ventilation shaft outside boxcut (but adjacent);</li> <li>Interim coal loading area (temporary loading periods);</li> <li>Road layout change to accommodate trucks; and</li> <li>132 kV power line layout change (main bulk supply from ESKOM)</li> </ul> </li> <li>Loading from stockpile and trucking of ore to an existing processing facility; and</li> <li>Widening of the R35 at intersections</li> </ul>



**Figure 4-1: Box-cut location at Elders Colliery**

## 5 Policy and legislative context

This section provides an overview of the policy and legislative context within which the proposed Elders Colliery Project will operate. It identifies all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process, which may be applicable or have relevance to the proposed Elders Colliery Project.

Table 5-1 provides the policy and legislative context for the proposed Elders Colliery project.

### 5.1 The Constitution of South Africa, 1996 (Act No. 108 of 1996)

The Bill of Rights is the cornerstone of democracy in South Africa, ensuring the rights of all people and affirming the democratic values of human dignity, equality and freedom. Section 24 is directly relevant to environmental law and states that everyone has the right to:

*“An environment that is not harmful to their health or well-being; and have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that: Prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development”.*

The Constitution of South Africa is the overarching framework legalisation driving the NEMA principles and therefore EIA process. The right to a safe environment and the right to information are addressed in the EIA process through stakeholder engagement, where available information pertaining to the environment and proposed activities are disclosed.

### 5.2 Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA)

The MPRDA makes provision for equitable access to and sustainable development of South Africa's mineral resources. The MPRDA requires that the environmental management principles set out in NEMA shall apply to all mining operations and serves as a guideline for the interpretation, administration and implementation of the environmental requirements of NEMA.

The MPRDA requires that a reconnaissance permission, prospecting right, Mining Right, mining permit, retention permit, technical corporation permit, reconnaissance permit, exploration right, production right, prospecting work programme; exploration work programme, production work programme, mining work programme, environmental management programme, or an environmental authorization issued in terms of the National Environmental Management Act, 1998, as the case may be, may not be amended or varied (including by extension of the area covered by it or by the addition of minerals or a share or shares or seams, mineralized bodies, or strata, which are not at the time the subject thereof) without the written consent of the Minister.

### 5.3 National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA)

Listed Activities are activities identified in terms of Section 24 of the NEMA, which are likely to have a detrimental impact on the environment, and which may not commence without EA from the Competent Authority (CA). EA required for Listed Activities is subject to the completion of either a Basic Assessment (BA) process or full Scoping and Environmental Impact Assessment (S&EIA) with applicable timeframes associated with each process. The EA must be obtained prior to the commencement of those listed activities.

## **5.4 National Water Act, 1998 (Act No. 36 of 1998) (NWA)**

The NWA promotes the good management of water resources as well as the prevention of water pollution due to project activities. Section 21 of the NWA outlines the water uses which require the need for a Water Use Licence Application (WULA). Currently, the proposed Elders Colliery Project water activities are authorised by a Water Use Licence (WUL) in April 2017 and amended WUL in November 2017 (WUL No. 03/B22A/ACFGIJ/5047, File No. 27/2/2/B111/11/1).

Due to the changes in the mine plan, a new WULA is being applied for under the NWA, in respect of the following water uses that will be triggered by the proposed project:

- Section 21 (c) and (i) water uses associated with activities within 500 m of a wetland;
- Section 21 (e) water uses associated with engaging in a controlled activity for the irrigation of land with waste or water containing waste;
- Section 21 (f) water use associated with an increase in volume for the authorised discharge of treated mine water; and
- Section 21 (g) water uses associated with a new coal loading area and increase in volume for the authorised pollution control dam and dust suppression.

## **5.5 Other applicable legislation**

### **5.5.1 The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA)**

The National Heritage Resources Act aims to promote good management of cultural heritage resources and encourages the nurturing and conservation of cultural legacy so that it may be bestowed to future generations.

The Act requires all developers (including mines) to undertake cultural heritage studies for any development exceeding 0.5 ha. It also provides guidelines for impact assessment studies to be undertaken where cultural resources may be disturbed by development activities.

As part of the 2015/2016 impact assessment process, a heritage assessment of the project area was undertaken. This assessment was uploaded on the SAHRA site along with the EIA/EMPr.

### **5.5.2 The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)**

The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources.

During the Integrated EIA process, biodiversity hotspots and bio-regions will be investigated to determine the potential impacts that the project may have on the receiving environment. The management and control of alien invasive species on the impacted areas during all the phases of the project will be governed by the NEM:BA. The NEM:BA ensures that provision is made by the site developer to remove any alien species, which have been introduced to the site or are present on the site.

The proposed Elders Colliery Project falls within the Mpumalanga Province, which has a provincial Biodiversity Sector Plan. This provides the conservation planning approach in the Mpumalanga Region.

### 5.5.3 National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA)

The National Environmental Management: Waste Act, 2008 (Act 59 of 2008) (NEM:WA) commenced on 1 July 2009. In terms of this Act, all listed waste management activities must be licensed and in terms of Section 44 of the Act, the licensing procedure must be integrated with the environmental impact assessment process. Government Notice 921, which commenced on 29 November 2013, lists the waste management activities that require licensing in terms of the NEM:WA. Licence applications for activities involving hazardous waste must be submitted to the national authority, the Department of Environmental Affairs (DEA) and those for general waste to the provincial authority.

NEM:WA previously excluded mine residues controlled under the MPRDA but the NEM:WA Amendment Act (NEM:WAA) came into effect on 2 June 2014 (Act No 26 of 2014, Government Gazette 37714) and makes provision for inclusion of mine residue deposits and stockpiles under Schedule 3 (defined wastes) of NEM:WA. Although the Minister of the DMRE is the licensing authority for residue stockpiles and residue deposits, their management must be in accordance with the NEM:WA Regulations as prescribed by the Minister of the Department of Environmental Affairs (DEA). The list of Waste Management Activities that may require licensing in terms of NEM:WA include:

- 29 November 2013 (Government Notice (GN) 921, Government Gazette No 37083) List of waste management activities that have, or are likely to have, a detrimental effect on the environment
- 24 July 2015 (Government Gazette GG 39020, GN: R632). Regulations regarding the planning and management of residue stockpiles and residue deposits<sup>3</sup>
- Part 8 of Chapter 4 of the NEM:WA came into effect on the 2 May 2014 (Government Gazette 37547, Proclamation no. 26). This section of the NEM:WA pertains to land contamination where “contaminated”, in relation to Part 8 of Chapter 4, means the *“presence in or under any land, site, buildings or structures of a substance or micro-organism above the concentration that is normally present in or under that land, which substance or micro-organism directly or indirectly affects or may affect the quality of soil or the environment adversely”*. The NEM:WA requires the land owner to register land that is contaminated with the Department of Environmental Affairs (DEA); and
- Regulations and National Norms and Standards that have relevance to the planning and management of mine residues and stockpiles and general waste and contaminated land management include the following:
  - Government Gazette No. 39020, GN: R632, 24 July 2015: deals with characterisation and classification of the residue; investigation and the selection of sites; design; assessment/prediction of impacts; analysis of risk relating to the management of residue stockpiles and deposits; duties of permit holders; monitoring and reporting; dust management; and decommissioning, closure and post-closure management
  - Government Gazette 41777, GN: 715, 18 July 2018: Waste Exclusion Regulations for the exclusion of a waste stream or portion of waste stream for beneficial use from the definition of waste
  - Government Gazette 41920, GN: R990, 21 Sep 2018: Amendment to GNR632 to allow for pollution control measures required for residue stockpiles and deposits to be determined on a case-by-case basis, based on a risk analysis conducted by a competent person
  - National Norms and Standards in Government Gazette No. 36784, 23 August 2013 for Waste Classification and Management (GN R364), Assessment of Waste for Landfill Disposal (GN R365) and Disposal of Waste to Landfill (GN R636)
  - National Norms and Standards in Government Gazette No 37083, 29 November 2013 for Storage of Waste (GN 926). GN926 require that general and hazardous waste storage facilities that can handle in excess of 100 m<sup>3</sup> and 80 m<sup>3</sup> of waste continuously, respectively should be registered. Biannual internal audits and biennial external audits of the registered facilities against the requirements of GN926 are required. This has relevance to the salvage yard at Hackney shaft

<sup>3</sup> The requirements in terms of this regulation have been addressed in the various sections of this report.



- National Norms and Standards in Government Gazette No. 37603, 2 May 2014 for Remediation of Contaminated Land and Soil Quality in the Republic of South Africa (GN331). A Site Assessment Report may be required for the land where the soil contamination is assessed in regard to the Norms and Standards

#### **5.5.4 National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA)**

The main objectives of NEM:AQA are to protect the environment by providing reasonable legislative and other measures to:

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

The Act has devolved the responsibility for air quality management from the national sphere of government to local spheres of government (district and local municipal authorities), who are tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and development of emissions reduction strategies. The National Ambient Air Quality Standards (NAAQS) for common pollutants, as set in terms of the NEM:AQA.

The National Dust Control Regulations (GN R.827), which were promulgated on 1 November 2013, define acceptable dust fall rates for residential areas as <600 (mg/m<sup>2</sup>/day) taken over a 30-day average (with no more than 2 exceedances per year, in non-sequential months), and non-residential areas as dust fallout >600<1200 (mg/m<sup>2</sup>/day) taken over a 30 day average (with no more than 2 exceedances per year, in non-sequential months).

The National Greenhouse Gas Emission Reporting Regulations (promulgated in April 2017) were released to introduce a single national GHG reporting system that would enable the implementation of the Carbon Tax Act. In addition to this, the reporting system is part of South Africa's Intended Nationally Determined Contribution under the Paris Climate Accord. According to Annexure 1 of the regulations.

#### **5.5.5 The National Forestry Act, 1998 (Act No. 84 of 1998) (NFA)**

The NFA protects against the cutting, disturbance, damage, destruction or removal of protected trees.

### **5.6 Municipal plans and policies**

#### **5.6.1 Municipality Integrated Development Plan**

Mining is one of the main activities within the Gert Sibande District Municipality, especially within the Govan Mbeki Local Municipality. Mining is one of the main contributors to the provinces GVA with coal and gold being one of the most important mining products.

One of the Gert Sibande District Municipality's Local Economic Development strategic programmes is to rejuvenate mining activity within the district as to ensure the sector continues especially in terms of new mining opportunities.

## 5.7 Thungela Resources policies and guidelines

### 5.7.1 Anglo American Inyosi Coal strategy and values

AAIC's strategy is to create maximum value through understanding and developing the market for PGMs, grow the Company to expand into those opportunities and to conduct its business cost effectively and competently. AAIC has the following six company values (see Figure 5-1).

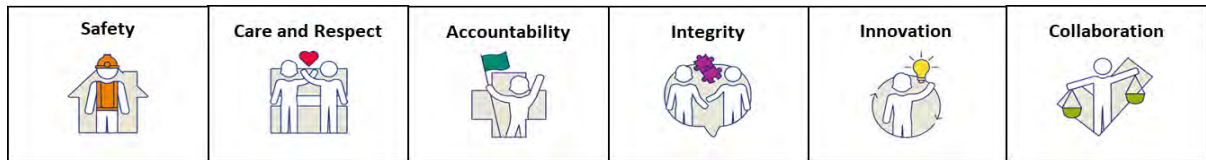


Figure 5-1: Anglo American Inyosi Values

### 5.7.2 Thungela Resources safety, health and environment (she) policy

Thungela Resources is committed to a high performance and purpose-led culture in which everyone demonstrates strong leadership and accountable. Thungela Resources commit to responsible environmental stewardship based on the efficient use of resources, climate risk management and promoting biodiversity and land stewardship. In addition to this, Thungela Resources create and share values with our stakeholders by helping to ensure their safety, health & wellbeing are not impacted by our activities; by making inclusion and empowerment a lived reality; and building partnerships with communities to create value around our operations.

The following principles guide Thungela Resources approach to SHE management:

- **Zero Mindset** – We shall apply the hierarchy of eliminating, avoiding, minimising, mitigating, remediating / rehabilitating and offsetting the SHE impacts and risks arising from our activities, products and services.
- **No Repeats** – All necessary steps will be taken to learn from SHE incidents, audit findings and other non-conformances to prevent their reoccurrence.
- **Simple Non-negotiable Standards** – Common non-negotiable SHE management, performance standards and procedures shall be applied throughout Thungela Resources as a minimum requirement.

To uphold our SHE principles of a Zero Mindset, No Repeats and Simple Non-negotiable Standards, Thungela Resources apply the following:

- **Leadership** – We expect everyone to demonstrate excellent SHE leadership and to be open and engaged on SHE. We make the safety and health of our people, the communities around us, and the environment, integral to achieving our objectives.
- **Integration** – We integrate SHE management into all operational activities, including integration with the Thungela Operating Model. By doing so, we integrate our commitments on safety, physical health and well-being, responsible management of biodiversity, and minimising environmental harm into how we operate.
- **Implementation** – We develop and embed long-term, sustainable SHE strategies into a lifecycle approach, including closure of operations, to deliver on the ESG Objectives. We apply the SHE-related ISO Standards management system framework and associated technical standards in our management of SHE. We identify, assess, prioritise, manage, and reduce or eliminate SHE-related risks, and we implement the opportunities we identify.
- **Governance & Compliance** – We fully understand and monitor all SHE compliance commitments and conditions. We ensure early identification of legal requirements, alignment between all disciplines and operations and comply with the relevant South African laws and regulations. We conduct our business ethically, in line with good corporate governance practices
- **Continuous Improvement** – We measure and analyse performance to improve our systems and management of SHE requirements and contribute towards continuous business improvement. We

ensure we have a fully engaged workforce everywhere we work, which includes contractors and suppliers.

### 5.7.3 Thungela Resources ESG Framework

The proposed Thungela Resources ESG framework is designed to address the material ESG topics that have been identified as part of:

- An external landscape review, including competitor positioning, stakeholder expectations and global/ South African ESG trends;
- The current ESG status of Anglo American Coal South Africa's activities; and
- Feedback from internal stakeholders on current initiatives and ambition levels.

The framework aims to be 'fit-for-purpose' for Thungela Resources, a single commodity miner operating in South Africa. It supports Thungela's purpose to "responsibly create value together, for a shared future".

The ESG commitments made as part of the ESG framework will be integrated into Thungela Resources operations to deliver responsible mining through all stages of asset lifecycles.

The following minimum requirements for responsible mining have been integrated into the framework, e.g.:

- As a minimum regulatory compliance and where appropriate adherence to generally accepted good practice standards;
- Management of environmental and social impacts to avoid, minimise, mitigate and where appropriate offset these impacts; and
- Strong governance underpins operating practices to ensure ESG risks and opportunities are addressed enabling continued social licence to operate.

### 5.7.4 Thungela Resources Water Management

Water is a fundamental requirement for our operations and future development, as it is to the communities in which we operate. We must therefore recognize our role and responsibility in water by making informed, sustainable and value protecting decisions as a business and stakeholder.

As such our preferred future is to be a Responsible Water Steward, by maximising the value from water resources while seeking to achieve no long-term net harm to the areas in which we operate. We recognize that we are a member of the larger community, and are a net positive contributor to that community. Where possible, we will strive to both improve water access to our communities, and lead sustainable water management within our regions.

Through the implementation of these activities we will achieve our strategic ambition:

- Securing water without compromising water resources and other users
- Facilitate and encourage water reuse/recycling and fit-for-purpose use;
- Drive compliance with our standards and regulations as a minimum;
- Develop sustainable water security projects and practices where we operate.

Ensure we do no harm to the environment by

- Minimising wastewater discharge
- Maximising water recycle and beneficial reuse opportunities within our communities
- Implementing fit-for-purpose projects that safely and sustainably store and manage water at and around our Operations

Proactively engaging to build capacity for effective water partnerships

- Playing a catalyst role for local and regional water management;
- Sharing knowledge, building capacity and establishing common outcomes;
- Supporting and promoting an internal culture of water conservation.

Minimising risk to protect and enhance value, while not externalising our impacts

- Identification and proactive management of water risk and opportunity;
- Integration of water management into long term business and sustainable mine closure planning;
- Understanding and internalising the water implications of climate change.

The Thungela Technical Standard on Water Management sets out the minimum requirements at Thungela. The Technical Standard and related Guideline(s) (which set forth best practices) address all key aspects of efficient water management, including water supply and security, water for operations, hydrology and hydrogeology, mine dewatering, water collection, storage, uses and discharge, closure, post-closure, water quality and potential environmental impacts, including sustainable and socially responsible water use, for sites and projects."

### 5.7.5 Anglo American Coal Public Participation Plan

In accordance with regulation 10(8) issued in terms of section 27(2) of the Disaster Management Act, 2002 (Act No. 57 of 2002), directions to address, prevent and combat the spread of COVID-19 and to alleviate, contain and minimise the effects of the national state of disaster were gazetted on 5 June 2020 in light of the Covid-19 pandemic.

As part of these regulations, it was required that the Public Participation Plan be presented to, and agreed upon by, the DMRE before commencing with any Public Participation Processes required under legislation.

Due to this, Anglo Operations (Pty) Ltd compiled a Public Participation Plan which applies to all of their operations/ facilities. This Public Participation Plan outlines all public engagement activities which will be undertaken for each phase of the Integrated EIA process (refer to Appendix E1).

This plan was agreed upon and approved by the DMRE in July 2020.

### 5.7.6 Other environmental planning and management guidelines

A number of planning and management guidelines have been developed by various governmental departments as well as that need to be considered as part of the process, including:

- The Mpumalanga Biodiversity Sector Plan;
- DWS, 2010. Operational Guideline: Integrated Water and Waste Management Plan. Resource Protection and Waste;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A2: Water Management for Mine Residue Deposits;
- Department: Water Affairs and Forestry, 2007. Best Practice Guideline A4: Pollution control dams;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline A6: Water Management for Underground Mines;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G1 Storm Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G2: Water and Salt Balances;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline G3. Water Monitoring Systems;
- Department of Water Affairs and Forestry, 2008. Best Practice Guideline G4: Impact Prediction;

- Department of Water Affairs and Forestry, 2008. Best Practice Guideline H1: Integrated Mine Water Management;
- Department of Water Affairs and Forestry, 2006. Best Practice Guideline H3: Water Reuse and Reclamation;
- DEAT. 2002. Integrated Environmental Management, Information series 2: Scoping. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 3: Stakeholder Engagement. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 4: Specialist Studies. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEAT. 2002. Integrated Environmental Management, Information series 12: Environmental Management Programmes. Department of Environmental Affairs and Tourism (DEAT. 2002);
- DEA. 2012. Companion to the EIA Regulations 2010, Integrated Environmental Management Guideline Series 7, Department of Environmental Affairs; and
- DEA. 2017. Guideline on Need and Desirability, Department of Environmental Affairs (DEA), Pretoria, South Africa.

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**Table 5-1: Policy and legislative context**

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
Constitution of the Republic of South Africa, (No. 108 of 1996)	Throughout the integrated scoping and EIA process	Chapter 2 – Bill of Rights Section 24 – Environmental rights The Constitution of South Africa is the overarching framework legalisation driving the NEMA principles and therefore EIA process. The right to a safe environment and the right to information are addressed in the EIA process through stakeholder engagement, where available information pertaining to the environment and proposed activities are disclosed. The proposed activities shall be conducted in such a manner that significant environmental impacts are avoided, where significant impacts cannot all together avoided be minimised and mitigated in order to protect the environmental rights of South Africans	Government of the Republic of South Africa
Minerals and Petroleum Resources Development Act 28 of 2002	Throughout the integrated scoping and EIA process	Anglo Operations (Pty) Ltd (AOPL) submitted an environmental authorisation application to the Mpumalanga Department of Mineral Resources (DMR) (now known as the Department of Mineral Resources and Energy (DMRE) for the proposed project on 16 July 2015 and subsequently a Scoping Report and Environmental Management Programme (EMPr) was submitted in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014. The EMPr was submitted for authority review on 25 January 2016.  Anglo submitted a section 11 application in terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002) (MPRDA) to the DMRE to transfer the Elders mining right from AOPL to Anglo American Inyosi Coal (Pty) Ltd (AAIC). The mining right and Deed of Cession was executed in July 2020. The EA was issued on 29 July 2020. The registered Interested and Affected Parties (I&AP's) were notified on 4 August 2020 via email and sms of the environmental authorisation. No appeals were received.	Department of Mineral Resources and Energy, Mpumalanga
National Environmental Management Act (No. 107 of 1998)	<ul style="list-style-type: none"> <li>Throughout the integrated scoping report</li> <li>Section 6 of this report details the proposed project</li> </ul>	Section 24 – Environmental Authorisation (control of activities which may have a detrimental effect on the environment) Section 28 – Duty of care and remediation of environmental damage Environmental management principles	Department of Mineral Resources and Energy, Mpumalanga
National Environmental Management Act, 1998 (Act 107 of 1998) and the EIA		The proposed Elders Colliery Project has EAs authorised under NEMA. The proposed changes to the 2016 project description	Department of Mineral Resources and Energy,

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
Regulations 2014 (GNR 984), as amended	<p>developments and associated listed activities triggered</p> <ul style="list-style-type: none"> <li>Section 6 details the listed activities to be authorised according to NEMA</li> </ul>	<p>triggers activities listed in GNR 983, 984 and 985 and will require an EA from the DMRE.</p> <p>According to GNR 982 of the NEMA, activities listed in GNR 984 require that a full S&amp;EIR be undertaken.</p> <p><b><u>Applicable Listing Notice 1 (GNR 983) activities:</u></b></p> <p><b>Activity 27</b> The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—</p> <ul style="list-style-type: none"> <li>(i) the undertaking of a linear activity; or</li> <li>(ii) maintenance purposes undertaken in accordance with a maintenance management plan.</li> </ul> <p><b>Activity 56</b> The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre—</p> <ul style="list-style-type: none"> <li>(i) where the existing reserve is wider than 13,5 metres; or</li> <li>(ii) where no reserve exists, where the existing road is wider than 8 metres;</li> </ul> <p><b><u>Applicable Listing Notice 2 (GNR 984) activities:</u></b></p> <p><b>Activity 6</b> The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent</p> <p><b>Activity 17</b> Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the MPRDA</p> <p><b><u>Applicable Listing Notice 3 (GNR 985) activities:</u></b></p> <p><b>Activity 12:</b> The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan.</p> <p><b>f. Mpumalanga</b></p>	Mpumalanga

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		<p>(i) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004;</p> <p>(ii) Within critical biodiversity areas identified in bioregional plans; or</p> <p>(iii) On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning or proclamation in terms of NEMPAA.</p> <p><b>Activity 15:</b> The transformation of land bigger than 1000 square metres in size, to residential, retail, commercial, industrial or institutional use, where, such land was zoned open space, conservation or had an equivalent zoning, on or after 02 August 2010.</p> <p><b>d. Mpumalanga</b></p> <p>(i) Inside urban areas; or</p> <p>(ii) A protected area identified in terms of NEMPAA, excluding conservancies.</p> <p>The proposed Elders Colliery Project has existing EAs authorised under NEMA. The proposed changes to the 2016 project description triggered the need for an Regulation 31 Amendment in terms of NEMA EIA regulation.</p> <p>However, as requested by the Mpumalanga DMRE, all the proposed changes that required a Regulation 31 amendment will be integrated into one integrated S&amp;EIR process.</p>	
Department of Environmental Affairs (DEA) Integrated Environmental Management Guideline Series, Guideline 5: Assessment of the EIA Regulations, 2012 (Government Gazette 805)	Throughout the authorisation process	Environmental impacts will be generated primarily in the construction phase of this project with associated operational phase impacts. These will be assessed as part of the proposed project	
Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004		An Environmental Assessment is required for the proposed project as activities are triggered under GN R984	



Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
Review in Environmental Impact Assessment, Integrated Environmental Management, Information Series 13, Department of Environmental Affairs and Tourism (DEAT), Pretoria.			
DEA 2017, Public Participation guideline in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa	Throughout the authorisation process	Public participation is a requirement of the integrated scoping/EIA process and will be conducted for the proposed project	
National Water Act, 1998 (Act 36 of 1998)	Throughout the integrated scoping and EIA process, including the WULA – pertaining to all water related aspects	<p>Elders Colliery water activities are authorised by a Water Use Licence (WUL) in April 2017, and amended WUL in November 2017 (WUL No. 03/B22A/ACFGIJ/5047, File No. 27/2/2/B111/11/1)</p> <p>The Elders Colliery will require a Section 21 (c &amp; I, e, f and g) WULA</p> <ul style="list-style-type: none"> <li>• <b>Section 21 (c) and (i):</b> Impeding, diverting or altering flow in a watercourse for the construction of the coal loading area within 500m of a river</li> <li>• <b>Section 21(e):</b> water use will result in irrigation within 500 m of a wetland. Will a Section 21 (c) and (i) water use be applicable for this or can we exclude it from Instream Water Use i.e. Section 21(c) and (i) does not apply, even if the irrigation area is within 500 m of a wetland</li> <li>• <b>Section 21(f):</b> discharge of waste or water containing waste for the discharge of treated water from the Water Treatment Plant</li> <li>• <b>Section 21(g):</b> disposing of waste in a manner which may detrimentally impact on a water resource for the construction of the coal loading area within 500m of a river</li> </ul>	Department of Water and Sanitation, Bronkhorstpruit
National Environmental Management Waste Act (Act No. 36 of 1998)	Throughout the integrated scoping report Section 4 of this report details the proposed project developments and associated listed activities triggered Section 6.3 details the	<p>It is expected that the following GNR 921 listed activities (Category B) will be triggered by the proposed changes at the Elders Colliery and will require a waste management licence</p> <ul style="list-style-type: none"> <li>• <b>Category B (10):</b> The construction of a facility for a waste management activity listed in category B of this schedule (not in isolation to associated waste management activity)</li> <li>• <b>Category B (11):</b> The establishment or reclamation of a residue stockpile or residue deposit resulting from activities</li> </ul>	DMRE through the integrated application process

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
	listed activities to be authorised	which requires a mining right, exploration right or production right in terms of MPRDA	
National Environmental Management Air Quality Act (Act No. 39 of 2004) (NEM:AQA)	Specialist studies, baseline description	Air quality management Section 32 – Dust control Section 34 – Noise control Section 35 – Control of offensive odours	Department of Environmental Affairs
The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA)	Throughout the authorisation process  Biodiversity Assessment  Baseline description Section 14  NEM:BA was used to inform the activities triggered by Listing Notice 3 (R. 985) in the 2014 NEMA Regulations.  The Mpumalanga Biodiversity Sector Plan provides land use recommendations which are considered in this application.	The National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEM:BA) provides for the management and conservation of South Africa's biodiversity within the framework of NEMA, as well as the protection of species and ecosystems that warrant national protection and the sustainable use of indigenous biological resources. The Act provides for listing of threatened or protected ecosystems, in one of four categories: critically endangered, endangered, vulnerable or protected.  During the Integrated EIA process, biodiversity hotspots and bio-regions will be investigated to determine the potential impacts that the project may have on the receiving environment. The management and control of alien invasive species on the impacted areas during all the phases of the project will be governed by the NEM:BA. The NEM:BA ensures that provision is made by the site developer to remove any alien species, which have been introduced to the site or are present on the site.  The proposed Elders Colliery Project falls within the Mpumalanga Province, which has a provincial Biodiversity Sector Plan. This provides the conservation planning approach in the Mpumalanga Region	Department of Environmental Affairs
Mine Health Safety Act, 1996 (Act No. 29 of 1996) (MHSA)		The Mine Health and Safety Act (Act No. 29 of 1996) (MHSA) aims to provide for protection of the health and safety of all employees and other personnel at the mines of South Africa	Department of Mineral Resources and Energy, Mpumalanga
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Throughout the authorisation process Biodiversity Assessment Baseline description Section 14	<ul style="list-style-type: none"> <li>Control measures for erosion</li> <li>Control measures for alien and invasive plant species</li> </ul>	Department of Agriculture

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
National Heritage Resources Act 25 of 1999 (NHRA)	Heritage assessment Baseline description Section 14	As part of the 2015/2016 impact assessment process, a heritage assessment of the project area was undertaken. This assessment was uploaded on the SAHRA site along with the EIA/EMP.	Mpumalanga Heritage Resource Authority
Spatial Planning and Land Use Management Act, (Act No. 16 of 2013) (SPLUMA)	Throughout the authorisation process	<p>The Spatial Planning and Land Use Management Act (Act 16 of 2013) (SPLUMA) was promulgated in May 2015.</p> <p>SPLUMA is a framework act for all spatial planning and land use management legislation in South Africa. It seeks to promote consistency and uniformity in procedures and decision-making in this field. SPLUMA will also assist municipalities to address historical spatial imbalances and the integration of the principles of sustainable development into land use and planning regulatory tools and legislative instruments. The need for SPLUMA authorisation will be determined during the EIA/EMP process</p> <p>AAIC applied for rezoning. This was a separate application and was submitted to the local municipalities.</p>	Municipality
The Promotion of Administrative Justice Act, (Act No. 3 of 2000) (PAJA)	Throughout the authorisation process	<p>This Act gives effect to the constitutional right to administrative action that is lawful, reasonable and procedurally fair. It also gives effect to the right to written reasons for administrative action as contemplated in section 33 of the Constitution. The Act aims to promote an efficient administration and good governance and to create a culture of accountability, openness and transparency in the public administration or in the exercise of a public power or the performance of a public function by giving effect to the right to just administrative action. In terms of the Act, administrative action which materially and adversely affects the rights or legitimate expectations of any person must be procedurally fair. "Administrative action" as defined in section 1 of PAJA means any decision taken, or any failure to take a decision, by-</p> <ul style="list-style-type: none"> <li>a) an organ of state, when <ul style="list-style-type: none"> <li>(i) exercising a power in terms of the Constitution or a provincial constitution; or</li> <li>(ii) exercising a public power or performing a public function in terms of any legislation; or</li> </ul> </li> <li>b) a natural or juristic person, other than an organ of state, when exercising a public power or performing a public function in terms of an empowering provision, which adversely affects the rights of any person and which has a</li> </ul>	

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		<p>direct, external legal effect, excluding certain classes of executive, legislative and quasi-judicial functions set out in the act</p> <p>The stakeholder engagement process will be undertaken in line with the NEMA requirements throughout the authorisation process to keep registered stakeholders notified of the process and any decisions taken by the competent authorities.</p>	
The Promotion of Access to Information Act, (Act No. 2 of 2000) (PAIA)	Throughout the authorisation process	<p>This Act gives effect to Section 32 of the Constitution by providing mechanisms to ensure access to certain information held by a public body as well as to information held by private bodies (in the latter case, as long as this information is required in order to exercise or protect any rights). The act allows for access to records, regardless of when such records came into existence. The Act specifically retains Sections 31 (1) and (2) of NEMA which also deal with access to information from a public or private body. While the Act confers specific rights of access to information, I&amp;APs should not forego the normal public participation process and only try to obtain information through the PAIA provisions. As registered I&amp;APs, they have specific rights (and responsibilities) in terms of being afforded an opportunity to "access" all the information to provide comments and to be informed of the outcome. The stakeholder engagement process will be undertaken in line with the NEMA requirements throughout the authorisation process to keep registered stakeholders notified of the process and any decisions taken by the competent authorities.</p> <p>The Protection of Personal Information Act 4 of 2013 (POPIA), which aims to promote protection of personal information, came into effect on 1 July 2021. The EIA Regulations, 2014 require, inter alia, transparent disclosure of registered stakeholders and their comments. In terms of the EIA Regulations, 2014, stakeholders who submit comment, attend a meeting or request registration in writing are deemed registered stakeholders who must be added to the project stakeholder database. By registering, stakeholders are deemed to give their consent for relevant information (including contact details) to be processed</p>	

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the legislation and policy context	Authority
		and disclosed, in fulfilment of the requirements of the EIA Regulations, 2014 and the National Appeal Regulations, 2014. <sup>4</sup>	
Noise standards	Baseline description Section 14	<p>There are a few South African Scientific Standards (SABS) relevant to noise from mines, industry and roads. They are:</p> <ul style="list-style-type: none"> <li>• South African National Standard (SANS) 10103:2008. The measurement and rating of environmental noise with respect to annoyance and to speech communication</li> <li>• SANS 10210:2004. Calculating and predicting road traffic noise</li> <li>• SANS 10328:2008. Methods for environmental noise impact assessments</li> <li>• SANS 10357:2004. The calculation of sound propagation by the concave method</li> <li>• SANS 10181:2003. The measurement of noise emitted by road vehicles when stationary</li> <li>• SANS 10205:2003. 'The measurement of noise emitted by motor vehicles in motion'</li> </ul> <p>The relevant standards use the equivalent continuous rating level as a basis for determining what is acceptable. The levels may take single event noise into account, but single event noise by itself does not determine whether noise levels are acceptable for land use purposes. With regards to SANS 10103:2008, the recommendations are likely to inform decisions by authorities, but non-compliance with the standard will not necessarily render an activity unlawful per se</p>	Municipality

<sup>4</sup> All personal information contained in this report will not be shared publicly and will only be distributed to the DMRE and the Elders Colliery Project team.

## **6 Description of the scope of the proposed overall activity**

### **6.1 Description of the activities to be undertaken**

The proposed changes to the Elders Colliery Project comprise the following infrastructure and activities:

- There will be changes made to the existing mine plan and block plan, namely
  - A smaller box-cut of 5.0365ha
  - A ventilation shaft outside box-cut (but adjacent)
  - A coal loading area including storage bin, and interim loading area during initial mine development of a duration of 3 months. The interim loading area will also cater for emergency overflows during operation
  - A change in the road layout to accommodate trucks
  - A 22 kV power line layout change;
- Trucking of ore to existing processing facility; and
- Widening of the R35 to create two intersections.

The proposed surface infrastructure at the proposed Elders Colliery Project is listed in Table 6-1.

### **6.2 Project description**

The proposed surface infrastructure at the Proposed Elders Colliery Project is listed in Table 6-1 and Figure 6-1. A detailed site layout plan is shown in Appendix B.

**Table 6-1: Proposed surface infrastructure for the proposed Elders Colliery Project**

Proposed infrastructure	Description	
	Underground Mine Shaft complex	Route servitude
<b>Surface Infrastructure</b>		
Roads	<u>Access road:</u> Access from the R35 to the mining area will be via a new intersection incorporating the existing Sudor Mine road. This road and intersection be upgraded to provincial standards. The same intersection will link the Silo facility and the underground shaft complexes	<u>Access road:</u> Access from the R35 to the silo and conveyor service road will be via a new intersection that incorporates the existing Sudor Mine road
	<u>Internal roads:</u> Roads within the shaft complex will be 6m wide asphalt surfaced roads	N/A
	<u>Service roads:</u> The service roads include roads from the shaft area to the substation, water treatment plant and water tanks. These roads will be 4m wide gravel roads, on which dust suppression will take place	<u>Service roads:</u> The service road for the conveyor and overhead powerline will run adjacent to the conveyor belt for its entire route. The service road will fall within the conveyor route servitude and is a 7 m wide gravel road on which dust suppression will take place  The combined area of all service road watercourse crossings will be more than 100m <sup>2</sup> , and will require the removal of more than 1
Power	During the construction phase, power will be supplied via a two 22kV (total of 44kV) powerlines which will follow the conveyor route servitude. Please refer to the description under conveyor route servitude. The powerlines will also be used for power supply during the construction and operational phase of the Elders underground mine	
Pipelines	Potable, dirty and sewage water pipe reticulation will be provided to various water supply and containment or treatment facilities. A polluted water pipeline will be installed from the underground mine to surface for transfer of polluted water to the pollution control dam (PCD)  Pollution Control Dam (PCD) to Water Treatment Plant (WTP): peak throughput: 66.5 l/s, internal diameter: 0.25 m Block 8 to PCD: peak throughput: 42 l/s, internal diameter: 0.227 m PCD to Elders underground storage: peak throughput: 23 l/s, internal diameter: 0.227 m	

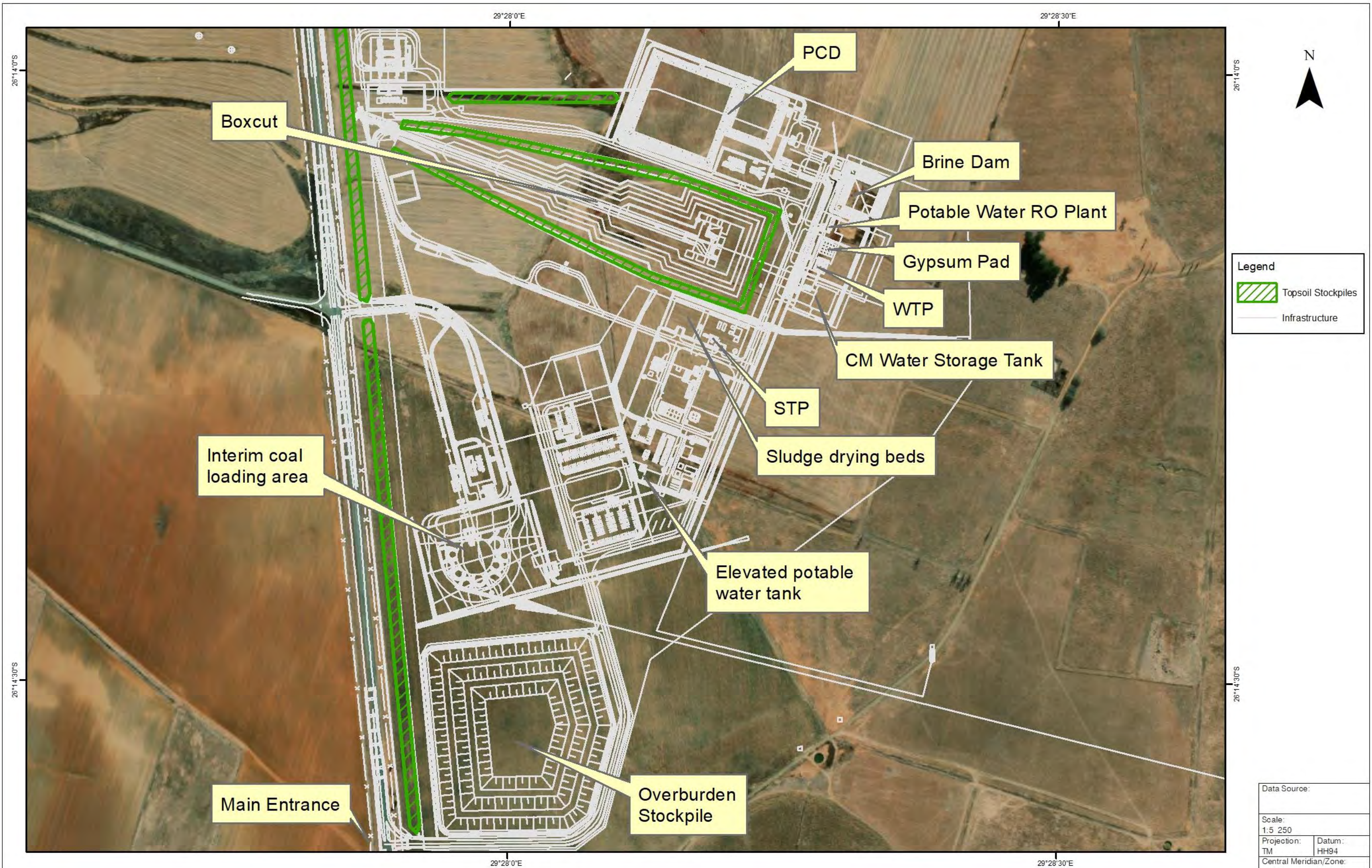
Proposed infrastructure	Description	
	Underground Mine Shaft complex	Route servitude
	<p>Silo PCD to main PCD: peak throughput: 4 l/s, diameter: 0.075 m</p> <p>Box-cut sump to PCD: peak throughput: 155 l/s, diameter: 0.36 m</p> <p>Potable pipelines: peak throughput: 15.2 l/s, internal diameter: 0.152 m</p> <p>Service water lines (to continuous miners): peak throughput: 19 l/s, diameter: 0.129 m</p> <p>Sewer lines: peak throughput: 12.2 l/s, diameter: 0.16 m</p>	
Bulk storage for fuel	<p>Four fuel tanks, each with a capacity of 63m<sup>3</sup>, will be installed at the Elders Colliery shaft area (combined capacity of 252m<sup>3</sup>)</p> <p>Oil tanks will have a combined capacity of 18m<sup>3</sup> (2 x 6m<sup>3</sup> and 2 x 3m<sup>3</sup>)</p>	N/A
Ventilation shafts	No ventilation shafts are planned on surface. All foundations, ducting, motors and fans will be located within the box-cut	N/A
Fencing	The perimeter of the shaft complex and silo / crushing facility will be fenced off with a high security fence with flat wrap razor wire top and bottom	The perimeter of the conveyor route servitude will be a 1.8m fence with adequate warning signage
<b>Stockpiles</b>		
Topsoil stockpiles	All topsoil stripped from the shaft complex area will be used to construct a berm diverting water around the complex	N/A
Overburden Stockpile	<p>The overburden softs will be utilised to construct the berm around the shaft complex area</p> <p>The box cut will be excavated selectively; overburden material contaminated with acidifying carbonaceous material will be excavated and transported to registered disposal facility. The excavated hard material not contaminated (clean) will be stockpiled and later used to backfill the mine shaft at mine closure. Approximately 1.6 Mm<sup>3</sup> (<i>in situ</i>) will be excavated from the box cut</p> <p>The area of overburden stockpile is 141 164 m<sup>2</sup></p>	N/A
Run of Mine (RoM)	No run-of-mine stockpile will be allowed for at Elders Colliery. All coal will be conveyed to an existing RoM stockpile	N/A



Proposed infrastructure	Description	
	Underground Mine Shaft complex	Route servitude
Waste Rock	No other waste rock dumps other than the overburden stockpiles are anticipated	N/A
Discard	No discard dumps on site will be necessary as all coal will be processed at an existing facility. However, a waste management licence was applied for as part of the 2016 application. The waste management licence allows for overburden to be transported to an approved processing facility.	N/A
<b>Solid Waste Management Facilities</b>		
General waste	General waste (including domestic waste, paper and scrap steel) will be temporarily stored in skips which will be placed in designated areas within the shaft complex and will be disposed of at a licensed municipal facility	N/A
Hazardous waste	Hazardous waste will be temporarily stored in skips or other specialised containers which will be placed in designated, concreted areas within the shaft complex and will be disposed of at a licensed hazardous waste facility	N/A
<b>Water Pollution Management Facilities</b>		
Pollution control dams (PCDs)	<p>Two PCDs (combined capacity: 45Mℓ) will be constructed to contain polluted water generated at the shaft area. The PCDs have been sized to contain the 1:50 year rain event.</p> <p>The volume of water in the PCD shall be kept to a minimum in order to have the maximum storage capacity available in the event of a large flood. A maximum of 5MI (24-hour operational storage) will be kept in the PCD.</p> <p>There will be a PCD at the 9T silo with a capacity of 1.25Mℓ.</p> <p>Excess water will be treated in the Water Treatment Plant (below) before being released to the environment.</p> <p>Excess water in the PCD during flood events that is not treated and released will be pumped underground to an underground facility earmarked for storage of excess water.</p> <p>During extreme flood events the PCD will spill. The PCD will be designed with an adequately sized spillway. Water spilled during rainfall in excess of the 1:50 year event would be diluted and therefore spilling to the natural environment</p>	N/A

Proposed infrastructure	Description	
	Underground Mine Shaft complex	Route servitude
	during these events will result in a water quality which is below the Resource Water Quality Objectives (RWQO).	
Sewage Treatment Plant (STP)	<p>A 100m<sup>3</sup>/day sewage treatment plant will be constructed to cater for 611 people at the underground mine. Sewer water reticulation piping shall be provided leading from the waste-water generating points to the treatment plant. Effluent from the treatment plant will be treated to quality suitable for release to the environment.</p> <p>Sludge drying beds shall be provided for the drying of sludge produced by the sewage treatment plant.</p>	N/A
Water Treatment Plant (WTP)	<p>In the initial stages of the project, water for industrial and potable use will be obtained from Block 8 and pumped into the PCD dam. From the PCD dam, water will be pumped to an initial 0.5Ml/day Reverse Osmosis (RO) plant for potable usage. Industrial water will only be treated if necessary to lower the pH and remove solids.</p> <p>Once the Elders mining operations become water positive, further RO plant modules will be added (Modular capacities still to be finalised but can be 1.0 M/day modules). The total capacity required during the life of mine of the RO plant facility is 5Ml/day in the worst case scenario</p> <p>Brine from the treatment plant will be accommodated in brine dams that are appropriately lined to prevent underground seepage. The gypsum pad will decant to the Brine ponds via a sloping pad and channel that is concrete lined.</p>	N/A







### 6.2.1 Construction phase

The construction phase of the proposed Elders Colliery Project is expected to take a maximum of two years.

#### Shaft complex

During the construction phase of the shaft complex, surface preparation of the construction and site area will be done by excavation, backfill and compaction. Each contractor will be provided with a laydown area, water and an electrical point of supply.

The provision of utilities, offices and warehousing will be temporary and supplied by each individual contractor. An area within the laydown area will be prepared to be used as a temporary wash bay for the cleaning of on-site construction vehicles. Once the final washbay has been constructed the use of this temporary area will be discontinued. The following buildings and amenities will be constructed at the shaft complex of proposed Elders Colliery Project:

- Administration building;
- Control Room/ medical facility/ proto building;
- Green Room/Covered Assembly;
- Medical Facility;
- Change House/lamp and crush room building;
- Assembly Point open area;
- Engineering/Mining/general store;
- Bulk Fuel Store;
- Paint/Oil/Gas Store Yard;
- Cable Repair Workshop;
- LDV Wash Bay;
- Security & Access Control;
- Bus Shelter;
- Carports;
- Banksman Cabin;
- Covered shaft waiting area;
- Shaft complex roads and parking;
- Fencing;
- Washbay and oil separator;
- Break test ramp;
- Crusher (peak operating throughput of 1 500 tons per hour and product size of -150mm);
- Silo (approximately 9,000 ton);
- Stone dust silo (100 ton);
- Outdoor yard Substation;
- Pollution control dams;
- Sewage treatment plant;
- Water treatment plant;
- Gypsum pad;
- Brine pond;
- Salvage yard; and
- Fire tanks.

The box-cut will be located to the east of the R35 provincial road accessing the No. 2 Seam initially. The No. 4 Seam will be accessed from the box-cut at a later stage of development. The portal will have an arched structure to support access to the underground workings. Ventilation fans and associated infrastructure will be located within the box-cut excavation.

### **Construction water & sewage treatment**

Potable water for the construction phase will be obtained from boreholes identified outside a 200 m radius from the box cut location. The borehole water will be pumped to a central temporary reservoir at ground level. Pre-treatment of the borehole water is allowed for to add chlorine and any other treatment that may be necessary – pending water test results - in order to make it safe for human consumption. A pump set will provide the necessary pressure to fill a temporary elevated tank that will supply potable water to the construction offices.

Construction service water will be trucked in Bowsers from Block 8 until the permanent raw water line from Block 8 has been constructed and commissioned.

Sewage from the offices and other sanitary facilities will be piped under gravity to a series of conservancy tanks. These tanks will be emptied on a bi-weekly basis and transported to an approved sewage treatment facility.

## **6.2.2 Operational phase**

### **Underground mining**

The Elders Colliery underground mine will use the bord and pillar mining method for coal extraction. Bord and pillar entails the cutting of a network of rooms into the coal seam. Pillars of coal are left behind to primarily support the roof. The underground mine will have an average production rate of 6 Mt per year from six continuous miner (CM) sections. Two seams will be mined, namely the No. 2 Seam and at later stage the No. 4 seam. The average depth at Elders Colliery is 51 m for No. 4 seam (Figure 6-4) and 60m for No. 2 seam (Figure 6-3). A typical bord and pillar mining layout is illustrated in Figure 6-2. The mine plan for the No.2 seam and No. 4 seam is shown in Figure 6-3 and Figure 6-4.

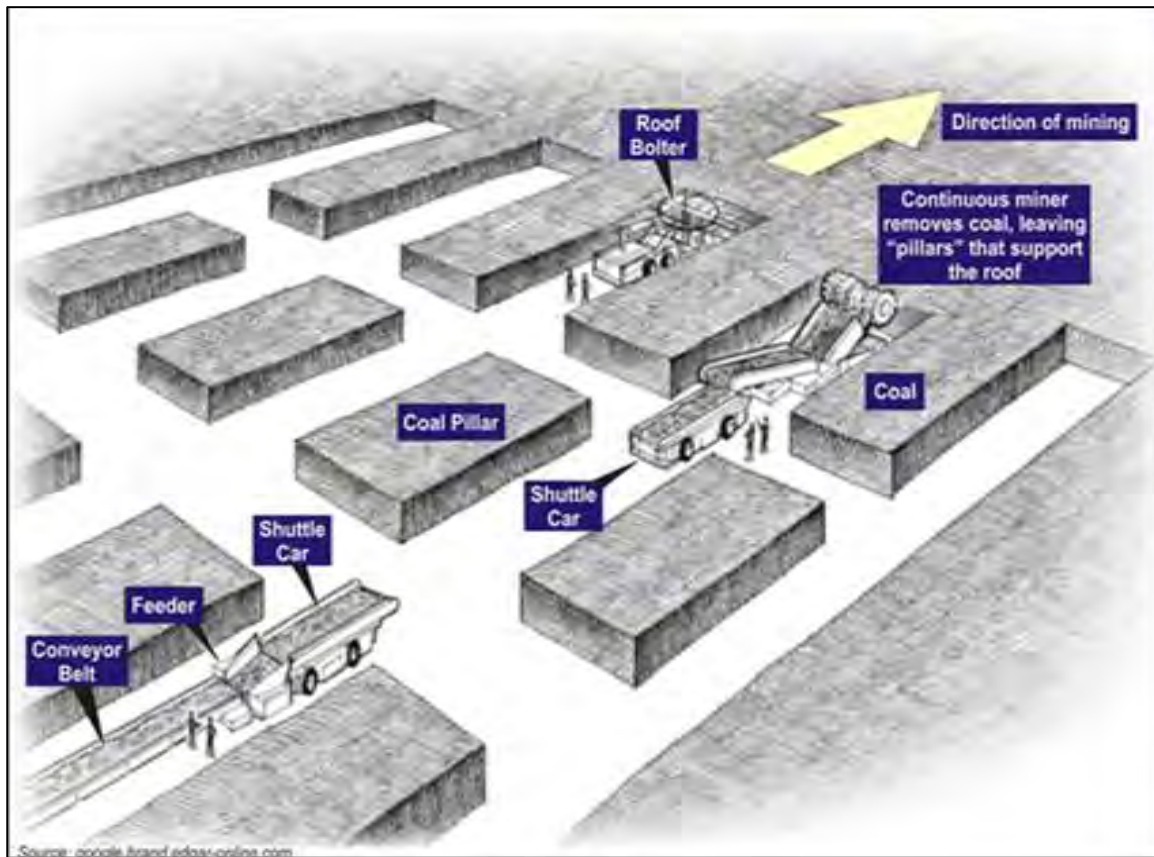


Figure 6-2: Typical bord and pillar layout

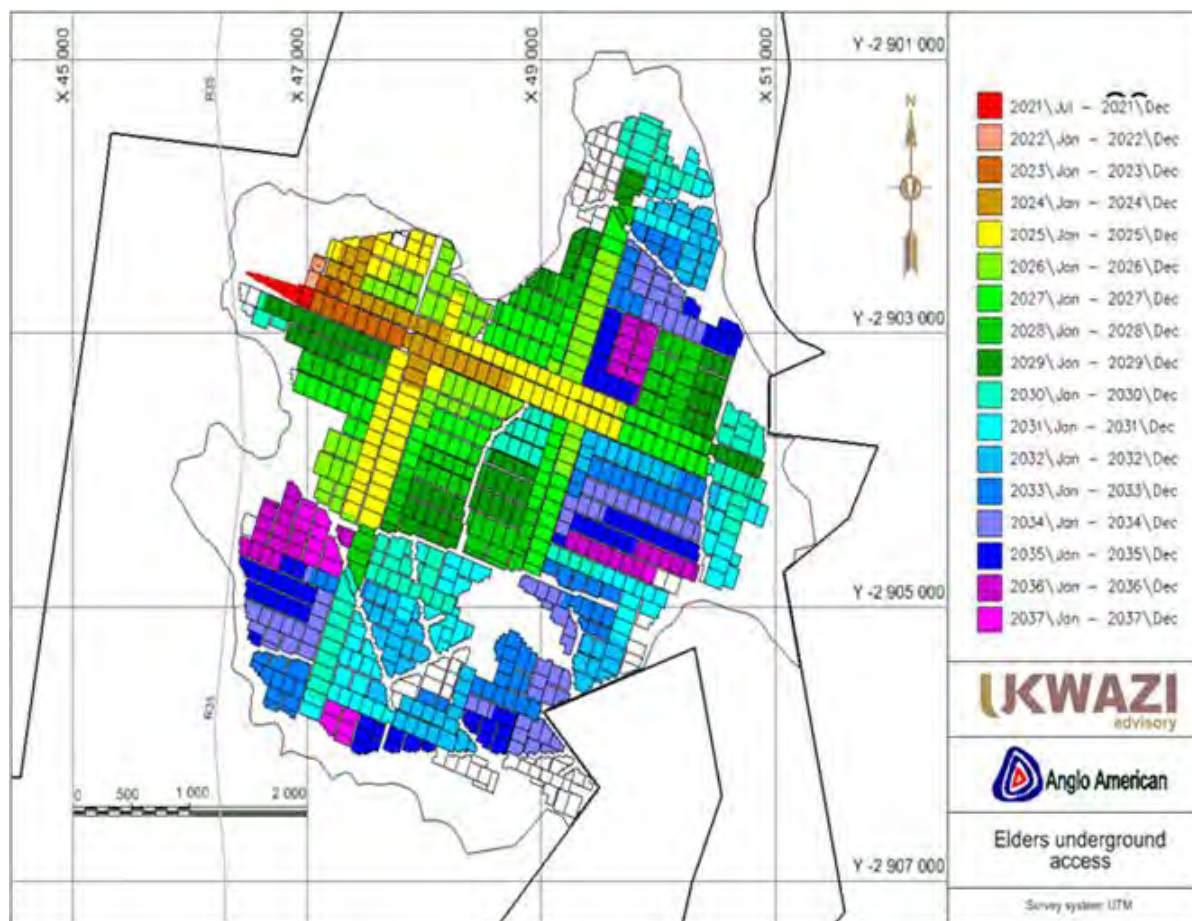


Figure 6-3: Elders Colliery underground mine plan for the No. 2 Coal Seam (Ukwazi, 2020)



Figure 6-4: Elders Colliery underground mine plan for the No. 4 Coal Seam (Ukwazi, 2020)

## **Continuous Miner section**

Continuous miner (CM) mechanised mining is used to develop the board and pillar primary, secondary and tertiary developments. The primary development is the main development on the mine. It offers primary access to the coal seam. The number of roadways is determined by the ventilation requirements as well as productivity of the CM.

The main development is in an easterly direction using nine roadways with secondary development towards the south and north, also using nine roadways. The section panels will also have nine roadways.

## **Cutting and loading**

A CM is used to cut/shear coal from the mining face. The machine continuously extracts coal since it is loading with a cutting steel drum and conveyor system. The machine is operated remotely which ensures that no person is on the mining face whilst the coal is being cut.

## **Hauling / transport**

Shuttle cars are used to transport/haul the broken coal from the back of the CM to the feeder breaker that feeds the main/secondary belt system inspection.

## **Support**

Trackless mechanical roofbolters are used to drill holes into the roof of the mining end. Steel roofbolts with resin are then installed to act as secondary support. These roofbolts keep the immediate strata together and assists in the prevention of rock/roof falls.

## **Water requirements during operations**

A water treatment plant is planned that will treat dirty water generated on the mine to supply all of the mine's potable and process water requirements. In the early years when the water make is expected to be too low to meet the mine's water demand, the make-up will be supplied boreholes. In this way the reuse of dirty water will be maximised.

In the initial stages of the project, water for industrial and potable use will be obtained from boreholes. From the Main PCD, water will be pumped to an initial 0.5 Ml/day reverse osmosis (RO) plant for potable usage. Industrial water will only be treated if necessary, to lower the pH and remove solids.

Once the Elders mining operations become water positive, further RO plant modules will be added. The total maximum capacity of the RO plant facility required during the life of mine is 7.2 Ml/day.

### **6.2.3 Closure phase**

During the closure phase, the mine surface area structures will be demolished, with the steel sold and re-enforced concrete broken up and removed from the mine site. Foundations will be broken up below the soil surface and removed from site.

Non-hazardous mine waste could be placed into the box-cut, provided authorisation is granted and the appropriate permits have been obtained. Waste areas will be shaped, clad and re-vegetated.

Off-site surface infrastructure as constructed for mining purposes will be decommissioned if no post-closure third party use is identified. This infrastructure will be demolished, roads will be ripped and culverts will be removed.

Constructed waste storage/disposal infrastructure could be used post-closure. This will require further investigation and discussions during the LOM.

The sewage treatment plant may be removed as its capacity may prove to be inadequate for future land uses. The shaft will be sealed at closure via standard plug design. Current planning does not



include pillar removal Equipment, wiring and other underground services will be removed to the extent required to limit the potential that unauthorised access is obtained by people scavenging.

Considering approximate final underground mining areas of 12.57 and 12.09 km<sup>2</sup> for the No. 2 and No.4 Seam workings respectively, an average mining height of 3 m and an average extraction rate of 68%, the total underground mine volumes to be flooded amount to approximately 25.65 and 24.67 Mm<sup>3</sup> respect

The numerical post-closure modelling results suggest that it will take around 90 years after closure before the water levels within the shallow weathered aquifer have stabilised, albeit the rebound or recovery curves show a typical parabolic profile with a substantial recovery of water levels within earlier years post closure (Delta H, 2020)

Due to natural attenuation (dispersion and mixing) and a low source strength, the seepage plume from the overburden stockpile migrates only very slowly towards the north and east according to the new prevailing gradients and is predicted to extend 100 years post closure approximately 80 m northwards and 140 m eastwards from the footprint area (Delta H, 2020).

The water treatment plant will be decommissioned within 3 years of mine closure. Thereafter the water make from underground workings will be managed such that it will be allowed to fill up through natural recharge to a pre-determined environmental safe level below decant level.

The rise of water will be closely monitored to ensure that the environmental safe level is not exceeded and that appropriate extraction works and treatment facilities are constructed in time to treat the surplus water once the environmental safe level is reached. The water will then be actively maintained at or below the environmental safe level.

A detailed decant management plan will be developed at mine closure. Ultimately water treatment solutions, either passive or active, will be implemented.

The proposed Elders Colliery Project is currently authorised to abstract (dewater) and treat mine generated water as part of the mine process or discharged into the Viskuil River. Thungela Resources are currently investigating whether it will be possible to treat the underground water through irrigation. This process will be applied for through a separate environmental authorisation process.

Monitoring of the water table rebound will continue post-closure and the modelling updated to quantify the long-term impacts. If necessary, the management measures should be revised based on the modelling results.

### **6.3 NEMA listed and specified activities for the proposed Elders Colliery Project**

The listed activities associated with the proposed Elders Colliery Project are provided in Table 6-2 and Table 6-2. Based on the listed activities, the proposed Elders Colliery Project will require an EA through the undertaking of a comprehensive Integrated EIA in terms of NEMA, NEM:WA and the MPRDA.

Based on discussions with the Mpumalanga DMRE, it was requested that the proposed changes which trigger the need for an amendment to the existing EMPr must be included in the S&EIR process. Due to this, the changes which trigger a Section 31 in terms of the NEMA EIA Regulations will be included as part of this Integrated EIA Report process going forward. Refer to Appendix D for Acknowledgement letter and communication from the Mpumalanga DMRE.

Authorisation in terms of NEMA, NEM:WA and MPRDA will be applied for from the Mpumalanga Province's DMRE.

**Table 6-2: Proposed Elders Colliery Project listed activities**

Name of activity	Aerial extent of the activity	Listed activity	Applicable legislation	Waste management authorisation
Change in mine plan	N/A		NEMA Section 31 application process - EMPr Amendment (Integrated into S&EIR process)	
Change in block plan layout	N/A		NEMA Section 31 application process – EMPr Amendment (Integrated into S&EIR process)	
Ventilation shaft (outside box cut)				
Hauling of coal with trucks via road				
Widening of the R35 for 2 intersections	6,808.9 m <sup>2</sup> (0.6809Ha)	X	NEMA Listing Notice 1 (GNR 983): Activity 56 triggered	
Coal Loading Area	858.4 m <sup>2</sup> (0.0858 Ha)	X	NEMA Listing Notice 1 (GNR 983): Activity 27; NEMA Listing Notice 2 (GNR 984): Activity 6 and 17; NEMA Listing Notice 3 (GNR 985): Activity 12 and 15	X (Category B Activity 10 and 11)

## 6.4 NWA listed and specified activities for the proposed Elders Colliery Project

The proposed Elders Colliery Project will also require a Water Use Licence Application (WULA) in accordance with the NWA, to be undertaken as part of the authorisation process.

Authorisation in terms of the National Water Act (NWA) will be applied for from Department of Water and Sanitation (DWS).

NWA Section 21 water uses which will be applied for as part of the proposed Elders Colliery Project include the following:

- Section 21(c) and (i): Impeding, diverting or altering flow in a watercourse for the construction of the coal loading area within 500m of a wetland;
- Section 21(e) water use will result in irrigation within 500 m of a wetland. Will a Section 21 (c) and (i) water use be applicable for this or can we exclude it from Instream Water Use, i.e. Section 21(c) and (i) does not apply, even if the irrigation area is within 500 m of a wetland;
- Section 21(f): discharge of waste or water containing waste for the discharge of treated water from the Water Treatment Plant; and
- Section 21(g): disposing of waste in a manner which may detrimentally impact on a water resource for the construction of the coal loading area and pollution control dam; and the use of wastewater for dust suppression.

Table 6-3 indicated the proposed changes and the Water Uses which are triggered for each proposed change. Figure 6-5 indicates the Water Uses location in relation to the proposed Elders Colliery Project.

**Table 6-3: NWA activities triggered by the proposed changes to Elders Colliery Project**

Name of activity	Applicable legislation
Change in mine plan	NWA Section 21(c) & (i), (g), (e) and (f) - Water Use Licence Amendment and Application
Change in block plan layout	No triggers
Ventilation shaft (outside box cut)	
Hauling of coal with trucks via road	

Name of activity	Applicable legislation
Widening of the R35 for 2 intersections	No triggers
Coal Loading Area	NWA Section 21(c) & (i) and (g) – New Water Use Licence Application

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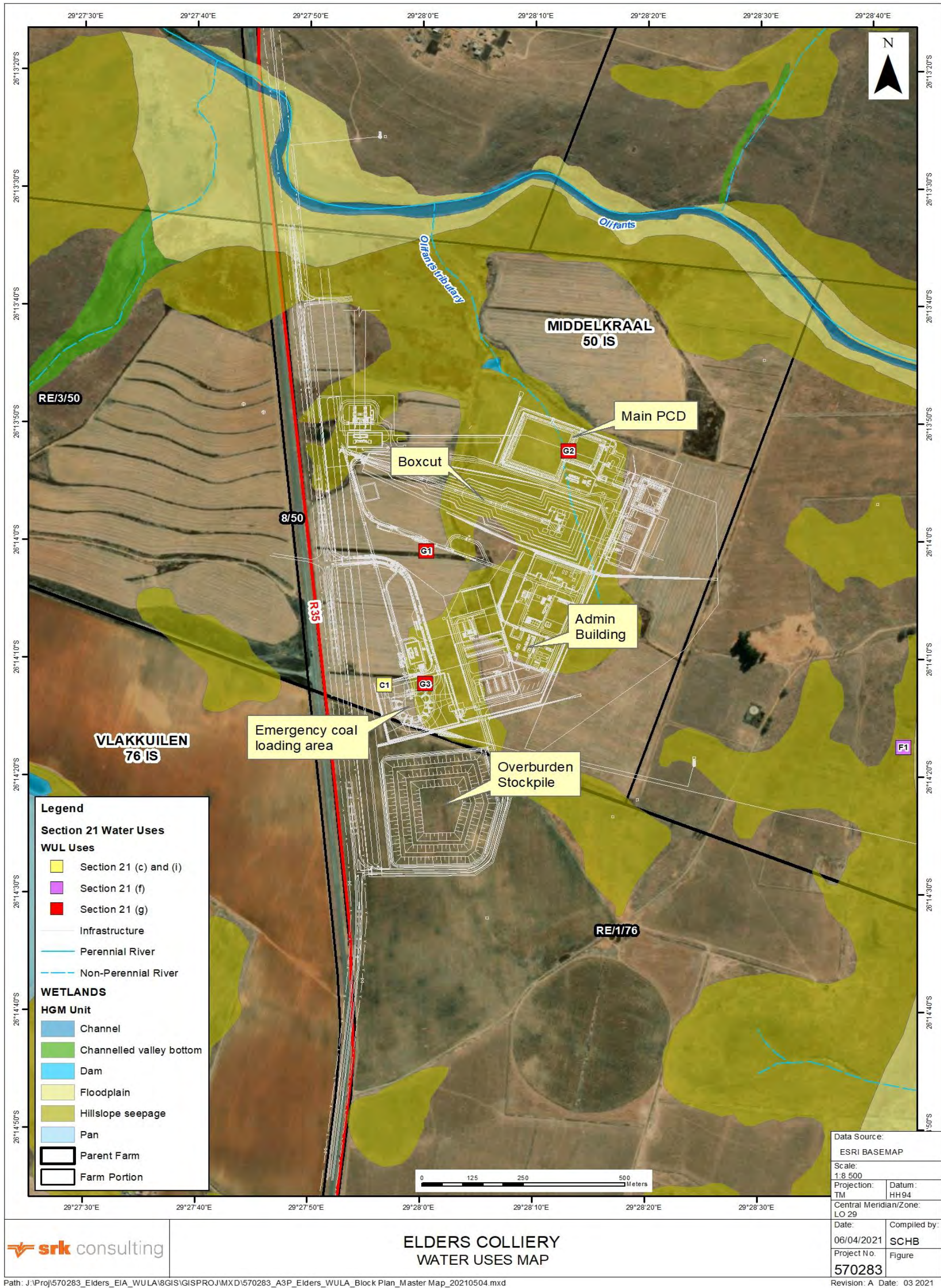


Figure 6-5: Proposed Elders Colliery Project water uses



## **7 Need and desirability of the proposed activities**

AAIC studies have shown a strong potential for the development of the deposit as satisfactory yields of export thermal coal provides a good fit with the AAIC strategy of expansion into this market. AAIC has identified that the domestic market can also be served with a secondary product and there are synergies with an existing colliery within the surrounding areas in that the proposed Elders Colliery Project could make use of the currently available processing plants.

### **7.1 Mining benefits**

The benefits of mining in South Africa is anchored by the dominant contribution to overall GDP, with coal mining playing a significant part. In addition, mining plays an important role in regional and local economic development.

AAIC has identified a number of benefits of the proposed Elders Colliery Project which include:

- Creation of employment opportunities on local and regional scale;
- It will ensure continued coal supply to export market;
- Secondary coal could potentially be supplied to Eskom. This of strategic importance for energy security in South Africa; and
- The export of coal will contribute to economic development, both locally and regionally.

### **7.2 Environmental responsibility**

The proposed Elders Colliery Project currently has existing approved EMPs and EMPs under the MPRDA.

The purpose of this document is to amend the existing approved EMPs and EMPs to include the activities and infrastructure associated with the proposed Elders Colliery Project as well as apply for new activities which were never considered during past Environmental Authorisation processes. The 2021 EMPs will contain management measures for the purpose to avoid, minimise and reduce the potential negative impacts on the environment, as a result of the mining at the proposed Elders Colliery Project.

The proposed Elders Colliery Project also has an existing WUL which was authorised in April 2017. This WUL has subsequently been amended (November 2017) (WUL No. 03/B22A/ACFGIJ/5047, File No. 27/2/2/B111/11/1). As part of the WUL, water quality monitoring will be conducted prior, during and after closure of the Elder Colliery.

### **7.3 Socio-economic benefits**

The proposed Elders Colliery Project is considered to have a positive impact on the socio-economic status through the employment of local labour from surrounding areas. Elders Colliery is committed to delivering improvements in the social and human capacities of the people who live in the areas surrounding, not only to maintain its social licence to operate, but to create real opportunities for economic and social advancement.

AAIC has various initiatives which would not only benefit employees of the colliery but also the surrounding communities and towns.

### **7.4 Employment and local procurement opportunities**

The employment opportunities within the Govan Mbeki Local Municipality have decreased resulting in the unemployment rate increasing over the last few years. This has led to many people choosing to migrate to Gauteng to seek employment.

The proposed Elders Colliery Project has yet to be constructed. Employment opportunities will arise during the construction and operation phases of the project. Table 7-1 indicates the estimated number of employees which will be employed from 2022 to 2026 (Elders Colliery Social and Labour Plan, 2020).

**Table 7-1: Estimated number of employees 2023 – 2027**

Category	Year				
	2023	2024	2025	2026	2027
	No. of Positions	No. of Positions	No. of Positions	No. of Positions	No. of Positions
Professionally qualified and experience specialists and middle management	48	67	79	83	83
Skilled technicians and academically qualified workers, junior management, supervisors	94	14	169	253	253
Semi-skilled and discretionary decision making	67	98	110	146	146
<b>Total</b>	<b>209</b>	<b>306</b>	<b>350</b>	<b>482</b>	<b>482</b>

## 7.5 No-Go option

Various collieries within the surrounding areas have reached the end of their life and are no longer operational. Should the proposed Elders Colliery Project not be approved and not be developed, the socio-economic initiatives which are planned as part of the proposed Elders Colliery Project will not occur and the benefits to the surrounding economies and communities will not be realised.

The proposed Elders Colliery Project would provide those that are no longer employed at the closed collieries within the area with new employment opportunities resulting in fewer job losses. Should the proposed Elders Colliery Project not be approved, this will result in an increase in job losses as there will be fewer opportunities within the area.

## **8 Existing surface infrastructure and activities**

### **8.1 Roads**

#### **8.1.1 R35**

The R35 is a single carriageway with 3.5m lanes in both directions and 1.5m hard shoulders. This road runs north to south and links the towns of Bethal and Middelburg. The R35's design speed is high at 120km/h. The road edge is well-maintained and the grass cut short in the road reserve (Aurecon, 2014).

#### **8.1.2 R544**

The R544 is a single carriageway with one 3.5m lane in each direction and grassed shoulders. The design speed is at 60km/h and sight distance is good at the intersection of R544 and R35 with no obstruction on the R35. The R544 is stop controlled at the intersection with the R35 being the major road having right of way (Aurecon, 2014).

#### **8.1.3 R542**

The R542 is also a single carriageway road with a single 3.5m lane in each direction having grassed shoulders on both sides. Sight distance is excellent, however, the road surface conditions vary from good to poor with evidence of significant road repairs and potholes together with severe rutting at the road edges. The indicated speed limit is 100km/h and reduces to 60km/h on approach to the intersection with the R35 (Aurecon, 2014).

### **8.2 Railway lines**

There are no railway lines or infrastructure in the immediate vicinity of the project site and from the preliminary project description it is not required. A rail line does exist approximately 5km east of the R35 and is aligned approximately in a north – south direction, thereafter heading southeast when travelling further south (Aurecon, 2014).

### **8.3 Dwellings**

#### **8.3.1 Vlakkuielen Community**

The Vlakkuielen community is predominantly located on the southern portion of the Hirsaw Estate; two households are detached from the main community and reside on the northern side of the estate. The Hirsaw Estate is located along the R35 national road between Bethal and the Goedeheop Colliery. The Vlakkuielen Community is a rural community with a total population of 128 people living in 23 households. (SRK, 2015).

#### **8.3.2 Middelkraal Community**

The Middelkraal community is made up of 18 households located on the northern side of the Olifants River. This community was relocated in 2007 from the Kleinfontein farm by Umcebo Mining, currently known as Glencore, to make way for the Middelkraal Mine (SRK, 2015).

#### **8.3.3 Hirsaw Estate**

Hirsaw Estate is located along the R35 national road between Bethal and the Goedeheop Colliery in the Govan Mbeki Municipality. Hirsaw Estate is owned by AAC (a member of Thungela Resources (Pty)) Ltd, however, is currently being leased and used for agricultural purposes.

## **9 Period for which the environmental authorisation is required**

It is envisaged that the construction of the infrastructure associated with the proposed Elders Colliery Project will take approximately 3 to 5 years, with the expected operational, closure and post-closure timeframes associated with these projects being in line with AAIC's current Mining Right.

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## 10 Project timeline

It is envisaged that the construction of the infrastructure associated with the proposed Elders Colliery Project will take approximately between 3 and 5 years to construct which included powerlines which can take up to 4.5 years to construct. Operations are expected to be over a timeframe of 14 years. Closure is expected to take 2 years and post-closure will take 5 years.

Should any of the abovementioned timeframes change, the DMRE will be notified of the change

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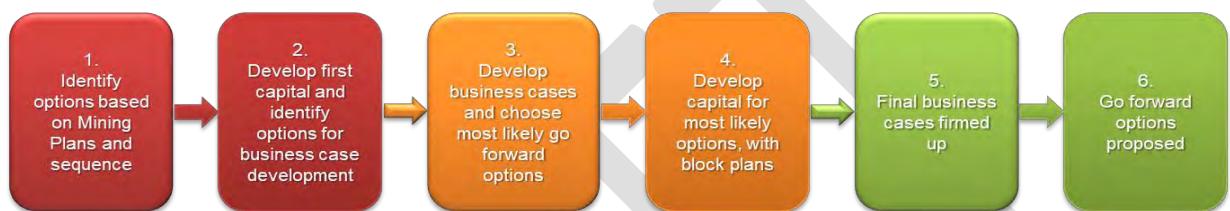
# 11 Motivation for the preferred development footprint

The study process follows a systematic method of analysis and enables the project team to derive the best solution and value.

The study approach is highlighted below as well as in Figure 11-1.

1. Identify options based on Mining Plans and sequence;
2. Develop first capital and identify options for business case development;
3. Develop business cases and choose most likely go forward options;
4. Develop capital for most likely options, with block plans;
5. Final business cases firmed up; and
6. Go forward options proposed.

Figure 11-1 presents the process that was followed through the development of the proposed Elders Colliery Project.



**Figure 11-1: Study process flow**

The section below describes the development footprint alternatives which have been considered for the activities and infrastructure associated with the proposed Elders Colliery Project. These include the following:

- Property and location;
- Design or layout;
- Project and coal supply alternatives;
- Technology to be used; and
- Operational alternatives.

Alternatives with regards to location, infrastructure and transportation were considered for the previous authorised EMPs for the proposed Elders Colliery Project.

## 11.1 Property alternatives

The identification and selection of alternative locations for the placement of the box-cut complex was undertaken based on a process that considered access to the reserves, location of sensitive environments, servitudes and proximity to existing processing plants.

Various parameters and criteria played an essential role in the consideration of the various box-cut locations. These included:

- Distance to existing processing plants (in terms of transport);
- Access to shaft from major road networks;
- Land owned by Anglo American;
- Geohydrological conditions;
- Geotechnical considerations in lieu of undermining of wetlands;
- Environmentally sensitive areas such as rivers and wetlands;
- Depth to reserve; and
- Proximity of communities to box-cut area in order to avoid resettlement.

### 11.1.1 The design or layout of the activity

The following aspects were taken into consideration for the design of the layout of the box-cut:

- The existing R35 provincial road;
- Regulation GN 704 which indicates that mining activities should take place outside the 1:100 year floodline or 100 m from a watercourse, whichever is the greatest;
- Minimising the overall footprint;
- Separation of clean and dirty water by having berms around the box-cut to divert clean water around the site, as well as directing all dirty water runoff from surface infrastructure areas to a pollution control dam; and
- Placing the box-cut outside of delineated wetlands and minimising any other associated surface infrastructure areas in the wetlands areas.

## 11.2 Project and coal supply alternatives:

The proposed Elders Colliery has been investigated and assessed since 2002. The following project and coal supply alternatives were considered throughout the years:

- **2002:** Resource offered to Eskom as part of the Kriel Power station supply, project includes open cast mining of entire area not overlain by wetlands;
- **2005:** Opencast and underground mining methods considered, supplying to Majuba Power station. It was planned to mine entire resource area not overlain by wetlands by means of open cast mining methods;
- **2007 and 2009:** Opencast and underground mining methods were considered by mining the entire area not overlain by wetland via open cast mining methods;
- **2011:** Use underground mining methods to access entire resource with an optional mini-pit on the western side - Primary and Secondary product;
- **2016:** Dual access boxcut development to access both the No. 2 and 4 Seams. Only underground mining methods proposed to access entire resource; and
- **2021:** The current preferred option includes using only underground mining methods to access the majority of the resource, mining the No. 2 and No. 4 seams. This option was chosen for the following reasons:
  - Most financially viable
  - Less impact on the delineated wetlands in the area
  - Less impact on surrounding water courses
  - No requirement for relocating communities
  - Less impact on current land use activities (mainly agriculture).

## 11.3 Technology alternatives

### 11.3.1 Mining methods:

The various mining methods that were chosen for investigation are proven mining methods within the industry. These methods are currently being exploited at various collieries within AAIC and Anglo American Coal (AAC) around the country. These methods can be summarised as follow:

- Bord and Pillar mining, mechanised mining with continuous miners and shuttle cars;
- Bord and Pillar mining with additional pillar extraction;
- Longwall mining;
- Bord and Pillar mining; and
- Open cast mining method.

A trade-off study between various mining methods (e.g. bord and pillar, bord and pillar stooping, long wall, and open cast) was conducted for the coal resources at the proposed Elders Colliery Project.

### 11.3.2 Water treatment options:

Numerous treatment options were considered when developing the water management strategy to ensure that contaminated water would not be released to the environment more than once in 50 years (a 2% or lower risk of spill, as required by GN704). These included consideration of various treatment plant sizes, coupled with provision of storage both on surface and in the underground workings. The required treatment rate differs significantly for the four scenarios assessed as follows:

- Scenario 0-A: 9 700 m<sup>3</sup>/day in 2032;
- Scenario 1-A: 7 200 m<sup>3</sup>/day in 2030;
- Scenario 0-B: 16 900 m<sup>3</sup>/day in 2032; and
- Scenario 1-B: 12 900 m<sup>3</sup>/day in 2030.

The results in the Scenario 0-B and 1-B are significantly higher than in the 'A' scenarios due to the low efficiency of the water treatment plant that was assumed.

If the treatment plant efficiency can be reduced such that the brine volumes generated are small and can be removed offsite rather than retreated (i.e. as per Scenario 0-A and 0-B) then the required treatment rate is expected to be less than 9 700 m<sup>3</sup>/day and with delayed filling of the underground, such that there is capacity available during the peak water make period, the required treatment rate is expected to be 7 200 m<sup>3</sup>/day.

After mining of the 2 Seam ceases in 2038, the entire 2 Seam will be available for storage and therefore treatment requirements will decrease, to only the meet the potable water requirements. No additional treatment of water would be expected during the operational life of the mine. The main PCD is required to have a capacity of at least 29 000 m<sup>3</sup> to accommodate the surface water inflows.

## 11.4 Operational alternatives

Various operational alternatives were considered for the various project components and were systematically assessed. Originally open-cast access was evaluated, but due to significant environmental considerations and impacts predominantly were not the preferred go-forward option during feasibility. As a result, underground access was identified as the preferred access method due to its lower impact on the receiving environment, allow selective mining, and importantly allowed synergy with the existing operators in the area. In terms underground access in turn, access alternatives were considered that included:

- Access via a narrow decline shaft. This option was discarded due to the vast construction requirements at the required No. 2 Seam depth, and slow associated ramp up
- Access via No. 4 Seam and then underground development to the No. 2 Seam. This option was discarded due to excessive construction costs and safety risks associated with underground development in the area
- Access via box-cut/drift. This option allowed for safe, controllable access and a quick ramp up to support economic viability. The box-cut also provides ready access to both the No. 2 and 4 Seam via surface. This was the preferred option taken into Feasibility

In terms of number of sections evaluated, a 3 and 5 CM (Continuous Miner) configuration were tested based on operational and minimum economic viability requirements.

## 11.5 No-Go alternative

As outlined in Section 7.5, various collieries within the areas surrounding proposed Elders Colliery Project have reached the end of their life of mine resulting in a loss of employment opportunities. It is anticipated that the development of the proposed Elders Colliery Project will provide employment opportunities to those who have lost their jobs due to the closure of these collieries.

In addition, as indicated in the Gert Sibanda District Municipality IDP, mining makes a significant contribution to the municipality's economy resulting in initiatives to rejuvenate the mining activities. The proposed Elders Colliery Project will contribute to this as it will provide job opportunities within the area and indirectly increase/ maintain the municipalities economy.

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## 12 Mining of future ore resources

It is very difficult to predict what advances in technology are likely to take place in future. Similarly, it is almost impossible to predict what economic conditions may be in force at that time. Experience has shown that technology has allowed mining companies to exploit deeper and lower grade deposits than was possible even twenty years ago.

Part of a mining company's responsibilities includes the stewardship of a resource, extracting economic value now without precluding future generations from further developing that resource.

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## 13 Details of the public participation process

This section provides details of the public participation process followed to date and focuses on:

- The objectives of public participation;
- Identification of I&APs; and
- Public participation process undertaken during 2021.

It is important to note, as requested by the DMRE, that this is an Integrated Draft EIA Report due to the incorporation of the Regulation 31 Amendment and WULA into the S&EIR process. Thus, there is only one Public Participation Process for the proposed changes to the project to avoid stakeholder fatigue.

Due to Covid-19, it is currently unknown whether a public meeting will occur, however, stakeholder engagement was undertaken in accordance with the Anglo Public Participation Plan which was agreed upon by Anglo and the DMRE for all Anglo Coal related Projects. In addition to this, should a stakeholder request a meeting this will be conducted accordingly and in line with the Anglo American Coal Public Participation Plan.

All public participation will be conducted in line with the AAIC Public Participation Plan, the relevant Covid-19 regulations as well as POPIA.

### 13.1 Objectives of public participation

The public participation followed for this environmental authorisation is an integrated and comprehensive process with the purpose of providing I&APs with sufficient and accessible information in an objective and transparent manner.

#### 13.1.1 During pre-application

The objective of the stakeholder engagement during pre-application phase is to introduce the project to stakeholders and to inform them that an environmental authorisation process will be followed to:

- Raise issues of concerns and make recommendations to be considered during the impact assessment phase
- Provide comment on project alternatives and the proposed process of assessment
- Verify that their issues were recorded and understood
- Contribute local knowledge to the process

#### 13.1.2 During scoping phase

The objectives of public participation during scoping phase is to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner to enable them to raise comments, issues of concern and suggestions for enhanced benefits. I&APs will also have an opportunity to provide input into the terms of reference (ToR) for the specialist studies, and to contribute relevant local and traditional knowledge to the environmental assessment.

#### 13.1.3 During impact assessment phase

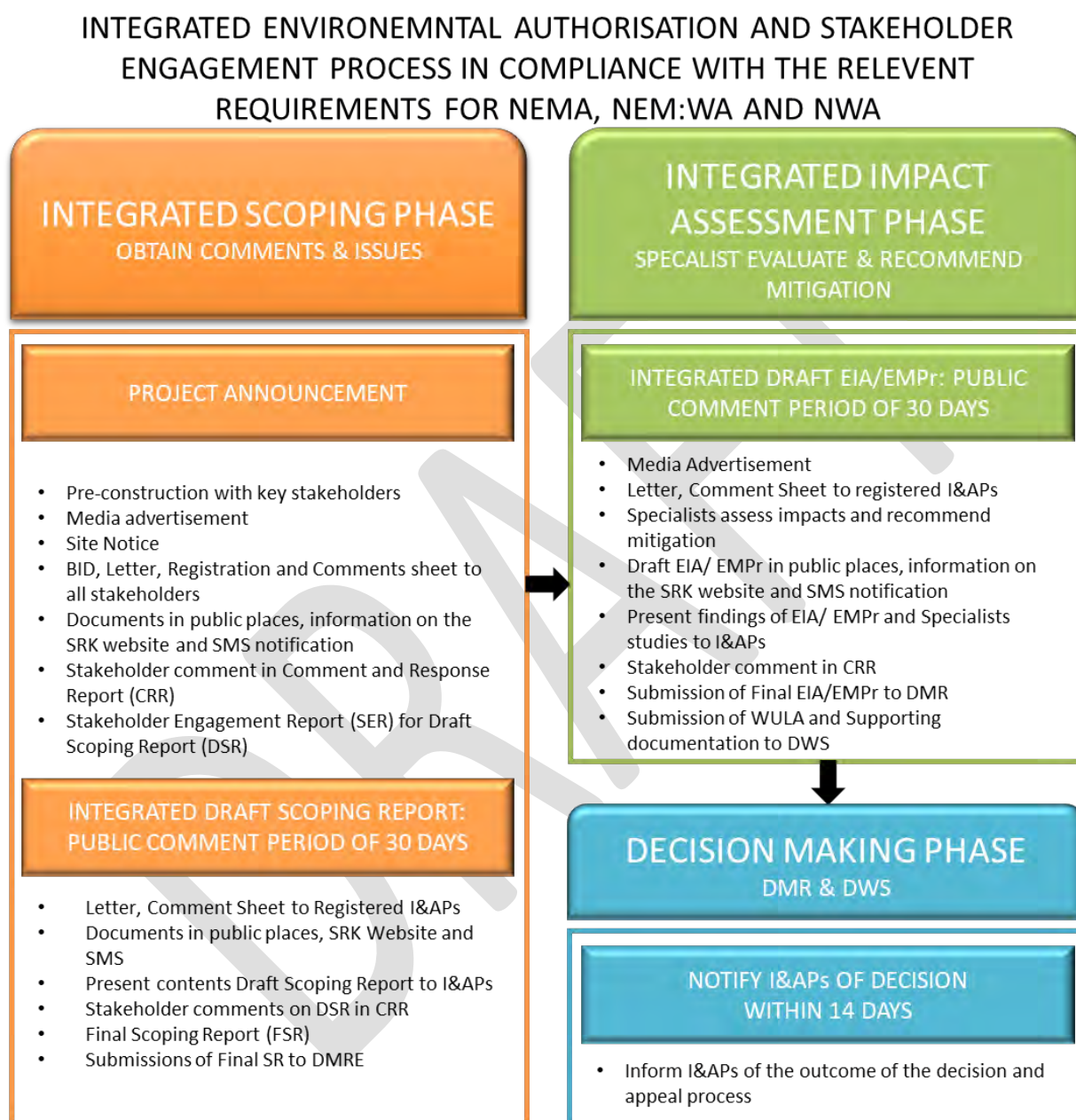
The objectives of public participation, during the Integrated EIA phase, are to verify that registered I&APs issues have been considered in the environmental assessment and to comment on the findings of the environmental assessment, including the potential negative and positive impacts and the proposed management measures.



### 13.1.4 During the decision-making phase

Following the outcome of the decision-making process by authorities, registered I&APs will be notified of the outcome and how and by when the decision may be appealed, should they wish to.

Public participation throughout the integrated environmental authorisation process is shown in Figure 13-1.



**Figure 13-1: Public participation throughout the integrated environmental authorisation process**

## 13.2 Stakeholder identification

The NEMA EIA Regulations (GN R 982 amended) require identification of and consultation with communities and interested and affected parties (I&APs). In terms of Section 24 0 (2) of NEMA, specific State Departments were identified and recognised as commenting authorities on aspects of the proposed Expansion Project. Representatives from these departments are included in the stakeholder database.

I&APs identified in previous environmental authorisations processes, together with lists of stakeholders with whom AAIC has regular contact and networking and referral formed the basis for the development of the stakeholder database.

The stakeholder database will be reviewed and updated after each round of engagement during the environmental authorisation process. Box 1 below provides more information regarding the distinction between I&APs and registered I&APs.

A register of I&AP in terms of Section 42 of the EIA Regulations (GN R 982 of 2014) was compiled. This regulation requires that the register contain full contact details of registered I&APs and be submitted to the competent authority. In order to maintain privacy of I&APs contact details, the register of I&APs in this report will not contain contact details but will be kept on record.

#### **Box 1. Distinction between I&AP's and Registered I&APs**

The NEMA Regulations (GN 982 amended) distinguishes between I&AP's and registered I&APs.

I&AP's, as stated 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 "**registered interested and affected parties**" means:

***An interested and affected party whose name is recorded in the register opened for that application.***

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

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

SRK's approach recognises that I&APs are diverse in character and in their project interest and the following criteria were used to identify the I&APs:

- **Zone of influence:** physical location relative to the project site and potential impacts. Generally, the closer stakeholders live to a project site the higher their interest and the potential impacts of the project
- **Stakeholder values:** the value stakeholders attach to the area that might be affected by the project. This includes aspects such as livelihoods, land use, ownership, heritage and sense of place
- **Jurisdiction:** the mandate/influence of institutions over regulatory process and public opinion
- Additional to the above criteria, the following aspects refined the I&AP identification process:
  - The demarcation area for stakeholder engagement of the proposed Elders Colliery Project falls within the boundaries of the Gert Sibande District Municipality and Govan Mbeki Local Municipality
  - Communication with Govan Mbeki Local Municipality, Ward 15
  - Directly affected landowners or occupants living adjacent to the project area influenced by the mining right area of the proposed Elders Colliery Project

A register of I&AP in terms of the NEMA Regulations (GNR 543) Section 24 has been developed. This register of I&APs covers the period 2012 – 2013 and has been updated in compliance to Section 42 of the EIA Regulations (GNR 982 of 2014) that requires that a register with full contact details of registered I&APs be submitted to the competent authority.

### 13.2.1 Identification of landowners

The identification of landowners in the project area is an important part of the public participation process. Table 13-1 indicates the landowners adjacent to and in the immediate surroundings of the proposed Elder Colliery.

**Table 13-1: Landowners located in close proximity to the proposed Elders Colliery Project**

Farm Name	Farm Portions	Owner
Middelkraal 50 IS	RE/3	Anglo American Inyosi Coal Pty Ltd
Middelkraal 50 IS	5	Anglo American Inyosi Coal Pty Ltd
Middelkraal 50 IS	6/3	Anglo American Inyosi Coal Pty Ltd
Middelkraal 50 IS	8/3	South African National Roads Agency Ltd
Schoon-Vlei 52 IS	RE	Anglo American Inyosi Coal Pty Ltd
Schoon-Vlei 52 IS	2	Anglo American Inyosi Coal Pty Ltd
Schoon-Vlei 52 IS	3	Anglo American Inyosi Coal Pty Ltd
Elandsfontein 75 IS	4	Anglo American Inyosi Coal Pty Ltd
Elandsfontein 75 IS	7	Anglo American Inyosi Coal Pty Ltd
Elandsfontein 75 IS	13	Anglo American Inyosi Coal Pty Ltd
Elandsfontein 75 IS	16/12	Anglo American Inyosi Coal Pty Ltd
Halfgewonnen 190 IS	4	Anglo American Inyosi Coal Pty Ltd
Elandsfontein 75 IS	8	AOPL
Schurvekop 227 IS	RE/7	Jastoet Holsteins (Pty) Ltd
Schurvekop 227 IS	12/5	Anglo American Inyosi Coal Pty Ltd
Schurvekop 227 IS	13/5	Anglo American Inyosi Coal Pty Ltd
Schurvekop 227 IS	14/6	Anglo American Inyosi Coal Pty Ltd
Schurvekop 227 IS	22/10	Schoeman Susanna Cornelia
Schurvekop 227 IS	RE/26	Anglo American Inyosi Coal Pty Ltd
Schurvekop 227 IS	27/26	Anglo American Inyosi Coal Pty Ltd
Schurvekop 227 IS	28/26	Anglo American Inyosi Coal Pty Ltd
Vlakkuijen 76 IS	RE	Anglo American Inyosi Coal Pty Ltd

### 13.2.2 Identification of District and Local Municipalities

The project area falls within the jurisdiction of the Gert Sibande District Municipality and the Govan Mbeki Local Municipality in the Mpumalanga Province. Details of the relevant municipalities and respective ward councillors are provided in Table 13-2.

**Table 13-2: District and Local Municipalities**

Municipality	Contact Person	Designation
Govan Mbeki Local Municipality	Mr Mmela Mahlangu	Municipal Manager
Govan Mbeki Local Municipality	Councillor Mtsweni Mabusa Joseph	Ward Councillor (Ward 15)
Gert Sibande District Municipality	Mr. CA Habile	Municipal Manager
Gert Sibande District Municipality	Mr. Muzi Chirwa	Executive Manager of the environmental department

### 13.2.3 Identification of relevant government departments

The relevant authority applicable to the environmental authorisation process for the proposed Elders Colliery Project is the DMRE as provided in Table 13-3. A meeting was held between Anglo and the DMRE on 26 November 2020 to discuss and confirm the process and way forward for the proposed Elders Colliery Project. Subsequent to the Regulation 31 and new S&EIR applications being submitted, DMRE requested that the process be combine into one integrated process.

The relevant authority applicable to the WULA and amendment process is the DWS. A pre-application meeting was held with the DWS via Teams on 24 November 2020 and the details of the case officer responsible for the Proposed Elders Colliery Project WUL is included in Table 13-3. The attendance registers and minutes of the meetings with the DMR and DWS are provided in Appendix F1.

**Table 13-3: Relevant Government Departments**

Department	Contact Person
Department of Water and Sanitation - Bronkhorstspuit	Mandlazi Nompumelelo

A site visit with DWS was held on the 15 April 2021 as part of the WULA process, the attendance register provided in Appendix F2.

## 13.3 Pre-announcement consultation

The purpose of the pre-announcement consultation is to:

- Inform all I&APs of the additional activities to be included in the approved EMPr;
- Provide sufficient information and opportunity to stakeholders to comment on the revised scope;
- Provide information on the integrated environmental authorisation process going forward; and
- The following activities formed part of the pre-announcement consultation which has already been conducted:
  - A background information document (BID), I&AP registration and comment form (in English, and Afrikaans) dated 19 May 2021. These provide information on the activities triggered in terms of NEMA EIA Regulations, the environmental authorisation process and how stakeholders can become involved.
  - The BID has been delivered to the directly affected communities, namely the Vlakkuielen and Middelkraal Communities
  - Comments received from I&APs during the pre-announcement consultation and integrated scoping phase were included in the Integrated FSR

### 13.3.1 Announcement

The project was announced to the public between **19 May 2021 and 18 June 2021**. I&APs were notified of the opportunity to comment on the proposed Elders Colliery Project and to register as an I&AP via various engagement methods for copies and proof of all notification materials). As part of the announcement phase of the project, 270 sms's and 65 emails were sent to those already on the stakeholder database.

### 13.3.2 Meetings with local authorities

A pre-application meeting was organised on the 26 November 2020 with the following personnel:

- Mpumalanga DMRE
- AAIC
- SRK

To reduce the spread of Covid 19, it was suggested that AAIC would attend the pre-application meeting with the DMRE in person and SRK would attend the meeting virtually through Microsoft Teams.

Unfortunately, on the day of the meeting, there was social unrest within close proximity to the DMRE's offices resulting in the pre-application meeting being cancelled and a telephonic call being conducted between the DMRE and AAIC.

### 13.3.3 Opportunities to comment

I&APs were encouraged to submit their written comments to SRK's stakeholder engagement office using the contact details provided in the stakeholder letters, BIDs and comment sheets. I&APs could also fill in comment forms at one of the public places, contact the SRK stakeholder engagement team via telephone, email or fax to submit comments and to discuss any issues of concern.

## 13.4 Availability of the draft scoping report for public comment

The Integrated DSR was made available for public comment in the following ways:

- The Integrated DSR was made available for public comment for a period of 30 days (19 May 2021 to 18 June 2021). This was announced to stakeholders in a letter dated 19 May 2021 (in English, Afrikaans and Zulu) and distributed to I&APs on the stakeholder database via email, fax or post
- Two site notices each in English, Afrikaans and Zulu was placed at various locations in the project area (Appendix E2)
- The Integrated DSR, letter and comment sheet was available for public viewing and comment at the following places:
  - Bethal Public Library
  - Kriel Public Library
  - Emalahleni Local Municipality (Kriel) Municipality Office
  - Komati Paypoint and Library
  - Vlakkulien Community
  - Middelkraal Community
- Advertisements were published in the following newspapers:
  - Ridge Times, 19 May 2021 (English and Afrikaans) (Appendix E2)
- Adjacent landowners and I&APs without email or postal addresses received SMS notification of the availability of the Integrated DSR for public comment
- The Integrated DSR, BID and comment sheet has been posted on the SRK website <https://docs.srk.co.za/en/za-elder-colliery-iea>
- Upon the completion of the 30-day commenting period of the Integrated DSR, any comments received from stakeholders during this time were included Integrated FSR which was submitted to the DMRE (competent authority) on 23 June 2021
- All registered I&APs will be informed of the submission of the Integrated FSR to the competent authority

## 13.5 Comments on the draft Scoping Report

The following comments in Table 13-4: Stakeholder comments from Scoping Phase in 2021 have been received by stakeholders during the 2021 round of engagement for the Scoping Phase of the Elders Colliery project. The table details the I&APs details and issue raised as well as the response provided by the SRK stakeholder engagement team.

**Table 13-4: Stakeholder comments from Scoping Phase in 2021**

I&AP Details	Issue/ request and response
<b>Name:</b> Madoda Elliot <b>Email:</b> <a href="mailto:madodaelliot62@gmail.com">madodaelliot62@gmail.com</a>	<u>Request/ comment:</u>

I&AP Details	Issue/ request and response
<p><b>Date received:</b> 14 June 2021</p> <p><b>Received via:</b> email</p>	<p>Afternoon I'm Elliot Dladla. I'm staying at middelkraal community I will like to the forms that send at mcebo it's individual or organization</p> <p><u>Response:</u></p> <p>Dear Mr Madoda Elliot,</p> <p>Thank you for your interest in the Integrated environmental authorisation project for Anglo American Inyosi Coal – Elders Colliery.</p> <p>Please find attached the Background Information Document in IsiZulu and English as well as a comment and registration form. Please contact Mr Abram on 079 698 1309 to view a hardcopy of the Scoping Report.</p> <p>Could you provide us with your contact details so we may register you as stakeholder on the project. This will allow us to send you updates on the project.</p> <p>If you have any queries please feel free to contact us.</p> <p><b>Kind Regards</b></p> <p><b>Karabo Maruapula</b> MSc, IAIASA, Environmental Scientist</p>
<p><b>Name:</b> Mikateko Chawane</p> <p><b>Contact Number:</b> 072 971 5721</p> <p><b>Email:</b> <a href="mailto:mikachawane@gmail.com">mikachawane@gmail.com</a></p> <p><b>Date received:</b> 18 May 2021</p> <p><b>Received via:</b> Email</p>	<p><u>Issue/ Request</u></p> <p>Dear Sir/Madam</p> <p>Your message dated 17<sup>th</sup> May 2021 on the Environmental Authorisation for Elders Colliery has reference.</p> <p>Kindly provide us with more information.</p> <p>Kind regards,</p> <p>KHAMELA PROPERTY INVESTMENT (pty) Ltd</p> <p>Mikateko Chawane</p> <p>Environmental Practice Learner</p> <p><u>Response:</u></p> <p>Good day Mr Mathebula,</p> <p>As discusses earlier, please see attached Background Information Document (BID) in English and IsiZulu regarding the Integrated Environmental Authorisation Process for Anglo American Inyosi Coal – Elders Colliery, Near Bethal in the Mpumalanga Province.</p>

I&AP Details	Issue/ request and response
	<p>Do not hesitate to contact me for more information regarding the project.</p> <p><b>Kind Regards</b></p> <p><b>Karabo Maruapula MSc, IAIASA</b>, Environmental Scientist</p>
<p><b>Name:</b> Miss Maria Mahlanga</p> <p><b>Contact Number:</b> 082 630 1235</p> <p><b>Email:</b> <a href="mailto:Mariamahlanga92@gmail.com">Mariamahlanga92@gmail.com</a></p> <p><b>Date received:</b> 14 June 2021</p> <p><b>Received via:</b> Comment form</p>	<p><u>Issue/ Request</u></p> <p>As the public notification has been made and accept it doesn't clearly illustrate the entire process of the (SLP) document and also doesn't give direction and the process of the community representation. The process and the direction of skills development and education a specifically on Basic and non-educated candidates. The direction and the process in financial assistance. Based on farming and life-stock that is within the community. Increment and donation to those who doesn't have and willing to have livestock.</p> <p><u>Response:</u></p> <p>Good day Maria,</p> <p>Thank you for your comment</p> <p>The SLP has a HRD (Human Resource Development) section within it which commits to skills developments to both employees and surrounding communities. The SLP will be implemented when the mine is fully operational.</p> <p>Should you require any additional information on this topic please contact Cecil Sebeko, the Social Performance Specialist for the Elders Collier Project</p> <p><b>Kind Regards</b></p> <p><b>Karabo Maruapula MSc, IAIASA</b> Environmental Scientist</p>
<p><b>Name:</b> Mr Madoda Elliot</p> <p><b>Email:</b> <a href="mailto:madodaelliot62@gmail.com">madodaelliot62@gmail.com</a></p> <p><b>Date received:</b> 21 June 2021</p> <p><b>Received via:</b> Email</p>	<p><u>Issue/ Request</u></p> <p>Afternoon</p> <p>My comment it's based on benefits of the community skills and development. Business, infrastructure and sports facility bus station</p> <p>I thank you</p> <p><u>Response:</u></p> <p>Good day Mr. Madoda Elliot,</p> <p>Thank you for your comment.</p>



I&AP Details	Issue/ request and response
	<p>The SLP has a HRD (Human Resource Development) section within it which commits to skills developments to both employees and surrounding communities. The SLP will be implemented when the mine is fully operational.</p> <p>Should you require any additional information on this topic please contact Cecil Sebeko, the Social Performance Specialist for the Elders Collier Project</p> <p><b>Kind Regards</b></p> <p><b>Karabo Maruapula MSc, IAISA</b></p> <p>Environmental Scientist</p>

### 13.6 Availability of the draft environmental impact assessment report and environmental management programme for public comment

The Draft Integrated EIA/EMPr will be made available for public comment from 6 October 2021 to 11 November 2021. The availability of the Draft Integrated EIA/EMPr and details relating to the public engagement meetings were announced as follows:

- Distribution of letters to registered I&APs to notify I&APs of the availability of the Draft Integrated EIA/EMPr and inviting registered I&APs to comment on the Draft Integrated EIA/EMPr
- Posting the Draft Integrated EIA/EMPr on the SRK website (<https://docs.srk.co.za/en/za-elder-colliery-iaa>); and at the following public places –
  - Elders Colliery Proposed Access Road
  - Bethal Public Library
  - Kriel Public Library
  - Komati Paypoint and Library
  - Vlakkuielen Community
  - Middelkraal Community
  - Emalahleni Local Municipality – Kriel Offices
- Advertisements were published in the Ridge Times newspaper (English and Afrikaans)

### 13.7 EIA public meetings

Due to Covid-19, it is currently unknown whether a public meeting will occur, however, stakeholder engagement was undertaken in accordance with the Anglo Public Participation Plan which was agreed upon by Anglo and the DMRE for all Anglo Coal related Projects. In addition to this, should a stakeholder request a meeting this will be conducted accordingly and in line with the Anglo American Coal Public Participation Plan.

All public participation will be conducted in line with the AAIC Public Participation Plan, the relevant Covid-19 regulations as well as POPIA.

### 13.8 Comment and response report

All comments raised by I&APs throughout the process have been recorded and any additional comments received during the Integrated EIA Phase will be compiled into a Comments and response Report. Key project concerns raised to date relate to:

- Community upliftment
- Employment opportunities

### 13.9 Summary of previous stakeholder engagement processes

The proposed Elders Colliery Project was first authorised in 2016 when the original Environmental Authorisation was conducted and later approved. During this Environmental Authorisation process public participation was conducted online with the relevant environmental legalisation. Table 13-5 is a summary of the comments and issues raised by I&As.

**Note:** *It is important to note that, as part of the 2016 project description an overland conveyor belt from the proposed Elders Colliery Project area to the Goedhoop Colliery was proposed. However, due to the closure of the Goedhoop Colliery this is no longer viable and will not be assessed as part of this environmental authorisation. However, comments received around the conveyor are still reflected in Table 13-5.*

**Table 13-5: Comments raised by I&As during the stakeholder engagement process from 2012 – 2015**

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>Affected parties</b>			
<b>Landowner/s</b>	25 June 2013 Lourens De Koning	There are rumours that there is a tender out to re-build a portion of the R35 close to the Goedehoop Colliery turn-off. Is this true and what are the implications of this to the proposed project?	Comment noted. This will not impact on the Elders Colliery Project as coal will not be transported by road during the operational phase.
<b>Landowner/s</b>	25 June 2013 Johan Potgieter	Landowners are tired of being walked over by the mine. We are of the opinion that nothing we say is taken into account or will make a difference to decisions taken by government whether projects are approved or not.	As part of the current Elders Colliery environmental authorisation process, all comments received from the public are documented in the Comment and Response table. Each comment is considered and responded to by the EAP/applicant. This table is included into the EIA/EMP which is submitted to authorities for review and consideration, prior to a decision being made on the proposed project. Stakeholders are notified of the decision and are provided an opportunity to appeal.
<b>Landowner/s</b>	25 June 2013 Johan Potgieter	No compensation for losses has been made to farmers, their families and their workers. Compensation is only given to communities.	All surface infrastructure for the Elders Colliery is located on property owned by Anglo American. Underground mining methods have been chosen to limit surface disturbance. Land owned by Anglo American is managed by Anglo Estates and all negotiations and compensation regarding land managed is facilitated by this department.
<b>Landowner/s</b>	11 March 2013 Nic Britz, NC Boerdery	The quantity of water used by the mine and the quality of drinking water must be monitored on a regular basis. Stakeholders must be kept informed of this monitoring information.	A water balance was calculated as part of the Surface Water Study. A surface and groundwater monitoring programme for the Elders Colliery has been included in the EIA/EMP which is available for public review and comment.
<b>Landowner/s</b>	25 June 2013 Nic Britz, NC Boerdery	How far apart are the coal seams that will be mined in the underground mining operation?	The distance between 4 Seam and 2 Seams varies between 4m to 20m.
<b>Landowner/s</b>	27 July 2015 Nic Britz, NC Boerdery	Is the Middelkraal community part of the Bethal municipality or are they on their own?	The Middelkraal Community falls within the Govan Mbeki Local Municipality (which includes Bethal), and the Gert Sibande District Municipality as per the demarcation board.
<b>Landowner/s</b>	27 July 2015 Nic Britz, NC Boerdery	The communities do not adhere to the carrying capacity of the land in terms of cattle grazing. They allow more cattle onto the land than the land can carry.	The Middelkraal community was relocated by Glencore Umcebo onto property not owned by Anglo American. Therefore, Anglo has no jurisdiction on that property and associated community.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
		The mines have moved the communities to the land and should therefore ensure that the carrying capacities are adhered to.	The Vlakkuielen community is located on land owned by Anglo. A census of the Vlakkuielen community was undertaken by SRK in September 2015 and shows an increase in cattle on the land. The Department of Agriculture was present at the last Vlakkuielen Working Group meeting (held on 14 October 2015) and agreed to request ownership certificates for all the cattle on the property. This issue is being addressed by Anglo through the working group.
Landowner/s	27 July 2015 Nic Britz, NC Boerdery	There are 50 whippet dogs at the Middelkraal community with which the community hunts on the farm Middelkraal on Sundays.	The Middelkraal community was relocated by Glencore Umcebo onto property not owned by Anglo American. Therefore, Anglo has no jurisdiction on that property and associated community.
Landowner/s	31 July 2015, Pieter Honeyborne, Landowner	Thank you for the opportunity to comment on the Elders project. I have a few concerns, namely water supply, safety fences and the servitude area at Block 8 & Block 20. Goedehoop Colliery is aware of my concerns, as I have discussed it with the Engineering Manager, Mr Rowan Youell. He has informed me that negotiations will take place within the next three weeks. I fully support this project that will have a positive effect on creating sustainable jobs in our community.	The concern is addressed by Goedehoop Colliery.
Landowner/s	25 June 2013 Nic Britz, NC Boerdery	Boreholes used by famers surrounding the proposed Elders Colliery must be assessed and monitored.	A groundwater study was undertaken as part of the impact assessment phase. The study included a hydro census which includes boreholes in the project area, as well as in a 100m buffer zone around the project area.
Lawful occupier/s of the land	25 June 2013 Johan Engelbrecht	How will mining affect boreholes and the availability of water from boreholes close to the proposed mine?	The hydro census will be updated one year prior to the operational phase of the project, to confirm boreholes users in the underground mining area.  The groundwater study has identified that the overlying aquifers retain their saturation status during underground operations and that a cone of depression does not form over and around the underground workings.  The groundwater study is included in the EIA.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
Lawful occupier/s of the land	25 June 2013 Johan Engelbrecht	I have taken responsibility for providing transport and electricity to members of the Vlakkuijen community since 2006 and have not been compensated for these expenses.	Compensation with regards to expenses as a result of the community has been discussed with Anglo Estates and Anglo American Government and Social Affairs (GSA) department as part of the lease agreement.  The matter is being addressed by Anglo independently of this environmental authorisation process.
Lawful occupier/s of the land	25 June 2013 Johan Engelbrecht	Please note that the current landowners are the registered users of the Weirs and the Dams in the Elders Colliery project area.	The Elders Colliery project will not abstract water from the Olifants River and other tributaries. Water for construction and operation will be obtained from Goedehoop Colliery.
Lawful occupier/s of the land	27 July 2015 Johan Engelbrecht	What was promised to the Vlakkuijen community in the meetings held with them on 26 July 2015?  We have concerns regarding the number of cattle allowed on the land that exceeds its carrying capacity.  The community brings in foreign cattle onto the land which could carry diseases that will have serious impacts on the farmer's cattle.  The communities rent out their informal homes to other people who bring in the foreign cattle.	A meeting was held with the Vlakkuijen community by Anglo on 22 July 2015 to disclose to the community the new mine plan and the implications for them, i.e. Anglo will no longer need to relocate them. No promises were made during this meeting, yet a number of issues and concerns were raised by the community. A working group has been set up with the community and meets every 2 <sup>nd</sup> Wednesday of the month.  The Vlakkuijen community is located on land owned by Anglo. A census of the Vlakkuijen community was undertaken by SRK in September 2015 and shows an increase in cattle on the land. The Department of Agriculture was present at the last Vlakkuijen Working Group meeting (held on 14 October 2015) and agreed to request ownership certificates for all the cattle on the property. This issue is being addressed by Anglo through the working group.
Lawful occupier/s of the land	27 July 2015 Johan Engelbrecht	What is the planned life of mine?  How will issues with surrounding communities, such as Middelkraal and Vlakkuijen that are negatively affecting landowners be managed?	The planned life of mine is 14 years.  The Middelkraal community was relocated by Glencore Umcebo onto property not owned by Anglo American. Therefore, Anglo has no jurisdiction on that property and associated community.  The Vlakkuijen community is located on land owned by Anglo and therefore Anglo Estates is involved in the management of those farms.  Influx of people into the area was assessed as part of the Social Impact Assessment and is included in the EIA/EMP.  Anglo can only implement policies that manage expectations around opportunities at the mine. The responsibility for management of influx and growth of population in the area is the jurisdiction of the local government and not the mine.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>Lawful occupier/s of the land</b>	27 July 2015 Johan Engelbrecht	There should be meetings with the communities to address the issue of the carrying capacity of the land, the number of cattle and the foreign cattle on the land.	<p>The Middelkraal community was relocated by Glencore Umcebo onto property not owned by Anglo American. Therefore, Anglo has no jurisdiction on that property and associated community.</p> <p>A census of the Vlakkuielen community was undertaken by SRK in September 2015 and shows an increase in cattle on the land. The Department of Agriculture was present at the last Vlakkuielen Working Group meeting (held on 14 October 2015) and agreed to request ownership certificates for all the cattle on the property. This issue is being addressed by Anglo through the Working group. The Vlakkuielen Working Group meets on the 2<sup>nd</sup> Wednesday of every month where these issues are discussed and addressed.</p>
<b>Lawful occupier/s of the land</b>	27 July 2015 William Seabi, Total Coal	The Forzando West project will come on-line within the next couple of years. We require full understanding of the environmental issues for Elders Colliery that is foreseen such as decanting. Total Coal will provide comment on the Scoping Report that will be made available for public comment.	<p>A groundwater study was undertaken as part of the impact assessment phase. This study has identified potential decant points after closure.</p> <p>Impacts from decanting have been assessed in the impact assessment tables.</p>
<b>Landowners or lawful occupiers on adjacent properties</b>	27 July 2015 Pieter Honeyborne, Landowner	<p>On 21 October 1991 Anglo sent a letter to my parents restricting us to construct any buildings on our farm without the consent of the mine.</p> <p>We received permission from the mine to build a second home on the property. However, the last four years the conveyor from Block 8 to Goedeheop Colliery has been vandalised and the communities use this material to build informal houses on the property – they apparently do not require permission from the mine to do so.</p> <p>The Block 8 servitude is registered in Anglo's name. According to the servitude agreement, Anglo is required to maintain the servitude. However, this has not taken place during the last four years and nothing has been maintained. This has resulted in the vandalising the conveyor belt and the</p>	<p>The concern was communicated to the Goedeheop Colliery management.</p> <p>As a result, further meetings with the farmers in the Goedeheop Colliery area have been set up to address the concerns related to Goedeheop Colliery.</p>



Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
		<p>influx of people onto our property. We as landowners have to protect ourselves against criminals. Therefor in legal terms, Anglo has not honoured the servitude agreement.</p> <p>On 15 June 1994 we received letters from Amcoal regarding its Landau Colliery for an assessment on our farms regarding the water problem.</p> <p>Two of our boreholes were destroyed by the mining activities. For the past four years there were three occasions where we have not had water on our farm. People from the communities come to our house to collect water in buckets and wheelbarrows from our private taps.</p> <p>Because of Block 8, my cattle do not have drinking water.</p> <p>Because of the influx of people, there is an increase in crime in the area. Everything gets stolen including machines and gearboxes.</p> <p>Our grievances have been raised in the past, but we have not been consulted and provided with feedback. With the mine's current history, I cannot see how the future will be any better.</p> <p>I don't know what to say about this. This is actually a joke. The consultants do not know what is really going on and is not aware of the tension that exists between the farmers and the communities.</p> <p>The farmers are now seen as the culprits because we are protecting what is ours.</p> <p>Strange people are coming onto our land and we cannot do anything about it.</p> <p>We have had no response from the mines regarding the security issues.</p>	

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
Landowners or lawful occupiers on adjacent properties	23 June 2013 Johannes Motau Vlakkuiilen Community	The Vlakkuiilen Community will be affected by the impacts of mining activities such as dust and other impacts.	An Air Quality study was undertaken as part of the impact assessment phase. Dust fallout for the proposed project was modelled. Dust fallout exceedances do not impact on any sensitive receptors.  Socio-economic impacts were assessed as part of the Social Impact Assessment and results of these are included in the EIA/EMP
Landowners or lawful occupiers on adjacent properties	23 June 2013 Jacob Chauke Vlakkuiilen Community	I request to communicate directly with Mrs Zareena Ebrahim of AAIC regarding the SMME opportunities for Elders Colliery.	The message was passed on to Mrs Ebrahim of Anglo American.  All queries regarding the environmental authorisation process should be addressed to SRK.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Joseph Vlakkuiilen Community	Elders Colliery must employ local contractors and communities in preference to external labour.	AAIC has a preferential procurement policy aimed at empowering local SMMEs and such policy will be applicable to the project's procurement strategy.  In terms of Labour, employment opportunities will also depend on the skills available. Skills are important and a specific level of training is required in order to work for Anglo Operations (Pty) Ltd (AAIC). Anglo Operations are unable to guarantee jobs to the community, however, they will look into opportunities for the community.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Joseph Vlakkuiilen Community	Commitments made in Social Labour Plans (SLPs) of other mines in the area have not been complied with. For example, communities have not been informed when blasting will take place at adjacent mines. Elders Colliery must therefore comply with the commitments made in their SLP and EMP.	A Social Impact Assessment was undertaken as part of the impact assessment phase. The results of this are included in the EIA/EMP. Mitigations measures with specific reference to compliance to the SLP have been included in the EMP.  A blasting study was also undertaken during the impact assessment phase. The results have been included in the EIA/EMP with specific reference to informing surrounding communities of the planned blasting.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Joseph Vlakkuiilen Community	How many communities or households will be affected in this project?	A socio-economic impact assessment was under during the impact assessment phase and has identified two communities within the vicinity of the box-cut (Middelkraal and Vlakkuiilen communities) and two communities within the vicinity of the proposed conveyor belt (Mahlathini and Hope Village).  In addition, a number of specialist studies (air quality and noise, heritage, blasting etc.) were undertaken to assess potential impacts of the project on these communities.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
Landowners or lawful occupiers on adjacent properties	23 June 2013 Joseph Vlakkuiilen Community	AAIC must ensure that the local communities benefit from the proposed development.	AAIC has a preferential procurement policy aimed at empowering local SMMEs and such policy will be applicable to the project's procurement strategy. In terms of Labour, employment opportunities will also depend on the skills available. Skills are important and a specific level of training is required in order to work for Anglo Operations (Pty) Ltd (AAIC). Anglo Operations are unable to guarantee jobs to the community, however, they will look into opportunities for the community.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Leonard Mahlangu / Simpiwe Ngobesa Vlakkuiilen Community	Please ensure that the youth from local communities are provided with employment opportunities at Elders Colliery, and that this is set out in the Social Labour Plan for the project.	
Landowners or lawful occupiers on adjacent properties	23 June 2013 Ronni Nkosi Vlakkuiilen Community	AAIC must provide the community with various opportunities for employment, for example as employees and as contractors.	
Landowners or lawful occupiers on adjacent properties	23 June 2013 Sarafina Mndebele Vlakkuiilen Community	AAIC must develop small business opportunities in the community so that the wealth is shared equally. The mine needs to consider employing women and the youth, not only the men.	
Landowners or lawful occupiers on adjacent properties	23 June 2013 Jacob Chauke Vlakkuiilen Community	Why has the schedule for the proposed construction of the project changed from 2014 to end 2015, as was mentioned at the last meeting with the Vlakkuiilen Community in June 2012?	Due to the change in project scope (by excluding the mini-pit) the proposed start date of the project has moved out. The new life mine plan is illustrated in the EIA/EMP.
Landowners or lawful occupiers on adjacent properties	23 June 2013 John Hlophe Vlakkuiilen Community	Electricity provision is the main concern for Vlakkuiilen community. Please provide the community with electricity until relocation takes place.	Electricity is provided to some of the Vlakkuiilen Community members by Eskom in the form of prepaid electricity. It is the responsibility of the municipality to provide electricity to houses without electricity in the interim. Anglo is working with Eskom to resolve this matter. Visits by Eskom to the site have been scheduled through the ward councillor.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Emma Mahlangu Vlakkuiilen Community	Other mines that are operational in the area have caused damage to houses in the Vlakkuiilen Community, especially the windows. They have also provided community members with groceries, why is this not taking place anymore?	AAIC is not responsible for the actions of other mining houses in the area. Grievances should be addressed directly with the mining companies concerned. In terms of impacts of the Elders Colliery, this EIA/EMP addressed all identified impacts of the proposed project and has provided mitigation measures in order to manage these impacts.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
Landowners or lawful occupiers on adjacent properties	23 June 2013 Thandi Vlakkuielen Community	There are community members who stay in mud houses. These houses are damaged and destroyed due to the blasting activities by other mines in the area. Please replace these mud houses with corrugated iron houses before resettlement takes place.	A blasting study was undertaken as part of the impact assessment phase. It was identified that there will be limited low impact on surrounding communities during the construction phase. AAIC is not responsible for the actions of other mining houses in the area. Grievance should be addressed directly with the mining companies concerned.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Florence Mudzanani, Essie Mnguni & Linah Nkosi Vlakkuielen Community	Houses in the Vlakkuielen community are falling apart. It is requested that AAIC build new houses for the community.	An updated census of the Vlakkuielen community was undertaken by SRK during September 2015. The Vlakkuielen Working Group has been set up to address the concerns of the community. The working group meets every 2 <sup>nd</sup> Wednesday of the month where these concerns are raised and addressed.
Landowners or lawful occupiers on adjacent properties	23 June 2013 Jacob Chawuka Vlakkuielen Community	Is SRK independent from Anglo American Inyosi Coal (AAIC*)?  *Project is now owned by AAIC.	Yes, SRK is an independent consultant who has been appointed by AAIC to assist with the environmental authorisations for the Elders Colliery Project. SRK has no vested interest in the outcome of this project and are legally required to maintain an independent perspective.
Landowners or lawful occupiers on adjacent properties	26 July 2015 Sophie Mahlangu Vlakkuielen Community	If underground mining takes place, will subsidence not take place, and will we not fall into those areas?	The bord and pillar mining method does not remove all the coal resource available, pillars are left behind in order to support to surface area. The mining engineers calculate what the sizes and the ratio must be in order for no subsidence to take place. The potential for surface subsidence was assessed in the EIA/EMP.
Landowners or lawful occupiers on adjacent properties	26 July 2015 Sarah Nkosi Vlakkuielen Community	Please look behind you to see the shack that I live in. That is my house and my home. Will you (Anglo American) build us brick houses?	Anglo has established a working group with the Vlakkuielen Community, which includes members from Anglo, the Vlakkuielen community and the ward councillors. The housing concern will be addressed as part of this working group. An updated census of the Vlakkuielen community was undertaken by SRK during September 2015.

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<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Sakhi Sam Mahlangu Vlakkuiilen Community	Sophie's question regarding the subsidence should not be taken lightly. There have been underground mines in the area where subsidence has taken place and the people who lived there are no longer around.  We have also seen a lot of smoke coming from these mining areas which has a negative impact on the environment and the communities living in this area.	The current mine plan shows that no underground mining will take place underneath any existing communities.  The bord and pillar mining method does not remove all the coal resource available, pillars are left behind in order to support to surface area. The mining engineers calculate what the sizes and the ratio must be in order to minimise the potential risk for subsidence to take place. The potential for surface subsidence was assessed in the EIA/EMP.  Subsidence has been observed at other historical mining operations where total extraction mining methods have been implemented.  There is no risk for spontaneous combustion on surface as no RoM stockpiles will be constructed. The box-cut face will be covered to avoid oxidation of the coal and associated spontaneous combustion.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Wonder Ndlovu Vlakkuiilen Community	There are two different departments within Anglo that deals with environmental issues: one looking after the environment and the associated permitting processes, and the other looking after the social affairs (CED – Community Engagement and Development department). Despite this, Anglo must still listen and respond to community issues during all meetings.	Anglo has established a working group with the Vlakkuiilen Community, which includes members from Anglo, the Vlakkuiilen community and the ward councillors. This working group will meet on a regular basis to provide feedback from all departments to the Vlakkuiilen community.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Sakhi Sam Mahlangu Vlakkuiilen Community	Please inform us of potential jobs that will be available during the life of the mine. Please inform us timeously of these employment opportunities in order for the Vlakkuiilen community to apply for these positions before anyone else. Vlakkuiilen could form companies that are contracted to Anglo American.	AAIC has a preferential procurement policy aimed at empowering local SMMEs and such policy will be applicable to the project's procurement strategy.  In terms of Labour, employment opportunities will also depend on the skills available. Skills are important and a specific level of training is required in order to work for Anglo Operations (Pty) Ltd (AAIC). Anglo Operations are unable to guarantee jobs to the community, however, they will look into opportunities for the community.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Jerry Tao Vlakkuiilen Community	When is the mine starting?	The mine plans to start with construction during the third quarter of 2016. The construction phase will last for approximately two years. The first coal is expected towards the end of 2018.

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<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Jerry Tao Vlakkuiilen Community	<p>Please let the mine start at the times you have described. The mine has been planned for many years but has not commenced. Our graves have been relocated but the mine has not started. Please stick to the timeframes.</p> <p>People from the mine run away and don't provide feedback to the communities.</p>	<p>The project was delayed for various reasons (technical and financial). Furthermore, the implementation of the project depends on its approval by Anglo executives. However, Goedeheop is now dependent on the supply of coal from Elders, and if Elders does not start then the Goedeheop plant will need to be closed.</p> <p>Anglo has established a working group with the Vlakkuiilen Community, which includes members from Anglo, the Vlakkuiilen community and the ward councillors. This working group meets once a month to provide feedback from all departments to the Vlakkuiilen community.</p> <p>There is a process in place supported by the working group of which the town councillor is part of, together with the Govan Mbeki local municipality town planners to establish a long-term solution for the community. Until this matter has been resolved the Vlakkuiilen community has agreed to use the current licenced grave site in Bethal for burials of their loved ones.</p>
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Johannes Motau Vlakkuiilen Community	<p>The Elders project goes back 10 years. This is the first time we have seen Marcia Mabuza from the CED department. We have been struggling to have our issues addressed by Anglo.</p> <p>You say the project will only start making money in 2018. But we are hungry now, not in 2018. We will not all benefit from a project that is only in the future. What will Anglo do about our situation now? Please give me money now, so that I can farm.</p> <p>How can we benefit from the land besides from mining?</p> <p>The land is currently under grazed and no development has taken place for the past 10 years.</p>	<p>Anglo has established a working group with the Vlakkuiilen Community, which includes members from Anglo, the Vlakkuiilen community and the ward councillors. This working group meets on a monthly basis to provide feedback from all departments to the Vlakkuiilen community.</p> <p>All concerns raised by the community are addressed as part of the Vlakkuiilen Working Group.</p>



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<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Sakhi Sam Mahlangu Vlakkuiilen Community	Anglo gives us timeframes within which they plan to start the mine, which means they are reliable and can be trusted. We appreciate that you give us the opportunity to raise our concerns. Anglo went from open cast mining to underground mining methods indicating that they have thought about the project.	Noted.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Petunia Muozanani Vlakkuiilen Community	Will you bring in your own employees during construction, or will you use people from the Vlakkuiilen community? If I am skilled in a certain area, but I don't have matric, will you still consider hiring me?	AAIC has a preferential procurement policy aimed at empowering local SMMEs and such policy will be applicable to the project's procurement strategy. In terms of Labour, employment opportunities will also depend on the skills available. Skills are important and a specific level of training is required in order to work for Anglo Operations (Pty) Ltd (AAIC). Anglo Operations are unable to guarantee jobs to the community, however, they will look into opportunities for the community. The project will adhere to the Mining Charter requirements and all CSI and SLP opportunities do not discriminate on the levels of education but are meant to cater for the broader community in development initiatives.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Jerry Tao Vlakkuiilen Community	You have relocated our graves. What will happen if someone in our community dies? Where will we have to bury them?	Anglo established a working group with the Vlakkuiilen Community, which includes members from Anglo, the Vlakkuiilen community as well as the ward councillors. There is a process in place supported by the working group of which the town councillor is part of, together with the Govan Mbeki local municipality town planners to establish a long-term solution for the community. Until this matter has been resolved the Vlakkuiilen community has agreed to use the current licenced grave site in Bethal for burials of their loved ones.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Johannes Motau Vlakkuiilen Community	How will you resolve the lack of water we are currently experiencing?	Anglo established a working group with the Vlakkuiilen Community, which includes members from Anglo, the Vlakkuiilen community as well as the ward councillors. Anglo is in a process of drilling a new borehole for the community for drinking water needs. This item is also a priority item for the working group.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Lendani Mbata Vlakkuiilen Community	At the next meeting, please ensure that you have the answers to our questions, especially for the important issues such as water.	Comments raised during the scoping phase of the project have been listed in the comments and response table included in the EIA/EMP. All comments have been responded to.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Johannes Motau Vlakkuiilen Community	Who will assist me from the Anglo team regarding my financial request?	Anglo is not a financial institution and is therefore not authorised to issue financial bonds.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Moses Mahlangu, Sakhi Sam Mahlangu Vlakkuiilen Community	We have too many meetings, but no answers to our questions. At the next meeting, please have responses to our queries from the experts, otherwise it creates confusion.	Comments raised during the scoping phase of the project have been listed in the comments and response table included in the EIA/EMP. All comments have been responded to.  In addition, Anglo established a working group with the Vlakkuiilen Community, which includes members from Anglo, the Vlakkuiilen community as well as the ward councillors. Meetings are held on a monthly basis to provide feedback to the community.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 Abraham Mokoena Middelkraal Community	We are in a crisis – there are no jobs. Will there be employment and training opportunities for skills during the Elders project? Some of us have companies. Will there be opportunities for contracting?	AAIC has a preferential procurement policy aimed at empowering local SMMEs and such policy will be applicable to the project's procurement strategy.  In terms of Labour, employment opportunities will also depend on the skills available. Skills are important and a specific level of training is required in order to work for Anglo Operations (Pty) Ltd (AAIC). Anglo Operations are unable to guarantee jobs to the community, however, they will look into opportunities for the community.
<b>Landowners or lawful occupiers on adjacent properties</b>	26 July 2015 MH Mahlangu Middelkraal Community	How big is the area that the Elders Project will be developed on and has the land been bought?	The surface infrastructure will cover an area of 65 ha, located on the farm Middelkraal. The underground mining area covers an area of 1 355 ha.  The conveyor belt including the new sections and upgraded section will be approximately 17 km long.  All the land on which surface infrastructure will be developed is owned by Anglo American. The majority of the land where underground mining will take place is owned by Anglo American.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
Landowners or lawful occupiers on adjacent properties	26 July 2015 Solomon Nzimande Middelkraal Community	Will the mining project affect our surface water, and groundwater?	Surface and groundwater studies have been undertaken as part of the impact assessment phase. These studies have identified that it will be unlikely that the Middelkraal community will be impacted by the project in terms of surface and groundwater.
Landowners or lawful occupiers on adjacent properties	26 July 2015 Linnah Mahlangu, Leta Mtetwa Middelkraal Community	Will we be relocated? Are you a hundred percent sure that there will be no reason to relocate this community and that we will only be neighbours?	The current Elders Colliery mine plan does not necessitate the relocation of the Middelkraal community.
Municipal councillor	17 August 2015 Mahlathini Community Meeting Steve Tshwete Local Municipality Ward 4 Councillor Edward Nyambi	With regards to IDs, the ward councillor acknowledges that this is a Home Affairs issue which he should facilitate – Community members are to consolidate a list of all members with/ without documents and the ward councillor will assist with this.	Not related to the Elders project but referred to Ward Councillor Nyambi to address the issue with the community.
		The Ward Councillor encourages communities to work together. As the conveyor belt will be directed between two municipal boundaries, the councillor believes in shared opportunities with other communities and will communicate with neighbouring farms accordingly.	Noted
		With regards to employment/unemployment, the councillor and his ward committee will gather information from community members to assess the skills available within the community.	Noted
		Mahlathini proposed that the community, together with the municipality and mine, can consider the option of identifying land and develop settlement options for a Mahlathini community settlement. The settlement land that the Municipality can develop and install basic services	Noted and Councillor. Advised to refer the proposal to mine community engagement forum and relevant departments within the Municipality

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
		Mahlathini will work together with the municipality and mine to identify land and develop settlement options for a Mahlathini community settlement. The settlement land can also be used to develop basic services through the municipality.	To be addressed in the mine forum as it is not related to the Elders Colliery project.
<b>Municipality</b>	20 June 2012 Wisdom Mpofu Gert Sibande District Municipality	A letter of consent from the landowner must accompany the application for the water use licence and surface rights.	The Department of Water and Sanitation requires that completed and signed DW902 forms (details of property owners) be submitted as part of the water use licence. Land owners are shown in Table 3-1.
<b>Municipality</b>	25 June 2013 Ignatius Matebula Gert Sibande District Municipality	Past experience has shown that many mines do not comply with rehabilitation regulations. AAIC has to indicate clearly how rehabilitation measure will comply with regulations.	A rehabilitation and closure plan was compiled as part to the impact assessment phase. This report is included in the EIA/EMP.
<b>Municipality</b>	25 June 2013 Ignatius Matebula Gert Sibande District Municipality	It is important that a study of the cumulative impacts of all the mines in the area be undertaken?	Current baseline conditions have been assessed by all specialists, which include current impact of adjacent mines to the Elders Colliery. The impact assessment has taken the baseline conditions into consideration when modelling potential impacts.
<b>Municipality</b>	20 June 2012 Wisdom Mpofu Gert Sibande District Municipality	We are deeply concerned about the impact of the proposed mining activities on the Gert Sibande District Municipality. How will these impacts be managed?	As part of the impact assessment phase, an impact assessment was undertaken, and an environmental management programme was developed which includes mitigation measures to avoid and minimise impacts and enhance positive impacts.
<b>Municipality</b>	25 June 2013 Ignatius Matebula Gert Sibande District Municipality	Are there studies undertaken in the area where the conveyor belt will be located and have any applications been submitted to the local municipality? Please contact the Land use Department (Mr Nic Van der Merwe) regarding the application.	The conveyor route has been included in all the specialist studies undertaken for the EIA/EMP.  In addition, rezoning applications will be submitted for all surface infrastructures, which includes the conveyor route and box-cut.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>Municipality</b>	20 June 2012 Wisdom Mpofu Gert Sibande District Municipality	The SDF aspects of the area need to be considered in the project. The municipal boundaries that the project falls in need to be confirmed to ensure that the correct authority authorises the project in terms of land use and zoning applications. The SDF of the Gert Sibande District Municipality and Govan Mbeki Local Municipality is up to date and is reviewed annually.	The municipal areas within which the project and the associated conveyor belt fall have been identified. The project will include rezoning which will take the SDF into consideration.
<b>Municipality</b>	20 June 2012 Wisdom Mpofu Gert Sibande District Municipality	The applicant should apply for rezoning because of the change in land use, depending on the current land zoning for the project area. This application should take current land use into consideration.	Rezoning applications will be submitted for all surface infrastructures, which includes the conveyor route and box-cut.
<b>Organs of state (Responsible for Infrastructure that may be affected Roads Department, Eskom, Telkom, DWA)</b>	3 April 2013 Pinky Monyela DWS	A comprehensive wetland specialist study is requested in which all wetlands are delineated and the Present Ecological State (PES) and Recommended Ecological Class (REC) for each wetland is indicated.	A wetland delineation study was undertaken as part of the impact assessment phase and is included in the EIA/EMP.
<b>DWS</b>	3 April 2013 Pinky Monyela DWS	A geochemical impact prediction should be included in the water use licence application.	A geochemical analysis was undertaken as part of the Groundwater study. This is included in the EIA/EMP and will be included with the WULA.
		Please provide clarity on the uses of discharged water.	Dirty water (discharge water) will be treated in a water treatment plant to suitable standards. Excess water will then be discharged back into the water resource. The sewage treatment plant will be designed to ensure that water discharged into the system will be according to accepted standards. Water uses associated with discharge is included in the WULA
		It must be reflected in the water balance that storage of water will take place in the underground workings and therefore minimises the need for surface water.	A water balance was undertaken, which took into consideration the storage of water underground. This was undertaken as part of the surface water study and is included in the EIA/EMP.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
		The interaction between groundwater and surface water needs to be understood.	The wetland reserve determination has taken into consideration the groundwater and surface water interaction. These potential impacts have been assessed and are included in the EIA/EMP.  The study indicated that there is an interaction between the wetland and groundwater table within the weathered zone. It is expected that the underground mining activities will take place below this weathered zone, and it is therefore unlikely that the mining activities will influence this interaction.
		What is the current land use at Elders Colliery?	The current land use is mainly agriculture.
		Who owns the land on which Elders Colliery is located on?	All land on which is surface infrastructure will be developed is owned by Anglo American. Some areas where underground mining will take place are owned by private landowners.
		The water use licence application must contain details of the water management measures for the post closure phase of the project.	The closure plan for the mine will contain a water management plan for during post closure as part of technical information for IWULA.  Impacts and management measures for the closure phase is included in the EIA/EMP.
<b>Communities</b>	17 August 2015 Mahlathini Community Meeting	The Mahlathini community would like to thank Goedehoop Colliery for the supply of water to the community.	Thank you for your comment.
<b>Communities</b>	Michael Thuhloane	The perception from the community is that people from other communities and other towns are getting jobs and Mahlathini feels left behind as they are not receiving opportunities. The Mahlathini community hope and believe that they will be considered for opportunities provided by Goedehoop Colliery.	In order to be employed by a mine, skills are important and legislation stipulates that a specific level of training is required in order to work for a mine. Anglo Operations (Pty) Ltd (AAIC) are unable to guarantee jobs to the Mahlathini community, however will liaise with the Ward Councillor and his ward committee to understand the skills set of community members for when there are potential job opportunities in the future.
<b>Communities</b>		When will -the projects start?	The Elders Colliery plans to start with construction during the third quarter of 2016. The construction phase will last for approximately two years. The first coal is expected towards the end of 2018.



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<b>Communities</b>	17 August 2015 Mahlathini Community Meeting Xolani Pikwa	Is the training for the underground mine machinery taught at home or would you need to train at the mine? Because when there are job opportunities at Goedehoop Colliery, the minimum requirements is that one need to have a relative working for the mine,	Training depends on the skills set required to use the machinery. AAIC will take Mahlathini, and other communities into consideration as and when job opportunities arise and if training is needed for that specific opportunity then it will be provided as employee skills and capacity building is also important to AAIC. Goedehoop Colliery engages continuously with all stakeholders on challenges around unemployment and skills/ capacity building possible opportunities.
<b>Communities</b>	17 August 2015 Mahlathini Community Meeting Johanna Ndlovu	Mahlathini community is extremely concerned that the Goedehoop Colliery conveyor belt will be passing through a few households.	The conveyor for the Elders Colliery has been re-routed to not pass the Mahlathini community directly. The conveyor route is approximately 500 m from the community.
<b>Communities</b>		Children in the Mahlathini community make use of the gravel roads, as there is a school bus route that travels on this road. In the rainy season, when the road is not useable, there is an alternative bus stop near the Goedehoop Colliery Kom Saam Saal mine property, outside the gate on the main access road. How will the new conveyor route impact the alternative bus stop near the road?	Anglo Operations (Pty) Ltd conducted an investigation to determine the route of the conveyor belt in relation to roads in order determine if the alternative bus stop will be affected Based on the route of the proposed Elders conveyor belt, it was confirmed that the new conveyor route from Elders will not impact the bus route.
<b>Communities</b>	17 August 2015 Mahlathini Community Meeting Nicholas Morokong	There are a large number of community members without South African Identity Documents (IDs).	Not related to the Elders project but referred to Ward Councillor Nyambi to address the issue with the community.
<b>Communities</b>	17 August 2015 Mahlathini Community Meeting Novageli Mayifele	Some Mahlathini community members were not given the opportunity to go to school. How will the project benefit these people?	The project will adhere to the Mining Charter requirements and all CSI and SLP opportunities do not discriminate on the levels of education but are meant to cater for the broader community in development initiatives.  Possible employment opportunities are on the basis of the requirements. Engagement channels will remain open in discussing unemployment challenges that exist within our zones of influence

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>Communities</b>	17 August 2015 Mahlathini Community Meeting Simphiwe Vilikazi	The meeting was focused on Mahlathini community members only. Please will AAIC consider surrounding farms for opportunities as well, as there is a need for skills and capacity building initiatives. We require skills and capacity building opportunities that will enable us to be employable with other mine houses or industries	AAIC has a preferential procurement policy aimed at empowering local (SMMs and such policy will be applicable to the project's procurement strategy  In terms of Labour, employment opportunities will also depend on the skills available. Skills are important and a specific level of training is required in order to work for Anglo Operations (Pty) Ltd (AAIC). Anglo Operations are unable to guarantee jobs to the community; however, they will look into opportunities for the community.
<b>Dept. Land Affairs</b>	25 June 2013 Jan Venter DARDLA – Mpumalanga <sup>7</sup>	Even though mitigation measures for dust pollution are in place at many mining operations, many of these measures are not effective. What other dust prevention measures will be in place?	Impacts on air quality were assessed by the Air Quality study. Mitigations measures were suggested and included in the EIA/EMP.  This includes dust suppression on roads and partial enclosure of the conveyor belt, reduced vehicle speed and dust control at transfer points.  A dust monitoring programme will be implemented throughout all phases of the project to monitor dust impacts.
<b>Dept. Land Affairs</b>	25 June 2013 Jan Venter DARDLA – Mpumalanga	What rehabilitation measures will be used in the rehabilitation plan for the Elders Colliery? Will these measures be included in the Final EIA/EMP Report?	A closure and rehabilitation plan has been compiled as part of the impact assessment phase. The following activities will be undertaken as part of the closure phase: <ul style="list-style-type: none"> <li>Decommissioning all surface infrastructure that has no beneficial post-closure use;</li> <li>Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;</li> <li>Rehabilitate disturbed land to a state that is suitable for its post-closure uses;</li> <li>Rehabilitate disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);</li> <li>Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;</li> <li>Rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage;</li> <li>Rehabilitate all disturbed land to a state where post-closure management is minimised;</li> </ul>

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>Dept. Land Affairs</b>	25 June 2013 Jan Venter DARDLA – Mpumalanga	What are the Pillar sizes that will be used in the underground mining operation and what are the safety factors associated with the underground operation?	A geotechnical assessment has been undertaken to determine the pillar sizes for the underground bord and pillar operations. The details of the safety factors will also be included in the water use licence application for the undermining of delineated wetlands, to be submitted to the Department of Water Affairs for approval.)
<b>Dept. Land Affairs</b>	25 June 2013 Jan Venter DARDLA – Mpumalanga	How will increased traffic impact on the road surface of the R35 be assessed?	A traffic impact assessment was undertaken in 2012/2013 which identified that the additional of construction vehicles to the existing road network will not have significant impact on current traffic volumes. During the operational phase, coal will be transported via a conveyor belt, therefore there will no impact on the current traffic volumes
<b>Traditional Leaders</b>			
<b>Dept. Environmental Affairs</b>	21 August 2012 Musa Mandlane, MDEDET	Which specialist studies will be conducted during the EIA for the proposed Elders Colliery?	A list of specialist studies undertaken as part of the impact assessment phase is included in the EIA/EMP.
<b>Dept. Environmental Affairs</b>	21 August 2012 Musa Mandlane, MDEDET	In which District Municipality is the majority of the proposed project activities located?	The majority of listed activities for the proposed project are located in the Gert Sibande District Municipality.
<b>Other Competent Authorities affected</b>	24 August 2012 F Murunga, DMR	Will the existing EMP for Goedehoop Colliery be amended to include Elders Colliery, or will there be a stand-alone EMP for the proposed Elders Colliery?	A stand-alone EIA/EMP has been prepared for Elders Colliery according requirements of NEMA.
		Is it the intention to submit a prospecting or mining rights application to the Department of Mineral Resources (DMR)?	The mining right application was submitted on 16 July 2015. The DMR reference number is MP 30/5/1/2/2 (10117) MR.
	20 October 2015 MC Mutengwe, DMR	Proof of correspondence with the various stakeholders must be included in the EIAR.	A stakeholder engagement process is being followed for the Elders Colliery environmental authorisation process. Proof of correspondence with stakeholders is included in this report.
		Should a Water Use Licence be required, proof of application for a license needs to be submitted.	A water use license application is currently available for public review (28 October – 26 November 2015). The water use licence application will be submitted to the DWS on 4 December 2015
		Provide a detailed explanation on the management of traffic during the contraction phase of the road.	Three temporary construction access roads to the Elders site off the R35 will be required. Heavy and light motor vehicles will be separated. The intention is to install traffic calming

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
			<p>infrastructure (temporary traffic bumps) during the duration of construction. All construction works will be fenced off to prevent interaction with public as the intention is for limited crossing of the R35 during construction operations. If any heavy machinery is required to cross the R35, proper safety measures which include flag men will be in place. Blasting activities to occur only during daylight hours.</p> <p>There will also be a new intersection constructed off the R35 opposite the Sudor access road for the operational phase.</p> <p>A detailed traffic management plan for the construction phase will be compiled and implemented by the contractor.</p>
		Please ensure that the EIAR includes the A3 size locality maps of the area and illustrates the exact location of the proposed development.	A3 maps have been included as part of this EIA/EMP.
		Should an application for Environmental Authorisation be subjected for any permits or authorisation in terms of the provisions of any Specific Environmental Managements Acts (SEMA's), proof of such application will be required.	<p>A waste licence is required, but the application was included with the environmental authorisation application.</p> <p>No other requirements have been identified.</p>
<b>Mpumalanga Tourism and Parks Agency (MTPA)</b>	7 October 2015 Dr MC Lotter, MTPA	The Freshwater assessment as determined in the Mpumalanga Biodiversity Sector Plan (MBSP) indicates that the proposed mine will undermine large portions of an Ecological Support Area: Wetland area that supports and feeds cleaner water into the upper Olifants River. The effect of the dewatering on this wetland during the underground mining process and the costs to provide a constant supply of clean water into this wetland system, needs to be considered and addressed in the studies that will be conducted.	<p>A wetland study was undertaken as part of the impact assessment phase. Impacts identified have been included in this EIA/EMP and mitigation and management measures to avoid and reduce these impacts have been included in the EIA/EMP.</p> <p>The majority of wetlands on site, specifically the hillslope seepage wetlands, are however predominantly maintained by shallow perched water tables and the shallow weathered aquifer that are generally separate from deeper groundwater and are thus considered unlikely to be affected by the dewatering.</p> <p>As the bord and pillar underground mining will take place below the weathered zone, it is unlikely that the underground mining will impact on groundwater flow into the wetland.</p>
<b>MTPA</b>	7 October 2015 Dr MC Lotter, MTPA	The accumulative impacts of AMD from the proposed underground mine and the nearby existing mines should be quantified.	Current baseline conditions have taken into consideration existing mining facilities in the immediate vicinity of the proposed Elders Colliery and are reflected in the quality and quantity of surface and groundwater monitoring results.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
		Liability for water purification and rehabilitation must be determined.	<p>The groundwater study indicated that the current groundwater is of good quality.</p> <p>AMD potential for the Elders Colliery was assessed as part of the groundwater study and is included in the EIA/EMP.</p> <p>The potential for AMD formation in the underground workings is highly probable. However, the potential for this AMD to decant onto surface, or to migrate laterally from the mine workings as groundwater seepage and to eventually contaminate water resources in the catchment, was assessed to be manageable to a medium consequence with a low significance.</p> <p>This will be managed by:</p> <ul style="list-style-type: none"> <li>• Optimising storage of mine water in mined out underground sections;</li> <li>• Monitoring of water levels</li> <li>• Water levels in the workings will be actively managed to ensure it remains below the decant elevation</li> <li>• A detailed decant management plan will be developed at mine closure. Ultimately water treatment solutions, either passive or active, will be implemented.</li> </ul> <p>The liability for water purification was quantified and is available in Appendix 9.</p>
<b>MTPA</b>	7 October 2015 Dr MC Lotter, MTPA	The current or present ecological status of the wetland system needs to be determined.	This was undertaken as part of the wetland study.
<b>MTPA</b>	7 October 2015 Dr MC Lotter, MTPA	The Olifants River's health status with regards to 4 different SASS 5 monitoring readings together with the current chemical analyses with focus on the pH and heavy metals present should be provided.	<p>Results of chemical analysis are provided in the surface water study.</p> <p>The results of the SASS5 monitoring is included in the EIA/EMP.</p>
<b>MTPA</b>	7 October 2015 Dr MC Lotter, MTPA	The decanting points must be determined and also the mitigating actions to prevent dirty water and AMD to reach the river.	The decanting points were identified as part of the groundwater study. All mitigation measures are included in the EIA/EMP.
<b>MTPA</b>	7 October 2015 Dr MC Lotter, MTPA	A cost benefit analysis is needed, taking into account the costs to purify the water for the next 100 years.	A closure cost for the water liability at Elders Colliery was undertaken by Anglo American.

Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
<b>MTPA</b>	7 October 2015 Dr MC Lotter, MTPA	The mine management plan with regards to discard dumps, coal stockpiles, washing plants, incline shafts and roads must be planned outside the 100 meter buffer of any wetland on site.	<p>The Elders Colliery will not have any discard dumps, coal run of mine stockpiles or washing plants. Use will be made of Goedehoop Colliery's existing facilities.</p> <p>The overburden stockpile has been placed outside of any delineated wetlands and floodlines. The No. 2 and No. 4 coal seams will be removed during the construction of the box-cut and taken to the Goedehoop Colliery.</p> <p>Due to the location of the No. 2 and No. 4 and required access to these seams, the box-cut and other associated infrastructure is partially located within a hillslope seepage wetland. The PES of this wetland has been rated as C – moderately modified due to agricultural activities. This impact is unavoidable, however, management measures have been included in the EIA/EMP to minimise these impacts.</p> <p>The mining method is underground mining and therefore limited surface infrastructure is required.</p>
<b>OTHER AFFECTED PARTIES</b>	24 June 2013 Alexander Adams, Sudor Coal	Will mining activities at Elders Colliery affect the Olifants River?	<p>A surface water study was undertaken as part of the impact assessment phase. This included potential impact of the Elders Colliery on the Olifants River.</p> <p>These impacts and management measures have been included in the EIA/EMP. Potential impact on the Olifants River is expected to be low if all mitigations measures are implemented.</p>
	24 June 2013 Alexander Adams, Sudor Coal	Is the AAIC coal resource in the north of the Elders Prospecting Right Area included in the project boundary?	The extent of the proposed underground mining area of the Elders Resources is included in the EIA/EMP. The mining right area applied for on the 16 <sup>th</sup> of July 2015 is included in the EIA/EMP
	1 March 2013 Tshilikzi Masalela, Transnet	The development must not have a direct or indirect impact on the existing rail line and its foundation.	Due to the distance of the railway line to Elders Colliery box-cut and associated conveyor belt, it is highly unlikely that the project will impact on any railway lines.



Interested and Affected Parties	Date Comments Received	Issues raised	EAPs response to issues as mandated by the applicant
	11 August 2015, Tshifhiwa Ludere, Eskom	<p>The environmental authorisation process for the proposed Elders Colliery affects existing Eskom Distribution lines, Komati Rural Tee-Komati 3 11kV, Export-Doornsfontein 22kV and Kudu-Doornsfontein 88 kV. Eskom distribution has no objection to the proposed development in portion 4&amp;9 of the farm Goedehoop 46 IS, provided Eskom's rights and services are acknowledged and respected at all times.</p> <p>Please see attached the full letter from Eskom with conditions that they request must be adhered to and accepted in writing before any development and or construction.</p> <p>(Full letter and annexures included as <b>Appendix 6-10</b>).</p>	Noted. Anglo will consult with Eskom prior to the commencement of construction.
<b>INTERESTED PARTIES</b>	24 June 2013 Mainah Medupi	Will the conveyor cross over the R35, and will this road be used during construction?	<p>The conveyor route will cross over the R35.</p> <p>The R35 will be utilised during the construction phase to deliver material to the proposed box-cut area.</p> <p>During blasting activities, the R35 will be temporarily closed.</p>
	24 June 2013 Mainah Medupi	Has construction activities commenced in the project area and when will procurement for the construction start?	<p>No construction will commence prior to the approval of all the relevant environmental authorisation processes. It is currently proposed that construction will commence in 2016. It has not been confirmed when procurement will take place.</p> <p>Procurement procedures will be communicated to tender contractors well before construction commences.</p>
	24 June 2013 Anton	Will blasting activities take place close to the R35, and if so, will the R35 be closed during this time?	<p>The impacts of blasting on the R35 were assessed during the impact assessment phase as part of the blasting study. This study is included in the EIA/EMP.</p> <p>Management measures for blasting are included in the EIA/EMP.</p> <p>During blasting activities, the R35 will be temporarily closed.</p>

## 14 Environmental and social attributes

This section provides an overview of the key environmental attributes that are found in the study area. This information is drawn from specialist studies undertaken during the 2015 environmental authorisation application process. These studies document baseline conditions and potential impacts associated with the proposed Elders Colliery Project.

Table 14-1 lists the specialist studies undertaken in 2015 which will inform the Integrated Scoping and Impact Assessment.

**Table 14-1: Specialist studies conducted in 2015 and the specialist who undertook the study**

Specialist Study	Specialist
Air Quality	Airshed Planning Professionals, Hanlie Liebenberg-Enslin
Soils and Land Capability Studies	Earth Science Solutions, Ian Jones
Noise	FMAC, Francois Malherbe
Cultural Heritage	Private, Johnny van Schalkwyk
Biodiversity	Ekolnfo, Willem de Frey
Surface Water	Jones and Wagner, Mike Palmer
Groundwater	JMA Consulting, Jasper Muller
Blasting	Blast Management and Consulting; Danie Zeeman
Socio-economic	SRK Consulting, Adel Malebana
Wetlands	Wetland Consulting Services; Dieter Kassier
Closure Costing and Rehabilitation	SRK Consulting, James Lake

Based on the change in project description, it was identified that some of the specialist studies would require an update. The specialist studies identified in Table 14-2 indicated the studies which were updated and the specialist that undertook the update.

**Table 14-2: Updated specialist studies conducted**

Specialist Study	Specialist
Closure Costing (Updated in 2019)	SRK Consulting, James Lake
Traffic (Updated 2019)	Aurecon, Mike Van Tonder
Groundwater (Updated in 2020)	Delta H, Kai Witthueser
Water Balance (Updated in 2020)	Jones and Wagener, Caroline Bladen
Wetland Assessment (Updated in 2021)	Wetland Consulting Services; Dieter Kassier
Tier 1 simulation (groundwater quality) (Conducted 2021)	University of Pretoria, John Annandale

**Note:** It is important to note that no additional specialist studies will be conducted for this project as the construction and operation of proposed Elders Colliery Project has not commenced and the area is still considered a Greenfield area. Thus, the existing specialist studies (including baseline environment, impact assessment, mitigation measures and monitoring) are still relevant.

The Specialist studies can be found in Appendix G

## 14.1 Climate and meteorology

*The information presented in this section is extracted from the specialist Air Quality specialist by Airshed in 2015 (Appendix G1).*

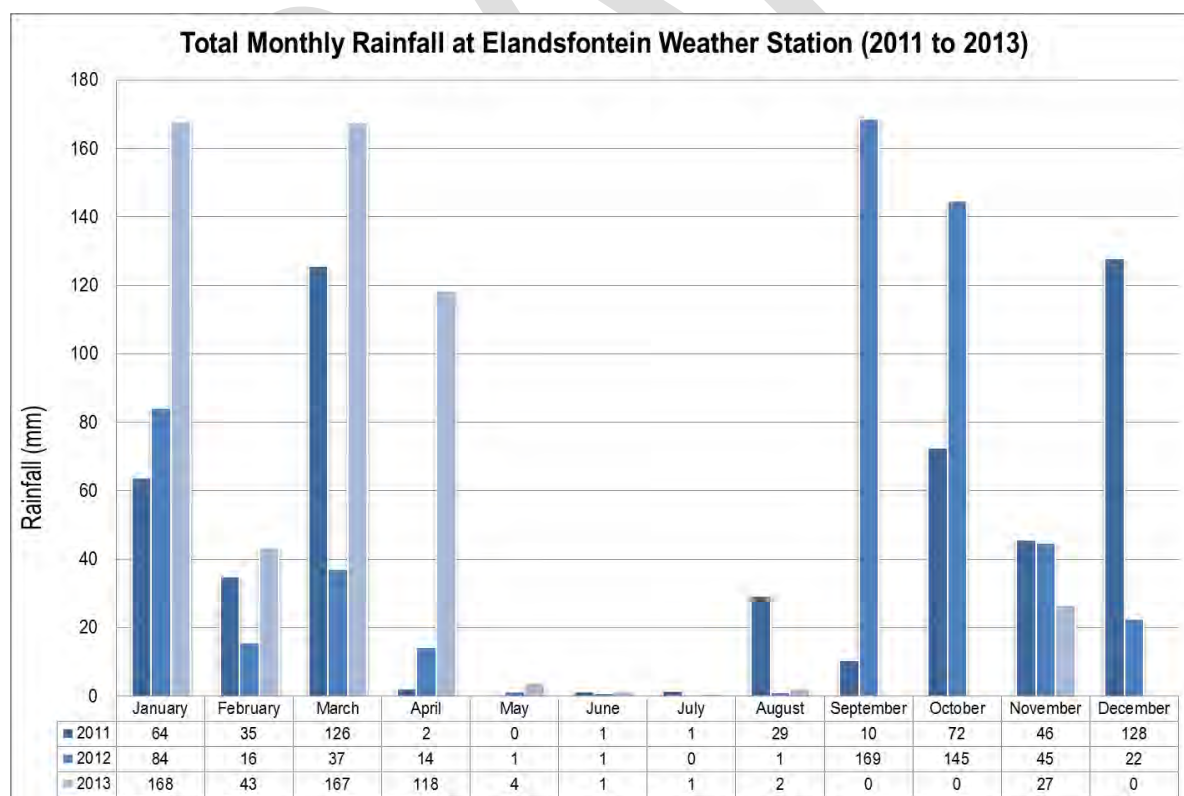
The proposed Elders Colliery Project is located where the climate is warm to hot in the summer with an average daily high of approximately 27°C. Winters are mild too cold with an average daily maximum of approximately 15°C. Frost and mist are frequently experienced during the winter months on the Mpumalanga Highveld.

### 14.1.1 Rainfall and evaporation

Precipitation represents an effective removal mechanism of atmospheric pollutants. Rainfall data for the Elandsfontein weather station is used for this study. Data availability for the period January 2011 to December 2013 was ~87.92 %.

Rainfall in the region is almost exclusively due to showers and thunderstorms and falls mainly in spring and summer months (October to March). The maximum rainfall occurs during the October to January period. Whereas spring and summer months receive about 85% of the rainfall, winter months are normally dry.

Annual rainfall recorded for 2011, 2012 and 2013 was ~514.2 mm, 534 mm and 531 mm respectively with annual data availability of 99.0 %, 94.6 % and 70.3 % respectively (Figure 14-1).



**Figure 14-1: Total Monthly Rainfall at Elandsfontein Weather Station (2011 to 2013) (Airshed, 2015)**

### 14.1.2 Site temperature

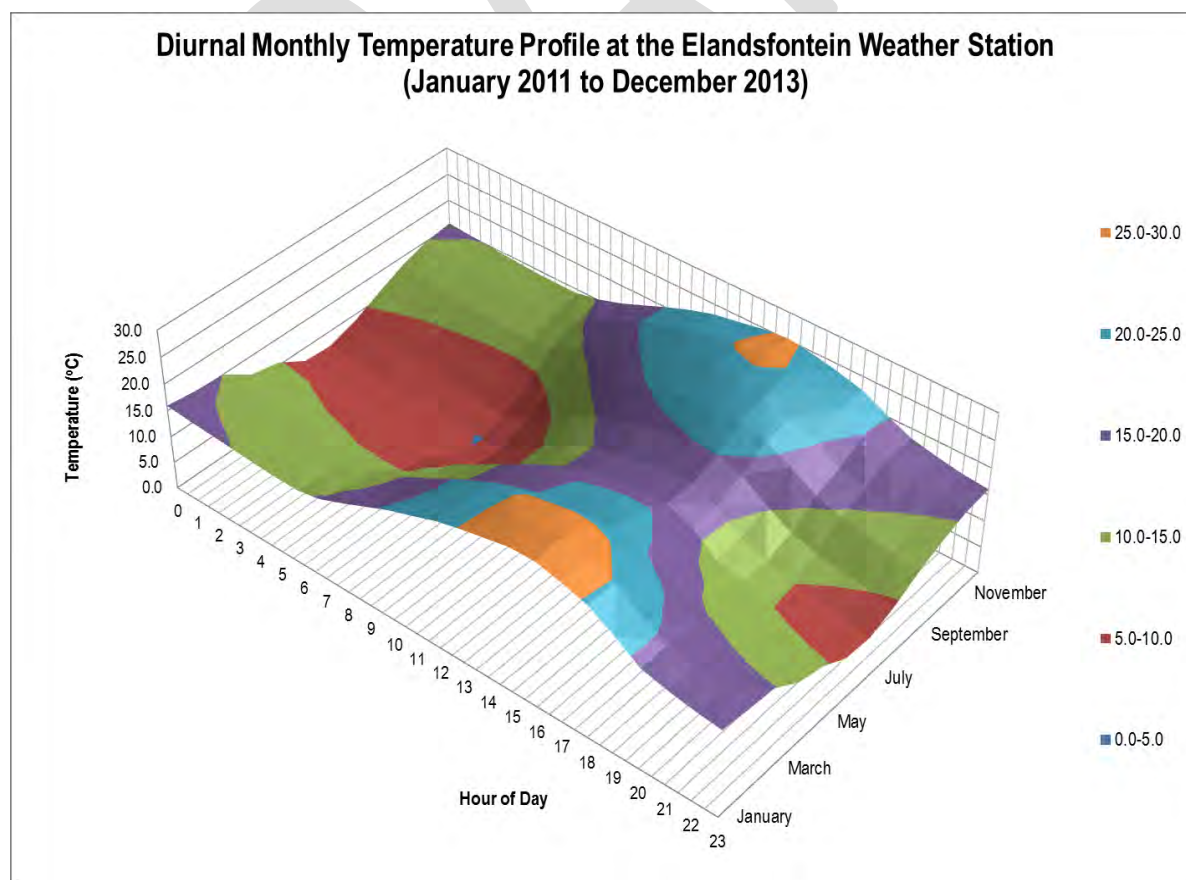
Air temperature is important, both for determining the effect of plume buoyancy (the larger the temperature difference between the emission plume and the ambient air, the higher the plume is able to rise), and determining the development of the mixing and inversion layers.

Diurnal and average monthly temperature trends are presented in Figure 14-2. Monthly mean and hourly maximum and minimum temperatures are given in Table 14-3.

Temperatures range between -5.0 and 33.7 °C. The highest temperatures were recorded in October and February, and the lowest in May. During the day, temperatures increase to reach maximum at around 15:00 in the afternoon. Ambient air temperatures decrease to reach a minimum at around 07:00 i.e. just before sunrise.

**Table 14-3: Monthly minimum, maximum and average hourly temperatures**

Monthly minimum, maximum and average temperatures (°C)												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Minimum	10.4	9.3	9.5	1.0	0.4	-3.6	-1.7	-3.7	-0.8	6.2	4.3	11.3
Average	19.7	19.2	18.4	14.6	13.5	10.4	10.3	11.9	14.6	16.8	18.6	18.7
Maximum	39.1	35.1	33.1	28.1	28.5	23.8	22.0	28.3	29.3	34.1	34.8	34.9



**Figure 14-2: Diurnal temperature profile (Elandsfontein data, 2011 to 2013) (Airshed, 2015)**



## 14.2 Geology

*The information presented in this section is extracted from the specialist Groundwater Specialist study undertaken by Delta H in 2020 (Appendix G7)*

The geology underlying the proposed Elders Colliery Project boundary consists almost entirely of sedimentary lithological units of the Vryheid Formation (indicated as Pv on Figure 14-3). The Vryheid Formation forms part of the Ecca Group of the Karoo Super Group and consists predominantly of sandstone and shale layers. Alluvium and aeolian deposits are evident along the banks of the major surface water drainage bodies in the study area, namely the Vlakkuiilen, Viskuiile and Joubertsvele Spruit.

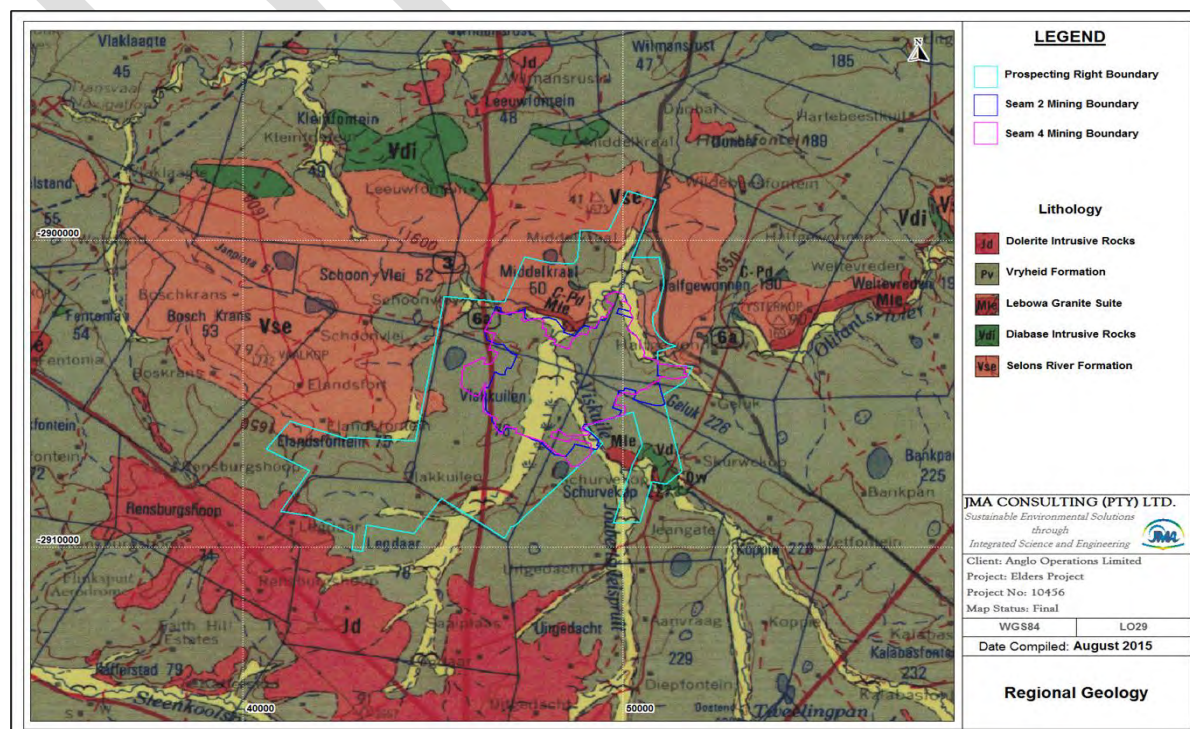
Jurassic Age dolerite intrusive (denoted as Jd on Figure 14-3) are evident in the south, south-western regions of the proposed project boundary. The dolerite present within the study area is younger than the rocks of the Vryheid Formation and intruded into and through these sedimentary lithologies.

Carbonaceous shale and coal layers are associated with the Vryheid Formation within the proposed project area, which will support widespread underground mining operations. The proposed project area is located within the central region of the Springs-Witbank Coal Field. There are five major coal seams within the Springs-Witbank Coal Field, namely (from the base upwards the No.1, 2, 3, 4 and 5 coal seams. The lower two coal seams are absent over the eastern and southern parts of the coalfield.

The coal seams are usually separated by coarse-grained sandstone, transgressing to siltstone or shale at the top.

The coal seam topography and aerial extent are commonly controlled by the pre-Karoo topography in the northern and western margins of the coalfield. Steeper dips are encountered where seams pinch out against pre-Karoo hills.

The intrusion of the dolerites within the study area also compartmentalise the coal seams. This compartmentalisation is important in terms of the geohydrological setting in that it plays a major role in the groundwater interaction between mines and the respective water balance calculations.



**Figure 14-3: Regional Geology for the proposed Elders Colliery Project area**

## 14.3 Soils, land use and land capability

*The information presented in this section is extracted from the specialist Soils, Land Use and Land Capability Specialist study undertaken by Earth Science Solutions (Pty) Ltd in 2015 (Appendix G2)*

### 14.3.1 Soils characterisation

The generally flat to slightly undulating topography has resulted in the in-situ formation of many of the soils, and a moderately predictable pedogenesis for the site, albeit that the retention of soil water within the vadose zone (lack of preferred horizontal flow) has resulted in the creation of an inhibiting layer (calcrete/ferricrete) within some of the soil profile and wetness features. This inhibiting layer or barrier to water movement enhances the inhibiting character to vertical flow within the profile, a factor that is considered important to the ecology and biodiversity of the area.

It is hypothesised that, the ferricrete layer (a hard, erosion-resistant layer of sediment rock) forms an inhibiting or restrictive layer that holds water within the soil profile and vadose zone, a factor that often results in the development of moderately extensive areas of wet based soils. The restriction of water movement vertically through the soil profile compounds the process of iron precipitation and the development of the evaporites, something common to the semi-arid environment.

The dominant soils classified are described in terms of their physical and chemical similarities and to some extent their topographic position and resultant pedogenesis, with their spatial distribution being of importance to the management recommendations.

The soils identified as part of the baseline assessment range from shallow sub-outcrop and outcrop of hard plinthite and parent materials (Sediments and intrusive dolerite) to moderately deep sandy loams and sandy clay loams, all of which are associated with either a rocky outcrop of sedimentary parent rock, or ferricrete/laterite "C" horizon at differing depths. The saprolitic horizons are generally quite thin, with soil occurring on hard bedrock in most instances mapped.

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

The shallow, to very shallow soil profiles are generally associated with an inhibiting layer at or close to surface is the defining feature that controls the ability (or not) of water to flow vertically down and through the profile (restrictive layer).

The degree to which the plinthite layer has been cemented (friability of the ferricrete) will determine the effectiveness of the layer as a barrier to infiltration, while the depth of overlying soil will dictate how easily or difficult it is for the soil water to be accessed by the fauna and flora, and in the extreme case weather water is held at surface as a pan.

The friability of the ferricrete will also have an effect on the amount of clay mineralisation that the soil contains within this horizon and will in turn influence the water holding characteristics of the soil and the degree of structure. In addition to the soil system of classification, a specific system has been developed for the describing and classification of ferricrete. This has been used to better understanding the land forms that result from ferricrete.

In contrast, the deeper and more sandy profiles, although associated with a similar lithological system have distinctly differing pedogenetic processes that are associated with lower clay contents, better drainage of the soils and a deeper weathering profile.



As with any natural system, the transition from one system to another is often complex with multiple facets and variations over relatively small/short distances. However, in simplifying the trends mapped, the following major soil groupings pertain:

- The deeper and more sandy loams are considered **High Potential** materials and are distinguished by the better than average depth of relatively free draining soil to a greater depth (> 1,200mm). This group are recognisable by the subtleness of the mottling (water within the profile for less than 30% of the season), are noted at greater depths within the profile (>500mm) and the land capability is rated as moderate intensity grazing and/or arable depending on their production potential
- In contrast, the shallower and more structured materials are considered to be more sensitive and will require greater management if disturbed. This group of shallower and more sensitive soils (< 500mm) are associated almost exclusively with the sub outcropping of the parent materials (Karoo Sediments) (geology) at surface and although they constitute a relatively small percentage of the overall area of study they have a relatively large and important function in the sustainability of the overall biodiversity of the area
- The third group of soils comprise those that are associated with the hard pan ferricrete layer and perched soil water. This group of soils have a set of distinctive characteristics and nature that are separated out due to their inherently much more difficult management characteristics. These soils are characterised by relatively much higher clay contents (often of a swelling nature), poor intake rates, poor drainage, generally poor liberation of soil water and a restricted depth – often due to the inhibiting barrier within the top 700mm of the soil profile. These soils will be more difficult to work in the wet state, store and re-instate at closure. This group of soils comprise the pan like structures and waterholes

#### 14.3.2 Soil chemical characteristics

Sampling of the soils for nutrient status was confined where possible to areas of undisturbed land. However, some of the better soil exposure is associated with land that has or could have been disturbed by farming activities. These results are representative indications of the pre-construction conditions, albeit that they are at best a reconnaissance representation of the baseline conditions and will need to be verified for particular sites as and when decommissioning and rehabilitation are considered.

The results of the laboratory analysis returned a variety of materials that range from very well sorted sandy loams with lower than average nutrient stores and moderate clay percentages (<20% - B2/1) to soils with a moderately stratified to weak blocky structure, sandy loam to clay loam texture and varying degrees of utilisable nutrient. The higher clay and more structured soils are generally confined to the lower slopes and depositional zone and associated with colluvial derived materials, while the wet based and wetland soils are confined to isolated midslope seepage areas and the alluvial flood plains.

The pH of the major soil forms ranges from acid at 5.8 to neutral and slightly alkaline at 7.5, a base status ranging from 3me% to 7me% (Eutrophic (slight leaching status) to Mesotrophic (moderate leaching status)), and nutrient levels reflecting generally high levels of calcium and sodium, but deficiencies in the levels of magnesium, potassium, phosphorous, copper, aluminium and zinc, with low stores of organic carbon matter.

The growth potential on soils with these nutrient characteristics is at best moderate to poor and additions of nutrient and compost are necessary if commercial returns are to be achieved from these soils. They are at best moderate to good grazing lands.

The more structured (moderate blocky) soils returned values that are indicative of the more iron rich materials and more basic lithologies. They are inherently high in iron and magnesium and low in potassium reserves and returned lower levels of zinc and phosphorous.

### 14.3.3 Soil physical characteristics

The majority of the soils mapped exhibit apedal to weak crumbly structure, low to moderate clay content and a dystrophic leaching status. The texture comprises sandy to silty sands for the most part, with much finer silty loams and clay loams associated with the colluvial and alluvial derived materials associated with the lower slope and bottom land stream and river environs.

Of significance to this study, and a feature that is moderately common across the site where the soils are associated with the sedimentary host rocks (albeit that it often occurs below the 1.5m auger depth on the deeper soils) is the presence of a hard pan ferricrete (plinthite) layer within the soil profile.

The semi-arid climate (negative water balance) combined with the geochemistry of the host rock geology are conducive to the formation of evaporites, with the development of ferruginous layers or zones within the vadose zone.

The accumulation of concentrations of iron and manganese rich fluids in the soil water will, in the presence of high evaporation result in the precipitation of the salts and metals within the soil profile. Over time, this process results in the development of a restrictive or inhibiting iron/magnesium rich layer/zone (cementing of the concretions into a hard pan ferricrete or Ouklip layer).

The negative water balance is evidenced by the generally low rainfall of 700mm/year or less, and the high evaporation that averages 1,350mm/year. These are the driving mechanisms behind the ouklip or hard pan ferricrete mapped.

The degree of hardness of the evaporite is gradational, with soft plinthic horizons (very friable and easily dug with a spade or shovel), through hard plinthite soil (varying in particle size from sand to gravel – but no cementation) to nodular and hard pan ferricrete or hard plinthic (cementation of iron and manganese into nodules) that are not possible to free dig or brake with a shovel.

This classification is taken from - Petrological and Geochemical Classification of Laterites -Yves Tardy, Jean-Lou, Novikoff and Claude Roquid, and forms the basis for classify the hard pan ferricrete or lateritic portion of the soil horizon in terms of its workability (engineering properties) and storage sensitivities.

The soil classification system takes cognisance of ferricrete and has specific nomenclature for these occurrences.

The variation in the consistency of the evaporite layer, its thickness and extent of influence across/under the site are all important to the concept of a restrictive horizon or barrier layer that is formed at the base of the soil profile and/or close to the soil surface. Where this horizon develops to a nodular form or harder (Nodular, Honeycomb and Hard Pan) the movement of water within the soil profile is restrict from vertical movement and is forced to move laterally or perch within the profile. It is this accumulation of soil water and the precipitation of the metals from the metal and salt rich water that adds progressively to the ferricrete layer over time.

Important to an understanding of the development of the ferricrete is the geological time they take to form and the presence of the specific soil and water chemistry under which the horizon forms. This situation will be very difficult to emulate or recreate if impacted or destroyed.

### 14.3.4 Soil erosion and compaction

Erodibility is defined as the vulnerability or susceptibility of a soil to erosion. It is a function of both the physical characteristics of a particular soil as well as the treatment of the soil and the topographic slope.

The resistance to, or ease of erosion of a soil is expressed by an erodibility factor ("K"), which is determined from soil texture/clay content, permeability, organic matter content and soil structure. The Soil Erodibility Nomograph (Wischmeier et al, 1971) was used to calculate the "K" value.

With the "K" value in hand, the index of erosion (I.O.E.) for a soil can then be determined by multiplying the "K" value by the "slope" measured as a percentage. Erosion problems may be experienced when the Index of Erosion (I.O.E) is greater than 2.

The majority of the soils mapped can be classified as having a moderate to high erodibility index in terms of their organic carbon content and texture (clay content), albeit that this rating is off-set and tempered by the undulating to flat terrain to an index of moderate or resistant.

However, the vulnerability of the "B" horizon to erosion once the topsoil and/or vegetation is removed must not be underestimated when working with or on these soils. These horizons (B2/1) are vulnerable and rate as medium to high when exposed.

The concerns around erosion and inter alia compaction, are directly related to the disturbance of the protective vegetation cover and topsoil that will be disturbed during any construction and operational phases of a mining venture. Once disturbed, the effects and actions of wind and water are increased.

Loss of soil (topsoil and subsoil) is extremely costly to any operation and is generally only evident at closure or when rehabilitation operations are compromised, while the impact of sedimentation on the receiving environment and the streams, dams and rivers in particular is detrimental to the systems health and functionality.

Well planned management actions during the planning, construction and operational phases will save time and money in the long run and will have an impact on the ability to successfully "close" an operation once completed. International guidelines for best practice and the IFC, require that erosion is managed and that the receiving environment is protected.

#### **14.3.5 Land capability and land use**

The area to be disturbed by the proposed project comprises a range of land capability classes, with significant areas of friable and good grazing potential class soil, smaller but highly sensitive sites that returned wet based soils, and a significant area of highly structured and sensitive materials that occur within the planned development footprint. These colluvial derived soils are at best considered to have a low intensity grazing land potential or wilderness status. The underground workings are overlain by the full suite of soil sensitivities and land capability, with a significantly large spatial area of the highly sensitive wetland soil ratings associated with the rivers and associated transition zone wet based soils, sensitive to moderately sensitive sandy loams and sandy clay loams associated with the middle and upper midslope positions and the more sensitive to high sensitivity shallow soils associated with the ridge slopes and erosive environment.

##### **Arable land**

There are little to no grazing land potential soils associated with this area. Although some soil depths are reflective of a arable status (>750mm), the growth potential (nutrient status and soil water capabilities) and ability of these soils to return a cropping yield equal to or better than the national average is lacking. This is due mainly to the poor rainfall. These variables reflect the natural conditions, and do not include any man induced additives such as fertilizers or water.

##### **Grazing land**

The classification of grazing land is generally confined to the shallower and transitional zones that are well drained. These soils are generally darker in colour and are not always free draining to a depth of 750mm but are capable of sustaining palatable plant species on a sustainable basis, especially since

only the subsoil's (at a depth of >500mm) are periodically wetted. In addition, there should be no rocks or pedocrete fragments in the upper horizons of this soil group. If present it will limit the land capability to wilderness land.

The majority of the study area classifies as low intensity grazing land or wilderness status.

### **Wilderness / conservation land**

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

### **Wetland (areas with wetland status soils)**

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

These zones (wetlands) are dominated by hydromorphic soils (wet based) that often show signs of structure and have plant life (vegetation) that is associated with seasonal wetting or permanent wetting of the soil profile (separate study).

The wetland soils are generally characterised by dark grey to black (organic carbon) in the topsoil horizons and are often high in transported clays and show variegated signs of mottling on gleyed backgrounds (pale grey colours) in the subsoils. Wetland soils occur within the zone of soil water influence.

A significant but relatively small proportion of the study area classifies as having wet based soils. However, it is important to note that a significantly large area of the open pit and infrastructure development being planned encroaches on soils with a wet base.

These should not be mistaken as wetlands in terms of the delineation but should be highlighted as potential zones of sensitivity with the potential for highly sensitive areas associated with the prominent waterway that cross-cut the mining development.

These zones are considered very important, highly sensitive and vulnerable due to their ability to contain and hold water for periods through the summers and into the dry winter seasons.

## 14.4 Biodiversity

The information presented in this section is extracted from the specialist Biodiversity undertaken by EkoInfo cc in 2015 (Appendix G3)

### 14.4.1 Flora

An original biodiversity assessment was conducted in 2002 and subsequently updated in 2013 and 2015. The original data and results from the November 2002 study are provided as is, while the February 2013 study expanded on it. The objective of the current September 2015 survey was to update the results from the previous surveys (2002 and 2013), in terms of recent changes in spatial and species data.

#### November 2002 survey

The survey was done during November 2002. This falls within the optimal period for vegetation surveys in the summer rainfall region between November and March. Rainfall was late, resulting in a poorly developed grasslayer, which hampered identification. The Braun-Blanquet approach was applied, which is the phytosociological standard for vegetation surveys in South Africa.

The TWINSPLAN analysis and Braun-Blanquet table confirmed the presence of two plant communities and four sub communities, of which only the community stands that correspond with the soil map were mapped. The two communities and four sub communities are:

- *Verbena bonariensis* - *Eragrostis plana* Grassland community on coarse textured soils
  - *Verbena bonariensis* - *Eragrostis plana* - *Eragrostis gummiflua* Sub-community in drier, high lying areas on sandy soils
  - *Verbena bonariensis* - *Eragrostis plana* - *Cirsium vulgare* Sub-community in moist, low lying areas on sandy loam soils
- *Themeda triandra* - *Senecio erubescens* Grassland community on fine textured soils
  - *Themeda triandra* - *Senecio erubescens* - *Hermannia transvaalensis* Sub-community in drier, rocky, high lying areas on loamy sand soils
  - *Themeda triandra* - *Senecio erubescens* - *Ranunculus multifidus* Sub-community in moist, low lying areas on sandy clay soils

Soil texture, altitude and human influence determine the distribution and condition of these two communities and their sub communities.

#### Dominant Species

A total of 182 species was recorded during the survey of which 18% are grasses, 79% forbs (cumulative), 4% sedges and 5% woody (cumulative).

The following species had an abundance cover of 25% or more in the different variations (grasses, forbs, sedges and woody species):

- *Verbena bonariensis* - *Eragrostis plana* - *Eragrostis gummiflua* Sub-community in drier, high lying areas on sandy soils;

Grasses	Forbs	Sedges	Woody species
<i>Cynodon dactylon</i>	<i>Hypochoeris radicata</i>	None	<i>Stoebe vulgaris</i>
<i>Eragrostis chloromelas</i>			
<i>Eragrostis curvula</i>			
<i>Eragrostis gummiflua</i>			

Grasses	Forbs	Sedges	Woody species
<i>Eragrostis micrantha</i> <i>Eragrostis plana</i> <i>Helictotrichon turgidulum</i> <i>Hyparrhenia hirta</i> <i>Imperata cylindrica</i> <i>Paspalum scrobiculatum</i>			

- *Verbena bonariensis* - *Eragrostis plana* - *Cirsium vulgare* Sub-community in moist, low-lying areas on sandy loam soils;

Grasses	Forbs	Sedges	Woody species
<i>Eragrostis curvula</i> <i>Eragrostis plana</i>	<i>Cirsium vulgare</i>	None	None

- *Themeda triandra* - *Senecio erubescens* - *Hermannia transvaalensis* Sub-community in drier, rocky, high lying areas on loamy sand soils; and

Grasses	Forbs	Sedges	Woody species
<i>Hyparrhenia hirta</i> <i>Themeda triandra</i> <i>Tristachya eucothrix</i>	<i>Berkheya carlinopsis</i>		<i>Diospyros lycioides</i> <i>Erythrina zeyheri</i> <i>Gnidia caffra</i> <i>Rhus krebsiana</i> <i>Rhus pentheri</i> <i>Stoebe vulgaris</i>

- *Themeda triandra* - *Senecio erubescens* - *Ranunculus multifidus* Sub-community in moist, low lying areas on sandy clay soils.

Grasses	Forbs	Sedges	Woody species
<i>Bromus catharticus</i> <i>Cynodon dactylon</i> <i>Elionurus muticus</i> <i>Eragrostis curvula</i> <i>Eragrostis plana</i> <i>Themeda triandra</i>	<i>Crinum bulbispermum</i> <i>Ipomoea aquatica</i> <i>Ranunculus multifidus</i> <i>Scabiosa columbaria</i> <i>Senecio erubescens</i>	<i>Eleocharis dregeana</i>	<i>Gomphocarpus fruticosus</i>

### Endangered or rare species

Flora in South Africa is given a conservation status on two levels. Nationally in terms of red data status and provincially in terms of protected species. Red data flora includes those species considered to be threatened on a national level through either over-exploitation or habitat destruction but also include species with very limited distribution or low densities. These species are also very difficult to identify and known to but a few specialists or interested individuals. Protected species involve those species, which are exploited commercially for their medicinal or collectors value, are easily identified and known to more individuals. Theoretically the protected species list should include all red data species known to occur in the relevant province. To compensate for the fact that this would make the list very cumbersome and that these species are difficult to identify, genera or families known to contain many red data species are also included.

### Red data flora

In the absence of a single authoritative list of Red Data Flora for the study area, a list was derived by comparing the PRECIS list of previously recorded species in the area and the actual species list of



the current survey, with the preliminary Red Data Flora list from Mpumalanga's Directorate Nature Conservation and the regional SABONET Red Data Flora list. From this comparison a list of four species, which occur in the grasslands of the study area, was obtained. The four species are *Nerine gracilis* R.A.Dyer (Family: *Amaryllidaceae*, Conservation status: Vulnerable), *Boophane disticha* (L.f.) Herb. (Family: *Amaryllidaceae*, Conservation status Near Threatened), *Eucomis autumnalis* (Mill.) Chitt. subsp. *clavata* (Baker) Reyneke (Family: *Hyacinthaceae*, Conservation status: Near Threatened) and *Hypoxis hemerocallidea* Fisch. & C.A.Mey. (Family: *Hypoxidaceae*, Conservation status: Near Threatened)

Of the four potential red data species only one near threatened species were recorded during the survey. It was the geophyte *Hypoxis hemerocallidea* Fisch. & C.A.Mey. It should be noted that *Hypoxis hemerocallidea* is a flagship species for the Grassland Biome.

### Protected species

A comparison of the survey species list and the Mpumalanga Conservation Act's list of protected flora indicated that the following species recorded during the survey have protected status:

1. *Crinum bulbispermum* (Burm.f.) Milne-Redh. & Schweick
2. *Cyrtanthus tuckii*
3. *Gladiolus crassifolius* Baker
4. *Gladiolus longicollis* Baker var. *longicollis*

It should be noted that all of the species from the three genera *Gladiolus*, *Crinum* and *Cyrtanthus* are protected in terms of the Mpumalanga Conservation Act's list of protected flora.

A remarkable stand of *Crinum bulbispermum* was observed in the northeastern corner of the study area in association with a large floodplain. Another protected species, which was seen during the surveys but did not occur in any of the plots, was the geophyte *Haemanthus montanus*. All species of the genus *Haemanthus* is also protected in terms of the Mpumalanga Conservation Act.

### Intruder or exotic species

The following two declared weeds and/ invasive species were recorded during the survey within the actual plots:

1. *Cirsium vulgare* (Savi) Ten. (= *C. lanceolatum* Scop.) (Scotch thistle, Spear thistle); and
2. *Solanum elaeagnifolium* Cav. (Silver-leaf bitter apple).

Both these species are declared weeds within category one, which mean they serve no useful economic purpose, and possess characteristics that are harmful to humans, animals or the environment.

Outside these plots, along the roads, along the skylines and on the fringes of the drainage lines, the presence of the following exotic trees were noticed:

- Wattles (*Acacia species*);
- Bluegums (*Eucalyptus species*); and
- Weeping willow (*Salix babylonica* L.).

### February 2013 survey

An additional 12 plots were surveyed during February 2013 mainly within the areas beyond the original extent.

The results from the November 2002 study was used to classify the vegetation in conjunction with recently available Landsat 8 satellite imagery from April 2013.

Based on this refined classification, most of the Elders Colliery proposed infrastructure footprint is located within a transformed fragmented area.

With regards to species of concern (Red Data, protected, medicinal), five (5) species threatened Red Data plants which have been recorded within the topocadastral grids associated with the study (Vulnerable, Endangered, Critical Endangered) namely:

- *Anacampseros subnuda* Poelln. subsp. *lubbersii* (Bleck) Gerbaulet (Vulnerable),
- *Frithia humilis* Burgoyne (Endangered),
- *Khadia carolinensis* (L.Bolus) L.Bolus (Vulnerable),
- *Nerine gracilis* R.A.Dyer (Vulnerable), and
- *Pachycarpus suaveolens* (Schltr.) Nicholas & Goyder (Vulnerable) had been.

The probability of the occurrence of species of concern is low for the Elders footprint area.

Therefore based on the November 2002 results plus the latest national and regional assessments, the ecological sensitivity of the two vegetation communities were adjusted to high for the *Verbena bonariensis* - *Eragrostis plana* Grassland community on coarse textured soils and very high for the *Themeda triandra* - *Senecio erubescens* Grassland community on fine textured soils.

### September 2015 update survey

Since the February 2013 report, the Red Data flora list had been updated in September 2015; however a comparison of the 2009 list and the current 2015 list indicated no change with regards to the expected threatened Red Data plants to be expected within the study area. Therefore the *status quo* remains with regards to the ecosystem diversity and species diversity. However in October 2014, the National Environmental Management Biodiversity Act's alien invasive regulations were updated and three recorded species previously excluded, was included and needs to be eradicated, especially the **pompom weed** (Category 1b) should be prioritised.

During the September 2015 site visit, it was noticed that the remaining patches vegetation (natural or pastures) in the new location of the non-linear infrastructure (mining complex) correlates with wetland conditions, which would explain why they had not been ploughed.

## 14.4.2 Fauna

A Fauna assessment was conducted in 2013 as well as updated in 2015. During the assessments conducted the following faunal groups were analysed:

### Dragonflies and damselflies

- Butterflies;
- Frogs;
- Reptiles;
- Birds; and
- Terrestrial Mammals.

### Red data fauna assessment

A total of 153 Red Data animals are known to occur in Mpumalanga (dragonflies, damselflies, butterflies, frogs, reptiles, birds and mammals). The following conservation categories are included:

- 22 species are listed as Data Deficient (DD);
- 65 species are listed as Near Threatened (NT);
- 43 species are listed as Vulnerable (VU);

- 16 species are listed as Endangered (EN);
- 7 species are listed as Critically Endangered (CR); and
- 1 species is listed as Extinct.

Estimated Probability of Occurrence (PoC) of the Red Data fauna assessment is based on:

- The size of the study area;
- The location of the study area;
- The diversity and status of each faunal habitat within the study area; and
- The connectivity of the study area to other untransformed faunal habitats.

An assessment of the PoC for these animals yielded the following probabilities:

- 101 species have a low PoC;
- 9 species have a moderate-low PoC;
- 17 species have a moderate PoC;
- 6 species have a moderate-high PoC; and
- 12 species have a high PoC.

Eight red data species were recorded in the study area during the survey period.

### Local Context

The presence of 172 animal species was confirmed during the 2013 summer investigation. The following results were recorded:

- 33 invertebrate species;
- 9 frog species;
- 8 reptile species;
- 99 bird species; and
- 23 mammals.

The diversity of animals recorded in the study area included eight Red Data species, namely:

- Greater Flamingo (*Phoenicopterus ruber Linnaeus, 1758*);
- Blue Korhaan (*Eupodotis caerulea* (Vieillot, 1820));
- African Grass-Owl (*Tyto capensis* (A. Smith, 1834));
- Melodius Lark (*Mirafra cheniana* Smith, 1843);
- Serval (*Leptailurus serval* (Schreber, 1776));
- Leopard (*Panthera pardus* (Linnaeus, 1758));
- Brown Hyena (*Parahyaena brunnea* (Thunberg, 1820)); and
- Honey Badger (*Mellivora capensis* (Schreber, 1776)).

The diversity of animals recorded in the study area included 83 Provincially Protected species and one Alien and Invasive species, namely the Spotted Maize Beetle (*Astylus atromaculatus*).

## September 2015 update survey

### Invertebrates:

Forty-eight invertebrate species are known from the study area, including seven dragonflies and damselflies, one termite, two grasshoppers, one antlion, six beetles, twenty-eight butterflies and one bee. Fifteen of the species are known from desktop only, twenty-seven of the species from field observations only and six species from both desktop and field observations. No red data invertebrates are included in the list of forty-eight species. One alien and invasive species was found to occur.

### **Herpetofauna:**

Thirty-nine herpetofauna species are known from the study area, including three toads, thirteen frogs, seventeen snakes, one agama, two skinks, two geckos and one monitor. Twenty-two of the species are known from desktop only, two of the species from field observations only and fifteen species from both desktop and field observations. No red data herpetofauna are included in the list of thirty-nine species.

### **Birds:**

Two hundred and seven bird species (Table 25) are known from the study area. The list includes birds from sixteen orders and fifty-six families. One hundred and five of the species are known from desktop only, one of the species from field observations only and one hundred and one species from both desktop and field observations. The birds known from the study area includes eleven red data species:

- Greater Flamingo – Near Threatened;
- Lesser Flamingo – Near Threatened;
- Southern Bald Ibis - Vulnerable;
- Secretarybird – Near Threatened;
- African Marsh-Harrier - Vulnerable;
- Lanner Falcon – Near Threatened;
- Lesser Kestrel - Vulnerable;
- Blue Korhaan – Near Threatened;
- Black-winged Pratincole – Near Threatened;
- African Grass-Owl - Vulnerable; and
- Melodious Lark – Near Threatened.

The birds of the study area also include two alien and invasive species:

- Rock Dove; and
- Common Myna.

### **Mammals:**

Forty-five mammal species (Table 26) are known from the study area. The list includes four insectivores, one hare, nine rodents, seventeen carnivores, one tubulidentate, one hyrax, two pigs and ten bovids. Sixteen of the species are known from desktop only, twelve of the species from field observations only and seventeen species from both desktop and field observations. The mammals known from the study area includes nine red data species:

- Southern African Hedgehog – Near Threatened;
- Swamp Musk Shrew – Data Deficient;
- Dark-footed Forest Shrew – Data Deficient;
- Forest Shrew – Data Deficient;
- Serval – Near Threatened;
- Leopard – Near Threatened;
- Brown Hyaena;
- Honey Badger; and
- Oribi.

## 14.5 Noise

*The information presented in this section is extracted from the specialist Noise study compiled by FMAC in 2015 (Appendix G4)*

### 14.5.1 Baseline noise

The current ambient noise levels in the Elders Colliery Project area are dominated by noise emissions from road traffic on the R35. This is particularly disturbing for the settlement north of the proposed Elders Colliery and a farmstead located south-west of the Colliery. Surrounding mines in the area also contribute to the current ambient noise levels, however much less than previously, as many mines have since closed down.

At the settlement, the current ambient noise levels range from approximately 45 dBA and 55 dBA during day-time and between 40 dBA and 50 dBA during night-time. The day-time noise levels fall within the SANS 10103 levels for urban districts and World Health Organisation (WHO) recommendations for residential areas. However, current ambient night-time noise levels of 50 dBA exceed SANS 10103 and WHO by 5 dBA, largely due to the close proximity of the settlement to the R35 and the road traffic emissions.

At the farmstead, the current ambient noise levels range from 45 dBA during day-time and between 35 dBA and 40 dBA during night-time. These measurements fall within WHO recommended limits of 55 dBA for day-time and 45 dBA night-time, as well as fall within the SANS 10103 guidelines of 45 dBA day-time and 35 dBA night-time noise levels (FMAC, 2015).

The results of the baseline noise measurements are summarised in Table 14-4 and Table 14-5. The detailed measurement results are given in Appendix D to this report.

**Table 14-4: Summary of the baseline noise measurement results: Day-time**

Point	Start Time	L <sub>Aeq</sub> (20 min) dBA	L <sub>A90</sub> dBA	L <sub>Aeq</sub> – L <sub>A90</sub> dB	Comments
P1	06/09/2015 11:44	34.4	27.4	7.0	Overcast. Birdsong in the fields. Children laughing in the settlement. Traffic on R35 audible.
P2	06/09/2015 13:05	36.2	30.0	6.2	Overcast. R35 audible in distance as a constant hum. Line of sight onto road. Occasional birdcalls.
P3	06/09/2015 12:30	30.6	24.2	6.4	Overcast. R35 audible in distance as a constant hum. Bird song in the nearby trees.
<b>Averages</b>		33.7	27.2	6.5	-

**Table 14-5: Summary of the baseline noise measurement results: Night-time**

Point	Start Time	L <sub>Aeq</sub> (20 min) dBA	L <sub>A90</sub> dBA	L <sub>Aeq</sub> – L <sub>A90</sub> dB	Comments
P1	06/09/2015 23:28	36.7	20.5	16.2	Clear skies with dense fog in lower lying areas and riverbeds. Occasional birdcalls. R35 audible in the distance. Very quiet when there is no traffic. Occasionally dogs barking in the settlement.

Point	Start Time	LAeq (20 min) dBA	LA90 dBA	LAeq – LA90 dB	Comments
P2	07/09/2015 00:04	34.2	17.0	17.2	Dogs howling, donkey braying afar. R35 audible, constant hum. Assortment of night birds calling. Clear skies but dense fog in lower lying areas and riverbeds. Cattle bellowing in the distance.
P3	07/09/2015 00:34	30.2	18.3	11.9	Clear skies with dense fog. R35 audible in the distance. Occasional bird calls. Donkey braying in the distance.
<b>Averages</b>		33.7	18.6	15.1	-

The following remarks apply to the results given in Table 14-4 and Table 14-5:

- The comments confirm that road traffic on the R35 provide a major source of noise in the area, although the detailed results show that during night-time it manifests more in terms of separated single events
- The measured LAeq (20 min) taken during day- and night-time are very much comparable
- However, the concurrently measured night-time LA90 are significantly lower than during day-time, the average difference being 15.1 dB compared to 6.5 dB during day-time. This indicates that noise single events, such as described in the comments and reflected in the detailed results, had a marked effect on the measured LAeq
- If it is assumed that in the absence of marked single noise events the typical difference between a measured LAeq and concurrent LA90 is 7 dB then the reference baseline ambient LAeq become 34.2 dBA and 25.6 dBA for day- and night-times, respectively
- Therefore, it is recommended that the reference noise levels onto which the noise emissions from the proposed Elders Colliery are projected be 34 dBA and 26 dBA for day- and night-times, respectively

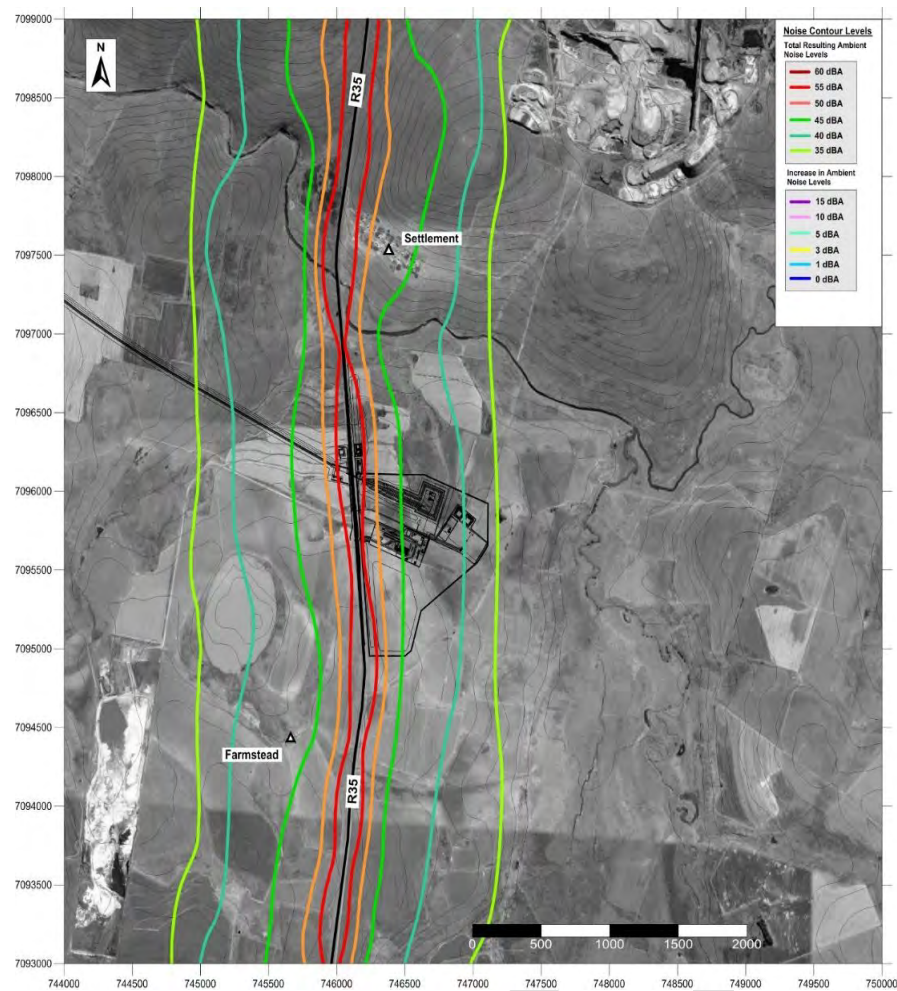
### 14.5.2 Current noise sources

During the site visit and from the previous noise study <sup>1</sup> it was clear that road traffic on the R35 is the dominant source of noise in the environment of the proposed Elders Colliery Project. Therefore, the noise emission levels caused by road traffic on the R35 were calculated for typical day- and night-time traffic flow conditions.

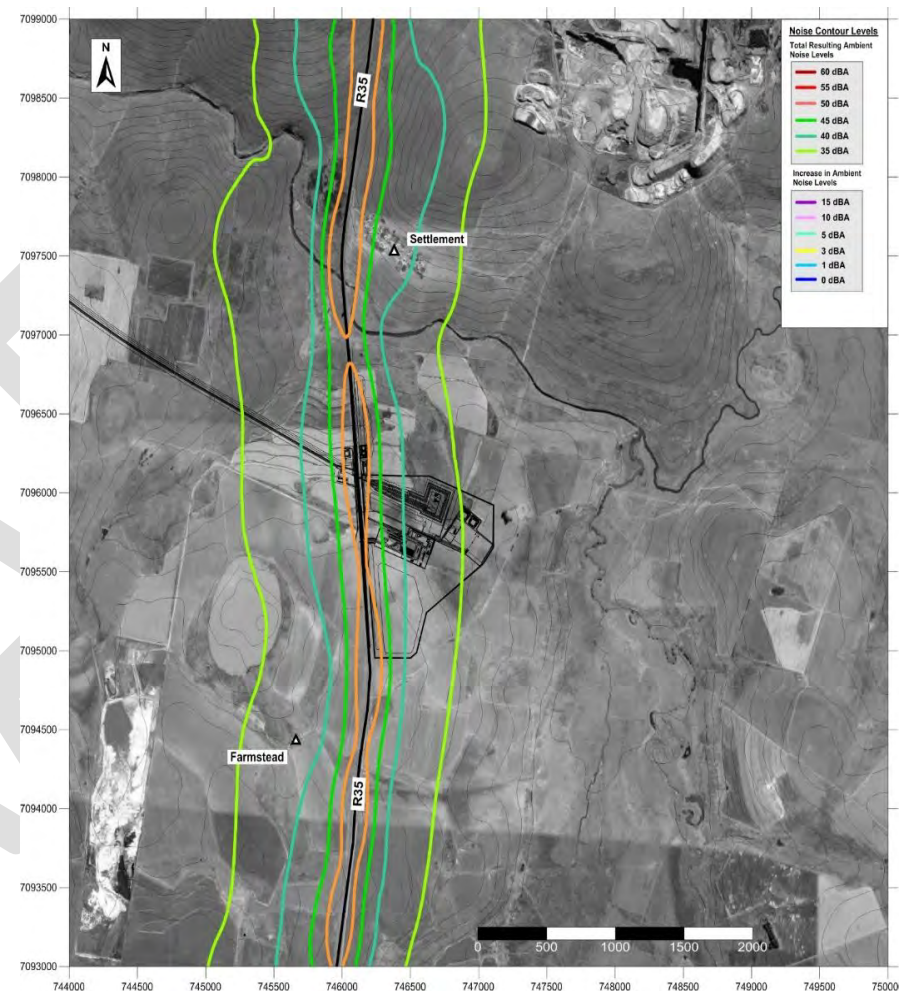
The following comments are based on the calculated current ambient noise levels as indicated in Figure 14-4 and Figure 14-5:

- At the settlement the current ambient noise levels range from approximately 45 dBA to 55 dBA and from approximately 40 dBA to 50 dBA during day- and night- time, respectively
- The day-time noise levels fall within the 55 dBA listed by SANS 10103 for 'urban districts' and the recommendation by the World Health Organisation (WHO) or residential areas
- For night-time the corresponding SANS 10103 and WHO noise level is 45 dBA. Therefore, there is an excess of approximately 5 dB for the settlement properties in close proximity to the R35. It must be stressed that this excess is solely due to the noise emissions from road traffic on the R35
- At the farmstead the current ambient noise level is below 45 dBA and between 35 dBA and 40 dBA during day- and night- time, respectively
- This falls well within the recommended limits of 55 dBA and 45 dBA of the WHO 9 for the day- and night-time, respectively. In terms of SANS 10103 this compares well with the 45 dBA and 35 dBA listed as typical for 'rural districts' for these time periods. Again, it must be stressed that the excess over 35 dBA is caused by the noise emissions from road traffic on the R35 alone





**Figure 14-4: Contours of the calculated day-time ambient noise levels for the R35 road**



**Figure 14-5: Contours of the calculated night-time ambient noise levels for the R35 road**

## 14.6 Blasting

*The information presented in this section is extracted from the specialist Blasting study compiled by Blasting Management and Consulting in 2015 (Appendix G5)*

Blasting operations have effect to its surroundings. These effects can manifest in the form of ground vibration, air blast, fumes, fly rock etc. The application of explosives breaking rock will always have a positive and negative manifestation of different energies. It is the effects that have negative outcome that we concentrate on and that will need to be managed. The following sections address the reason, prediction, modelling and control on aspects like ground vibration, air blast, fly rock and fumes.

### 14.6.1 Ground vibration

Explosives are used to break rock through the shock waves and gasses yielded from the explosion. Ground vibration is a natural result from blasting activities. The far field vibrations are inevitable, but un-desirable by products of blasting operations. The shock wave energy that travels beyond the zone of rock breakage is wasted and could cause damage and annoyance. The level or intensity of these far field vibration is however dependant on various factors. Some of these factors can be controlled to yield desired levels of ground vibration and still produce enough rock breakage energy.

Factors influencing ground vibration are the charge mass per delay, distance from the blast, the delay period and the geometry of the blast. These factors are controlled by planned design and proper blast preparation.

The larger the charge mass per delay - not the total mass of the blast, the greater the vibration energy yielded. Blasts are timed to produce effective relief and rock movement for successful breakage of the rock. A certain quantity of holes will detonate within the same time frame or delay and it is the maximum total explosive mass per such delay that will have the greatest influence. All calculations are based on the maximum charge detonating on a specific delay.

Secondly is the distance between the blast and the point of interest / concern. Ground vibrations attenuate over distance at a rate determined by the mass per delay, timing and geology. Each geological interface a shock wave encounters will reduce the vibration energy due to reflections of the shock wave. Closer to the blast will yield high levels and further from the blast will yield lower levels.

Thirdly the geology of the blast medium and surroundings has influences as well. High density materials have high shock wave transferability where low density materials have low transferability of the shock waves. Solid rock, i.e. norite, will yield higher levels of ground vibration than sand for the same distance and charge mass. The precise geology in the path of a shock wave cannot be observed easily, but can be tested for if necessary, in typical signature trace studies.

### Ground vibration limitations on structures

Limitations on ground vibration are in the form of maximum allowable levels or intensity for different installations and / or structures. There are no specific South African standards or criteria for safe ground vibration levels. Ground vibration limits are dependent on the intensity and frequency of the ground vibration.

Currently the United States Bureau of Mines (USBM) criterion for safe blasting is applied as an industry standard where private structures are of concern. This is a process of evaluating the vibration amplitudes and frequency of the vibrations according to set rules for preventing damage. The vibration amplitudes and frequency are then plotted on a graph. Low frequency of ground vibration will allow for low levels of ground vibration and high levels of ground vibration will allow for high levels of ground

vibration. Table 14-6 below shows a graph of the USBM analysis for safe ground vibration levels. Data is inserted to demonstrate typical results. The graph indicates two main areas:

- Safe ground vibration levels: Analysed data is displayed in the bottom half of the graph; and
- Unsafe ground vibration levels: Analysed data is displayed in the top half of the graph.



**Figure 14-6: USBM Analysis Graph**

Additional limitations that should be considered are as follows, these were determined through research and various institutions:

- National Roads/Tar Roads: 150 mm/s;
- Steel pipelines: 50 mm/s;
- Electrical Lines: 75 mm/s;
- Railway: 150 mm/s;
- Concrete aged less than 3 days: 5 mm/s;
- Concrete after 10 days: 200 mm/s; and
- Sensitive Plant equipment: 12 mm/s or 25 mm/s depending on type – some switches could trip at levels less than 25 mm/s.

Considering the above limitations, BM&C work is based on the following:

- USBM criteria for safe blasting;
- The additional limitations provided;
- Consideration of private structures;
- Should these structures be in poor condition is the basic limit of 25 mm/s reduced to 12.5 mm/s or even when structures are in very poor condition limits will be restricted to 6 mm/s; and
- We also consider the input from other consultants in the field locally and internationally.

## Ground vibration limitations with regards to human perceptions

A further aspect of ground vibration and frequency of vibration is the human perception. It should be realized that the legal limit for structures is significantly greater than the comfort zones for people. Humans and animals are sensitive to ground vibration and vibration of the structures. Research has shown that humans will respond to different levels of ground vibration and at different frequencies.

Ground vibration is experienced as “Perceptible”, “Unpleasant” and “Intolerable” (only to name three of the five levels tested) at different vibration levels for different frequencies. This is indicative of the human’s perceptions on ground vibration and clearly indicates that humans are sensitive to ground vibration. This “tool” is only a guideline and helps with managing ground vibration and the respective complaints that people could have due to blast induced ground vibrations. Humans already perceive ground vibration levels of 4.5 mm/s as unpleasant. (See Figure 14-7).

Generally people also assume that any vibrations of the structure - windows or roofs rattling - will cause damage to the structure. Air blast also induces vibration of the structure and is the cause of nine out of ten complaints.

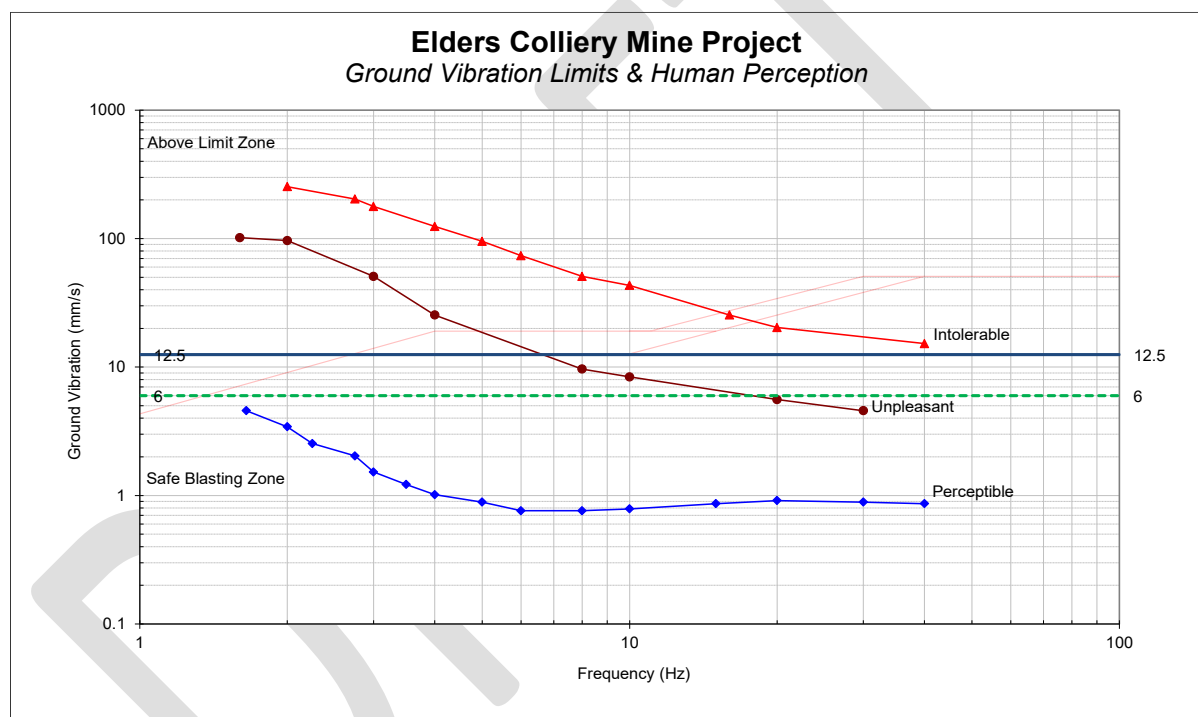


Figure 14-7: USBM Analysis with Human Perception

### 14.6.2 Air blast

Air blast or air-overpressure is pressure acting and should not be confused with sound that is within audible range (detected by the human ear). Sound is also a build up from pressure but is at a completely different frequency to air blast. Air blast is normally associated with frequency levels less than 20 Hz, which is the threshold for hearing. Air blast is the direct result from the blast process although influenced by meteorological conditions the final blast layout, timing, stemming, accessories used, covered or not covered etc. all has an influence on the outcome of the result.

The three main causes of air blasts can be observed as:

- Direct rock displacement at the blast; the air pressure pulse (APP);
- Vibrating ground some distance away from the blast; rock pressure pulse (RPP); and
- Venting of blast holes or blowouts; the gas release pulse (GRP).



## Air blast limitations on structures

The recommended limit for air blast currently applied in South Africa is 134dB. This is specifically pertaining to air blast or otherwise known as air-overpressure. This takes into consideration where public is of concern. Air-overpressure is pressure acting and should not be confused with sound that is within audible range (detected by the human ear). However, all attempts should be made to keep air blast levels generated from blasting operations below 120dB or greater magnitude toward critical areas where public is of concern. This will ensure that the minimum amount of disturbance is generated towards the critical areas surrounding the mining area.

Based on work carried out by Siskind *et.al.* (1980), monitored air blast amplitudes up to 135dB are safe for structures, provided the monitoring instrument is sensitive to low frequencies (down to 1Hz). Persson *et.al.* (1994) have published the following estimates of damage thresholds based on empirical data (Table 14-6). Levels given in Table 14-6 are at the point of measurement. The weakest point on a structure is the windows and ceilings.

**Table 14-6: Damage Limits for Air Blast**

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

All attempts should be made to keep air blast levels generated from blasting operations well below 120dB where public is of concern. This will ensure that the minimum amount of disturbance is generated towards the critical areas surrounding the mining area and limit the possibility of complaints due to the secondary effects from air blast.

## Air blast limitations with regards to human perceptions

Considering the human perception and misunderstanding that could occur between ground vibration and air blast, BM&C generally recommends that blasting be done in such a way that air blast levels is kept below 120dB. In this way it is certain that fewer complaints will be received for blasting operations. The effects on structures that startled people are significantly less – thus no reason for complaining. It is the actual influence on structures like rattling of windows or doors or large roof surface's that startle people. These effects are sometimes misjudged as ground vibration and considered as damaging to the structure.

Initial limits for evaluating conditions have been set at 120dB, 120 dB to 134dB and greater than 134dB. USBM limits are 134dB for nuisance, at this level 5% of residents would be expected to complain, because they are startled and frightened; even 120dB could sometimes lead to rattling windows, feelings of annoyance and fright.

## Air blast prediction

An aspect that is not normally considered as pre-operation definable is the effect of air blast. This is mainly due to the fact that air blast is an aspect that can be controlled to a great degree by applying basic rules. Air blast is the direct result from the blast process, although influenced by meteorological conditions, the final blast layout, timing, stemming, accessories used, covered or not covered etc. all has an influence on the outcome of the result.

Standards do exist and predictions can be made, but it must be taken in to account that predictions of air blast are most effective only when measured and calibrated according to the circumstances where blasting is taking place. Measured data showed significant variations due to changing meteorological

conditions. It was decided to rather apply the basic standard prediction method for air blast prediction and not using the recorded data.

Table 14-7 below is a summary of values predicted according to Equation 2. Figure 14-8 shows the graphical relationship for air blast as set out in Table 14-7.

**Table 14-7: Air Blast Predicted Values**

No.	Distance (m)	Air blast (dB) for 195 kg Charge	Air blast (dB) for 1570 kg Charge
1	50.0	143	150
2	100.0	138	146
3	150.0	131	138
4	200.0	128	135
5	250.0	126	133
6	300.0	124	131
7	400.0	121	128
8	500.0	119	126
9	600.0	117	124
10	700.0	115	122
11	800.0	114	121
12	900.0	112	120
13	1000.0	111	119
14	1250.0	109	116
15	1500.0	107	114
16	1750.0	105	113
17	2000.0	104	111
18	2500.0	102	109
19	3000.0	100	107
20	3500.0	98	106





**Figure 14-8: Predicted air blast levels**

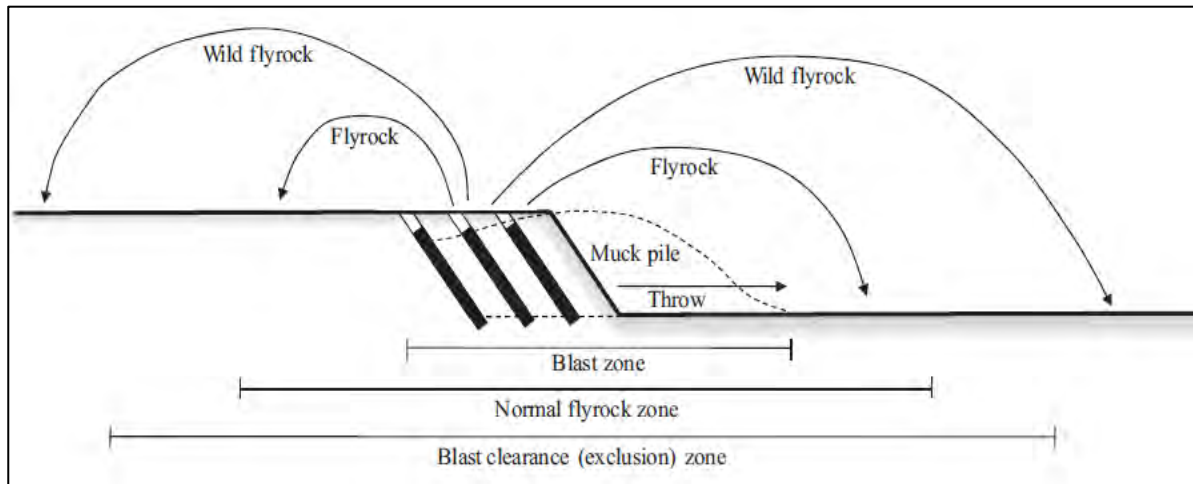
### 14.6.3 Fly rock

Blasting practices require some movement of rock to facilitate the excavation process. The extent of movement is dependent on the scale and type of operation. For example, blasting activities within large coal mines are designed to cast the blasted material much greater distances than practices in a quarrying or hard rock operations. This movement should be in the direction of the free face, and therefore the orientation of the blasting is important. Material or elements travelling outside of this expected range may be considered to be fly rock.

Fly rock can be explained and defined in the following three categories:

- Throw - the planned forward movement of rock fragments that form the muck pile within the blast zone;
- Fly rock - the undesired propulsion of rock fragments through the air or along the ground beyond the blast zone by the force of the explosion that is contained within the blast clearance (exclusion) zone. Fly rock using this definition, while undesirable, is only a safety hazard if a breach of the blast clearance (exclusion) zone occurs; and
- Wild fly rock - the unexpected propulsion of rock fragments, when there is some abnormality in a blast or a rock mass, which travels beyond the blast clearance (exclusion) zone.

Figure 14-9 below shows the schematic fly rock terminology.



**Figure 14-9: Schematic of fly rock terminology**

### Fly rock causes

Fly rock from blasting can result from the following conditions:

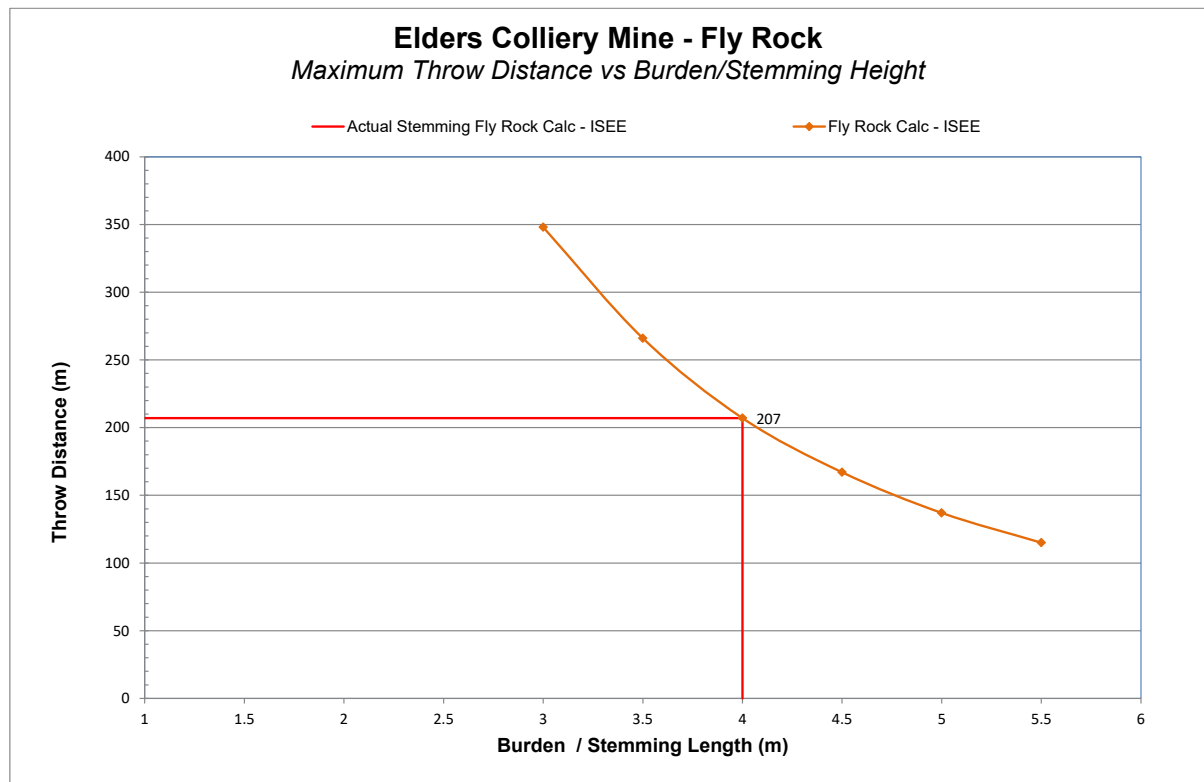
- When burdens are too small rock elements can be propelled out of the free face area of the blast;
- Rock elements can be forced upwards creating a crater forming fly rock when burdens are too large and movement of blast material is restricted and stemming length is not correct; and
- If the stemming material is of improper quality or too little the stemming is ejected out of the blast hole and fly rock is created.

Stemming of correct type and length is required to ensure that explosive energy is efficiently used to its maximum and to control fly rock.

### Fly rock predictions

The occurrence of fly rock in any form will have a negative impact if found to travel outside the safe boundary. A general unsafe boundary is normally considered to be within a radius of 500 m. If a road, structure, people or animals are within the 500 m unsafe boundary of the blast, irrespective of the possibility of fly rock or not, precautions must always be taken to stop the traffic, remove people and / or animals for the duration of the blast.

Calculations are also used to help and assist determining safe distances. Method currently applied by BM&C is according to the International Society of Explosives Engineers (ISEE) Blasters Handbook. Using these calculations the minimum safe distances can be determined that should be cleared of people, animals and equipment. Figure 14-10 shows the results from the ISEE calculations for the two types of operations and drill diameter sizes that are applied in the design for this project. The stemming length calculation in the design is based on a midrange of 25 times the blast hole diameter. The absolute minimum exclusion zone calculated is 207 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be excluded 100%. Best practices can be and are implemented. The occurrence of fly rock can be mitigated but the possibility of the occurrence there off, can never be eliminated.



**Figure 14-10: Predicted Fly rock**

### Impact of fly rock

The occurrence of fly rock in any form will have impact if found to travel outside the safe boundary. This safe boundary may be anything between 10m or 500m. If a road or structure or people or animals are closer than the safe boundary from a blast irrespective of the possibility of fly rock or not precautions should be taken to stop the traffic, remove people or animals for the period of the blast. Fact is fly rock will cause damage to the road, vehicles or even death to people or animals. This safe boundary is determined by the appointed blaster. BM&C normally recommends no shorter distance than 500m.

### 14.6.4 Vibration impact on provincial and national roads

The influence of ground vibration on tarred roads are expected when levels is in the order of 150mm/s and greater. Or when there is actual movement of ground when blasting is done to close to the road or subsidence is caused due to blasting operations. Normally 100 blast hole diameters are a minimum distance between structure and blast hole to prevent any cracks being formed into the surrounds of a blast hole. Crack forming is not restricted to this distance. Improper timing arrangements may also cause excessive back break and cracks further than expected. Fact remain that blasting must be controlled in the vicinity of roads. There is no record of influence on gravel roads due to ground vibration. The only time damage can be induced is when blasting is done next to the road and there is movement of ground. Fly rock will have greater influence on the road as damage from falling debris may impact on the road surface if no control on fly rock is considered.

Air blast does not have influence on roads due to the type of structure. The structure is flat on the ground and cannot be influenced by air blast.

### 14.6.5 Vibration will upset adjacent communities

The effects of ground vibration and air blast will have influence on people. These effects tend to create noises on structures in various forms and people react to these occurrences even at low levels. As with human perception given above – people will experience ground vibration at very low levels. These levels are well below damage capability for most structures.

Much work has also been done in the field of public relations in the mining industry. Most probably one aspect that stands out is “Promote good neighbour ship”. This is achieved through communication and more communication with the neighbours. Consider their concerns and address in a proper manner.

The first level of good practice is to avoid unnecessary problems. One problem that can be reduced is the public's reaction to blasting. Concern for a person's home, particularly where they own it, could be reduced by a scheme of precautionary, compensatory and other measures which offer guaranteed remedies without undue argument or excuse.

In general it is also in an operator's financial interests not to blast where there is a viable alternative. Where there is a possibility of avoiding blasting, perhaps through new technology, this should be carefully considered in the light of environmental pressures. Historical precedent may not be a helpful guide to an appropriate decision.

Independent structural surveys are one way of ensuring good neighbour ship. There is a part of inherent difficulty in using surveys as the interpretation of changes in crack patterns that occur may be misunderstood. Cracks open and close with the seasonal changes of temperature, humidity and drainage, and numbers increase as buildings age. Additional actions need to be done in order to supplement the surveys as well.

The means of controlling ground vibration, overpressure and fly rock have many features in common and are used by the better operators. It is said that many of the practices also aid cost-effective production. Together these introduce a tighter regime which should reduce the incidence of fly rock and unusually high levels of ground vibration and overpressure. The measures include the need for the following:

- Correct blast design is essential and should include a survey of the face profile prior to design, ensuring appropriate burden to avoid over-confinement of charges which may increase vibration by a factor of two;
- The setting-out and drilling of blasts should be as accurate as possible and the drilled holes should be surveyed for deviation along their lengths and, if necessary, the blast design adjusted;
- Correct charging is obviously vital, and if free poured bulk explosive is used, its rise during loading should be checked. This is especially important in fragmented ground to avoid accidental overcharging;
- Correct stemming will help control air blast and fly rock and will also aid the control of ground vibration. Controlling the length of the stemming column is important; too short and premature ejection occurs, too long and there can be excessive confinement and poor fragmentation. The length of the stemming column will depend on the diameter of the hole and the type of material being used; and
- Monitoring of blasting and re-optimising the blasting design in the light of results, changing conditions and experience should be carried out as standard.

### 14.6.6 Cracking of houses and consequent devaluation

Houses in general have cracks. It is reported that a house could develop up to 15 cracks a year. Ground vibration will be mostly responsible for cracks in structures if high enough and at continued high levels. The influences of environmental forces such as temperature, water, wind etc. are more reason for cracks that have developed. Visual results of actual damage due to blasting operations are

limited. There are cases where it did occur and a result is shown in Figure 14-11 below. A typical X crack formations is observed.



**Figure 14-11: Example of blast induced damage**

Observing cracks of this form on a structure will certainly influence the value as structural damage has occurred. The presence of general vertical cracks or horizontal cracks that are found in all structures does not need to indicate devaluation due to blasting operations but rather devaluation due to construction, building material, age, standards of building applied. Proper building standards are not always applied or else stated was not always applied in the country side when houses were built. Thus damage in the form of cracks will be present. Exact costing of devaluation for normal cracks observed is difficult to estimate. A property valuator will be best to determine property value. The value of the property will however be determined on the total property and not only on the condition of the house. Mining operations may not have influence to change the status quo of any property.

#### **14.6.7 Water well influence from blasting activities**

Water boreholes are present around the proposed site. The author has not had much experience on the effect of blasting on water wells but specific research was done and results from this research work are presented.

Case 1 looked at 36 case histories. Vibration levels up 50 mm/s were measured. The well yield and aquifer storage improved as the mining neared the wells, because of the opening of the fractures from loss of lateral confinement, not blasting. This is similar to how stress-relief fractures form. At one site the process was reversed after the mine was backfilled. It was more likely the fractures were recompressed. It was stated that blasting may cause some temporary (transient) turbidity similar to those events that cause turbidity without blasting. Such as:

1. Natural sloughing off inside of the well bore due to inherent rock instability. This can be accelerated by frequent over pumping. This is common to wells completed through considerable thickness of poorly consolidated and/or highly fractured clay stones and shale's; and

2. Significant rainfall events. The apertures of the shallow fractures that are intersected by a domestic well are commonly highly transmissive, thus will transmit substantial amounts of shallow flowing and rapidly recharging water. This water will commonly be turbid and can enter the well in high volumes. The lack of grouting of the near surface casing commonly allows this to happen. Also, if the top of the well is not grouted properly surface water can enter along the side of the casing and flow down the annulus.

The Berger Study observed ground-water impacts from manmade stress-release caused the rock mass removal during mining, but nothing from the blasting. The water quality and water levels were unaffected by the blasting. The “opening up” of the fractures lowered the ground-water levels by increasing the storage or porosity.

A study tested wells 50 m from a blast. Wells exhibited no quality or quantity impacts. Blast pressure surges ranged from 3 cm to 10 cm. Blasting caused no noticeable water table fluctuations and the hydraulic conductivity was unchanged. The pumping of the pit and encroachment of the high wall toward the wells dewatered the water table aquifer.

It may then be concluded from the studies researched as follows: Depending on the well construction, litho logic units encountered, and proximity to the blasting, it is believed that large shots could act as a catalyst for some well sloughing or collapse. However, the well would have to be inherently weak to begin with. The small to moderate shots will not show to impact wells. The minor water fluctuations attributed to blasting may cause a short-term turbidity problem, but do not pose any long-term problems. This fluctuation would not cause well collapse, as fluctuations from recharge and pumping occurs frequently. Long term changes to the well yield are more likely due to the opening of fractures from loss of lateral confinement. Short term dewatering of wells is caused by the opening of the fractures creating additional storage. A longer-term dewatering is caused by encroachment of the high wall and pumping of the pit water. The pit acts like a large pumping well. It is not believed that long term water quality problems will be caused by blasting alone. The possible exception is the introduction of residual nitrates, from the blasting materials, into the ground water system. This is only possible through wells that are hydro logically connected to a blasting site. Most of the long-term impacts on water quality are due to the mining (the breakup of the rocks). The influence will also be dependant if wells are beneath the excavation. Stress relief effects occur at shorter distances in this instance.

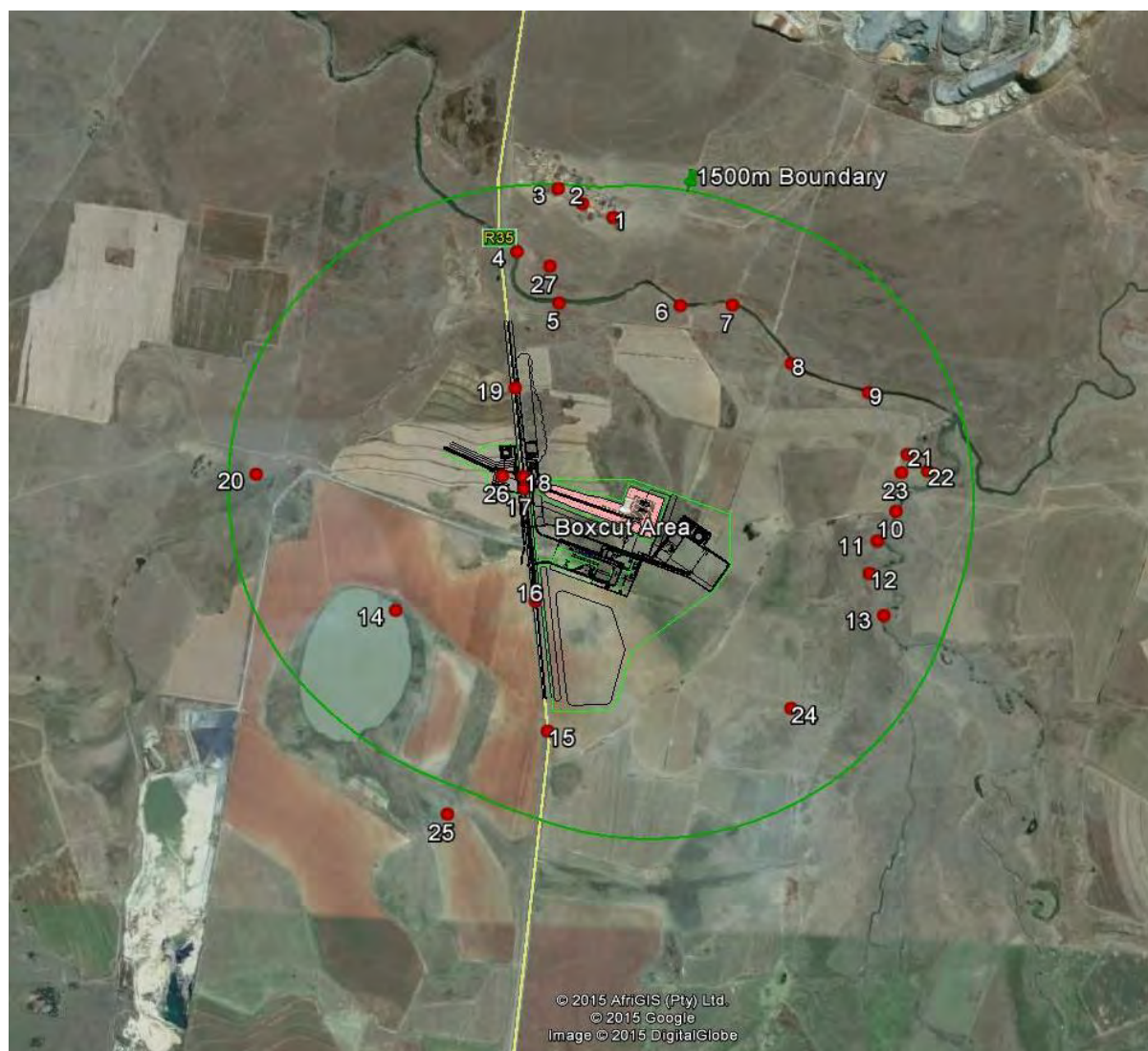
The results observed and levels recorded during research done showed that levels up to 50 mm/s or even higher in certain cases did not have any noticeable effect. It seems that safe conditions will be in the order of the 50 mm/s. In addition to this there are certain aspects that will need to be addressed prior to blasting operations.

As part of the baseline all possible structures in a possible influence area is identified. The site was reviewed and presented hereafter. The site was reviewed / scanned using Google Earth imagery. Information sought from review was typically the kind of surface structures that are present in a 1500 m radius from the proposed box-cut that will require consideration during modelling of blasting operations. This could consist of houses, general structures, power lines, pipe-lines, reservoirs, mining activities, roads, shops, schools, gathering places, possible historical sites etc. A list was prepared as best possible for each structure in the vicinity of the pit areas. The list prepared covers structures and points of interest (POI) in the 1500 m boundary. A list of structure locations was required for determining the allowable ground vibration limits and air blast limits possible. Note: Red Place marks = POI indicators

Figure 14-12 shows an aerial view of the box-cut area, the planned underground and surroundings with points of interest. The list compiled is provided in Table 14-8 below.



## Box-cut area



Note: Red Place marks = POI indicators

**Figure 14-12: Aerial view and surface plan of the proposed mining area with points of interest identified.**

**Table 14-8: List of points of interest used (WGS84 – LO 29°)**

Tag	Description	Classification	Y	X
1	Informal Housing	1	-46771.63	2901484.76
2	Informal Housing	1	-46622.64	2901415.50
3	Informal Housing	1	-46505.87	2901338.88
4	Olifants River	6	-46303.24	2901650.14
5	Olifants River	6	-46506.56	2901907.09
6	Olifants River	6	-47094.90	2901923.21
7	Olifants River	6	-47348.11	2901921.69
8	Olifants River	6	-47633.30	2902214.38
9	Olifants River	6	-48007.35	2902361.75
10	Viskuile River	6	-48137.26	2902954.55
11	Viskuile River	6	-48045.73	2903103.24

Tag	Description	Classification	Y	X
12	Viskuile River	6	-48007.59	2903265.12
13	Viskuile River	6	-48076.17	2903475.95
14	Pan	6	-45713.07	2903440.18
15	R35 Road	5	-46445.49	2904042.68
16	R35 Road	5	-46388.71	2903396.37
17	R35 Road	5	-46337.78	2902836.67
18	R35 Road	5	-46333.67	2902775.92
19	R35 Road	5	-46293.01	2902332.32
20	Cement Dam	5	-45038.15	2902759.35
21	Structure	2	-48193.45	2902670.64
22	Structure	2	-48292.01	2902753.62
23	Building/Structure	2	-48164.76	2902761.43
24	Cement Dam	5	-47623.86	2903937.33
25	Informal Settlement	1	-45961.16	2904453.75
26	Silo	5	-46230.65	2902771.15
27	Windmill	8	-46463.23	2901723.20

Notes: The type of POI's identified is grouped into different classes. These classes are indicated as "Classification" in table above. The classification is a Blast Management & Consulting classification to assist with sorting the different types of installations. Table 14-9 below shows the descriptions for the classifications used.

**Table 14-9: POI Classification used**

Class	Description
1	Rural Building and structures of poor construction
2	Private Houses and people sensitive areas
3	Office and High-rise buildings
4	Animal related installations and animal sensitive areas
5	Industrial buildings and installations
6	Earth like structures – no surface structure
7	Graves & Heritage
8	Water Borehole

## 14.7 Air quality

*The information presented in this section is extracted from the specialist Air Quality study undertaken by AirShed in 2015 (Appendix G1)*

### 14.7.1 Receptors

The proposed Elder Colliery Project area is surrounded by power stations with the nearest one being Kriel which is approximately 22 km to the west of Elders Colliery. Both Komati and Hendrina Power Stations are located about 25 km away, with Komati to the north and Hendrina to the north-east. Duvha Power Station is located further away (~50 km) to the north-northwest, near Emalahleni. All farm houses and settlements in the area were identified as sensitive receptors from an air quality perspective. Table 14-10 provides the co-ordinates of the sensitive receptors at Elders Colliery.

Nearby communities include Middlekraal, which is located about 1.5 km away to the north of the proposed Elders Colliery Project; Vlakkuijen is located about 4 km away to the south; while Elandsfontein, Vaalkop and Janpieta are located about 5 to 8 kms away to the east. A small-scale piggery is located about 1 km to the southeast of the box-cut (Figure 14-13).

**Table 14-10: Co-ordinates of Elders Colliery identified sensitive receptors**

Sensitive Receptor	Latitude	Longitude
Janpieta	26°13'33.51"S	29°25'12.51"E
Legdaar	26°17'57.51"S	29°26'23.34"E
Schurvekop	26°17'35.93"S	29°29'44.32"E
Elandsfontein	26°14'25.96"S	29°25'48.18"E
Middlekraal	26°13'12.20"S	29°27'50.88"E
Halfgewonnen	26°12'56.50"S	29°31'56.26"E
Vaalkop	26°14'1.01"S	29°25'8.07"E
Vlakkuijen	26°15'55.24"S	29°27'44.52"E
Small scale piggery	26°14'55.54"S	29°27'33.85"E

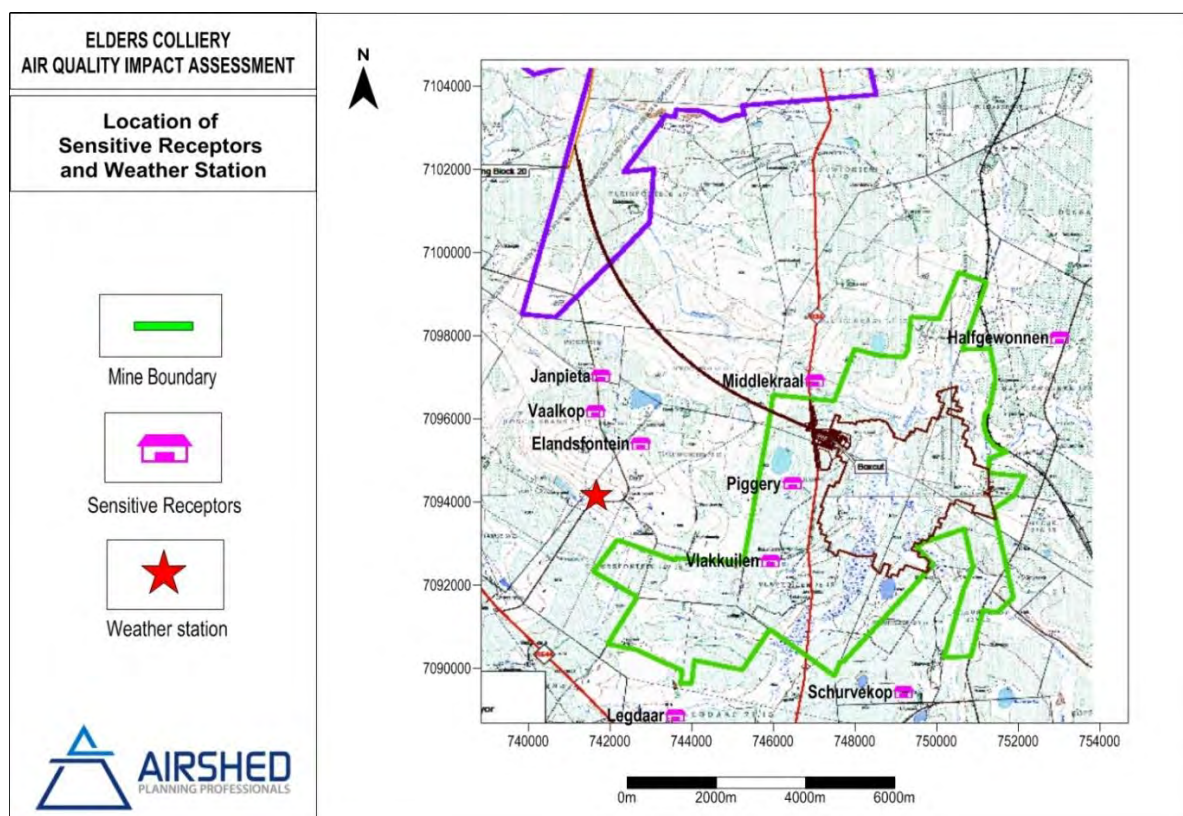


Figure 14-13: Elders Colliery in relation to identified sensitive receptors (AirShed, 2015).

### 14.7.2 Sources of air pollution

The Mpumalanga Highveld has been subjected to various air pollution studies mainly looking at the elevated air pollution concentrations within the regions as well as the long-range transportation of pollutants associated with the air pollution concentrations and the impact which these may have on the surrounding regions.

There are seven main sources of air pollutions within the region namely, power generations, mining and industrial activities, biomass burning, vehicle entrainment on paved and unpaved roads, vehicle tailpipe emissions, informal refuse burning and wind erosion of open areas.

#### Power Generation

Operational power stations in close proximity of the proposed Elders Colliery Project include Matla, Kriel, Kendal, and Komati power stations. The main emissions from such electricity generation operations are carbon dioxide (CO<sub>2</sub>), sulfur dioxide (SO<sub>2</sub>), nitrogen dioxides and ash (particulates).

#### Mining and industrial activities

Emissions from coal combustion by power generation, metallurgical and petrochemical industries represent the greatest contribution to total emissions from the industrial/ institutional / commercial fuel use sector within the Mpumalanga region (HPA, 2011).

Based on the Highveld Priority Area Air Quality Management Plan conducted in 2011 it was identified that the metallurgical industry is estimated to be responsible for at least ~50% of the particulate emissions within the region. This group includes iron and steel, ferro-chrome, ferro-alloy and stainless steel manufacturers (HPA, 2011). The petrochemical and chemical industries are primarily situated in Secunda (viz. Sasol Chemical Industries). In addition to this, the use of coal for power generation as well as coal gasification in the region is a significant source of SO<sub>2</sub> emissions.

Other industrial sources include: brick manufacturers which use coal and woodburning and wood drying by various sawmills and other heavy.

In the immediate vicinity of the proposed Elders Colliery Project, the industrial activities include but are not limited to Komati, Kriel and Hendrina power stations as well as Goedehoop, Koorfontein, Kriel and Sudor coal mines.

### **Biomass burning**

The biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands. Within the project vicinity, wild fires (locally known as veld fires) may represent significant sources of combustion-related emissions.

### **Vehicle entrainment on paved and unpaved roads**

Vehicles which travel on unpaved roads are significant sources of fugitive dust emissions. Particles from the road surface are lifted due to the vehicle wheels causing dust. The quantity of dust emissions from unpaved roads varies linearly with the volume of traffic.

The emissions from paved roads are significantly less compared to unpaved roads, however, they do contribute to particulate load. The fugitive dust emissions are due to the re-suspension of loose material on the road surface.

### **Vehicle tailpipe emissions**

Emissions resulting from motor vehicles can be grouped into primary and secondary pollutants. While primary pollutants are emitted directly into the atmosphere, secondary pollutants form in the atmosphere because of chemical reactions. Roads that are in the vicinity of the proposed Elders Colliery Project are the R35, R38, R544 and R542.

### **Informal refuse burning**

Additional sources of emissions come from the waste sector and typically include informal refuse and tyre burning. The informal burning of refuse within former township areas and burning of waste at local municipal landfill sites represents a source of concern in all provinces.

### **Wind erosion of open areas**

Emissions generated by wind erosion are dependent on the frequency of disturbance of erodible surface. Every time that a surface is disturbed, its erosion potential is restored. Further erodible surfaces may occur as a result of agriculture and / or grazing activities.

## **14.7.3 Ambient air quality**

### **Measured Ambient Air Quality**

The identification of existing sources of emission and the characterisation of ambient pollutant concentrations is fundamental to the assessment of the potential for cumulative impacts in the region. Ambient monitoring data was obtained from Eskom's Elandsfontein monitoring station and from the Elders monitoring campaign.

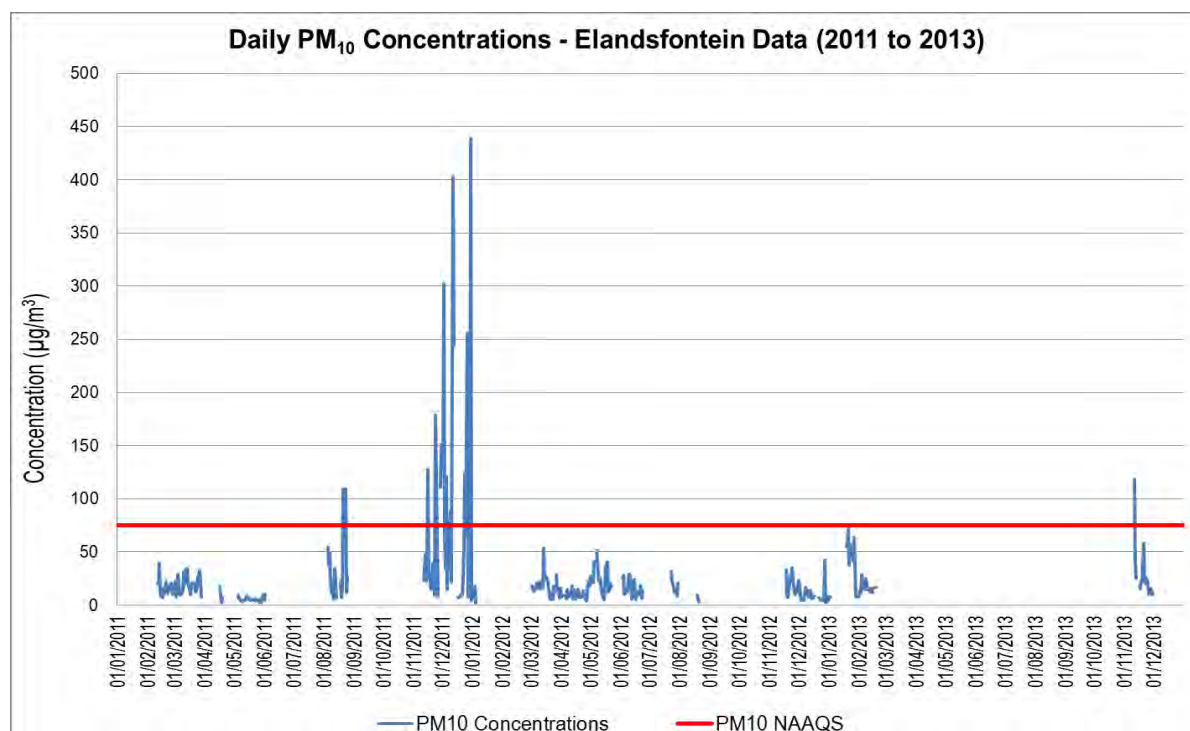
The Air Quality Specialist Report was conducted in 2015 thus the information obtained from the Elandsfontein station for PM10 is for the period January 2011 to December 2013. In addition to this, the dust fallout results were provided for April 2013 to September 2014 through the Elders monitoring campaign. It is important to note that no construction has occurred and the area remains the same since the Air Quality Report was compiled. Due to this, no additional information was required.



### Eskom's Elandsfontein Monitoring Station – Thoracic particulate matter (PM10)

Ambient PM10 data were obtained from the Eskom Elandsfontein monitoring station for the period January 2011 to December 2013. Data availability was recorded as 25.14% for PM10. The relatively low data availability for PM10 should be taken into account when interpreting the data.

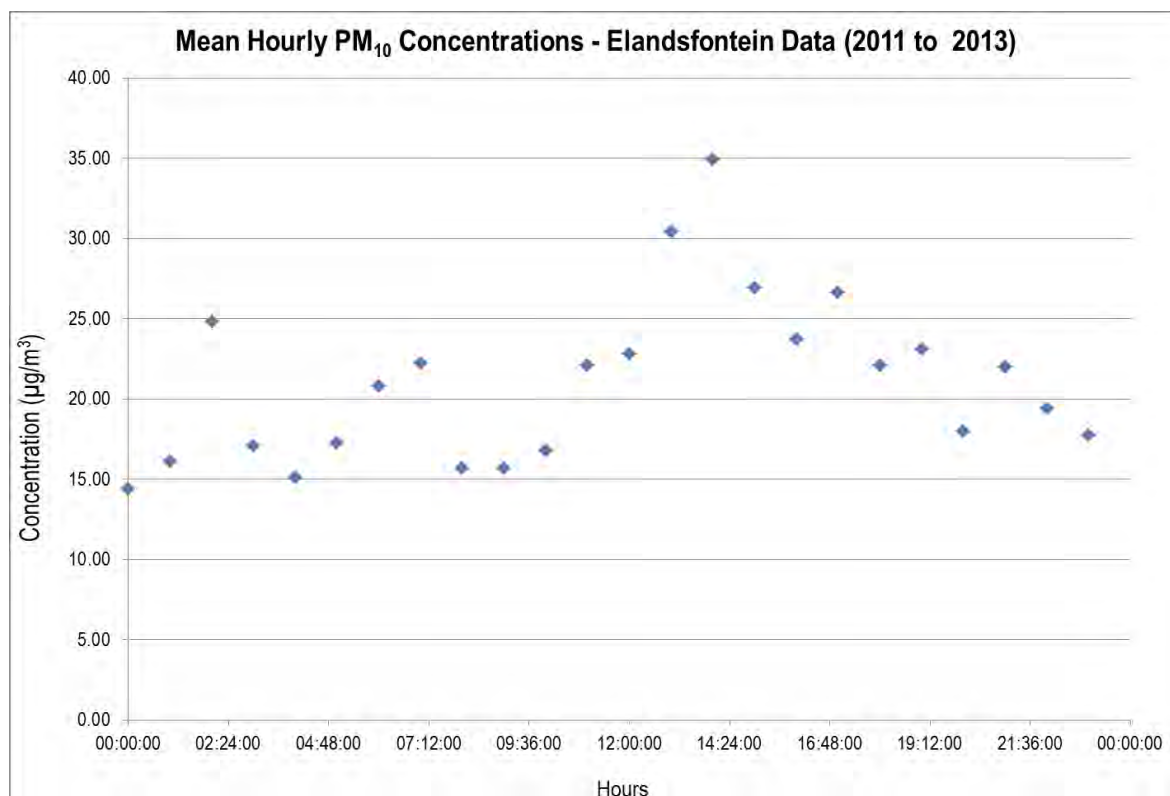
Figure 14-14 indicates the recorded daily PM10 concentrations for 2011 to 2013. It was found that during 2011 there were 18 exceedances of the NAAQ limit of  $75 \mu\text{g}/\text{m}^3$  identified at the Eskom Elandsfontein monitoring station, while there was none in 2012 and one exceedance in 2013. Annual concentrations ranged between  $14.77 \mu\text{g}/\text{m}^3$  in 2011 to  $26.89 \mu\text{g}/\text{m}^3$  in 2013.



**Figure 14-14: Daily PM<sub>10</sub> concentrations recorded at Elandsfontein (January 2011 to December 2013) (Airshed, 2015)**



A diurnal profile in the PM<sub>10</sub> concentrations peak in the afternoon and evening. This may be related to anthropogenic activities such as vehicular transport or industrial activities in the region (Figure 14-15).



**Figure 14-15: Mean hourly PM<sub>10</sub> concentrations recorded at Elandsfontein (January 2011 to December 2013) (AirShed, 2015)**

#### **Elders Monitoring Campaign – Dust Fallout**

The proposed Elders Colliery set up dust buckets in order to monitor the dust fallout within the area in order to create a baseline prior to the construction of the project. The location of the dust buckets at the Elders monitoring dustfall buckets is indicated illustrated in Table 14-11 and Figure 14-16.

Based on the sampled taken between April and November 2013 it was identified that the dust fallout rates were low and generally were compliant with the national regulations on Dust Fallout. However, there were some exceedances (in line with the non-residential limits) at sites EDB 02 and EDB 05. Sampling site EDB 02 had a dust fallout rate above 816 mg/m<sup>2</sup>-day throughout the sampling period. Based on the AirShed study this exceedance was associated with an unpaved roads adjacent to the sampling site, which provides access to the nearby Sudor mine and well as potential agricultural activities.

Sampled dust fallout rates at sites EDB 06 to EDB 07 were found to be in compliance with the regulation, remaining below 300 mg/m<sup>2</sup>-day throughout the sampling period. Results from site EDB 01, EDB 03 and EDB 05 were inconclusive; this is due to the lack of data in the latter months of the year.

Sampled dust fallout rates for the period January to September 2014 were low and within the acceptable dust fallout rates for non-residential areas (1 200 mg/m<sup>2</sup>-day), ranging between a minimum of 7 mg/m<sup>2</sup>-day and a maximum of 403 mg/m<sup>2</sup>-day. It must be noted that results for site EDB 01 to EDB 05 are inconclusive due to poor data quality.

**Table 14-11: Elders Colliery Dust bucket locations**

Dust bucket	Latitude	Longitude
EDB01	-26°13'57.555 S	29°27'32.022 E
EDB02	-26°13'41.821 S	29°27'36.374 E
EDB03	-26°13'45.946 S	29°27'26.951 E
EDB04	-26°13'51.053 S	29°27'24.645 E
EDB05	-26°11'56.59 S	29°25'03.23 E
EDB06	-26°09'57.245 S	29°24'07.805 E
EDB07	-26°09'33.319 S	29°24'02.779 E
EDB08	-26°13'57.555 S	29°27'32.022 E



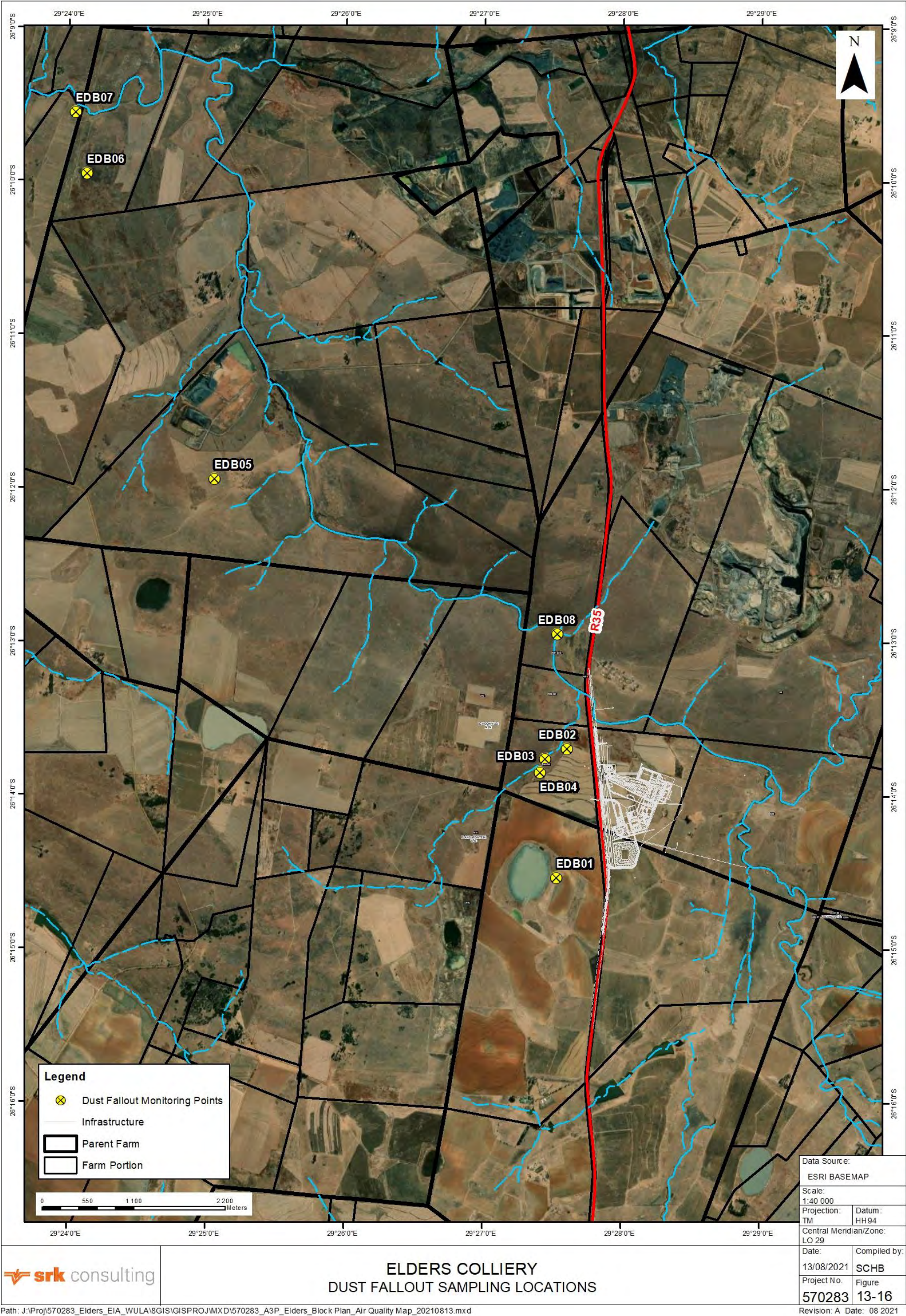


Figure 14-16: Elders Colliery Dust Fallout Sampling Location



## Modelled ambient air quality

The proposed Elders Colliery Project is located in the Mpumalanga Highveld and is therefore situated within the boundaries of the Highveld Priority Area (HPA). This area has been classified as an area with poor air quality. Due to this, in 2007, the Minister of Environmental Affairs declared a portion of Mpumalanga and Gauteng provinces as air quality priority area.

As part of the HPA baseline study, a comprehensive emissions inventory was completed for the region. Based on the HPA baseline and the inventory results, a comprehensive dispersion model was developed for the area.

Figure 14-17 and Figure 14-18 indicate the dispersion model created for the Mpumalanga and Gauteng areas. Based on Figure 14-17 and Figure 14-18 it was predicted that the ambient air quality standards would be exceeded. Based on these dispersion modelling results, the Air Quality Management Plan (AQMP) identified Baseline Hotspots for SO<sub>2</sub> and for PM<sub>10</sub>. Due to this, the project design should therefore also ensure minimal contribution to SO<sub>2</sub> and PM<sub>10</sub> concentrations.

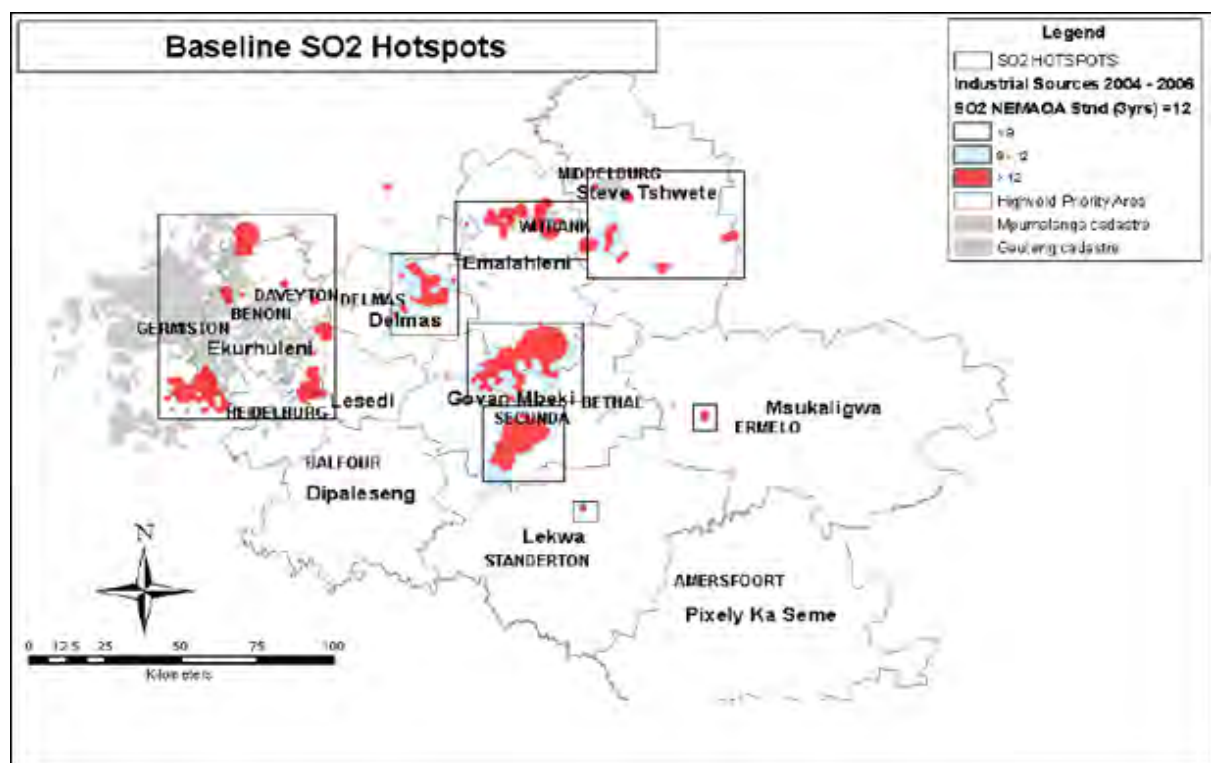


Figure 14-17: Simulated frequencies of exceedance of ambient SO<sub>2</sub> NAAQS (DEA, 2010)

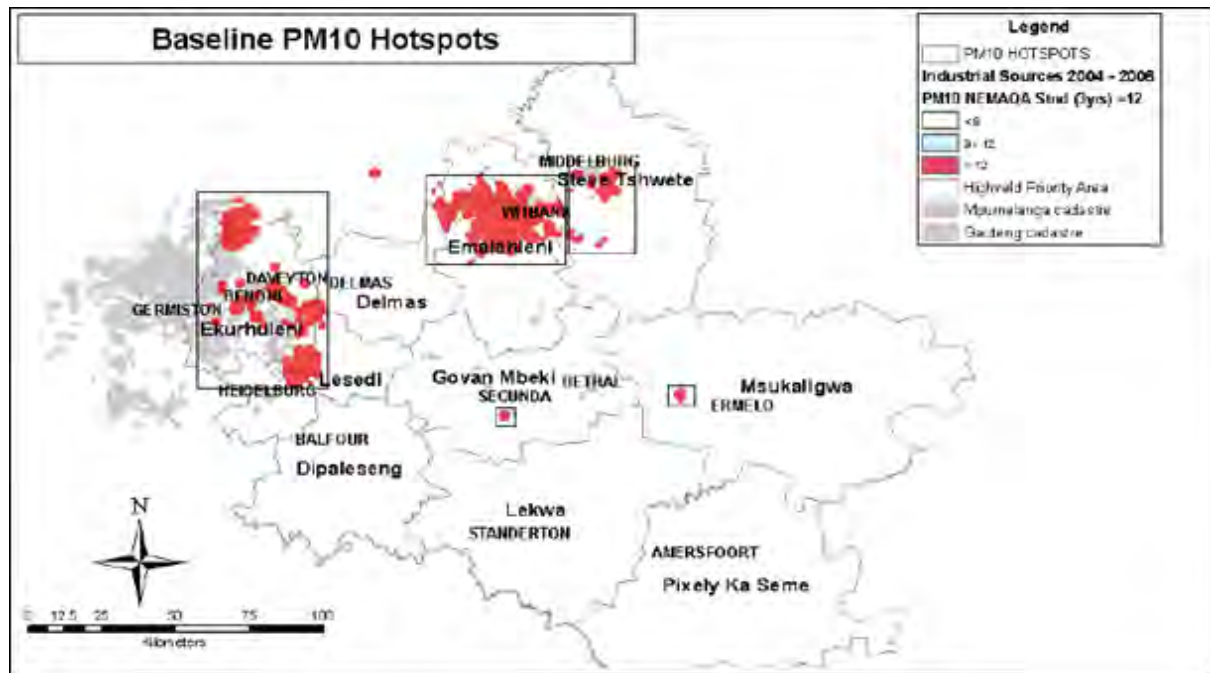


Figure 14-18: Simulated frequencies of exceedance of ambient PM10 NAAQS (DEA, 2010)

#### 14.7.4 Dispersion modelling

Dispersion modelling was undertaken to determine highest hourly, highest daily and annual average incremental ground level concentrations for each pollutant. These averaging periods were selected to facilitate the comparison of predicted pollutant concentrations with relevant air quality standards and dust-fall limits. It should be noted that the ground level concentration isopleths depicted present interpolated values from the concentrations predicted by AERMOD for each of the receptor grid points specified.

Plots reflecting daily averaging periods contain only the 99th percentile predicted ground level concentrations, for those averaging periods, over the entire period for which simulations were undertaken. It is therefore possible that even though a high daily average concentration is predicted to occur at certain locations, that this may only be true for one day of the year.

## 14.8 Archaeological and cultural heritage

*The information presented in this section is extracted from the specialist Heritage and Palaeontology studies undertaken by J A van Schalkwyk in 2015 (Appendix G6)*

A cultural heritage assessment was undertaken as part of the 2015/2016 environmental authorisation process.

### 14.8.1 Identified sites

Based on the site visit, the following heritage sites, features and objects were identified in the proposed development area:

#### Stone Age

- No sites, features or objects dating to the Stone Age were identified in the study area.

#### Iron Age

- No sites, features or objects dating to the Iron Age were identified in the study area.

#### Historic period

- No sites, features or objects dating to the historic period were identified in the study area.

Sites, features or objects of cultural heritage significance were not identified in the proposed mining area hence there is not further baseline to report on. (Van Schalkwyk, 2015).



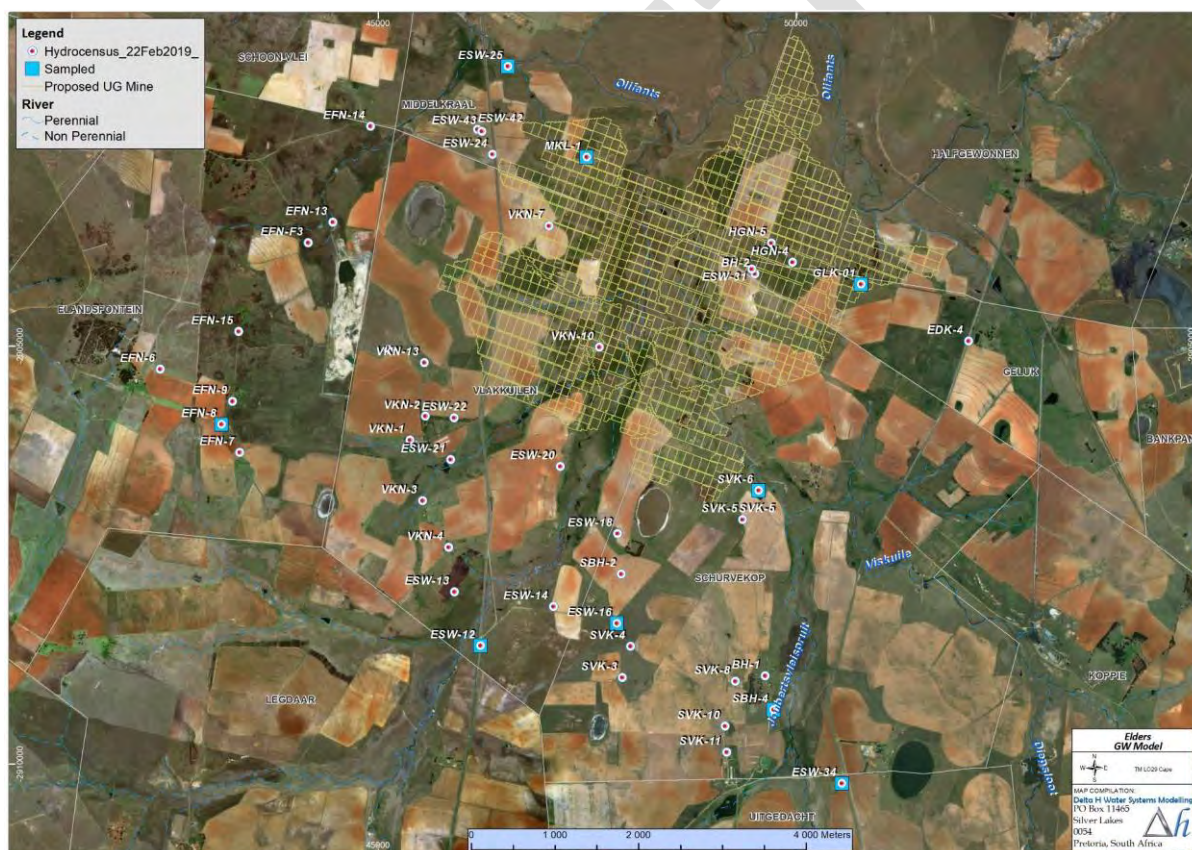
## 14.9 Geohydrology

*The information presented in this section is extracted from the specialist Hydrogeological study undertaken in 2015 JMA Consulting, 2019 and the update in 2021 by DeltaH (Appendix G7)*

### 14.9.1 Hydrocensus

A groundwater hydrocensus of the Elders Colliery project area was undertaken from the 18th of February to the 22nd of February 2019. The hydrocensus took cognisance of the 2002 and 2012 hydrocensus completed by JMA Consulting (Pty) Ltd. A total of 50 boreholes were located and verified in the field, largely within the proximity of the proposed underground mining area. The spatial distribution of the boreholes is shown in Figure 14-19, while the identified borehole coordinates, status and uses including groundwater levels are shown in Table 14-12. The boreholes in Table 14-12 are generally in a poor condition, mainly because of their age and neglect.

Ten water samples were analysed for major and trace elements to provide an evaluation of the ambient groundwater quality. Twenty-six groundwater level measurements could be obtained during the hydrocensus. The water levels measured during the 2019 hydrocensus in the area ranged between 0.6 metre below ground level (mbgl) and 35.2 mbgl, with an arithmetic average of around 8.4 mbgl.



**Figure 14-19: Hydrocensus (2019) boreholes, Elders Colliery (DeltaH, 2019).**

**Table 14-12: Summary of hydrocensus boreholes (bold BH IDs indicate sampled boreholes) (DeltaH, 2019).**

BH	Long_WGS	Lat_WGS	GW level (mbgl)	Comment	Parent Farm
BH-1	29.49667	26.29163	0	Wind pump. Borehole in use for domestic purposes.	SCHURVEKOP
BH-2	29.49522	26.24825	35.2	Monitoring borehole, well is in good condition. No markings could be observed.	GELUK
EDK-4	29.52087	26.25541	9.96	General condition of the borehole is good. Allen key bolt was replaced and thread lubricated.	
EFN-13	29.44468	26.24283	3.54	-	
EFN-14	29.44915	26.23246	4.94	Overall condition good. Bee infested.	ELANDSFONTEIN
EFN-15	29.43346	26.25468	3.31	Open hole not in use.	
EFN-6	29.42410	26.25876	14.81	Wind pump not in use	
EFN-7	29.43364	26.26773	-	Destroyed	
<b>EFN-8*</b>	29.43145	26.26470	4.95	Open hole, not used.	
EFN-9	29.43276	26.26220	6.87	Wind pump. Borehole is in use and pumps into a 5000l JOJO tank for domestic use.	
EFN-F3	29.44175	26.24506	-	Spring	
<b>ESW-12*</b>	29.46254	26.28849	2.54	General condition of the borehole is good. Allen key bolt was replaced and thread lubricated.	VLAKKUILEN
ESW-13	29.45942	26.28270	5.07	General condition of the borehole is good. Allen key bolt was replaced and thread lubricated.	
ESW-14	29.47126	26.28423	-	Open hole, not used.	
<b>ESW-16*</b>	29.47888	26.28602	3.06	General condition of the borehole is good. except for casing. Allen key bolt was replaced and thread lubricated. Bolt size is 8mm.	SCHURVEKOP
ESW-18	29.47892	26.27635	-	Bee infested	
ESW-20	29.47201	26.26912	8.17	General condition of the borehole is good. Allen key bolt was replaced and thread lubricated.	VLAKKUILEN
ESW-21	29.45892	26.26843	-	General condition of the borehole is in a reasonable condition. Bee-hives inside the borehole. Could not measure water level.	
ESW-22	29.45928	26.26391	4.56	Borehole is in a reasonable condition. Allen key bolt was replaced and lubricated. Bolt size is 8mm	

BH	Long_WGS	Lat_WGS	GW level (mbgl)	Comment	Parent Farm
<b>ESW-25*</b>	29.46559	26.22593	0	Artesian hole	MIDDELKRAAL
ESW-31	29.49487	26.24775	13.12	Borehole in good condition. Borehole is fenced off.	GELUK
<b>ESW-34*</b>	29.50588	26.30322	13.26	Borehole damaged, casing bent.	UITGEDACHT
ESW-42	29.46197	26.23277	t.b.d.	Borehole with 75mm ID casing (located in bean crops)	MIDDELKRAAL
ESW-43	29.46248	26.23299	t.b.d.	Borehole with 75mm ID casing (located in bean crops)	
HGN-4	29.49976	26.24700	4.39	Borehole is open and not in use.	HALFGEWONNEN
HGN-5	29.49718	26.24493	-	No access	
<b>MKL-1*</b>	29.47506	26.23572	0.6	Open hole not in use. Situated at old homestead.	MIDDELKRAAL
RP-1	29.38531	26.28984	-	Hand pump and is used for domestic purposes.	RENSBURGSHOOP
SBH-2	29.47937	26.28071	2.8	Overall borehole condition is good except for marker pole. Borehole was drilled in 2017.	SCHURVEKOP
<b>SBH-4*</b>	29.49770	26.29527	3.21	Monitoring borehole. Overall condition is very good. Borehole drilled in 2017. More details in spreadsheet.	SCHURVEKOP
SVK-10	29.49188	26.29709	-		
SVK-11	29.49208	26.29991	-	Borehole equipped with a hand pump Borehole water is used for domestic purposes.	
SVK-3	29.47955	26.29185	-	Wind pump. No access for meter to measure water level. Borehole used for cattle drinking water.	
SVK-4	29.48053	26.28850	8.32	Wind pump. Water used for cattle	
SVK-5	29.49388	26.27478	-	Borehole is equipped with a windmill. Not in use. Base plate closed no access.	
SVK-8	29.49309	26.29222	-	Maize field	
VKN-1	29.45401	26.26631	15.54	Borehole is used for domestic purposes. Hole is equipped with a 0.56kw submersible pump.	VLAKKUILEN
VKN-10	29.47667	26.25623	1.89	Newly renovated wind pump. Water used for cattle.	
VKN-12	29.45138	26.25658	16.91	Borehole is equipped with a new wind pump. Water is used for cattle.	
VKN-13	29.45570	26.25798	-	Open hole, not in use blocked at 1.0m	
VKN-2	29.45585	26.26372	-	Destroyed	

BH	Long_WGS	Lat_WGS	GW level (mbgl)	Comment	Parent Farm
VKN-3	29.45556	26.27286	24.69	This borehole supplies drinking water to a village close by. Hole is equipped with a submersible pump	
VKN-4	29.45871	26.27787	0	Borehole is equipped with a windmill. Borehole is not in use. Located next to an abandoned village.	
VKN-7	29.47059	26.24318	0	Destroyed	
SVK-6*	29.49578	26.27161	5.49	Borehole is open and not in use. The pipe in the borehole has no use.	SCHURVEKOP
SVK-5	29.49388	26.27478	0	Wind pump\cattle water	SCHURVEKOP
KT-02	29.36526	26.32362	0	Blocked	KRAALSTAD
HB0-04*	29.38364	26.32659	1.25	Borehole is open and is not in use.	KRAALSTAD
ESW-24	29.46379	26.23547	0	Overall condition good. Bee infested.	MIDDELKRAAL
GLK-01*	29.50796	26.24933	0	Newly renovated wind pump. Water used for cattle.	GELUK

## 14.9.2 Geohydrology features

### Unsaturated zone

A hydrogeology study was conducted in 2002 and 2015 by JMA and more recently in 2019 by Delta H. Based on these studies the hydrocensus results indicated the thickness of the unsaturated zone ranges to be from 0.7 m to 35.2 m, with an arithmetic average of around 10.1 m. The groundwater model considers flow and transport processes within the unsaturated zone, with a capillary pressure-saturation relationship (after van Genuchten) typically of a loamy sand assigned to the weathered aquifer and of a coarse sand assigned to the fractured Karoo rocks and dolerites.

### Saturated zone

Based on the conceptual hydrogeological understanding of the site, the following hydro-stratigraphic zones are differentiated within the model area:

- Shallow alluvial and weathered Karoo aquifer;
- Fractured Karoo aquifer;
- Dolerite intrusions; and
- Artificial mine aquifer.

#### Weathered Karoo aquifer

The weathered zone of the Karoo sediments hosts the unconfined or semi-confined shallow weathered Karoo aquifer or hydro-stratigraphic zone. The weathered zone is typically around 15m thick and water levels within this aquifer are often shallow (few meters below ground level). Due to direct rainfall recharge and dynamic groundwater flow through the unconfined aquifer in weathered sediments, the water quality is generally good, but in the absence of an overlying confining layer also vulnerable to pollution. Localised perched aquifers may occur on clay layers or lenses but are due to their localised nature of no further interest in the context of the current study. Water intersections in the weathered aquifer are mostly above or at the interface to fresh bedrock (sandstone or sills), where less permeable layers of weathering products and capillary forces limit the vertical percolation of water and promote lateral water movement. Groundwater daylights as springs where the flow path is obstructed by less permeable dolerite sills (contact springs) or where the surface topography cuts into the groundwater level at e.g. drainage lines (free draining springs).

#### Fractured Karoo aquifer

The fractured Karoo aquifer consists of the various lithologies of siltstone, shale, sandstone and the coal seams. Groundwater flow is governed by secondary porosities like faults, fractures, joints, bedding planes or other geological contacts (including coal seams), while the rock matrix itself is considered impermeable. Geological structures are generally better developed in competent rocks like sandstone, which subsequently show better water yields than the less competent silt- or mudstones and shales. Not all secondary structures are water bearing due to e.g. compressional forces by the neo-tectonic stress field overburden closing the apertures. The fractured Karoo aquifer is considered a semi-confined aquifer, depending on the prevailing sedimentary succession.

Fractured Karoo aquifers have typically a low hydraulic conductivity ( $<0.001$  m/d) but are known to be highly heterogeneous with yields ranging from 0.5 to 2 L/s. Higher yields are typically associated with higher hydraulic conductivities along shallow coal seams and at contact zones with intrusive rocks. Depending on the residence time of the water in the aquifer, groundwater quality can be poor.

### **Dolerite intrusions**

The Karoo rocks in the project area were intruded by dolerite sills or dykes, with their contact zones with the host rock providing preferential flow paths, while the dolerite itself is rather impermeable or semi-permeable (hydraulic conductivity of approximately  $1\text{E-}8$  m/s). This setting promotes groundwater ponding and flow along, but not across the sills and dykes.

### **Artificial mine aquifer**

Artificial Karoo aquifers will be created by the future underground (bord and pillar) mining of the No. 4 coal seam with an average extraction factor of 68% and an average stoping height of around 3m (pers. comm., C. Els, Lead mining engineer, Ukwazi). The underground mining will create artificial high porosity and conductivity networks within the No. 4 coal seam of the fractured Karoo aquifer.

### **Hydraulic conductivity**

JMA Consulting (Pty) Ltd drilled during their 2002 Elders Colliery groundwater studies 40 hydrogeological boreholes (4 deeper EDK boreholes ranging from 45 to 90 mbgl and 36 shallow boreholes to generally 30 mbgl, which were augmented in 2005 by two additional shallow (30 mbgl) boreholes. Geological logs, blow yields, water levels (2002) and hydraulic conductivity values determined by slug tests are available for most of the boreholes (Table 14-12). Only nine water levels are available for the deeper boreholes. Blow yields range from 0 to 6 l/s, with an average of 0.98 L/s for 17 boreholes with blow yields larger zero. Hydraulic conductivity values based on slug tests performed on 43 shallow boreholes (ESW boreholes) and 4 deep boreholes (EDK boreholes) along with measured porosities and calculated storativities. The arithmetic averages were subsequently used as initial hydraulic conductivities of the aquifers for the model calibration.

## **14.9.3 Groundwater levels**

Based on the 104 collated data, the groundwater levels are generally shallow and range from just 0.68 mbgl (or 0 mbgl for springs) to 35.2 mbgl; with a regional average of 10.1 mbgl. Using the measured groundwater table elevations, Delta H established the correlation between surface topography and elevation of the groundwater level within the shallow aquifer for the wider area of interest. Based on the regional results, a very good correlation between the measured water levels and surface topography is obvious ( $R^2 = 0.98$ , i.e. approximately 98 % of observed water level variations can be explained by variations in surface elevation) and it can be assumed that the water table within the shallow weathered aquifer mimics the surface topography at the regional scale. The few obvious outliers from the regression line are probably due to groundwater abstractions preceding water level measurements.

## **14.9.4 Groundwater potential contaminants**

Based on the site-specific geochemical studies and experience from active collieries, the main potential impacts on the ambient groundwater quality associated with the proposed underground mining of the No. 4 and 2 coal seams are acidic contact water with elevated salt and metal concentrations, i.e. acid rock drainage.

Acid rock drainage conditions are likely to be associated with coal exposed in the underground mine voids (included abstracted groundwater in contact with the coal) and the overburden stockpile, as most tested over-/interburden and coal samples were classified potentially acid generating.

The elevated salt concentrations due to the oxidation of sulphide bearing minerals are dominated by sulphate, whereas metals of concern potentially mobilised under acidic conditions are iron and manganese and to a lesser degree barium and nickel.



## 14.9.5 Groundwater quality

### Water quality results (JMA, 2002/2003)

Most boreholes sampled by JMA in 2002/03 (with 8 additional analysis for 2012) show a good drinking water quality with a few exceedances of NH<sub>3</sub> (2 boreholes), NO<sub>3</sub> (1 borehole), F (2 boreholes) and Fe (2 boreholes) limits. The Piper diagram, a graphical visualisation of major cation and anion ratios, characterises the regional groundwater type as a Ca-Mg-HCO<sub>3</sub> or Na-HCO<sub>3</sub> facies, with several samples trending towards Na-Cl facies. The bicarbonate dominance in most samples is a result of CO<sub>2</sub> equilibration of rainwater with the atmosphere and percolating rainwater with the further CO<sub>2</sub> enriched soil atmosphere as a result of the decay of plant humus, litter and other organic substrates. Water seeps through the soil and vadose zone, also rich in carbon dioxide from weathering of carbonate minerals, which in turn dissolves as bicarbonate into the water. The bicarbonate enriched water signature indicates potential fresher, recently recharged groundwater. The mixed cation signatures (calcium/magnesium versus sodium) can be attributed to cation exchange reaction that occurs during the evolution of groundwater within the soil and rock matrix.

Some groundwater samples, i.e. MKL-2, HGN-F1, HGN-3 and EFN-F1, are clearly dominated by chloride anions instead of bicarbonate anions. These sodium-chloride waters indicate highly mineralised, deeper, and less mobile water which is not part of the active hydrogeological cycle. The depositional environment of the Karoo Supergroup was driven by sea water interaction and deposition with sodium and chloride enrichment of deposited minerals. The same enrichment is observed in groundwater interacting with these minerals. The mixed groundwater signatures between bicarbonate and chloride anion respectively calcium/magnesium and sodium cation dominance indicate the evolution and/or mixing of groundwater within the natural aquifer system from freshly recharged shallow groundwater to deeper mineralised groundwater.

### Water quality results (Delta H, 2019)

Similar to the earlier results, the majority of groundwater samples collected during the hydrocensus show a dominant Na-HCO<sub>3</sub> (sodium- bicarbonate) water facies, indicating freshly recharged groundwater which had limited time to equilibrate with the aquifer material along its flow path. Dominant bicarbonate anion signatures are as before attributed to CO<sub>2</sub> equilibration with the atmosphere (rainwater) and vadose zone. Sample ESW-3, characterised by a Na+K-Cl+NO<sub>3</sub> (chloride + nitrate) water facies, represents highly mineralised, stagnant groundwater that equilibrated with sodium and chloride rich sediments of the Karoo Supergroup.

The TDS, Ca, Cl and NO<sub>3</sub> as N concentrations exceed in borehole ESW-3, and TDS and Na concentrations in borehole ESW-12 the DWA SAWQG for domestic use. The iron concentration in borehole ESW-16 exceeds both, the DWA SAWQG for domestic use target values and SANS 241-1 (2015) drinking water limits, while iron concentrations in boreholes HBO4, MLK-1 and SBK-4 exceed only the DWA SAWQG for domestic use target values. The elevated iron concentrations at these boreholes are not expected to be geogenic, but potentially from the rusted steel casing of the boreholes itself. All tested samples exceed turbidity value based on the SANS 241-1 (2015) drinking water standard.

### Water quality results (Delta H, 2021)

Groundwater quality results obtained from sampling towards the end of the pumping tests of newly drilled boreholes at Elders Colliery (Delta H 2020) are presented in Table 14-13 and compared to the stipulated limits as set out in the SANS 241-1:2015 for Drinking Water and the more stringent South Africa Water Quality Guidelines (SAWQG) for domestic use. Note that the comparison to drinking water standards and guidelines does not suggest that groundwater abstracted will be used for drinking

purposes. It is evident that the groundwater of the tested boreholes indicates generally a good quality, with neutral pH values and electrical conductivities ranging from 14 to 59 mS/m. However, some elements exceed target values, including turbidity (all samples, result of open boreholes without filter screen and the analysis of unfiltered samples), chloride (1 sample), fluoride (1 sample), nitrate (2 samples), aluminium (2 samples), iron (2 samples) and manganese (4 samples).

A Tier 1 simulations was conducted on Borehole 7 (BH7) in 2021 to investigate alternative water treatment options. As part of the Tier 1 Simulation is was identified that the water abstarctcted was of very good quality. Refer to Appendix G7 for the Tier 1 Simulation results.

As the proposed Elders Colliery Project is developed, the box cut will first intersect the shallow weathered and upper fractured Karoo aquifer before the underground mine workings will intercept the deeper fractured Karoo aquifer and coal seams. As these aquifers are intercepted, groundwater inflows into the mine workings will occur with a subsequent partial dewatering of the surrounding aquifer and exposure of sulphide bearing sediments to oxygen. This process will drive or acid mine drainage over time, i.e., a deteriorating water quality due to pyrite oxidation (controlled by available oxygen) as the mine develops and expose larger volumes of the material to oxygen. While earlier studies suggest that a circum-neutral to slightly acidic water quality might be ultimately expected (based on the available neutralising capacity of the sediments), elevated sulphate concentrations around 1 600 mg/l to 1 700 mg/l for the life of mine (4 200 mg/l for the overburden stockpile) and up to 4 500 mg/l post-closure were predicted.

The predicted post-closure concentrations should in this context be seen as likely concentrations while oxygen or ferric iron (as another oxidant) are available to facilitate pyrite oxidation, i.e. before the mine is fully inundated and these oxidants depleted with time. The predicted future water inflows and qualities will gradually develop over the life of mine and post closure, with good water qualities expected to be encountered in the box cut and shallow underground mine workings and estimated operational water qualities to develop as the aquifer surrounding the mine is dewatered and exposed to oxygen.

These qualities are likely to decline over the life of mine before the predicted post-closure qualities are ultimately established. As the mine is inundated post closure and the system starved of oxygen (and any ferric iron consumed by pyrite oxidation), pyrite oxidation will gradually cease, and the water qualities start to improve again. However, this process might take numerous decades.

**Table 14-13: Groundwater quality from newly tested boreholes compared to relevant standards**

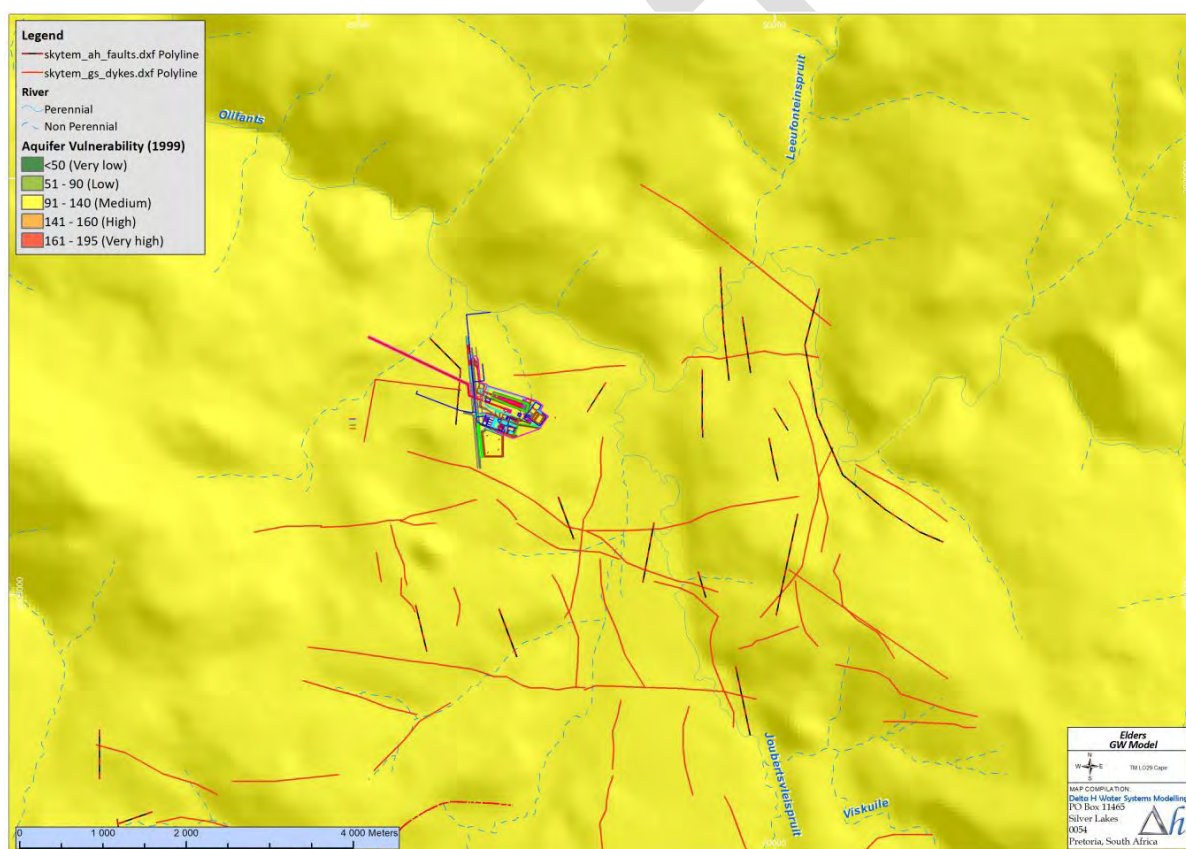
Name	DWA SAWQTV Drinking Water	SANS 241- 1: 2015	EGW3 (BH3)	EGW- BH6	7/275 BH1	7/675 BH5	EGW2 (BH2)	8/155 (BH7)	EGW4 (BH4)
Sample ID			105195	105196	105197	105198	105199	105200	105201
pH	6-9	5-9.7	6.8	6.6	6.6	7.9	7.7	6.9	7.1
Electrical Conductivity mS/m	70	170	27.7	13.9	25.5	59.2	31.6	27.7	22.8
Total Dissolved Solids	450	1200	262.0	122.0	198.0	340.0	196.0	190.0	196.0
Turbidity in N.T.U	1	1	413.0	18.0	165.0	14.0	3.0	652.0	21.0
Total Alkalinity as CaCO <sub>3</sub>	NS	NS	72.0	68.0	48.0	104.0	152.0	104.0	112.0
Ca (mg/L)	32	-	19.0	7.4	15.3	16.7	30.3	20.7	17.5
Mg (mg/L)	30	-	9.6	4.4	8.3	4.3	13.1	10.3	8.5
Na (mg/L)	100	200	24.1	12.2	15.8	90.2	13.3	15.8	14.5
K (mg/L)	50	-	6.1	4.1	4.3	0.8	6.5	6.4	4.9
Chloride as Cl	100	300	8.0	2.0	24.0	123.0	6.0	7.0	2.0
Sulphate as SO <sub>4</sub>	200	500	<2	<2	14.0	9.0	12.0	20.0	3.0
Fluoride as F	1	1.5	0.2	<0.2	<0.2	7.9	0.3	0.3	0.7
Nitrate as N	6	11	11.3	0.1	9.0	0.1	0.1	2.3	0.3
Ortho Phosphate as P			<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1
Free & Saline Ammonia as N	NS	NS	0.1	0.1	0.1	0.1	0.2	0.2	0.1
Al (mg/L)	0.15	0.3	0.409	0.311	< 0.100	< 0.100	< 0.100	< 0.100	< 0.100
Fe (mg/L)	0.1	2	0.304	0.241	0.030	0.029	< 0.025	0.027	< 0.025
Mn (mg/L)	0.05	0.4	0.161	0.092	0.056	0.032	< 0.025	0.189	< 0.025
U (mg/L)		0.03	< 0.010	< 0.010	< 0.010	0.012	< 0.010	< 0.010	< 0.010
Zn (mg/L)	3	5	0.022	< 0.010	0.021	< 0.010	< 0.010	0.024	< 0.010

## 14.9.6 Aquifers

### Groundwater vulnerability

Groundwater vulnerability gives an indication of how susceptible an aquifer is to contamination. Aquifer vulnerability is used to represent the intrinsic characteristics that determine the sensitivity of various parts of an aquifer to being adversely affected by a contaminant load imposed from surface. Figure 14-20 shows the national groundwater vulnerability ratings underlying the project area, indicating the tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer. The method is based on the DRASTIC method which includes the following parameters: Depth to water table; Recharge (net); Aquifer media; Soil media; Topography; Impact of the vadose (unsaturated) zone; conductivity (hydraulic).

Based on the national results (Figure 14-20), the aquifer underlying the project area has a medium vulnerability rating.

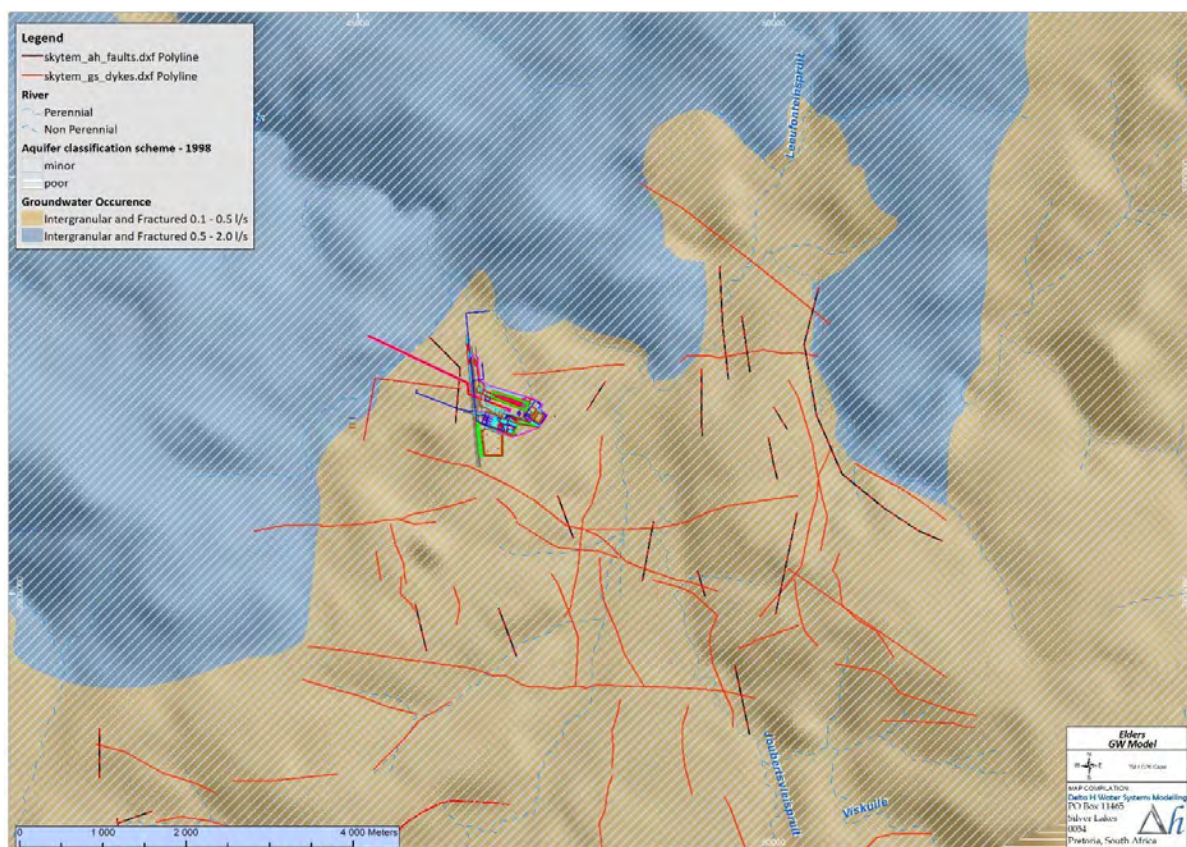


**Figure 14-20: Groundwater vulnerability map for the Elders project area.**

### Aquifer classification

According to the Hydrogeological Map (1:500 000) series, the regional hydrogeology is characterized as an 'intergranular and fractured aquifer' with a typical potential yield of 0.1 to 0.5 litres per second, (Figure 14-21). A micro-fractured matrix in the fractured Karoo aquifers provides the storage capacity with limited groundwater movements, while secondary features such as fractures / faults and bedding planes enhance the groundwater flow. The intergranular aquifer is associated with the river alluvial and quaternary sand deposits





**Figure 14-21: Aquifer classification map for the Elders project area**

Based on the aquifer classification map (Parsons and Conrad, 1998), the aquifer system underlying the site is regarded a mainly “poor aquifer” to “minor aquifer” (Figure 14-21). A summary of the classification scheme is provided in Table 14-14. In this classification system, it is important to note that the concepts of Minor and Poor Aquifers are relative and that yield is not quantified. Within any specific area, all classes of aquifers should therefore, in theory, be present.

**Table 14-14: Aquifer classification scheme after Parsons and Conrad (1998)**

Aquifer	Description
<b>Sole source aquifer</b>	An aquifer used to supply 50% or more of urban domestic water for a given area, for which there are no reasonably available alternative sources, should this aquifer be impacted upon or depleted.
<b>Major aquifer region</b>	High-yielding aquifer of acceptable quality water.
<b>Minor aquifer region</b>	Moderately yielding aquifer of acceptable quality or high yielding aquifer of poor quality water.
<b>Poor aquifer region</b>	Insignificantly yielding aquifer of good quality or moderately yielding aquifer of poor quality, or aquifer that will never be utilised for water supply and that will not contaminate other aquifers.
<b>Special aquifer region</b>	An aquifer designated as such by the Minister of Water

### Aquifer protection classification

As part of the aquifer classification, a Groundwater Quality Management (GQM) Index is used to define the level of groundwater protection required (Parsons 1995). The point scoring system and classification of the Elders project area are presented in Table 14-15

**Table 14-15: Groundwater Quality Management (GQM) Classification System**

Aquifer System Management Classification		
Class	Points	Project area
Sole Source Aquifer System:	6	
Major Aquifer System:	4	
Minor Aquifer System:	2	2
Non-Aquifer System:	0	
Special Aquifer System:	0 – 6	
Aquifer Vulnerability Classification		
Class	Points	Project area
High:	3	
Medium:	2	2
Low:	1	

The recommended level of groundwater protection based on the Groundwater Quality Management Classification is calculated as follows: GQM Index = Aquifer System Management x Aquifer Vulnerability = 2 x 2 = 4

A Groundwater Quality Management Index of 4 was estimated for the project area from the ratings for the Aquifer System Management Classification (Table 14-14). According to this estimate, a medium-level of groundwater protection (Table 14-15) is required for the intergranular and fractured aquifer. Reasonable groundwater protection measures are recommended to ensure that no cumulative pollution affects the aquifer, even in the long term. DWSs water quality management objectives are to protect human health and the environment. Therefore, the significance of this aquifer classification is that if any potential risk exists, measures must be taken to limit the risk to the environment, which in this case is the protection of the underlying aquifer.

**Table 14-16: GQM index for the Elders project area.**

Index	Level of Protection	Project area
<1	Limited	
1 - 3	Low Level	
3 - 6	Medium Level	4
6 - 10	High Level	
>10	Strictly Non-Degradation	

### 14.9.7 Groundwater modelling

#### Model set-up and boundaries

The model domain covers a surface area of 1 705 km<sup>2</sup> and overlaps the B11A, B, C and D quaternary catchments. The boundaries of the model follow in the south and west the boundaries of quaternary catchment B11A, in the north the boundary of quaternary catchment B11B and in the east the perennial Steenbokspruit and for a short section a topographical high. The topographic highs (catchment boundaries) are sufficiently far removed from the proposed Elders Colliery underground workings and are therefore considered to define also local groundwater divides or natural flow and transport boundaries. The chosen approach ensures a dependable water balance for the model with rainfall recharge.



## **Groundwater sources and sinks**

### **Groundwater recharge**

The groundwater recharge and seepage rates as given in Section 14.9.3 were assigned to the top layer of the Elders Colliery groundwater model as aerial seepage rates (2nd type/Neumann or specified flux boundary condition). The recharge rates were considered fixed for the calibration of the model.

### **River courses**

Water leaves the model domains via a number of non-perennial and perennial rivers. All non-perennial rivers or drainage lines were generally classified within the model domain as continuously gaining rivers (i.e. groundwater is only allowed to discharge into them) and therefore described within the model using SPRING's 'river package', with no exfiltration of surface water allowed. The chosen approach ensures no water losses from rivers into the model domain, while simulating potential leakage of groundwater into surface water courses (groundwater baseflow) as suggested by GRA II (Table 2.2). The stage of each river node was carefully aligned with the height of the Digital Elevation Model (DEM) at that point and an incision the river bottom of 5 m below topography assumed.

Water leaves the model domain via numerous perennial and non-perennial rivers. Notwithstanding the type, all surface water drainages were classified as continuously gaining river courses. A river or 3rd type (Cauchy) boundary condition was assigned to the streams and river courses within the model domain whereby the leakage of groundwater into the river (or vice versa) depends on the prevailing gradient. Based on estimated baseflow rates for the catchments of interest, the streams/rivers were generally classified as potentially gaining streams/rivers and no leakage of surface water into the aquifer respectively the model domain allowed. With the chosen approach, no water losses occur from the perennial and non-perennial rivers into the model domain, but groundwater on either side of the river/drainage might discharge into it as a function of the calculated gradients. The streams act therefore only as groundwater sinks. In the absence of site-specific data, a river-bed conductance of  $1\text{E-}7$  m/s was assumed for all river courses within the model area and an incision of 5 meters below the surrounding topography is assumed for the hydraulic active riverbed.

### **Pollution Control Dams**

The Pollution Control Dams (PCDs) and brine dam will be lined with a Class C liner, i.e. a composite liner (GM/CCL) comprising of a HDPE Geomembrane (GM), a low permeability compacted clay liner (CCL) of 300 mm thickness and an underdrainage system (e.g. finger drains) for leak detection. Due to the extremely low permeability of the HDPE liner, leakage through a composite liner occurs predominantly through geomembrane defects, with the fluid passing through the geomembrane defect (pinholes and welding defects), flowing laterally some distance between the geomembrane and the clay liner (interface flow due to liner wrinkling) before it infiltrates and seeps through the clay liner (Giroud 1997). e instead of assigned (and uncertain) flows being the driver of groundwater flow.

## 14.10Wetlands

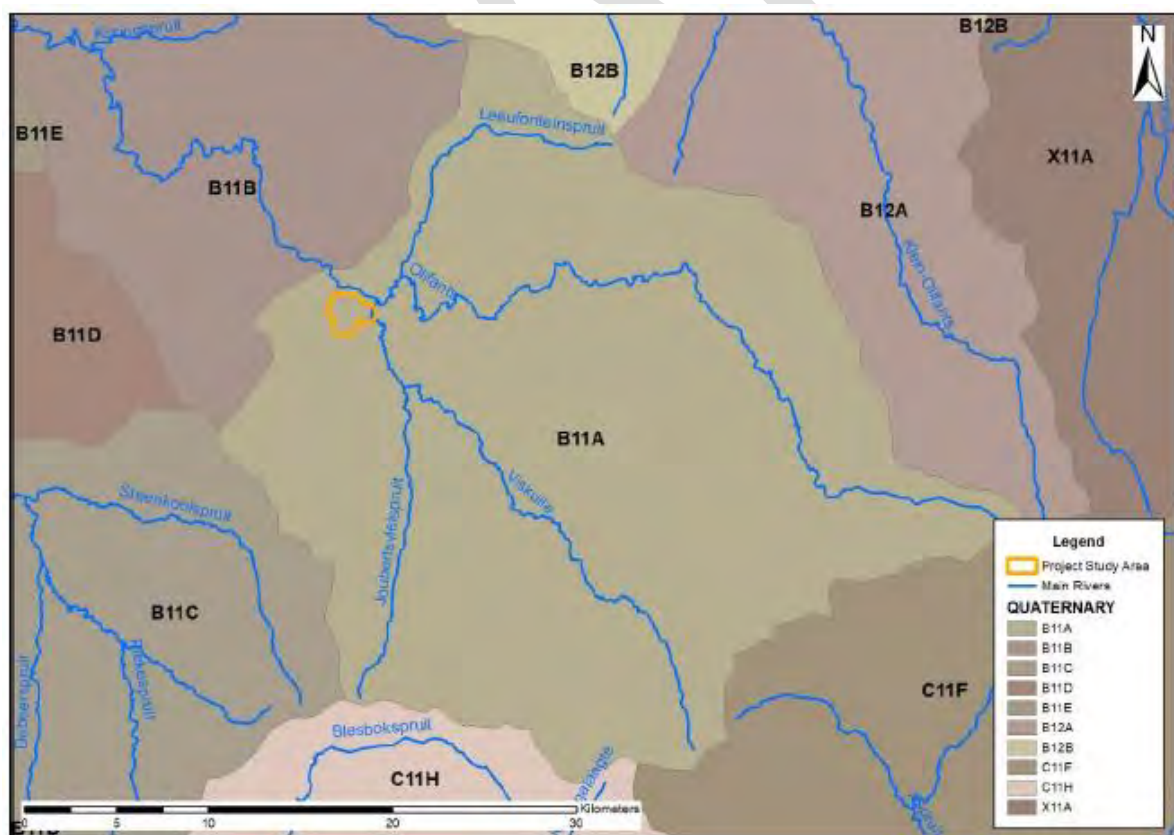
*The information presented in this section is extracted from the specialist Wetland assessment undertaken by Wetland Consulting in 2021 (Appendix G8).*

### 14.10.1 Catchments and Rivers

The proposed Elders Colliery Project is located within the Olifants River Catchment (Primary Catchment B), with the specific affected quaternary catchment being B11A. Catchment B11A is drained by the Olifants River and its tributaries the Viskuele, Joubertsveispruit, Leeufonteinspruit and Vlakkuienspruit. Information regarding catchment size, mean annual rainfall and runoff for the quaternary catchment is provided in the Table 14-17 and Figure 14-22 (Middleton, B.J., Midgley, D.C and Pitman, W.V., 1990).

**Table 14-17: Table showing the mean annual precipitation, run-off and potential evaporation per quaternary catchment**

Quaternary Catchment	Catchment Surface Area (ha)	Mean Annual Rainfall (MAP) in mm	Mean Annual Run-off (MAR) in mm	MAR as % of MAP	Potential Evaporation (PE) in mm	Ratio of MAR to PE
B11A	94 549	699	67.8	9.7 %	1942.8	0.36



**Figure 14-22: Map showing the approximate location of the study area in relation to the quaternary catchment, with principal rivers also illustrated**

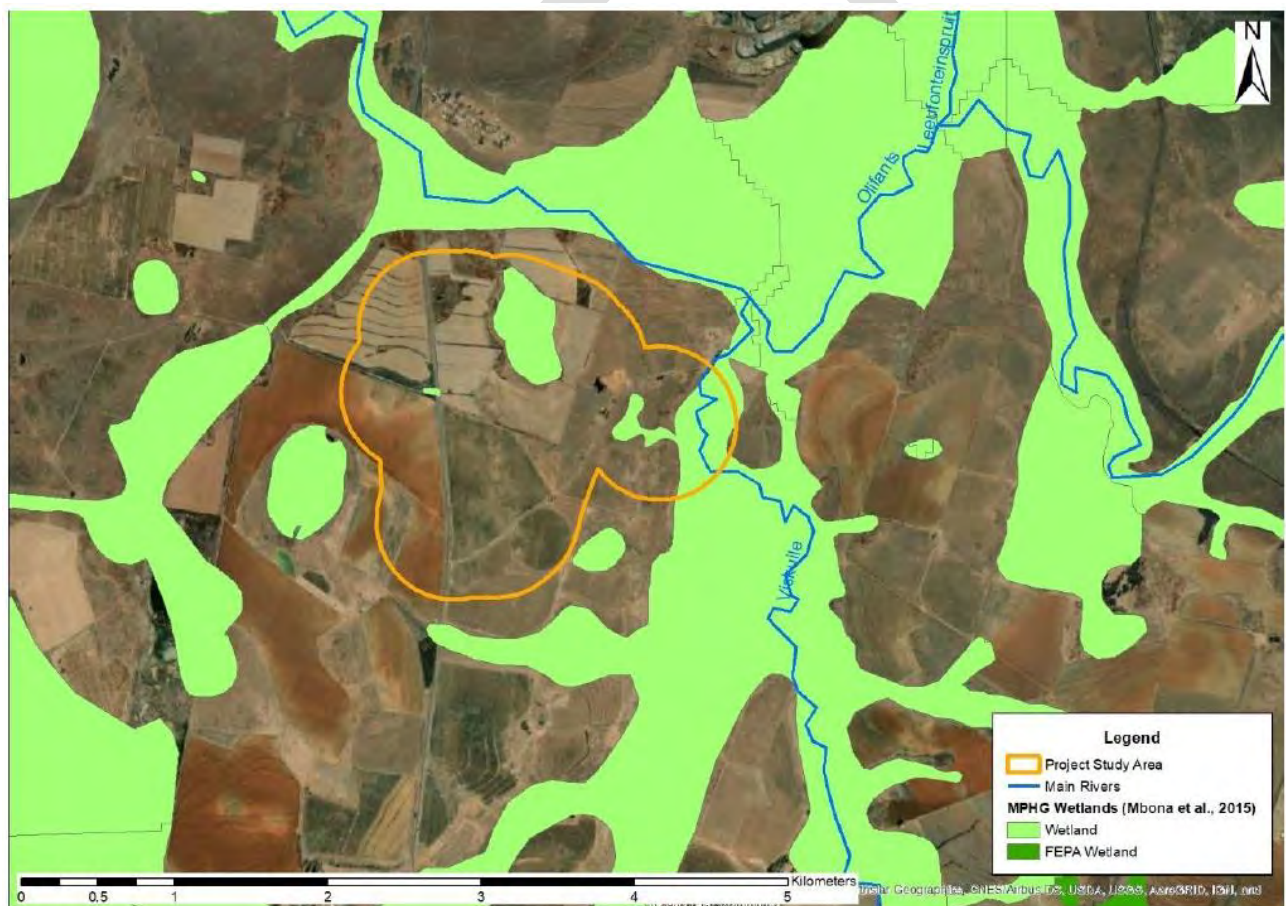
### 14.10.2 Freshwater Ecosystem Priority Area and National Wetland Inventory 5

The Atlas of Freshwater Ecosystem Priority Areas (FEPA) in South Africa (Nel et al, 2011) (The Atlas) which represents the culmination of the National Freshwater Ecosystem Priority Areas project (NFEPA), provides a series of maps detailing strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources.

For the Mpumalanga Highveld, the NFEPA dataset was updated through a WRC funded project (Mbona et al., 2015), resulting in the generation of the Mpumalanga Highveld Wetlands (MPHG Wetlands) dataset.

The MPHG Wetlands dataset indicates numerous wetlands as occurring within the project study area as well as immediate surroundings. However, none of these wetlands are classified as Freshwater Ecosystem Priority Area (FEPA) wetland.

The more recent National Wetland Inventory 5 wetland dataset was also consulted, as illustrated in Figure 14-24. Based on the National Wetland Map 5, a number of wetland systems occur within the general area, with Seep and Floodplain wetlands indicated as occurring within the project study area (Figure 14-23).



**Figure 14-23: Map showing wetlands and wetland FEPA's within the study area and surroundings as per Mbona et al. (2015). No wetland FEPA's occur within the project study area.**



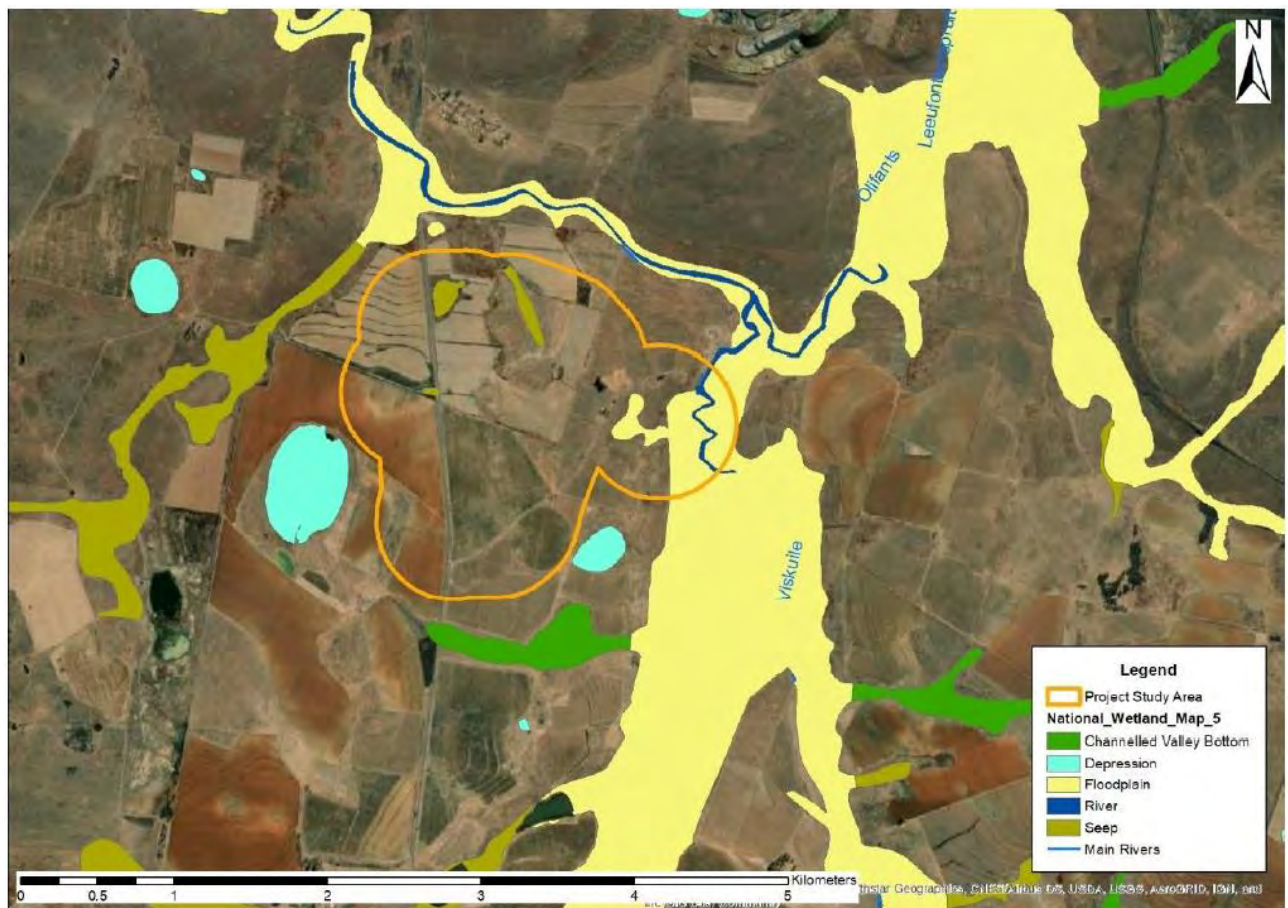
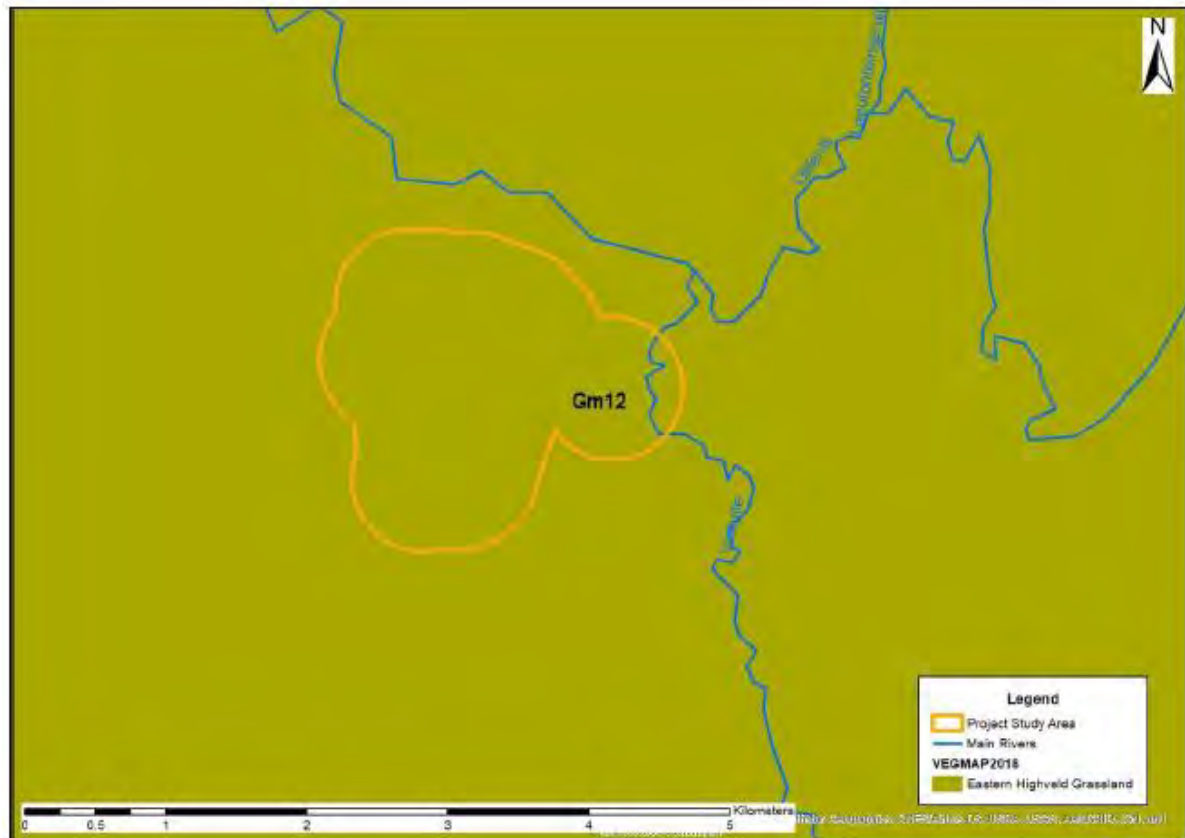


Figure 14-24: Extract of the National Wetland Map 5 for the project study area and surrounds.

### 14.10.3 Vegetation

Several vegetation classification systems have been compiled for South Africa. According to the most recent vegetation classification of the country, “The Vegetation of South Africa, Lesotho and Swaziland” (Mucina and Rutherford, 2006), the study area falls within the Grassland Biome, Mesic Highveld Grassland Bioregion. At a finer level, the area is categorised as Eastern Highveld Grassland (Gm12). Eastern Highveld Grassland is listed as **Vulnerable** in the National List of Ecosystems that are Threatened and in Need of Protection (GN1002 of 2011).



**Figure 14-25: Map showing the vegetation types of the study area and surrounds as per Mucina and Rutherford (2006).**

#### **14.10.4 Mpumalanga Biodiversity Sector Plan 2013**

The Mpumalanga Biodiversity Sector Plan (MBSP) is a spatial tool that comprises a set of maps of biodiversity priority areas for use in land-use and development planning, environmental assessment and regulation, and natural resource management (MTPA, 2014). One of the key outputs of the MBSP is the identification of biodiversity priority areas. This was achieved through the compilation of maps indicating Critical Biodiversity Areas (CBAs).

Figure 14-26 illustrates the terrestrial biodiversity assessment of the MBSP for the study area. A CBA Irreplaceable area occurs within the east of project study area associated with the Viskuele floodplain wetland, with an adjacent ESA (Ecological Support Area) overlapping with Seep wetlands located on the slope. Extensive CBAs are associated with the Olifants River floodplain just to the north of the site. Most of the project study area is however classified as Modified or Modified – Old Lands, with some further areas of Other Natural Habitat.

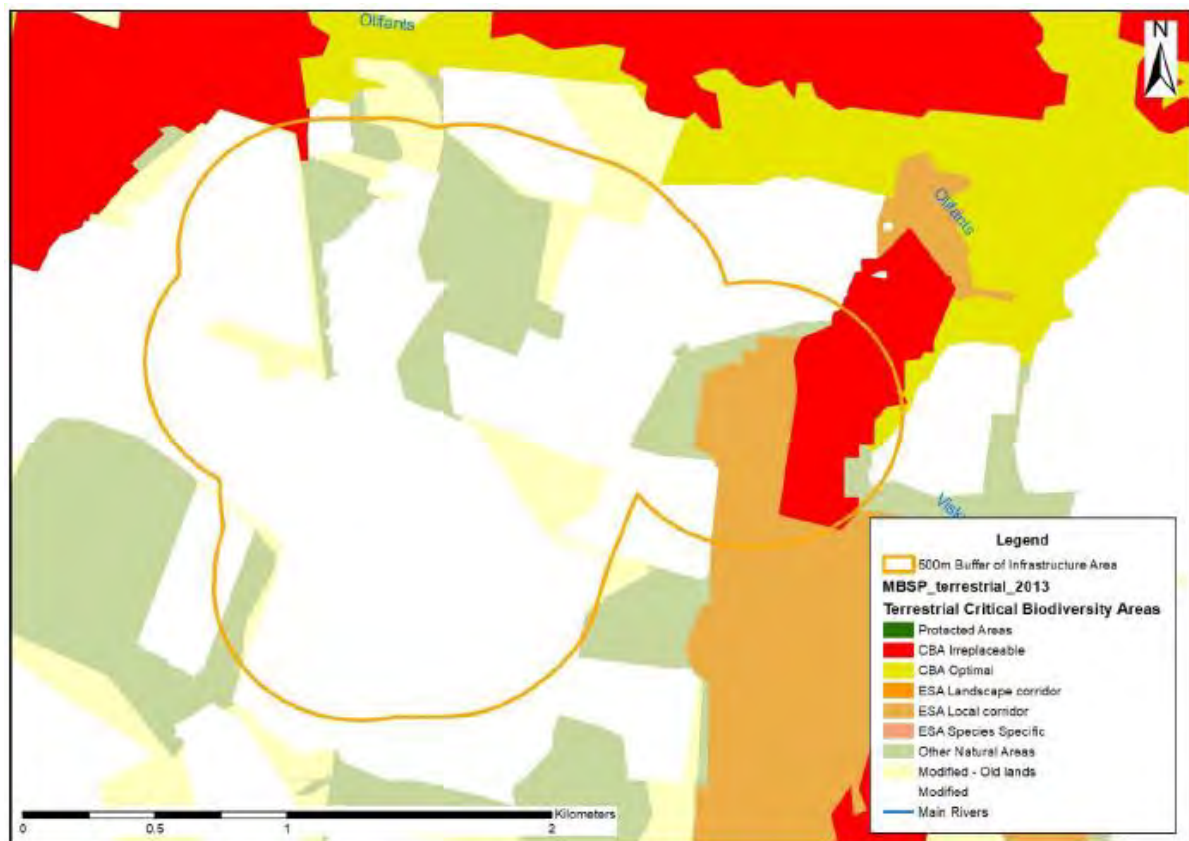


Figure 14-26: Extract from the provincial conservation plan for the study area.

#### 14.10.5 Wetland delineation and classification

Four different natural hydrogeomorphic wetland types were identified on site:

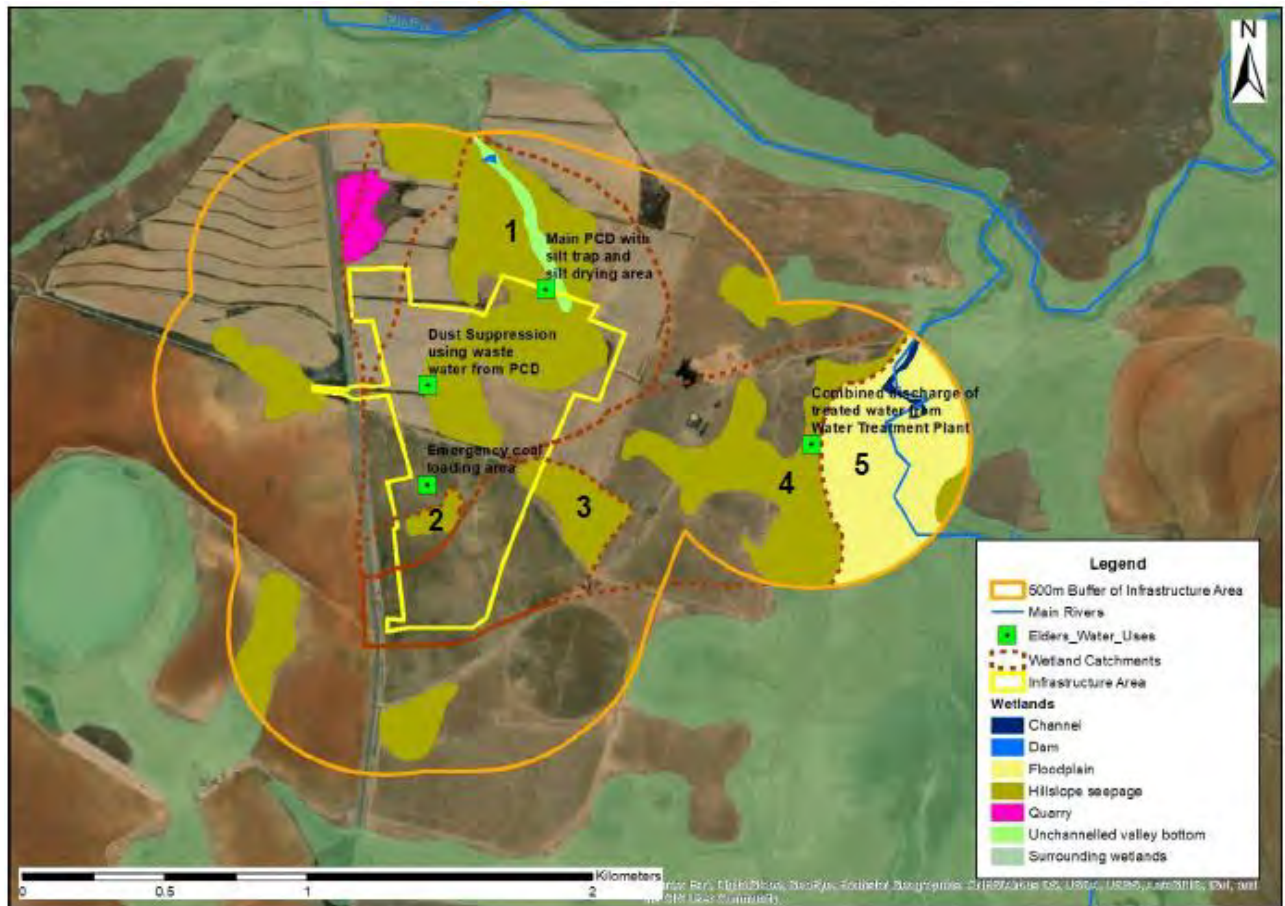
- Channel
- Floodplain wetland
- Unchannelled Valley Bottom wetland
- Seep wetland

These wetlands cover approximately 116.7 hectares, which makes up 29.4 % of the study area. Delineated wetlands are illustrated in Figure 14-27 below, while more detail on the extent and types of wetland habitat identified is provided in Table 14-18.

Table 14-18: Extent of the different wetland types identified on site.

Wetland Type	Area (ha)	% of study area
Unchannelled Valley Bottom	2.4	0.6 %
Floodplain	26.6	6.7 %
Channel	0.8	0.2 %
Seep	86.9	21.9 %
TOTAL	116.7	29.4 %
Dam	0.1	1.0 %





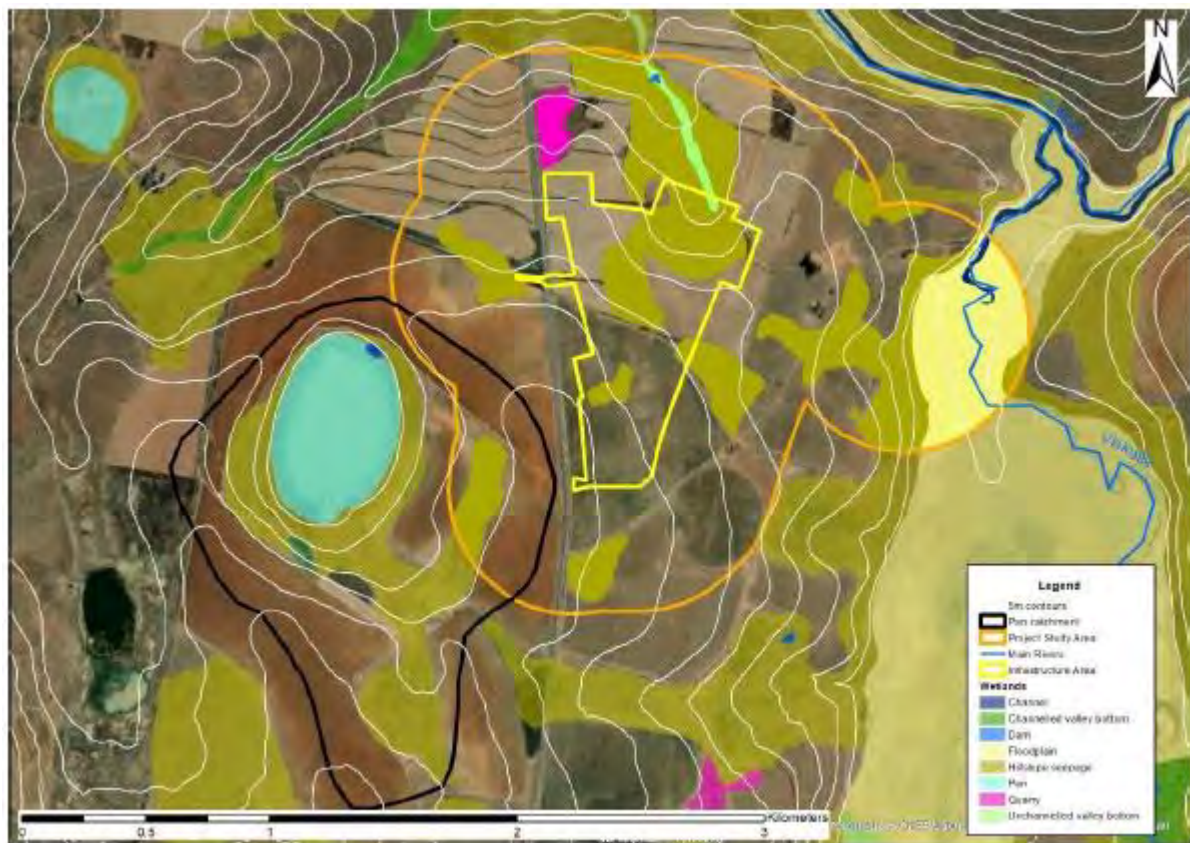
**Figure 14-27: Map showing the extent of the delineated and classified wetlands within the study area and immediate vicinity. Also shown are approximate catchment boundaries of the various wetland units identified.**

Wetland system 1 consists of a large Valleyhead Seep wetland and associated Unchannelled Valley Bottom wetland that forms a small tributary to the Olifants River to the north. The wetland is considered temporary to seasonal in nature across most of its extent, with only a small pool-like area near the top of the Unchannelled Valley Bottom wetland supporting surface water for extended periods.

Wetland system 2 represents a small, isolated Seep wetland located within a cultivated field. The entire wetland has been cultivated and now natural vegetation remains within the wetland. The wetland is only evident on site through a patch of greyer, more leached soils. The presence of a clear e-horizon within the soil profile indicates that subsurface interflow is the main driver of this wetland habitat.

Wetland system 4 consists of a Seep wetland located on an east facing slope along the western bank of the Viskouille Floodplain, which in turn forms wetland system 5. The upper reach of the wetland system 4 Seep is characterised by low slopes and has been disturbed by past agricultural activity, while the lower reach is much steeper and consequently has been excluded from past cultivation and is more intact. This wetland is also considered temporary to seasonal in nature and maintained by interflow. An old erosion feature was observed within the wetland just to the north of the proposed discharge point (water use being applied for). This old erosion gully has exposed the subsurface interflow and some surface seepage of water was in evidence though the visible wetness is very localised and does not extend significantly into the Floodplain of wetland system 5.

A large seasonal Pan wetland occurs just to the southwest of the project study area (refer to Figure 14-28 below). It is clear from this map that the infrastructure area falls outside the topographic catchment of the Pan. It can therefore be concluded that the large Pan will not be impacted by currently proposed project activities.



**Figure 14-28: Map showing the location of the large Pan wetland and its associated catchment in relation to the project study area and proposed surface infrastructure area.**

#### 14.10.6 Present Ecological Status (PES) Assessment

The Present Ecological Status (PES) Assessment allows for each wetland to be classified according to a rating scale (Table 14-19).

**Table 14-19: Table showing the rating scale used for the PES assessment.**

Description	Combined impact score	PES Category
Unmodified, natural.	0-0.9	A
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of natural habitats and biota may have taken place.	1-1.9	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2-3.9	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4-5.9	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6-7.9	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	F

The large floodplain wetland habitat associated with Viskuele and Vlakkuienspruit confluence is considered to be in a B/C category, indicating wetland habitat that is Largely Natural to Moderately Modified

Some back-flooding occurs within the Viskuele channel from the weir on the Olifants River, while some channel incision is also evident within the lower reaches of the Vlakkuienspruit. The vegetation of the

floodplain is largely intact, though evidence of heavy livestock utilisation was observed, while linear disturbances associated with fence lines and firebreaks also occur.

The Seep wetlands within the study area vary from Moderately Modified (category C) to Seriously Modified (category D) depending mostly on the level of direct alteration of habitat through conversion to cultivated fields. Refer to Table 14-20 and Figure 14-29 for the PES rating for each identified wetland.

**Table 14-20: Results of the PES assessment showing the revised PES categories determined as part of the current study as well as the 2015 PES categories.**

Wetland System	2015 PES	Assessment categories				Combined score
		Hydrology	Geomorphology	Water Quality	Vegetation	
Wetland 1 - Seep	C	46%	66%	40%	70%	D
Wetland 1 – Valley Bottom	C	61%	90%	83%	84%	C
Wetland 2 – Seep	n/a	14%	47%	16%	0%	E
Wetland 3 - Seep	D	32%	46%	32%	38%	E
Wetland 4 - Seep	C	59%	81%	75%	76%	C
Wetland 5 - Floodplain	B/C	n/a				



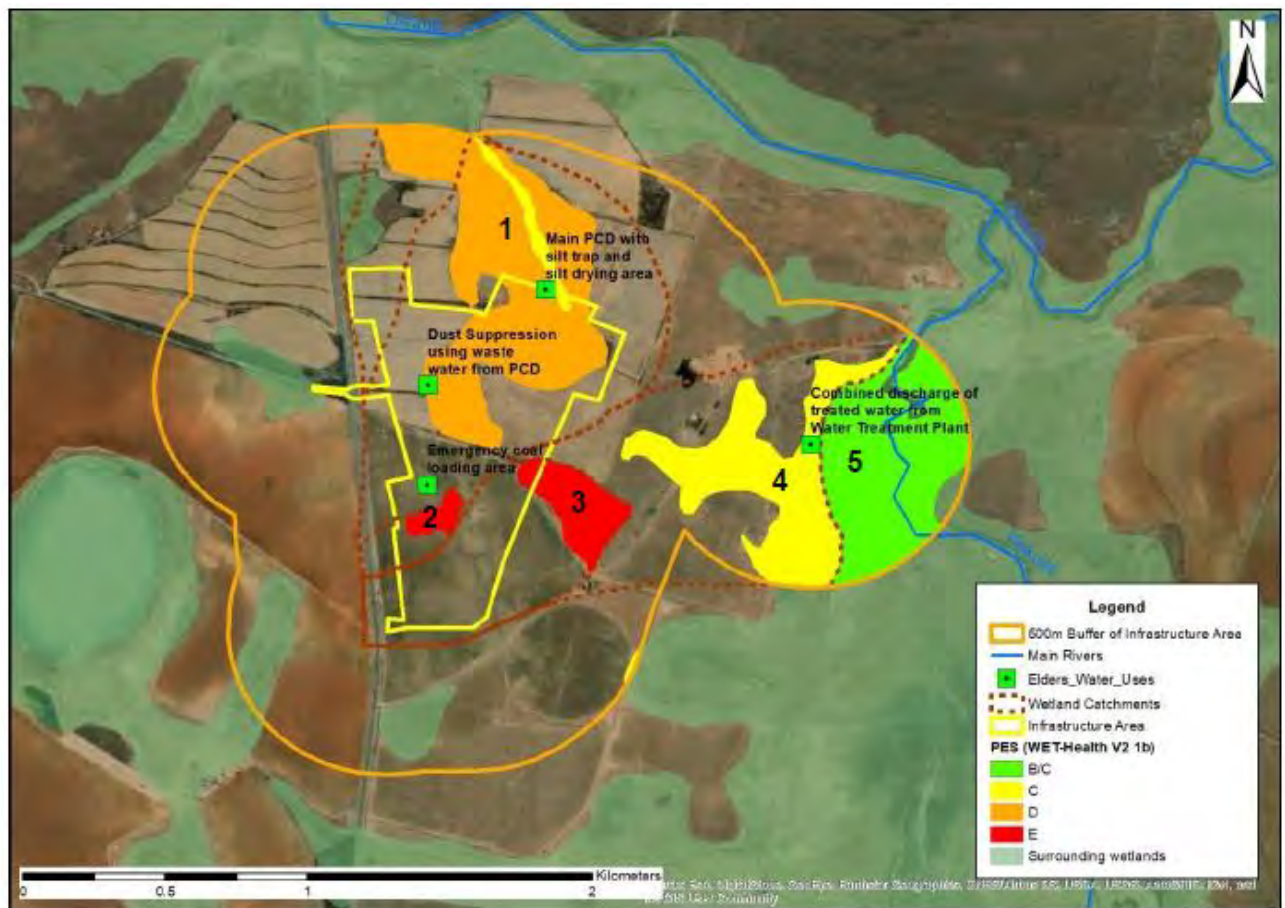


Figure 14-29: Results of the PES assessment.

## 14.11 Surface water hydrology

*The information presented in this section is extracted from the specialist Surface Water study undertaken by JAWS, 2019.*

### 14.11.1 Catchment characteristics

The proposed Elders Colliery is situated within the Witbank Dam catchment, which is part of the Loskop Dam catchment. Majority of the mine property lies within the quaternary sub-catchment B11A, with a portion of the western tip of the mine boundary lying in quaternary sub-catchment B11B. Both fall within the Limpopo-Olifants primary drainage region.

The site lies within the Witbank Dam catchment, which is part of the Loskop Dam catchment and falls within the Olifants Water Management Area (WMA).

All mining areas drain to the Olifants River. Much of the underground mining area underlies the Vlakkuielen and Viskuele Rivers and their floodplains.

The Olifants River flows into the Witbank Dam, which in turn flows into the Loskop Dam. From the Loskop Dam, the Olifants River flows through Mpumalanga and the central part of the Kruger National Park to Mozambique. (JAWS, 2015).

### 14.11.2 Receiving water body

The receiving water body for the assessment of the potential surface water quality impacts related to the proposed Elders Colliery is considered to be Witbank Dam. The use of this dam is motivated on the basis that:

- Beyond Witbank Dam, the potential impact of the mine becomes extremely small due to the water volumes in the catchment and dilution effects
- Further, by the time the water reaches Witbank Dam it is required to be suitable for use for all of the expected uses (drinking water, agricultural, industrial and aquatic ecosystems). Thus, by achieving compliance in terms of these, no additional impacts are expected downstream of Witbank Dam. The receiving water body is relevant only in so far as it defines the aerial extent of the catchment to be considered in the impact assessment and described in the baseline study
- The use of Witbank Dam is based on the relatively small size of the Elders mine area compared to the catchment for Witbank Dam. The next large dam is Loskop Dam
- The catchment area to the Witbank Dam, is reported as 3 579 km<sup>2</sup>, while that for Loskop Dam totals some 12 285 km<sup>2</sup>. The proposed area within the mine boundary is approximately 58.7 km<sup>2</sup>. The mine area thus totals approximately 1.64% of the Witbank Dam catchment, and only some 0.48% of the Loskop Dam catchment
- The mean annual runoff (MAR) for Witbank Dam is some 125 x 10<sup>6</sup> m<sup>3</sup>, while the MAR for the proposed mining area is estimated at 2.57 x 10<sup>6</sup> m<sup>3</sup>

### 14.11.3 Surface water use

Water downstream of the site, up to the Witbank Dam, is primarily used for agricultural and livestock watering purposes, as well as mining.

A survey was conducted during the 2012/2013 study, of surface water use in the area through a surface water use survey (by telephonic interviews, e-mail and post). In general, response to the survey was poor, with a low percentage return of questionnaires and/or inability to reach the participants to conduct telephonic interview. The outcome of the survey is indicated in Table 14-22

In addition to the surface water use survey, the Department of Water Affairs' WARMS Office in Nelspruit was approached to obtain information on abstraction water uses registered with the Department. A summary of the information for quaternary catchment B11A is provided in Table 14-21.

According to the Department's records, a total of 3 395 058 m<sup>3</sup>/annum is abstracted for the purposes of crop irrigation, livestock watering and mining.

During the surface water use survey, the following comments were raised regarding water resources in the area:

- Water in the Olifants River is polluted. Impact from Sudor coal on the water quality of the Olifants River catchment was raised as a concern by the farmers in the area.
- Water quality in the river is critical for livestock watering.

**Table 14-21: Abstraction of surface water in quaternary catchment B11A according to the DWS's WARMS registration system**

Quaternary catchment B11A	m <sup>3</sup> /annum
<b>Water uses</b>	
Irrigation	3 017 428
Livestock watering	17 630
Mining	360 000
<b>Water resource</b>	
Bankspruit	452 020
Unnamed dam	306 710
Unnamed dam/river:	145 480
Fountain	2 000
Klein Olifants River:	640 500
Various dams	257 250
Mooivlei dam	110 975
Olifants River	927 430
Tributary of Olifants River	448 760
Vlaklaagte Dam	35 533
Wasserman Dam	68 400



**Table 14-22: Surface water use survey**

Farm name	Name of owner	Surface water use							
		Crops		Livestock		Human consumption		Recreational	Other
RE/3 of Middelkraal 50 IS, Ptn 2 of Schoonvlei 52 IS, Ptns 3,9-12 of Elandsfontein 75 IS	Mr Nic Britz	None		Cattle (700), sheep(250)	Olifants River and earth dams	None (from boreholes)		None	
Ptn 8 of Kleinfontein 49 IS	Mr Otto Myburgh			Cattle (250-300)	Olifants River	Domestic use (5 families)	Spring	None	
Ptn 4, 7, 8 of Elandsfontein 75 IS; RE and Ptn 1 of Vlakkuijen 76 IS; Ptn 1 of Geluk 226 IS; Ptn 22 of Schurvekop 227 IS; Ptns 3, 13 of Halfgewonnen 190IS	Anglo Operations Ltd and SCSchoeman (leased by Mr Johan Engelbrecht)	46 ha under centre pivot. Mainly fodder for cattle. Sometimes maize	Source: River and dam	Cattle (1100)	Source: River and dam	None		None	

#### 14.11.4 Dry weather flow (DWF)

An accepted definition for dry weather flow is that flow that is equaled or exceeded 70% of the time. DWF flows were therefore determined from the 30th percentile of the simulated flow record. These were compared to the deficient flow-duration-frequency graphs for the hydrozone into which the mining area falls, published in WR90. The simulated DWF was seen to be lower than predicted for the hydrozone. However, the simulated DWF was still selected based on the following:

- The coarseness of the hydrozone (covers a large area)
- The site is located high in the hydrozone and therefore we would expect to generate a lower base flow than regions lower down in the catchment
- The flows for the hydrozone are generalised for the region, while the simulated flow has been calibrated against recorded flow data
- The flows for the hydrozone are based on naturalised flows and do not account for changes in the catchment, abstractions etc. Calibrating on actual measured data should allow for these factors
- It should be noted that selecting the lower DWF flows is more conservative in terms of assessing impacts on watercourses during dry seasons but less conservative if required environmental releases are to be obtained from these numbers

The expected DWF for various catchments is presented in Table 14-23.

**Table 14-23: DWF for catchments relevant to the proposed Elders Colliery**

Catchment	Catchment area (km <sup>2</sup> )	Computed DWF (x 10 <sup>6</sup> m <sup>3</sup> per month average)	Computed DWF (l/s average over month)
A1	1070.00	0.18	69.4
A8	956.00	0.16	62.0
A9	939.84	0.16	61.0
A10	562.63	0.09	36.5
A11	81.33	0.01	5.3
A12	73.24	0.01	4.8
A13	539.94	0.09	35.0
A14	392.30	0.07	25.5
A15	65.88	0.01	4.3
A25	323.76	0.05	21.0
A27	318.91	0.05	20.7
A30	231.90	0.04	15.1
A31	81.92	0.01	5.3
A32	77.66	0.01	5.0
A33	35.00	0.01	2.3
A34	225.87	0.04	14.7
A35	457.11	0.08	29.7

#### 14.11.5 Flood peaks

Several points of interest, or nodes, were identified for peak flow calculations. These were located where streams enter and exit the mining area (.

Catchment areas and slopes were determined from the contour plan provided by the client, as well as the 1:50 000 series topographical maps (2629 AB Vandykdrif, 2629 AD Bethal, 2629 BA Hendrina, 2629 BC Davel, 2628 BB Kendal, 2629 BD Breyten).

There are a multitude of methods available for the determination of peak flows, with the applicability of each method depending largely on catchment area, but also the region in which the peak flow is being determined.

### 14.11.6 Flood peaks and volumes

Several points of interest, or nodes, were identified for peak flow calculations. These were located where streams enter and exit the mining area and are indicated on Table 14-24.

Catchment areas and slopes were determined from the contour plan provided by the client, as well as the 1:50 000 series topographical maps (2629 AB Vandykdrif, 2629 AD Bethal, 2629 BA Hendrina, 2629 BC Davel, 2628 BB Kendal, 2629 BD Breyten).

There are a multitude of methods available for the determination of peak flows, with the applicability of each method depending largely on catchment area, but also the region in which the peak flow is being determined.

The methods used were the Rational Method, the Standard Design Flood (SDF) method (Alexander, 2002), the Synthetic Unit Hydrograph method, the Regional Maximum Flood (RMF) method (Kovács, 1988) and the Direct Run-off Hydrograph (DRH) method.

The peak flows calculated using each method were evaluated for each node and a representative value adopted. The 1:50, 1:100, 1:200 year and Regional Maximum Flood (RMF) for each node, together with catchment areas, are presented in Table 14-24.

The flood volumes were based on the simplified hydrograph proposed by Kovacs, and the relationship between the Regional Maximum Flood and Mean Annual Runoff as derived from the measurement of various extreme flood events across South Africa, documented in various DWS (former DWA) publications.

*Note that the Regional Maximum Flood (RMF) method is not applicable to catchments smaller than 1 km<sup>2</sup>.*

**Table 14-24: Peak flows determined for Elders**

Catchment	Area (km <sup>2</sup> )	Recurrence interval	Flood Peaks (m <sup>3</sup> /s)	Flood volume (m <sup>3</sup> x 10 <sup>6</sup> )
A1	1070	50 year	1500	102
		100 year	2087	142
		200 year	3033	206
		RMF	2071	140
A2	4.8	50 year	69	0.2
		100 year	89	0.3
		200 year	109	0.4
		RMF	181	0.6
A3	1.7	50 year	39	0.1
		100 year	50	0.1
		200 year	61	0.1
		RMF	123	0.2
A4	1.4	50 year	35	0.1
		100 year	44	0.1
		200 year	54	0.1

Catchment	Area (km <sup>2</sup> )	Recurrence interval	Flood Peaks (m <sup>3</sup> /s)	Flood volume (m <sup>3</sup> x 10 <sup>6</sup> )
		RMF	114	0.2
A5	3.2	50 year	63	0.2
		100 year	80	0.2
		200 year	99	0.3
		RMF	155	0.4
A6	14.4	50 year	59	0.4
		100 year	75	0.5
		200 year	92	0.6
		RMF	276	1.9
A7	11.4	50 year	49	0.3
		100 year	62	0.4
		200 year	77	0.5
		RMF	252	1.5
A8	956	50 year	1497	96.4
		100 year	2083	134.1
		200 year	3030	195.1
		RMF	1949	125.5
A9	940	50 year	1450	92.6
		100 year	2017	129
		200 year	2933	187
		RMF	1931	123
A10	563	50 year	1838	94.6
		100 year	2461	127
		200 year	3490	180
		RMF	1435	74
A11	81.3	50 year	520	10.4
		100 year	697	13.9
		200 year	993	19.9
		RMF	532	10.7
A12	73.2	50 year	486	9.1
		100 year	654	12.3
		200 year	884	16.6
		RMF	511	9.6
A13	540	50 year	1543	76.4
		100 year	2078	102.8
		200 year	2953	146
		RMF	1432	70.9
A14	392	50 year	1439	61.5
		100 year	1926	82.3
		200 year	2730	116.6

Catchment	Area (km <sup>2</sup> )	Recurrence interval	Flood Peaks (m <sup>3</sup> /s)	Flood volume (m <sup>3</sup> x 10 <sup>6</sup> )
		RMF	1205	51.5
A15	66	50 year	432	7.6
		100 year	583	10.3
		200 year	831	14.6
		RMF	491	8.6
A16	10	50 year	109	0.6
		100 year	139	0.8
		200 year	171	0.9
		RMF	240	1.3
A17	1.6	50 year	32	0.1
		100 year	40	0.1
		200 year	49	0.1
		RMF	118	0.2
A18	5.4	50 year	113	0.4
		100 year	144	0.6
		200 year	177	0.7
		RMF	190	0.7
A19	6.0	50 year	59	0.2
		100 year	75	0.3
		200 year	93	0.4
		RMF	198	0.8
A20	4.0	50 year	55	0.2
		100 year	70	0.2
		200 year	86	0.3
		RMF	170	0.5
A21	2.4	50 year	41	0.1
		100 year	52	0.1
		200 year	64	0.1
		RMF	139	0.3
A22	6.8	50 year	75	0.3
		100 year	96	0.4
		200 year	118	0.5
		RMF	207	0.9
A23	3.1	50 year	44	0.1
		100 year	56	0.2
		200 year	68	0.2
		RMF	154	0.4
A24	8.4	50 year	74	0.4
		100 year	95	0.5
		200 year	116	0.6

Catchment	Area (km <sup>2</sup> )	Recurrence interval	Flood Peaks (m <sup>3</sup> /s)	Flood volume (m <sup>3</sup> x 10 <sup>6</sup> )
		RMF	224	1.1
A25	324	50 year	1220	47.7
		100 year	1635	64.0
		200 year	2321	90.8
		RMF	1086	42.5
A26	2.4	50 year	53	0.1
		100 year	67	0.2
		200 year	83	0.2
		RMF	138	0.3
A27	319	50 year	1243	48.3
		100 year	1667	64.8
		200 year	2363	91.8
		RMF	1077	41.9
A28	1.3	50 year	34	0.1
		100 year	43	0.1
		200 year	53	0.1
		RMF	112	0.2
A29	4.6	50 year	71	0.2
		100 year	90	0.3
		200 year	111	0.4
		RMF	178	0.6
A30	232	50 year	922	31.0
		100 year	1238	41.5
		200 year	1760	59.0
		RMF	907	30.4
A31	81.9	50 year	498	10.0
		100 year	671	13.5
		200 year	956	19.3
		RMF	533	10.7
A32	77.7	50 year	492	9.6
		100 year	661	12.9
		200 year	941	18.4
		RMF	523	10.2
A33	35.0	50 year	309	3.7
		100 year	417	5.0
		200 year	597	7.1
		RMF	386	4.6
A34	226	50 year	901	29.9
		100 year	1210	40.1
		200 year	1720	57.0



Catchment	Area (km <sup>2</sup> )	Recurrence interval	Flood Peaks (m <sup>3</sup> /s)	Flood volume (m <sup>3</sup> x 10 <sup>6</sup> )
		RMF	894	29.6
A35	457	50 year	1397	64.1
		100 year	1880	86.2
		200 year	2667	122.3
		RMF	1308	60.0
A36	5.9	50 year	58	0.2
		100 year	74	0.3
		200 year	91	0.4
		RMF	196	0.8

### Floodline determination

It is important to note that the floodlines computed during the 2012/2013 study are now more than 5 years old. However, a review of Google Earth images indicates that the catchment has not changed substantially since the delineation.

Floodlines were determined based on the calculated flood peaks at each node. A steady flow, backwater analysis was performed for each stream using the HEC-RAS river modelling system. HEC-RAS was developed by the United States Army Corps of Engineers and is considered industry standard software for floodline determination in many countries, including the United States, the United Kingdom, Europe, Australia and South Africa.

When determining floodlines, each stream is defined by inputting a number of cross sections along the length of the stream. The mapping data used consisted of 1m contour interval dtm (digital terrain model), as well as an elevated 5 m contour interval dtm, received from the client.

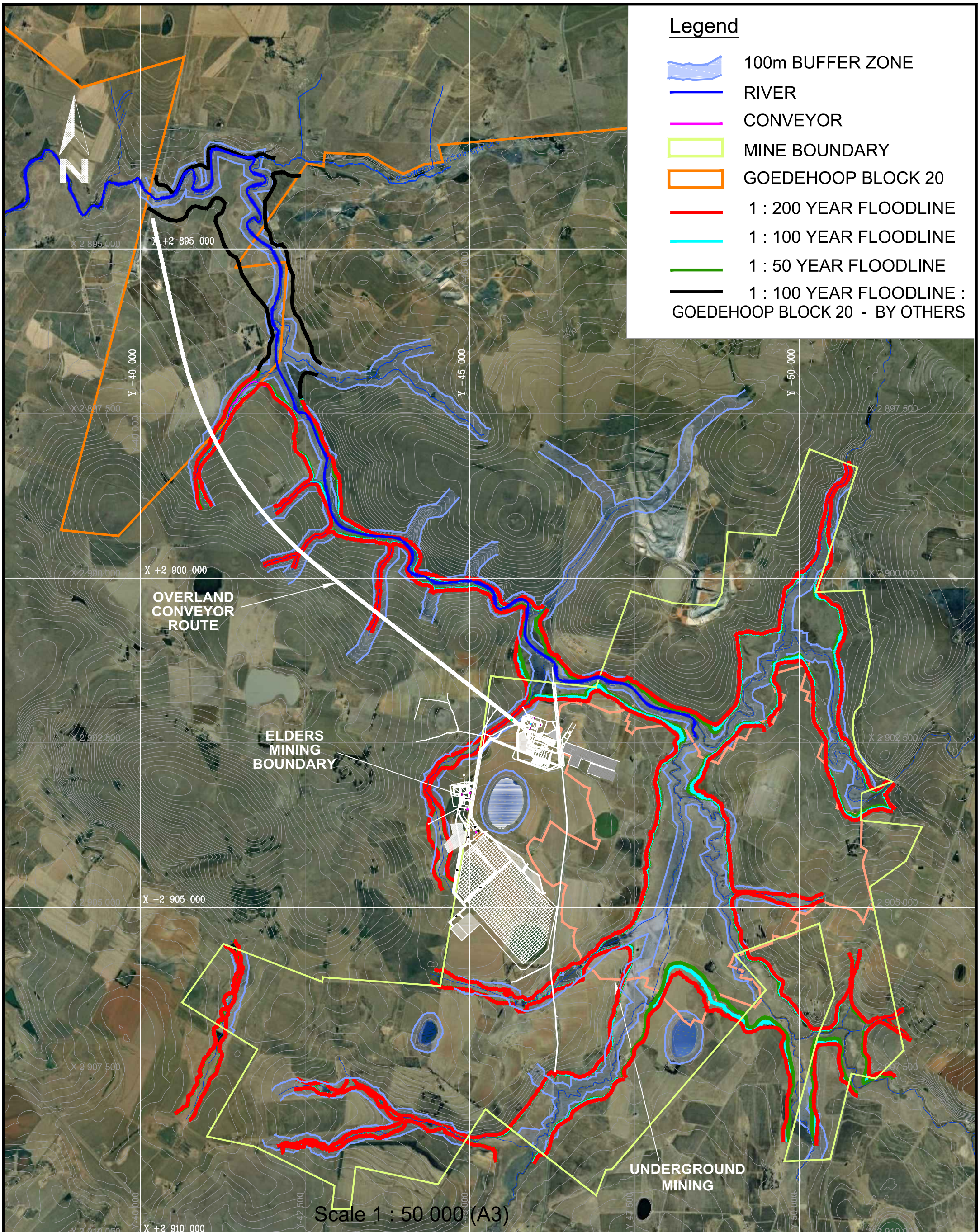
It should be noted that the accuracy of the floodlines produced in this study is commensurate with the accuracy of the dtm data provided. With a contour interval of 1 m, the accuracy of the floodlines can be considered to be within 1 m vertically. Therefore, the accuracy of the floodlines in areas where the 5 m contour interval dtm was used will be considerably less.

The floodlines given here are considered suitable for planning purposes only. Where infrastructure is to be located adjacent to streams, the floodlines should be determined more accurately using a digital terrain model (dtm) developed from a field survey at the area of concern.

The 1:50, 1:100 and 1:200 year floodlines have been computed for the proposed Elders mine boundary as well as along the conveyor route.

The floodlines can be seen in Table 14-26.





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SRK Consulting  
 Elders Colliery  
**FLOODLINES**

Ø:D202/01

**Figure 6.4.4(a)**



### 14.11.7 Surface water quality

The baseline surface water quality is described in this section. It is important to note that the surface water quality analysis carried out during the 2012/2013 study are now more than 5 years old. However, review of Google Earth images indicates that the catchment has not changed substantially since the analysis.

J&W were appointed by Oryx Environmental in 2005/6 to compile the surface water specialist report for the proposed Elders Colliery underground mining project. This included baseline surface water sampling and hydrology, as well as a mine water balance and an interim, incomplete draft report was submitted in September 2006. The project was, however, discontinued before the impact assessment, mitigation and IWULA were completed.

Baseline water quality sampling undertaken in the 2005/6 study is out-dated but has been included in this assessment for completeness. Updated monthly sampling over a 12-month period (i.e. from Aug 2012 to July 2013) was carried out as part of the 2012 study. For the 2012 study, the baseline surface water quality monitoring programme was expanded to include 13 locations where streams enter and leave the mine boundary. Each location was sampled 12 times, being once a month over a period of one year.

#### Surface water quality monitoring locations

The surface water monitoring points for the previous baseline study as well as the updated baseline study for the proposed Elders Colliery are illustrated in Figure 14-31 and the coordinates to these points are given in Table 14-25.

**Table 14-25: Description and co-ordinates of surface water monitoring locations**

Sampling Location	Description	Farm Portion	Coordinates
<b>2005/6 Surface water study monitoring points</b>			
E8	Tributary of the Olifants River	Middelkraal 50 IS	X: 2902540.04 Y: -48267.93
E9	On Olifants River downstream of the proposed 2005/6 activities	Middelkraal 50 IS	X: 2901234.50 Y: -46264.50
E10	Along the Viskui River upstream of the proposed 2005/6 activities	Schurvekop 227 IS	X: 2906626.29 Y: -49545.91
E11	Along the Olifants River upstream of the proposed 2005/6 activities	Halfgewonnen 190 IS	X: 2902428.67 Y: -52595.12
E12	Along the Leeufontienspruit	Middelkraal 50 IS	X: 2892752.96 Y: -53927.84
E13	Along the Olifants River Downstream of the proposed 2005/6 activities	Klienfontein 49 IS	X: 2896378.00 Y: -42095.26
<b>Updated 2013 Surface water study monitoring points</b>			
ESW01	At the Pan (Vlakkuijen Pan)	Vlakkuijen 78 IS	X : 2903338.084 Y: -45540.273
ESW02	At the Pan to the east of the Vlakkuijen River	Schurvekop 227 IS	X: 2906949.854 Y: -48297.872
ESW09	Along the Olifants River downstream of the workings	Middelkraal 50 IS	X: 2901166.105 Y: 46197.032

Sampling Location	Description	Farm Portion	Coordinates
ESW10	Tributary of the Olifants River downstream of the proposed activities	Elandsfontein 147 IS	X: 2904623.429 Y: -40608.862
ESW11	Along Vlakkuielen River upstream of the proposed activities	Vlakkuielen 78 IS	X: 2908368.320 Y: -46231.212
ESW12	Along Viskuele River upstream of the proposed activities	Schurvekop 227 IS	X: 2908923.838 Y: -50076.867
EWS13	Along Viskuele River upstream of the proposed activities	Schurvekop 227 IS	X: 2907434.531 Y: -50872.659
ESW14	Along a Tributary Viskuele River upstream of the proposed activities	Schurvekop 227 IS	X: 2906662.004 Y: -51232.102
ESW15	Along Viskuele River upstream of the proposed activities	Schurvekop 227 IS	X: 2906949.854 Y: -48297.872
ESW16	Along Viskuele River downstream of the proposed activities	Middelkraal 50 IS	X: 2903065.150 Y: -48122.063
ESW17	Tributary of the Olifants River upstream of the proposed activities	Halfgewonnen 190IS	X: 2903038.933 Y: -51425.841
ESW18	Along the Leeufontienspruit	Middelkraal 50 IS	X: 2897996.425 Y: -50860.666
ESW19	Along the Olifants River upstream of the proposed activities	Middelkraal 50 IS	X: 2901478.832 Y: -49424.521

## Legend

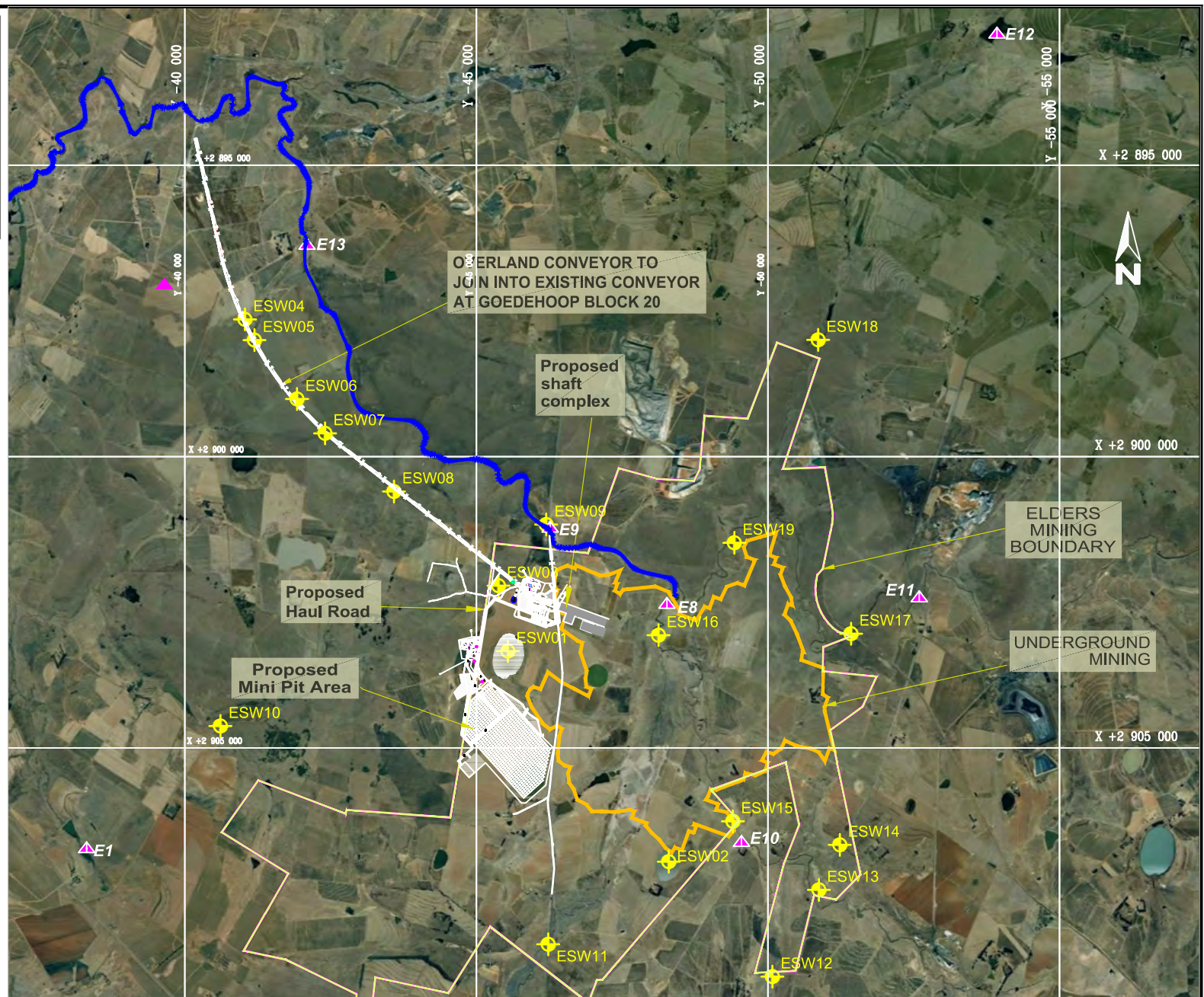
- Conveyor
- Mine Boundary
- Extent of Underground Mining
- ◆ ESW04 Monitoring Points (2013)
- ▲ E13 Monitoring Points (2005/06)

### COORDINATE SYSTEM CLARKE 1880 LO29 2005/6 Monitoring Points

POINT	Y	X
E8	-48267.93	2902540.04
E9	-46264.50	2901234.50
E10	-49545.91	2906626.29
E11	-52595.12	2902428.67
E12	-53927.84	2892752.96
E13	-42095.26	2896378.00

### COORDINATE SYSTEM CLARKE 1880 LO29 Current and 2013 Monitoring Points

POINT	Y	X
ESW01	-45540.27	2903338.08
ESW02	-48297.87	2906949.85
ESW03	-45378.89	2902215.42
ESW04	-41030.84	2897645.51
ESW05	-41194.10	2898000.46
ESW06	-41924.44	2899011.43
ESW07	-42405.24	2899600.06
ESW08	-43586.44	2900597.74
ESW09	-46197.03	2901166.10
ESW10	-40608.86	2904623.42
ESW11	-46231.21	2908368.32
ESW12	-50076.86	2908923.83
ESW13	-50872.66	2907434.53
ESW14	-51232.10	2906662.00
ESW15	-48297.87	2906949.85
ESW16	-48122.06	2903065.15
ESW17	-51425.84	2903038.93
ESW18	-50860.67	2897996.42
ESW19	-49424.52	2901478.83





### 14.11.8 Water quality interpretation

The values for various constituents measured around the Elders site were compared to the interim RWQO for catchment management unit MU 8. pH, SO<sub>4</sub>, EC and heavy metals (Iron (Fe), Manganese (Mn), Aluminium (Al) and Boron (B)) are discussed below.

#### pH

The pH of natural waters is a measurement of the acidity/alkalinity and is the result of complex acid-base equilibrium of various dissolved compounds. The pH of most raw water sources is within the range of 6.5 - 8.5 (DWAF, 1996). A decrease in the pH of water in a mining area will be an indication of acid mine drainage (AMD).

The 2005/6 results show that the monitoring locations are compliant to the interim RWQO. However, the updated 2013 results indicate a very high pH of above 8.4 for the two pans, along the Olifants River, Vlakkuielen and Viskuele Rivers Leeufontienspruit, as well as around the project area (monitoring locations EWS01, ESW02, ESW06, ESW09, ESW10, ESW11, ESW13, ESW15, ESW16, ESW17, ESW18 and ESW19). This may be due to farming activities in the surrounding area that have expanded over the last 5 to 7 years.

#### Sulphate (SO<sub>4</sub>)

The concentration of sulphates in surface water is typically low (~5 mg/l), although concentrations of several hundred mg/l may occur where dissolution of sulphate minerals or discharge of sulphate-rich effluents takes place (DWAF, 1996). AMD decanting or seeping from mining areas can increase the sulphate in surface water significantly. Chemical fall-out during rain events in areas where coal burning takes place can also increase the sulphate content of surface water bodies.

The 2005/6 results show that along the Olifants River elevated sulphates were found. Current studies show the same, with elevated values of sulphates found at both pans, along the Olifants River, Vlakkuielen and Viskuele Rivers, Leeufontienspruit, as well as around the project area (monitoring locations ESW01, ESW02, ESW03, ESW09, ESW10, ESW11, ESW12, ESW14, ESW15, ESW16, ESW17, ESW18 and ESW19).

This baseline water quality indicates that the catchment is already impacted on by mining and agricultural activities in the surrounding area.

#### Electrical conductivity

Electrical conductivity (EC) is a measure of the ability of water to conduct an electrical current, which is as a result of the presence of charged ions such as carbonate, bicarbonate, chloride, sulphate, nitrate, sodium, potassium, calcium and magnesium (DWAF, 1996). It is therefore an indicator of the salinity, or total salt content, of water.

Accumulation of salts can influence the potential of downstream water users to use the water for uses such as irrigation for agriculture.

The 2005/6 results show that along the Olifants River, as well as along Leeufontienspruit, elevated values of EC were found. Current studies show the same with elevated values of EC at similar locations to those where elevated SO<sub>4</sub> was found (i.e. both pans, along the Olifants River, Vlakkuielen and Viskuele Rivers as well as around the mining area, at monitoring locations ESW01, ESW02, ESW03, ESW09, ESW10, ESW11, ESW12, ESW14, ESW15, ESW16, ESW17 and ESW19).

The baseline water quality therefore indicates that the catchment is already impacted on by mining and agricultural activities in the surrounding area.

#### Iron (Fe)



Iron (Fe) is the fourth most abundant element, constitutes 5% of the earth's crust and is found in many minerals. An important mineral in the context of this investigation is pyrite (FeS), which is often associated with coal formations. Iron can be present in water as dissolved ferric iron (Fe III), as ferrous iron (Fe II) or as suspended iron hydroxides. The concentration of dissolved iron in unpolluted surface water is typically in the range of 0.001 - 0.5 mg/l (DWAf, 1996). The interim RWQO for iron was set as 1 mg/l for MU8.

In general, the iron concentration in the Olifants River sub-catchment as shown in the 2005/6 study indicate slightly to highly elevated iron concentrations. The current study indicates iron concentrations below or at this level, or slightly elevated (but below 2 mg/l).

Highly elevated iron concentrations were noted in both pans at monitoring locations ESW01 and ESW02. The baseline water quality therefore indicates that the catchment is already impacted on by mining and agricultural activities in the surrounding area.

### **Aluminum**

Aluminium occurs in water either as suspended aluminium minerals or as dissolved aluminium species. The concentration of dissolved aluminium in unpolluted water at neutral pH is typically 0.005 mg/l or less. In water with a low pH, or where soluble aluminium complexes are present, the dissolved aluminium concentration can rise to high values (DWAf, 1996).

The 2005/6 results show that along the Olifants River, as well as around the mining areas, elevated concentrations of aluminium were found. Current studies show the same, with aluminium concentrations in both pans, along the Olifants River, Vlakkuielen and Viskuele Rivers, Leeufontienspruit as well as around the mining area, at monitoring locations ESW01, ESW02, ESW03, ESW05, ESW06, ESW07, ESW08, ESW09, ESW10, ESW11, ESW12, ESW13, ESW14, ESW15, ESW16, ESW17, ESW18 and ESW19) exceeding the interim RWQO of 0.02 mg/l. The baseline water quality therefore indicates that the catchment is already impacted on by mining and agricultural activities in the surrounding area.

### **Manganese**

Manganese (Mn) is a relatively abundant element which constitutes 0.1% of the earth's crust. The median concentration in fresh water is 8 µg/l, with a range of 0.02 to 130 µg/l (DWAf, 1996).

The 2005/6 results show that along the Olifants River, as well as in the Vlakkuielen and Viskuele Rivers, elevated concentrations of Mn were found. Current studies show the same, with the Mn concentration along the Olifants River, Vlakkuielen and Viskuele Rivers, as well as around the mining area at monitoring locations, ESW02, ESW03, ESW06, ESW09, ESW10, ESW12, ESW13, ESW14, ESW15, ESW16, ESW17 and ESW19 above the interim RWQO of 0.4 mg/l.

The baseline water quality therefore indicates that the catchment is already impacted on by mining and agricultural activities in the surrounding area.

### **Ecoli and Total Coliforms**

Escherichia coli (e.coli) is normally found in the gastrointestinal tracts of both humans and animals, and often is responsible for diarrheal diseases. The interim RWQO for the MU 8 for e.coli is 130 per 100 ml.

The current study shows high counts of e.coli along the Olifants River, Vlakkuielen and Viskuele Rivers, as well as around the project area, which may be attributed to cattle farming in the area.

Total coliforms are used to estimate microbial growth in water treatment processes.

The current study shows high counts of Total coliforms when comparing to South African Water Quality Guidelines for domestic use (2nd Edition 1996) along the Olifants River, Vlakkuijen and Viskuije Rivers, as well as around the project area, which may be attributed to cattle farming in the area.

Analysis of the other constituents indicates the following for catchment MU 8:

- In both pans (ESW01, ESW02) elevated concentrations of TDS, Chloride (Cl), Fluoride (F), Calcium (Ca), Magnesium (Mg) and Sodium (Na) were observed. These elevated concentrations may be due to farming activities in the area;
- In pan (ESW01) elevated concentrations of Potassium (K) were observed, which may be due to farming activities in the area; and
- Around the Elders mine boundary, elevated levels of TDS, Chloride (Cl), Fluoride (F), Calcium (Ca), Sodium (Na) and Magnesium (Mg) were observed. These elevated concentrations may be due to a combination of mining activities in the area, as well as farming activities.

#### 14.11.9 Water balance

*The information presented in this section is extracted from the specialist Surface Water Technical Memo undertaken by JAWS, 2020. (Appendix G9)*

A water balance model has been developed using the GoldSim Modelling Software, with the use of Excel as a database for inputs and outputs. The purpose of the water balance model is to estimate the volumes of water that will be generated by the proposed activities at Elders, including effluent water and surface runoff from the dirty areas. This is assessed together with the water demands on the site to determine whether the site will operate with a water surplus or deficit and to determine the storage/treatment capacity required to ensure legal compliance, in terms of prevention of spills from the site. The water balance modelling is therefore a key input to the overall water management strategy for the site.

#### 14.11.10 Schematic flow diagram

The overall schematic water balance for Elders is presented in Figure 14-32. The schematic water balance diagram represents the water flows between the different elements at Elders, including both clean and dirty (polluted) water and forms the basis of the GoldSim Water Balance model.

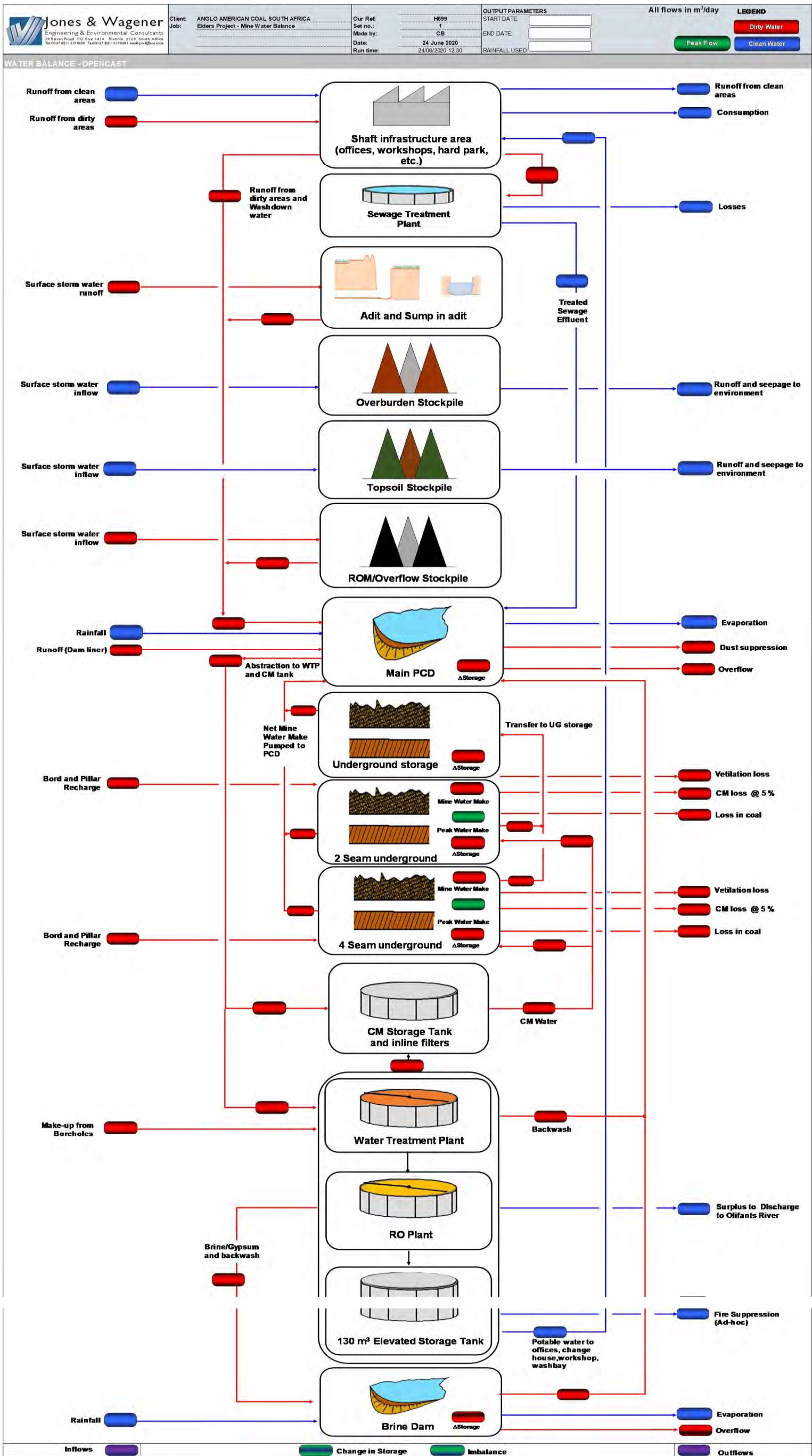


Figure 14-32: Elders Colliery Water Balance (JAW, October 2020)

- Groundwater ingress reports, via the underground dams, to the boxcut sump and then to the PCD rather than directly to the PCD. The box cut sump pump rate to the PCD may need to be increased to account for this change. Previously a maximum pump rate of 6000 m<sup>3</sup>/day was utilised. Input regarding the finalised pump rate is therefore required from Semane
- The PCD will no longer pump directly to the WTP but rather via the continuous miners (CM) storage and Raw Water Tank (previously no such tank was shown on the project PFDs, there was only a CM tank) and then to the WTP
- As received from Semane, sewage from certain areas will report to Conservancy Tanks (tank sized at about 2.5 m<sup>3</sup> maximum; 3 tanks, emptied fortnightly) with contents reporting to STP for local processing and not removed from site. Semane indicated via email on 13 October 2020 that these are small quantities which can be considered negligible (i.e. as it is already included in assumption of wastewater generated). Previously it was assumed all sewage would report to the sewage treatment plant (STP), with all treated sewage effluent recycled to the PCD

None of the changes noted above are expected to materially alter the results of the water balance. It is therefore recommended, in the interest of time, to move forward with the water balance as is, without the aforementioned changes to the flow diagram or model.

#### 14.11.11 Water usage

The following information will be used for the water balance in terms of water usages and losses:

- Water make from underground, together with water recovery from the continuous miners (CM) will be brought to surface and pumped into the Main PCD, rather than being recirculated underground. Water needed for the CMs underground will be then be sourced from the Main PCD, via a CM Tank. This water passes through inline filters before being sent back underground
- A maximum of five CMs will be utilised underground. The ramping up of the CMs, together with the associated dates, are provided in Table 14-26. This is based on information provided by Ukwazi via email, dated 23 June 2020
- Based on information provided by Semane, a water requirement of 1 296 m<sup>3</sup>/day for the peak five CMs will be utilised, with the water use requirement pro-rated according to the number of CMs in operation at any given time
- Water losses due to the CM usage, ventilation system and the coal removed from the workings will be accounted for. The following will be utilised in the water balance model:
  - CM loss: 5% of the CM water use
  - Water lost in the ROM coal: 288 m<sup>3</sup>/day per CM
  - Ventilation loss: 133 m<sup>3</sup>/day per CM
- During the initial years of mining, make up water, if required, will be provided from boreholes. The boreholes are to be confirmed and yield tests to be carried out. The only current usable borehole is ESW 25. Boreholes ESW 42 and ESW 43 are yet to be confirmed, drilled and tested. This water will be treated before use
- Potable water for use at the workshops, offices and change house will be supplied from the potable water treatment plant. The potable water requirement has been based on information provided by Semane, with 154 personnel requiring 35 l/day and 160 personnel requiring 150 l/day at the change houses
- It will be assumed that 60% of the total potable water will report to the sewage treatment plant, while the remaining 40% would be lost from the system through consumption
- It will be assumed that 90% of the water treated at the STP will report as treated effluent to the Main PCD (i.e. a 10% loss of water is accounted for at the STP)
- Washdown water at the shaft infrastructure area will be accounted for. This will be based on 1 080 l/hr for 5 hr/day as received from Semane, with the water being sourced from the treatment plant and reporting to the Main PCD

**Table 14-26: Continuous Miner ramp up schedule**

Continuous Miner	Start Date	End Date
<b>2 Seam</b>		
1	August 2022	August 2034
2	March 2024	September 2036
3	September 2024	May 2037
4	September 2024	January 2036
5	March 2025	July 2037
<b>4 Seam</b>		
1	August 2034	May 2050
2	September 2036	January 2050
3	May 2037	November 2050
4	January 2036	November 2050
5	July 2037	February 2050

### 14.11.12 Water management

The following will be utilised in the water balance with regard to water management:

- Dirty runoff from the dirty areas at the shaft, as well as the ROM/Overflow stockpile will be directed, via a silt trap, to the Main PCD;
- Runoff from the external catchment draining towards the mine surface infrastructure area will be diverted, minimising the volume of water reporting to the Main PCD;
- The layout used to delineate the various sub-catchments on the mine surface infrastructure site was provided by Semane;
- Runoff from the adit (or boxcut) will report to the adit sump and from there be pumped to the Main PCD. A maximum pump rate of 6 000 m<sup>3</sup>/day will be utilised in the water balance model, based on information provided by Ukwazi;
- Excess water underground that cannot be stored underground will be pumped to surface, to the Main PCD, from which it will be pumped to either the CM tank for reuse underground or to the water treatment plant, where it will be treated and discharged into the environment;
- In the previous iteration of the water balance, it was assumed that the underground storages would be allowed to fill up as quickly as possible, rather than any water brought to surface and treated to delay the filling up of the underground. It is recommended that, for this iteration of the water balance, two scenarios be assessed:
  - Fill up the underground as quickly as possible; and
  - Pump water to surface to delay filling up of underground such that there is available capacity underground during the peak underground water make for storage, so as to minimise the peak treatment rate;
- Sewage flow from the change house and offices will be directed to the Sewage Treatment Plant (STP). The treated sewage wastewater will be discharged into the wetland, however, all wastewater will report to the Main PCD with sludge directed to sludge drying beds before being disposed of, off site;
- Sludge generated from the treatment process will be directed to a gypsum pad from where gypsum will be disposed of, off site;
- The water treatment plant will pump treated water to a 130 m<sup>3</sup> elevated potable water tank for use as follows -



- For fire suppression on surface and underground
- Potable water underground
- Potable water at workshops and office
- Potable water at change houses;
- Water from the water treatment plant will also be transferred to the proposed RO Plant. The treated effluent from the RO Plant will be used for potable water supply with excess discharge to the environment; and
- Backwash from the RO Plant will be directed to a brine dam, where water will be allowed to evaporate or be pumped to the Main PCD. The water volumes for backwashing of the treatment plant were provided by Semane, October 2020 at 2.5 % of the raw water.

#### 14.11.13 Groundwater inflows

The groundwater inflows reporting to the underground mine significantly impact the water balance and the required water management at the mine. The updated groundwater inflows received from Delta H on the 8 October 2020 inflows are provided in Table 14-27 below.

**Table 14-27: Groundwater inflow**

Year	4 Seam	2 Seam	Total
	All in ML/d		
2021		0.42	0.42
2022		0.29	0.29
2023		0.91	0.91
2024		2.76	2.76
2025		4.1	4.1
2026		5.61	5.61
2027		6.1	6.1
2028		6.66	6.66
2029		6.89	6.89
2030		7.38	7.38
2031		8.17	8.17
2032		9.28	9.28
2033		9.02	9.02
2034	0.1	8.13	8.23
2035	0.23	7.76	7.98
2036	0.52	7.08	7.6
2037	0.71	5.80	6.51
2038	1.35	5.50	6.85
2039	1.63	5.21	6.84

Year	4 Seam	2 Seam	Total
	All in Ml/d		
2040	1.65	4.91	6.56
2041	1.84	4.61	6.45
2042	2.07	4.31	6.38
2043	2.29	4.02	6.31
2044	2.08	3.72	5.80
2045	1.81	3.42	5.23
2046	1.57	3.12	4.69
2047	1.69	2.83	4.52
2048	1.83	2.53	4.36
2049	2.03	2.23	4.26
2050	1.62	1.93	3.55

In the previous revision of the water balance, no seasonal water levels were available for calibration, hence no predicted seasonality was provided for the groundwater inflows. A seasonal variability in inflows will be assumed based on the rainfall seasonality, varying between 25% above and 25% below the average.

#### 14.11.14 Underground storage capacity over time

The storage volumes that are expected to become available over time are provided in Table 14-28. These storage volumes were based on information provided by Ukwazi, 28 July 2020.

**Table 14-28: Expected underground storage capacity**

Date that storage becomes available	Total cumulative storage capacity (m <sup>3</sup> )
August 2023	14 170
August 2030	1 663 052
August 2031	2 927 919
August 2034	4 393 320
August 2035	5 039 525
August 2037	5 739 152
August 2038	22 666 848
August 2041	23 724 290
August 2043	25 050 178
August 2047	28 014 094
August 2049	28 626 571
August 2050	29 207 566

## 14.12 Socio-economic structure

*The information presented in this section is extracted from the specialist Socio-economic study compiled by SRK in 2015 (Appendix G10)*

### 14.12.1 Zone of Influence

The socio-economic baselines study has been broken into distinct categories consistent with the Primary and Secondary Zone of Influence (Zol) as per the SEAT 3 document. The Zol is the area within which a project has impacts or influence, these impacts can be either direct physical impacts or induced or interactive impacts. Typically the social Zol is unique to each project and is larger than the actual project footprint (i.e. the mine lease area, or land used for mining and infrastructure).

For the Elders project the social Zol has been delineated as follows:

- The Primary Zone of Influence - In terms of the proposed Elders Colliery, the primary Zol includes the 'footprints' of areas immediately adjacent to the primary and service infrastructure of the mine. This includes the Vlakkuielen and Middelkraal Communities, which are within the primary Zol
- The Secondary Zone of Influence - This Zol includes Bethal and Emzinoni which are both located in the GMLM. It is anticipated that Bethal and Emzinoni will both experience impacts from the proposed development. Furthermore, due to the location of the mining operation future activities and interaction will be focused upon the GMLM. The Mahlathini informal settlement, located 10 km from the proposed infrastructure, also falls within this Zol
- The Tertiary Zone of Influence - This Zol includes Kriel and Thubelihle, both located in the ELM. It is also anticipated that both Kriel and Thubelihle might experience changes and impacts due to their proximity to the proposed mine

#### Primary Zone of Influence

There are two communities which are within the primary Zone of Influence. The information for the Vlakkuielen community draws on information from the household census conducted in 2012 and 2015 to provide characteristics of the affected households. The information for Middelkraal community was gathered from secondary sources, site observations and a focus group discussion on 15 September 2015.

#### Vlakkuielen Community

The Vlakkuielen community is predominantly located on the southern portion of the Hirsaw Estate; two households are detached from the main community and reside on the northern side of the estate. The Hirsaw Estate is located along the R35 national road between Bethal and the Goedehoop Colliery in the GMLM.

##### Population

The Vlakkuielen Community is a rural community with a total population of 127 people living in 23 households. This gives an average household size of 5.5 people, reflecting the norm for rural agricultural households in South Africa. During the 2015 household surveys, 37% of the population were children below the age of 18, whereas 10% of the population was made up of pensioners above the age of 65.

##### Education

Wazana Primary School was the only school at Vlakkuielen and was closed in December 2014. Nine learners who were registered at the school were transferred to The Friedman Primary School on the farm Blinkwater. This school is 25 km from Vlakkuielen. The DoE is providing learners with transport to and from school on a daily basis. The Friedman Primary School is registered with the DoE and receives food for their feeding programme and teaching aids such as text books.

### Health

A mobile clinic visits the community once a month to distribute basic medication. For more serious complications and child birth people from the community generally travel to Bethal and Emzinoni where there clinics, a hospital and doctors.

### Employment, livelihood and income

As is the case in many rural farming areas of South Africa, the Vlakkuielen community is characterised by high levels of unemployment. During the household census affected households indicated that they are suffering as a result, particularly with issues such as food security and electricity costs.

### Housing

Housing in the Vlakkuielen community is varied in both construction type and size. There are the original houses constructed by the farm owner, these are generally constructed using brick and cement with asbestos roofing.

The second type of housing is more informal structures constructed using corrugated iron sheeting. These houses are generally constructed by extended family members who do not have the funds to build a more formal structure.

There are also a couple of traditional structures in the community built using mud, stone and wood. Two households in the community currently reside within the Wazana Primary School.

### Infrastructure and services

**Transport:** Due to the rural and remote nature of the Vlakkuielen Community transport is a serious issue for the community. During the census survey it was often mentioned that transport made up a significant percentage of a households monthly costs.

**Refuse Removal:** There is no municipal refuse removal service, all households indicated that they either burned or buried it. While this is a simple and cost effective solution for the community it could potentially lead to unhygienic conditions which might impact on household members' health.

**Sanitation:** The availability and access to sanitation services is an important social service, and can often be an indicator of a community's social wellbeing. Sanitation services in the Vlakkuielen community are varied. Some households, particularly the older farm houses, have flushing toilets with septic tanks, however the majority of the community make use of self-built unventilated pit latrines.

**Water:** Water in the Vlakkuielen community is supplied by a groundwater borehole which is pumped to storage tanks via a windmill. There is also a pump operated by a generator that pumps water out of the Olifants River, however this is often in a state of disrepair and not a reliable source.

Households have standpipes in their yards to access the water from the borehole. It is reported by the community that the water sources are generally reliable and the quality is acceptable for human and animal consumption.

**Electricity:** The availability of electricity as an energy source is vitally important as households utilise it for both cooking and lighting. Some of the key points regarding electricity provision in Vlakkuielen are:

- Of the households, 11 have access to municipal electricity;
- Electricity is purchased on a pre-paid basis;
- The primary household structure/s are connected, additional structures, such as storerooms, are either connected informally (extension cords or homemade connections) or do not have electricity; and,
- The most common complaint regarding electricity is that it is very expensive.

## **Middelkraal**

The Middelkraal community is made up of 18 households located on the northern side of the Olifants River. This community was relocated in 2007 from the Kleinfontein farm by Umcebo Mining, currently known as Glencore, to make way for the Middelkraal Mine.

### Education

There is no school in Middelkraal and as a result learners travel to neighbouring townships such as Emzinoni and Hendrina. The Department of Education is responsible for transporting learners to and from school on a daily basis at no cost to the learners. Some of the children at Middelkraal used to attend Wazana Primary School at Vlakkuielen, which has since been closed and learners taken to the Friedman Primary School.

### Health

There is no clinic in the Middelkraal Community. The community members travel to Vlakkuielen (8.4 km away) to access a mobile clinic once a month. The mobile clinic distributes basic medication and attends to chronic conditions from the community. For more serious complications and child-birth people from the community generally travel to Govan Mbeki Clinic and Bethal Hospital, ± 20 km away.

### Employment, Livelihoods and Income

The Middelkraal community is characterised by high levels of unemployment. During the focus group discussions in September 2015, households indicated that they were suffering as a result, particularly with issues such as food security and electricity costs. It was difficult to determine exact employment levels of the community, however, most of the community members mentioned that they depended on government grants such as pensions, disability and child support for their livelihoods

### Agriculture

While there were small pieces of land allocated for agriculture, there was no evidence of any crop farming activities at Middelkraal. Focus group discussions with the Middelkraal community revealed that the community members collectively owned the following livestock.

### Housing

Houses in the Middelkraal community are all similar 77m<sup>2</sup> five roomed houses, made of cement bricks and corrugated iron sheets within a 400m<sup>2</sup> plots. The houses are supplied with electricity, water and sewerage. These houses were built by Glencore, previously known as Umcebo, following the relocation of the community from Kleinfontein farm in 2007. As part of the relocation agreement with Umcebo Mining, residents had to pay for their own electricity and water and maintain their own houses after initial problems were addressed

### Land Tenure

Allegedly, households in the Middelkraal community were promised title deeds for their properties when they were relocated. However, gathered from discussions with some members of the community, they still had not received their title deeds. There are also allegations of intimidation by surrounding land owners in terms of their ownership of the land, and that they did not have any legal rights to the land as a result of not having title deeds. This issue has resulted in frustration and lack of trust of mining in general, and expectations that other mines should take responsibility for these legacy issues are evident.



### Infrastructure and Services

**Transport:** Due to the rural and remote nature of the Middelkraal Community transport is a serious issue for the community. Typically, people use lifts for personal transport, at a cost of between R15 and R20 single trip to Bethal.

**Refuse Removal:** There is no municipal refuse removal service, all households at Middelkraal indicated that they either burned or buried their waste.

**Water:** Water in the Middelkraal community is supplied by groundwater boreholes, which is pumped to storage tanks via a windmill. Households have standpipes in their yards to access the water from the borehole. It was reported that the water sources were generally unreliable and the quality of water was not acceptable for human and animal consumption due to the sewage flowing into the Olifants River

**Sanitation:** All houses at Middelkraal were provided with internal flushing toilets with septic tanks. However, with the shortage of water in the area, these toilets are mostly not working, resulting in blockages in the houses and an unhealthy environment. As a result, most of the households have constructed pit latrines outside their houses.

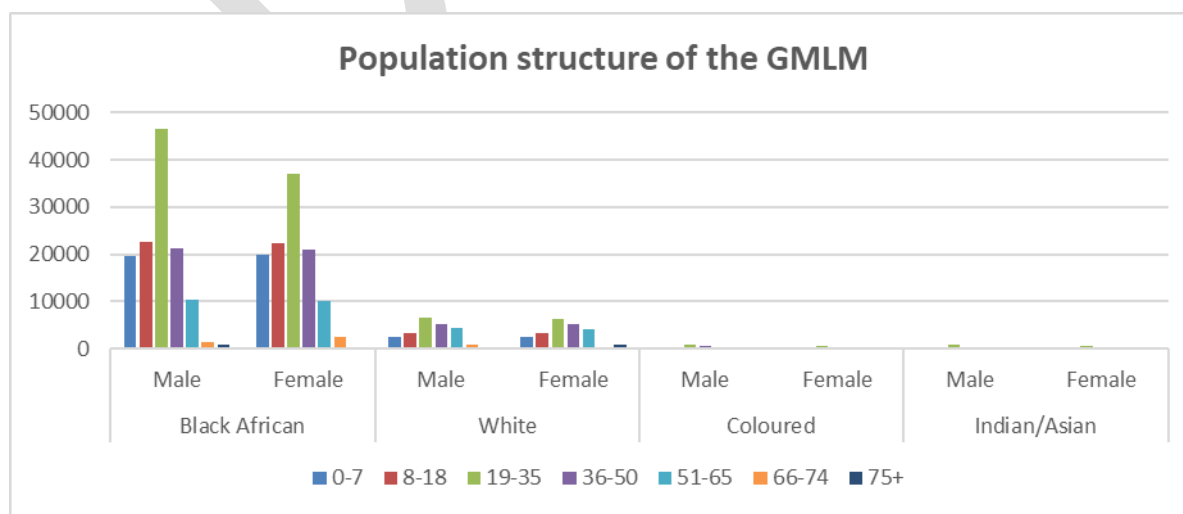
**Electricity:** Households at Middelkraal use prepaid electricity for lighting and use wood and coal for cooking and heating. Most of the households complained about the costs of electricity and the lack of access to wood and coal in Middelkraal, as compared to Kleinfontein, where they easily had access to these.

### **Secondary Zone of Influence**

The Secondary Zol includes the towns of Bethal and Emzinoni which both fall within the Govan Mbeki Local Municipality (GMLM). It is anticipated that both of these communities will be affected by both induced and interactive impacts due to the construction of the mine and their location on the R35 transport corridor

### **Demography**

The age and gender composition of the population is a key determinant of population change and dynamics. Age distribution is an important indicator of both current and future needs regarding education, health care for children and elderly, employment opportunities for those in the economic age group and provision of social services such as pensions to those in need. Figure 14-33 provides a breakdown of the total population.



**Figure 14-33: Population structure of the GMLM**

### Population growth and migration

The GMLM has experienced an average population growth rate of 9.5% per annum since 2007 to 2011. This is significantly higher than the current national average of 0.5%. This rapid growth is due partly to natural population growth but also because of in migration of job seekers.

Since 2007 the GMLM has experienced a growing in migration each year. This can predominantly be attributed to people in search of employment opportunities in the mining and power generation sectors and the influx of migrants from Zimbabwe and Mozambique.

### Education and Literacy

Education and literacy levels are key indicators of development in a population. Education attainment levels as well as access to education facilities are also important indicators to take into account. From a GMLM point of view the education system continues to deteriorate. GMLM has seen a decrease in the matric pass rate from 71% in 2011 to 64% in 2012.

Municipal statistics from Statistics South Africa (2011) show that about 18% of the GMLM residents aged 20 and above were functionally illiterate, with no schooling at all and a few with some primary education.

### Health

As of 1 April 2012, the GSDM as opposed to the GMLM, is responsible for the provision of health care in the municipality. This process is line with the trend throughout the province whereby the district municipalities have become responsible for health services.

Within the urban areas of the GMLM population groups generally have good basic health with low HIV/AIDS prevalence rates. A large percentage of families living in formal urban areas have access to medical aid and rely on private sector medical services.

People living in rural and informal settlements generally have poor access to basic health care and are heavily dependent on Government and employers to provide basic health needs. There are high HIV/AIDS prevalence rates among this group. Poor living conditions, and inaccessibility of basic health facilities contributes to the poor health profile.

The HIV prevalence rate in the GMLM was estimated at 30.9% in 2009, (GMLM IDP 2012), which is significantly higher than the provincial average of 24% (the national average is 17%-18%<sup>12</sup>). HIV prevalence rate according to the District Health Information Systems (excluding pregnant women) stood at 33.0% in 2011 (a decrease from 35.3% in 2010). Key informant interviews have indicated that GMLM has the highest HIV rate in GSDM.

GMLM currently has 11 clinics, three community health centres and two hospitals. There are also four mobile clinics within the municipality.

### Housing

The GMLM is the main housing provider, which provides low-cost housing schemes and human settlement related programmes funded by the national Department of Human Settlement. The GMLM is identifying for the purpose of acquisition 3800 ha to be purchased to accommodate growth in the GMLM for 2011-2017 (based on economic growth of 3%).

Adequate housing remains a serious challenge for the municipality. The GMLM IDP reports that there are 29 478 households without access to formal housing. The housing backlog is estimated at approximately 58 000 units, including 18 887 in situ developments (formal stands), and over 34 000 backyard dwellers (over the age of 18). The 2011 stats indicate that there were 23 365 informal housing units within the GMLM, the majority of these are at Embalenhle.

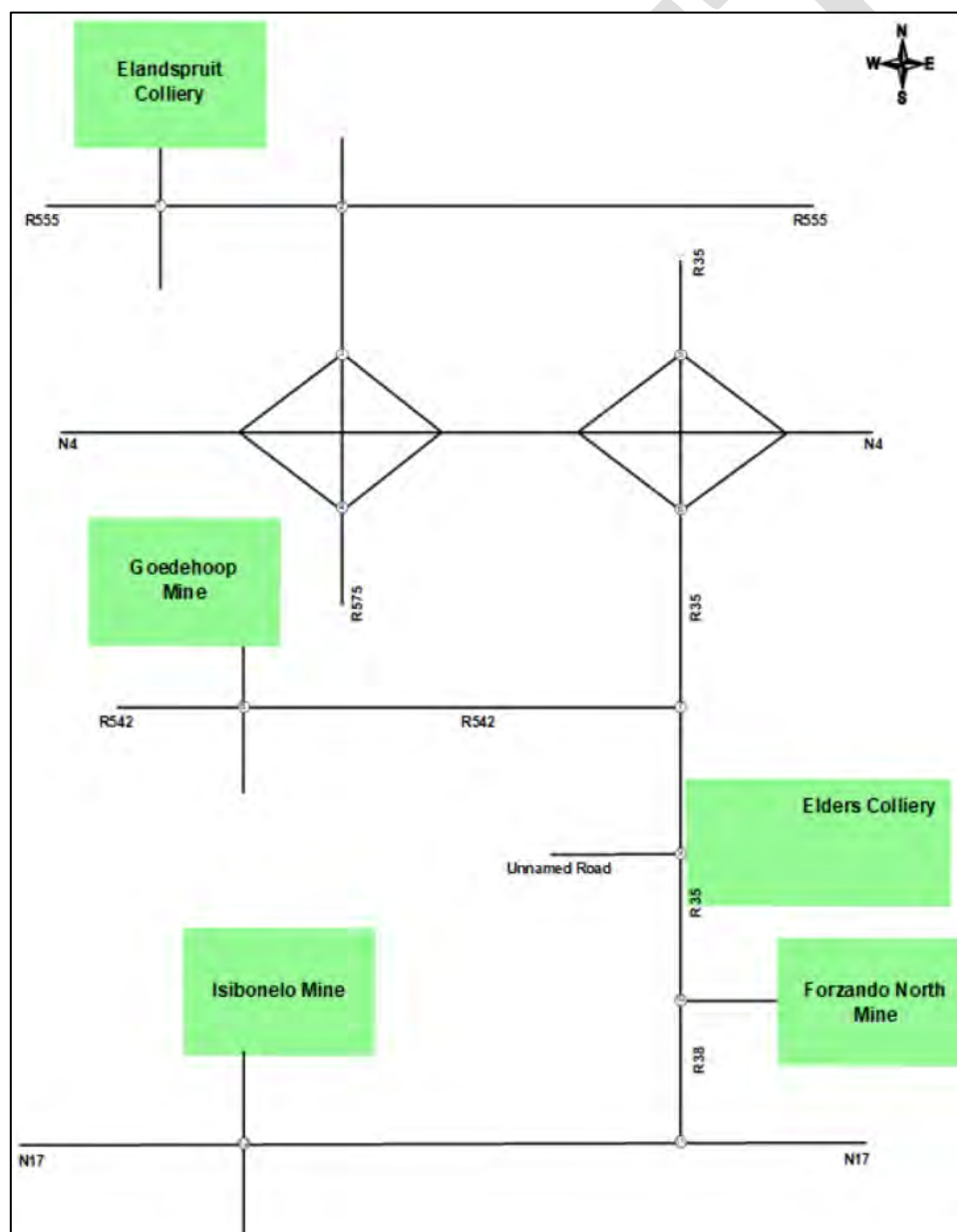
## 14.13 Traffic

*The information presented in this section is extracted from the specialist Traffic study undertaken by Aurecon, 2019.*

The proposed Elders Colliery is located primarily east of the provincial road R35 approximately 47km to the south of Middelburg, approximately 55km to the southeast of eMalahleni, and approximately 20km north of Bethal. Kriel is located approximately 12km to the east of the site. Access to the Colliery will be an intersection with the R35.

### 14.13.1 Road Network surrounding the proposed Elders Colliery Project

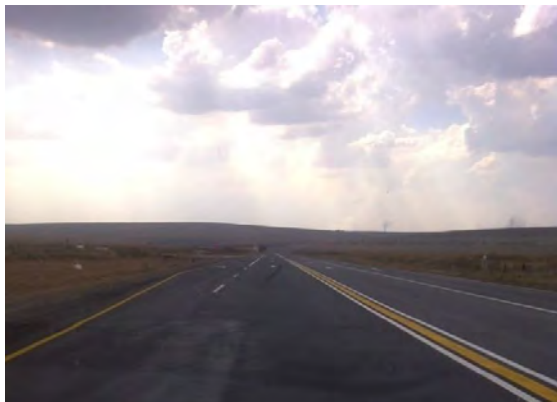
Figure 14-34 is a map of the road network most likely to be affected by this proposed Elders Colliery Project. The following section provide a description of the existing roads surrounding the proposed Elders Colliery project.



**Figure 14-34: Road Network around the proposed Elders Colliery Project**

### R35

The R35 road (Figure 14-35) is in excellent condition with very good geometry. The road is a single carriageway with 3,5m lanes in both directions and 1,5m hard shoulders. Sight distance is in excess of 200m at the Elders Colliery access point. Signage is good and the speed limit varies between 60-100km/h. The road edge was well maintained, and the grass was cut short in the road reserve. No adverse safety conditions were observed.



**Figure 14-35: Photo of the R35**



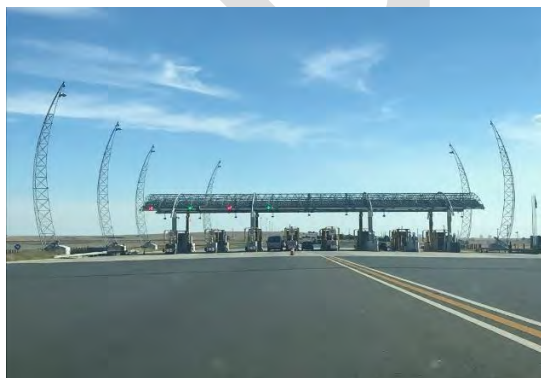
**Figure 14-36: Photo of the R542**

### R542

The R542 road (Figure 14-36) is a single carriageway road with a single 3.5m lane in each direction having grassed shoulders on both sides. Sight distance is excellent however the road surface conditions vary from good to poor with evidence of significant road repairs and potholes together with severe rutting at the road edges. The indicated speed limit is 100km/h and reduces to 60km/h on approach to the intersection with the R35. No adverse safety conditions were observed.

### N17

The N17 road (Figure 14-37) is in excellent condition with very good geometry. The road is a single carriageway with 3,7m lanes in both directions and 1,5m hard shoulders. Signage is good, and the speed limit varies between 100-120km/h. The road edge was well maintained, and the grass was cut short in the road reserve. No adverse safety conditions were observed. The Trichardt Toll Plaza is located on the N17 on the way to Isibonelo Mine.



**Figure 14-37: Photo of the N17**



**Figure 14-38: Photo of the N4**

## N4

The N4 road (Figure 14-38) is in excellent condition with very good geometry. The road is a dual carriageway with 3,7m lanes in both directions and 1,5m hard shoulders. Signage is good, and the speed limit varies between 100-120km/h. The road edge was well maintained, and the grass was cut short in the road reserve. No adverse safety conditions were observed.

## R575

The R575 road (Figure 14-39) is a single carriageway road with a single 3.5m lane in each direction with 1.5m hard shoulders on both sides. Sight distance is good however the road surface conditions vary from good to poor with evidence of significant road repairs and potholes together with severe rutting at the road edges. The indicated speed limit is 80km/h. No adverse safety conditions were observed.



Figure 14-39: Photo of the R575



Figure 14-40: Photo of the R555

## R555

The R542 road (Figure 14-40) is a single carriageway road with a single 3.5m lane in each direction having grassed shoulders on both sides. Climbing lanes are provided for steep segments. Sight distance is good, however the road surface conditions vary from good to poor with evidence of significant road repairs and potholes together with severe rutting at the road edges. The indicated speed limit is between 60-80km/h. No adverse safety conditions were observed.

### 14.13.2 Traffic counts

The potential maximum impact of the proposed Elders Colliery will be during the weekday AM and PM peak hours when background traffic is the highest. The existing traffic volumes on the surrounding road network were obtained from classified traffic counts undertaken by Bala Survey and Research at the following intersections:

1. R555 / Road to Elandspruit Colliery
2. R555 / R575
3. R575 / N4 North Ramp
4. R575 / N4 South Ramp
5. R35 / N4 North ramp
6. R35 / N4 South ramp
7. R35 / R542 North
8. R542 / Goedehoop Mine Access





Table 14-29 summarises the existing traffic analysis without adding mine generated traffic. The responsibility of upgrades where required lies with the road authority as these are required due to pre-existing traffic congestion.

**Table 14-29: Summary of existing traffic analysis**

Summary of existing Traffic Analysis			
Intersection	Upgrade needed (Yes/No)	Upgrade type	Responsibility
R555 / Road to Elandspruit Colliery Intersection	No	-	-
R555 / R575 Intersection	Yes	Upgraded to a signalized intersection	Road Authority
R575 / N4 North Ramp Intersection	No	-	-
R575 / N4 South Ramp Intersection	No	-	-
R35 / N4 North Ramp Intersection	Yes	North and South Approach: Remove stop control	Road Authority
R35 / N4 South Ramp Intersection	Yes	North and South Approach: Remove stop control	Road Authority
R35 / R542 North Intersection	No	-	-
R542 / Goedehoop Mine Access Intersection	No	-	-
R35 / Unnamed Road Intersection	No	-	-
R35 / Road to Forzando North Mine Intersection	No	-	-
N17 / Moses Kotane / R38 Intersection	No	-	-
N17 / Road to Isibonelo Mine Intersection	No	-	-

## 15 Possible mitigation measures that could be applied

The proposed Elders Colliery Project will occur within the previously authorised area, which has already been assessed. The specialist studies assessed potential environmental and social impacts that may occur as a result of the proposed Elders Colliery Project. Appropriate mitigation and management measures to avoid and /or minimise the identified impacts associated with the project were developed and included in the EMPr (Part B, Section 28).

The mitigation hierarchy was applied throughout the Integrated Scoping and EIA/EMPr Process. The mitigation hierarchy is an approach to mitigation planning and can be summarised into the following steps:

- Avoidance
- Minimisation
- Restoration
- Offsets

In the Scoping Phase, mitigation measures are predominantly focussed on avoidance and minimisation. This is done through activities, such as the site layout selection process and implementation of the environmental design criteria, including the environmental sensitivity plan, by the engineering team.

In the Impact Assessment Phase, the findings and recommendations of the specialist studies were used to develop the environmental and operational controls which are focused on impact minimisation and restoration (as part of mine rehabilitation and closure). The mitigation measures are fully described in Part B of this report.

With the mitigation measures applied, the residual risk significance for the assessed impacts and risks is generally low or medium.

## 16 Motivation where no alternatives were considered

Alternatives relating to location, infrastructure and transportation were considered in the previous EMPs compiled for the proposed Elders Colliery Project. The location of the proposed project is therefore constrained to the location of the mineral resource, and proven reserve. As such, no property alternatives were considered for this project.

In addition, the infrastructure and activities associated with the proposed Elders Colliery Project will be situated within the current mining rights and surface lease areas. Existing technologies will also be applied to the mining activities and therefore no technology alternatives are available at this stage of the study.

DRAFT

## **17 Statement motivating the preferred site**

Refer to Section 11 for motivation for preferred site.

DRAFT



## 18 Environmental Impact Assessment

This section provides an overview of the impact assessment methodology, specialist findings and recommendations. It also includes the findings of the impact assessment phase which includes both positive and negative impacts identified for the various phases of the project (pre-construction, construction, operation and decommissioning and closure).

### 18.1 Approach

#### 18.1.1 Prediction of significant environmental issues

Potential environmental issues or impacts associated with the proposed Elder Colliery Project were identified during the Integrated EIA phase through a review and consideration of the following:

- The nature and profile of the receiving environment which included both a desktop evaluation (available documents, existing EMPs, GIS maps) and a site visit to areas where the proposed mining activities will be constructed and operated;
- Understanding of the direct and indirect effects of the project as a whole;
- Inputs received from the I&APs and the authorities during the pre-application phase, Integrated scoping phase and EIA phase;
- Inputs received from specialists appointed to conduct the various studies for the proposed Elders Colliery Project; and
- Legal context.

Environmental and social issues have been highlighted in Section 18.2 for each environmental aspect considered. In addition to this, the cumulative impacts have been briefly described in Section 18.5.

#### 18.1.2 Mitigation of impacts

A detailed assessment was conducted to evaluate possible impacts with input from the project team, the specialist studies and I&APs making use of the impact assessment methodology described in section 18.3.

Practical mitigation measures were identified with the following objectives:

- 1) To firstly strive to prevent the occurrence of the impact; and
- 2) If the impact cannot be prevented, then measures need to be put in place to minimise the significance of the impact

The mitigation measures associated with the proposed Elders Colliery Project have been included Table 18-3 to Table 18-5.

### 18.2 Summary of environmental and social impacts identified during the EIA process

The infrastructure associated with the proposed Elders Colliery Project and the areas to be disturbed fall within the Elders Colliery mining right area. If managed according to the proposed management measures in Table 18-3 to Table 18-5 and Part B, Section 30, negative impacts associated with construction, operation, closure and post closure phases of the proposed Elders Colliery Project activities can be mitigated and positive impacts can be enhanced.

Table 18-1 includes a summary of the expected impacts, for the proposed Elders Colliery Project which have been extracted from the specialist's studies, as well as from the comments received during the stakeholder engagement activities undertaken to date. These impacts have been assessed in line with the impact assessment methodology in Section 18.3.

**Table 18-1: Positive and negative impacts regarding project alternatives for Elders Colliery**

Positive Impacts		Negative impacts	
Mining alternatives			
Open cast mining (alternative)			
<ul style="list-style-type: none"><li>• Employment opportunities providing livelihood to mine workers.</li></ul>		<ul style="list-style-type: none"><li>• Decrease in agricultural area.</li><li>• Removal of vegetation and decrease in associated wetland areas.</li><li>• Decrease of surface water runoff due to open pit capturing rain water.</li><li>• Potential formation of groundwater cone of depression.</li><li>• Potential for acid mine drainage due to contamination of groundwater and surface water.</li><li>• Increased dust generation due to open cast blasting and operations.</li><li>• Increased noise generation due to construction and operational vehicles.</li></ul>	
Underground mining (current scope)			
<ul style="list-style-type: none"><li>• Reduced impact on current land uses.</li><li>• Minimal loss of livelihood for surrounding communities and adjacent land owners.</li><li>• Reduced impact on biodiversity (including vegetation and wetlands).</li><li>• Reduced impact on surface water quality and quantity.</li><li>• Reduced impacts on air quality and noise generation.</li><li>• Reduced rehabilitation costs.</li><li>• Reduced socio-economic impacts as there will be limited economic and physical displacement.</li></ul>		<ul style="list-style-type: none"><li>• Potential for acid mine drainage due to contamination of groundwater and surface water.</li><li>• Potential for groundwater contamination resulting in impacts on borehole qualities.</li><li>• Potential decrease in yields of boreholes.</li><li>• Potential decrease in groundwater interaction with wetlands.</li></ul>	
Transportation			
Trucking (current scope)			
<ul style="list-style-type: none"><li>• Use of existing road networks, therefore no construction of alternative transport infrastructure is required, therefore limiting impact of construction additional infrastructure.</li></ul>		<ul style="list-style-type: none"><li>• Increase of traffic volumes on existing road networks.</li><li>• Increased possibilities for road accidents including cars and pedestrians.</li><li>• Increase in dust fallout and noise generation on the existing road network.</li><li>• Deterioration of existing road network due to additional heavy vehicles.</li></ul>	

### 18.3 Impact assessment methodology

The impact significance rating process serves two purposes: firstly, it helps to highlight the critical impacts requiring consideration in the management and approval process; secondly, it serves to show the primary impact characteristics, as defined above, used to evaluate impact significance.

The impact significance rating system is presented in Table 18-2 and involves three parts:

**Part A:** Define impact consequence using the three primary impact characteristics of magnitude, spatial scale/population and duration;

**Part B:** Use the matrix to determine a rating for impact consequence based on the definitions identified in Part A; and

**Part C:** Use the matrix to determine the impact significance rating, which is a function of the impact consequence rating (from Part B) and the probability of occurrence.

**Table 18-2: Methodology used to determine the impact significance**

PART A: DEFINING CONSEQUENCE IN TERMS OF MAGNITUDE, DURATION AND SPATIAL SCALE					
Use these definitions to define the consequence in Part B					
Impact characteristics	Definition	Criteria			
MAGNITUDE	Major -	Substantial deterioration or harm to receptors; receiving environment has an inherent value to stakeholders; receptors of impact are of conservation importance; or identified threshold often exceeded			
	Moderate -	Moderate/measurable deterioration or harm to receptors; receiving environment moderately sensitive; or identified threshold occasionally exceeded			
	Minor -	Minor deterioration (nuisance or minor deterioration) or harm to receptors; change to receiving environment not measurable; or identified threshold never exceeded			
	Minor +	Minor improvement; change not measurable; or threshold never exceeded			
	Moderate +	Moderate improvement, within or better than the threshold; or no observed reaction			
	Major +	Substantial improvement; within or better than the threshold; or favourable publicity			
SPATIAL SCALE OR POPULATION	Site or local	Site specific or confined to the immediate project area			
	Regional	May be defined in various ways, e.g. cadastral, catchment, topographic			
	National/ International	Nationally or beyond			
DURATION	Short term	Up to 18 months.			
	Medium term	18 months to 5 years			
	Long term	Longer than 5 years			
PART B: DETERMINING CONSEQUENCE RATING					
Rate consequence based on definition of magnitude, spatial extent and duration					
		SPATIAL SCALE/ POPULATION			
		Site or Local	Regional	National/ international	
MAGNITUDE					
Minor	DURATION	Long term	Medium	Medium	High
		Medium term	Low	Low	Medium
		Short term	Low	Low	Medium
Moderate	DURATION	Long term	Medium	High	High
		Medium term	Medium	Medium	High
		Short term	Low	Medium	Medium
Major	DURATION	Long term	High	High	High
		Medium term	Medium	Medium	High
		Short term	Medium	Medium	High
PART C: DETERMINING SIGNIFICANCE RATING					
Rate significance based on consequence and probability					
		CONSEQUENCE			
		Low	Medium	High	
PROBABILITY (of exposure to impacts)	Definite	Medium	Medium	High	
	Possible	Low	Medium	High	
	Unlikely	Low	Low	Medium	

\* M – Magnitude, D – Duration, S – Scale, C – Consequence, P – Probability, SI – Significance

## 18.4 Environmental and social impacts and mitigation measures

The main environmental disturbance / impact will occur during the construction and operations phase of the project as a result of clearing the area as well as the movement of construction vehicles and trucks on the mine during the establishment the various activities associated with the proposed Elders Colliery Project. In addition to this, the proposed Elders Colliery Project will be a new mine and will operate through the life of the mine. Due to this, the environmental and social impacts have been identified and mitigated in Table 18-3 to Table 18-5. In addition to this the EMPr has been compiled inline with the impacts and mitigations associated with the proposed project (Section 28)

The following sections provide further details on the potential impacts (negative and positive), in terms of the various environmental and social aspects for each aforesaid activity and the associated actions that will be undertaken during the implementation of the project.

Table 18-3 below provides an assessment of potential impacts of the Elders Colliery during the Construction Phase.

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Table 18-3: Assessment of potential impacts of the Elders Colliery during the Construction Phase

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Topography	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Alteration of topography</b> The development of the box-cut involves the removal of topsoil and overburden and will change the local topography of the site. This will have visual impact on the Middelkraal community.	Mt: Moderate D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Demarcate development footprint area. No development outside of this footprint will take place.</li> <li>Where required, vegetate stockpiles in order to minimise visual transformation of topography and ensure that the stockpiles are free draining.</li> </ul>	Mt: Moderate D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium
Soils	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>The loss of utilisable resource (sterilisation and erosion), compaction and contamination or salinisation.</b> During the construction phase the loss of the utilisation of the soil resource will impact the land use, reducing the land capability from low intensity grazing land to mining. The construction for the mining and its support activities will, if unmanaged and without mitigation: <ul style="list-style-type: none"> <li>Have a definite negative impact on the environment due to the loss of the soil area and thus the use of the utilisable resource;</li> <li>Have the potential for contamination (hydrocarbon and reagent chemical spills, raw materials and spillage of coal, etc.), compaction of working/laydown areas and storage facility footprint and the potential for erosion (wind and water – dust and suspended solids) over unprotected areas;</li> <li>Have a moderate negative intensity potential ranking based on the confined (limited to footprint of impact) and compact nature of the infrastructure for the relative size of the infrastructure;</li> <li>Will continue throughout the construction phase and into the operational phase;</li> <li>Will be permanent but reversible (can be broken down or backfilled) and rehabilitated; and</li> <li>Is confined to site only.</li> </ul>	Mt: Major D: Long term S: Site C: High P: Definite St: High (-)	High	<ul style="list-style-type: none"> <li>Concurrent rehabilitation of all affected sites that are not required for the operation – rehabilitation of temporary structures and footprint areas used during the feasibility investigation (geotechnical pits, trenching etc.) and the construction phase;</li> <li>Separation of the utilisable soils (such as topsoil) and ferrirete base materials from each other and from the soft overburden;</li> <li>Effective cladding of the berms and soil, ferrirete stockpiles/heaps with vegetation or large rock fragments, and the minimising of the height of storage facilities to 15m and soil berms to 1,5m wherever possible;</li> <li>Restriction of vehicle movement over unprotected or sensitive areas, this will reduce compaction. This will be undertaken by fencing the box-cut and associated surface infrastructure area;</li> <li>Vehicles are to remain on the service road and will be limited to a speed of 40 km/h;</li> <li>Natural soil amelioration (cultivation) to enhance the oxygenation and growing capability (germination) of natural regeneration and/or seed within the stockpiled soils (maintain the soils viability during storage) and areas of concurrent rehabilitation.</li> <li>Limiting the area of impact to as small a footprint as possible, inclusive of resource stockpiles and the length of servitudes, access and haulage ways and conveyor systems wherever possible;</li> <li>The development and inclusion of soil management as part of the general housekeeping operations, and the independent auditing of this management;</li> <li>Regular servicing of all vehicles in bunded areas to reduce spillage and contamination;</li> </ul>	Mt: Moderate D: Long term S: Site C: Medium P: Possible St: Medium (-)	Medium
	Construction of box-cut and associated surface infrastructure	<b>Contamination of soil resources during construction</b> It is anticipated that during the construction of the Elders Colliery, there is the potential of spillage of carbonaceous material and contamination of soils. Contamination by dirty water run-off and/or spillage of hydrocarbons and/or chemicals is also expected from construction vehicles and machinery, as well as dust and emissions from the process. The impact of the Elders Colliery on the soil resource will have a negative medium significance. Although the magnitude will be minor, the impact will last for the life of the operation (long term) and will be permanent to irreversible if not rehabilitated.	Mt: Minor D: Long term S: Site specific C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Develop a leak/spill procedure for all possible areas of leaks/spillages.</li> <li>Spill kits will be provided for on site for spill clearing.</li> <li>Spills will be cleared and remediated immediately as per the mine's Leak/Spill Procedure.</li> </ul>	Mt: Minor D: Short term S: Site specific C: Low St: Low (-)	Low



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Biodiversity	Site clearing and grubbing of the footprint areas associated with the box-out and associated surface infrastructure. Construction of box-out and associated surface infrastructure.	<b>Permanent loss of habitat for flora and fauna</b> Based on the surface area of the proposed box-out and associated infrastructure, it is evident that the box-out and associated infrastructure will not contribute significantly to direct habitat loss and fragmentation on a local scale. The change in land use is mainly related to existing transformed areas, namely cultivated land (more than 50%). However, should the lost cultivated land be replaced by transforming natural vegetation, additional natural vegetation will be lost. The non-linear surface infrastructure associated with the mining activity has a limited negative impact on the natural vegetation on a local and regional scale.  <i>This impact will continue during the construction and operational phases.</i>	Mt: Minor D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Fence development footprint area prior to commencement of construction to limit impact on adjacent vegetation areas.</li> <li>Removal of vegetation should be restricted to the relevant infrastructure footprints only.</li> <li>Topsoil should be stored separately to be used in rehabilitation and landscaping.</li> <li>No off-road driving into the natural remaining vegetation should be allowed especially by heavy machinery.</li> <li>The development of erosion gullies will be monitored and managed.</li> </ul>	Mt: Moderate D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium
		<b>Habitat fragmentation</b> The box-out and associated infrastructure will negatively impact on already isolated patches of natural vegetation, and therefore will consolidate the transformed area. Therefore the magnitude of the box-out and associated infrastructure to habitat fragmentation locally is considered to be minor. However, as the impact will be long term, the significance rating is medium.  <i>This impact will continue during the construction and operational phases.</i>	Mt: Minor D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Prevent any and all effluent from the mining activities of entering the wetland habitat.</li> <li>Prevent all open fires, provide fire-safe zones, facilities and suitable fire control measures.</li> <li>Use of branches of trees, shrubs or any vegetation for fire making purposes is strictly prohibited.</li> <li>Provide sufficient on-site ablution, sanitation and waste management and hazardous materials management facilities.</li> <li>The use of the natural veld for ablution purposes shall not be permitted under any circumstances.</li> <li>Dust control on all roads should be prioritised.</li> <li>A road management plan should be compiled prior to commencement of construction activities.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium
		<b>Loss of species of concern</b> More than 50% of the area associated with the box-out and associated infrastructure is already transformed and therefore the potential for impacting negatively on species of concern is lower. Furthermore the use of underground mining as opposed to open cast mining effectively has reduced the potential impact of loss of species of concern. The magnitude of the box-out and associated infrastructure to loss of species of concern is considered to be minor. However, as the impact will be long term, the significance rating is medium.  <i>This impact will continue during the construction and operational phases.</i>	Mt: Minor D: Long term S: Site C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Areas of natural vegetation within the box-out and associated infrastructure area will be inspected for the presence of species of concern during the optimal time prior to construction by a registered and experienced biodiversity team.</li> <li>Employees at the mine will be educated about the environment, the species of concern present and how to deal with them.</li> <li>Employees will not be allowed to harvest, utilise, manage or control any natural resource (water, soil, flora, fauna) unless it is done within the framework of a biodiversity action plan.</li> <li>No alien invasive plant or feral animal (domestic or wild) will be introduced into the area or be allowed to establish or spread in the area.</li> <li>An alien invasive eradication programme will be developed and implemented during the life of mine.</li> <li>No animal may be hunted, trapped, snared or captured for any purpose whatsoever. Fences and boundaries will be patrolled weekly in order to locate and remove snares and traps.</li> <li>Speed of vehicles will be limited to 40 km/h.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Possible St: Medium (-)	Medium



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Surface Water	Site clearing and grubbing of the footprint areas associated with the box-out, associated surface infrastructure	<p><b>Pollution of surface water resources</b></p> <p>During the construction phase topsoil will be stripped and civil works, in the form of earthworks and terracing, will be undertaken as part of the preparation of the area for the construction of infrastructure such as roads, change house, wash bays, offices, workshops, crushers, water treatment plant, sewage treatment plant, etc. Construction equipment will be mobile on the site.</p> <p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Erosion of soils during rainfall events, with elevated suspended solids in the runoff water.</li> <li>Resultant elevated suspended solids in the watercourses, as well as sedimentation in the watercourses.</li> <li>Hydrocarbon spillages from fuel storage, servicing areas or construction equipment itself, with resultant elevated hydrocarbon concentrations in runoff water and watercourses.</li> </ul> <p>The Olifants River catchment is considered a stressed water resource in terms of both the quantity of water in the system and the quality of the water. It also forms the main water supply for the Witbank area (from the Witbank Dam), as well as for irrigation water further downstream (from the Loskop Dam). Any impact on the quantity or quality of water in the system has the potential to affect the quality and assurance of supply to the community and agriculture.</p>	<p>M: Moderate D: Short term S: Local C: Medium P: Possible St: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Construction will be limited to the project footprint.</li> <li>'No-go' zones will be delineated for contractor's camp.</li> <li>Appropriate stormwater management measures will be implemented, including the temporary diversion of upstream run-off from the construction and laydown areas.</li> <li>Surface water management measures, such as stormwater canals, sediment traps and PODs are to be constructed first to ensure that runoff and dirty water spills are contained.</li> <li>Servicing of construction vehicles will take place only in dedicated areas that are equipped with drip trays.</li> <li>Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil.</li> <li>Spill-sorb or a similar product will be kept on site, and used to clean up hydrocarbon spills in the event that they should occur.</li> <li>Erosion protection measures will be implemented at steep areas.</li> <li>A waste management plan will be developed for the construction phase.</li> <li>An appropriate sewage management strategy will be implemented during the construction phase.</li> <li>Water quality monitoring will be undertaken downstream of the construction areas, before and during construction where practical, in order to detect any increase in suspended solids or turbidity.</li> <li>If erosion is evident, or the water quality monitoring indicates an increase in suspended solids, water management around the construction areas will be reviewed.</li> </ul>	<p>M: Minor D: Short term S: Local C: Low P: Possible St: Low (-)</p>	Low
	Development of box-out	<p><b>Pollution of surface water resource</b></p> <p>During the development of the box-out, much of the overburden removed prior to the exposing of coal has the potential to contain some carbonaceous material.</p> <p>The box-out will be excavated selectively, any overburden material contaminated with acidifying carbonaceous material will be excavated and transported to an existing mineral residue disposal facility.</p> <p>The excavated hard material (overburden) that is clean will be stockpiled to the south of the inclined shaft and later used to backfill the mine shaft at mine closure. This material will remain in the stockpiles for the duration of mining until closure.</p> <p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Erosion during rainfall events, resulting in increased turbidity and suspended solids in the runoff water, reporting to the local watercourses.</li> <li>Deposition of sediments in the local watercourses, impacting on the aquatic ecology.</li> <li>Overburden stockpiles will potentially contain carbonaceous material, with the potential to affect downstream watercourses by increasing sulphate and TDS concentrations.</li> </ul>	<p>M: Moderate D: Short term S: Local C: Medium P: Possible St: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Surface water management measures, such as stormwater canals, sediment traps and PODs are to be constructed first to ensure that runoff and dirty water spills are contained.</li> <li>The stormwater runoff from the overburden stockpile will be caught in a clean water cut off channel. The channel will convey the water to a silt trap from where it will discharge into the proposed clean water channel at the office area and conveyed into the veld.</li> <li>Prior to discharge to the veld, should the water quality from overburden stockpile channel not be suitable for discharge this should be pumped to the POD.</li> <li>Water quality monitoring will be undertaken downstream of the construction areas before and during construction, where practical, in order to detect any increase in suspended solids or turbidity</li> </ul>	<p>M: Minor D: Short term S: Local C: Low P: Possible St: Low (-)</p>	Low
	Development of box-out	<b>Impact on surface water quality due to dewatering of water ingress to box-out and inclined shaft</b>	<p>M: Moderate D: Short term</p>	Medium	<ul style="list-style-type: none"> <li>The maximum volume of water expected to be generated at the start of mining at the box-out in 2018</li> </ul>	<p>M: Minor D: Short term</p>	Low

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		Water that enters the box-cut and incline shaft excavations, both from groundwater seepage and direct rainfall, is expected to be largely clean. However, there is a possibility that this water makes contact with carbonaceous and pyritic materials. The water quality from the box-cut and incline shaft is therefore likely to be slightly to moderately impacted in terms of sulphate, TDS and suspended solids. Impacts may arise from: <ul style="list-style-type: none"> <li>Discharge of the potentially impacted water to the environment, with a resultant increase in sulfate and TDS concentrations in the natural watercourses.</li> <li>Deposition of sediments in the local watercourses, impacting on the aquatic ecology.</li> </ul>	S: Local C: Medium P: Possible St: Medium (-)		<p>is likely to be around 167 m<sup>3</sup>/day during the summer period. The water will be contained at the site, in the POD, for re-use in dust suppression on haul roads, and as construction water, if the quality is suitable. The water will not be discharged.</p> <ul style="list-style-type: none"> <li>Surface water management measures, such as storm water canals, sediment traps and PODs are to be constructed first to ensure that runoff and dirty water spills are contained</li> </ul>	S: Local C: Low P: Unlikely St: Low (-)	
	Construction of box-cut, associated surface infrastructure	<b>Reduction in catchment yield</b> During construction, prior to the commissioning of the POD, surface runoff will be released to the catchment once sediment has settled out. The water management infrastructure will be constructed first to enable the containment of dirty water generated during the remainder of the construction period. Impacts may arise from: <ul style="list-style-type: none"> <li>Containment of contaminated runoff water emanating from the site, including the mine infrastructure area with no release to the catchment.</li> </ul> The duration of the potential impacts is therefore long term. Although runoff from dirty areas will be contained (see management measures below) and the probability of impact is definite, its magnitude has still been assessed as minor on the basis of the very small area that will be contained.	Mt: Minor D: Long term S: Regional C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>The aerial extent of the disturbed and potentially contaminated areas will be kept to the demarcated construction footprint.</li> <li>Areas where dirty construction activities are carried out (e.g. servicing areas and workshops, fuel storage areas, waste storage areas) surrounded by bunds.</li> <li>Clean upslope runoff will be diverted around construction activities.</li> </ul>	Mt: Minor D: Long term S: Regional C: Medium P: Possible St: Medium (-)	Medium
	Truck transport of coal from Elders Colliery to various processing operations.	<b>Pollution of surface water resource</b> Transport of coal/ interburden by truck has the potential to impact on watercourses and general runoff quality, primarily due to spillage of coal, as well as contaminated water from the truck itself and at transfer stations. Impacts may arise from: <ul style="list-style-type: none"> <li>Spillage of water from truck load boxes</li> </ul>	Mt: Moderate D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Loading of trucks will take place only within the designated dirty water areas.</li> <li>Loading of trucks will be carefully controlled to ensure that overloading will not take place.</li> <li>Truck load boxes will be covered with tarpaulins to prevent spillage of coal from the backs of trucks during transport.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Unlikely St: Low	Low
Groundwater	Storage of overburden material, overburden stockpile	<b>The formation of acid mine drainage (AMD) as a result of ingress water and oxygen into the stockpiled overburden</b> The potential impact of seepage water into shallow weathered aquifer from the overburden stockpile is considered to be moderate. Potential contaminants may impact on the groundwater usage, which includes domestic and agricultural use. Generally, overburden is considered inert and therefore does not have a great potential for AMD. However, during the removal of the overburden in the construction of the box-cut, there is the potential to remove some of the coal from the No. 2 and No. 4. This coal has AMD potential as per the results of the geochemical analysis of the coal. The AMD potential of the overburden stockpile is considered moderate in the long term as the overburden will be stockpiled for the LOM. The impact will be limited to the site.	Mt: Moderate D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Verify AMD generation potential of the overburden only through sampling and analyses of core samples from the box-cut location.</li> <li>Ensure that all coal is removed from the overburden before placement on the stockpile.</li> <li>Coal removed from overburden to be taken to various collieries within the area and included in the processing plant.</li> <li>Place the overburden on a properly prepared and compacted footprint.</li> <li>A civil engineering design, incorporating footprint preparation, leachate control and storm water management, must be undertaken and submitted to DWS for approval.</li> <li>Compact and shape overburden stockpile to be free draining to minimise rainfall infiltration.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Unlikely St: Low (-)	Low



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
	Construction of box-cut	<b>Influx of groundwater into box-cut void</b> The void in the box-cut will lead to an influx of groundwater. This will result in the potential dewatering of the surrounding shallow and deep aquifers. This will manifest as a groundwater cone of depression in the water table with negative consequences of the availability of groundwater for existing borehole users around the proposed box-cut. The magnitude is considered minor due to the limited extent of the impact (500m around box-cut). However the significance is medium due to the duration of the impact throughout the construction and operational phases of the project.	Mt: Minor D: Long term S: Site C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Sealing of box-cut walls with shotcrete/gunite which will allow groundwater levels to reduce and re-establish the cone of depression.</li> <li>Should an instance arise where groundwater be contaminated, this will be investigated and responded to accordingly to address the matter.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Possible St: Medium (-)	Medium
	Construction of box-cut	<b>Contamination of groundwater resources due to spillage</b> It is anticipated that deterioration of groundwater quality may occur from the infiltration from contaminants including hydrocarbons, chemicals and carbonaceous material affecting surface water from the box-cut area into the adjacent aquifers. However, these impacts will only occur within the box-cut and associated infrastructure footprint.	Mt: Moderate D: Short term S: Local C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>A leak/spill detection plan should be devised and implemented for all possible areas of leaks/spillages.</li> <li>Regular groundwater monitoring from existing and proposed monitoring boreholes will be undertaken to identify any potential contamination of groundwater resources.</li> <li>Should pollution be identified within the groundwater resources, the source of the pollutants will be identified and the applicable remediation measures will be implemented.</li> <li>Develop and maintain a Standard Operating Procedure to contain and remediate any accidental hydrocarbon or other chemical spillages.</li> <li>Spill kits should be made available and used in the event of a spill. Contain spillage, excavated and dispose of contaminated material/soil required at accredited disposal site. .</li> <li>If properly contained and/or excavated quickly impacts are reversible and unlikely to occur</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
Wetland	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Loss and disturbance of wetland habitat</b> The clearing of vegetation and soil stripping from the proposed box-cut and surface infrastructure areas will result in the complete and permanent loss of wetland habitat located within the proposed footprints. The PES of the hillslope seepage wetlands has been rated as moderately and largely modified. It is further likely that site clearing activities will result in disturbances to wetland habitat outside the direct development footprints through activities such as temporary stockpiles, construction camps, vehicle turning circles etc. The loss of wetland habitat cannot be totally avoided. It is however possible to minimise the disturbance of wetland habitat outside the direct development footprint through implementation management measures.	Mt: Major D: Long term S: Site C: High P: Definite St: High (-)	High	<ul style="list-style-type: none"> <li>The proposed development footprint will be fenced off and all activities contained within the fenced off area.</li> <li>Clearly demarcate the proposed development footprints and limit all activities to the demarcated area.</li> <li>Develop and implement a construction stormwater management plan prior to the commencement of site clearing activities.</li> <li>Rehabilitate and re-vegetate all disturbed areas as soon as possible following disturbance.</li> <li>Inform contractors regarding the location and sensitive of all wetland areas.</li> </ul>	Mt: Moderate D: Long term S: Site C: High P: Definite St: Medium (-)	Medium

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Increased surface runoff from bare soil areas and sedimentation into adjacent wetlands</b> Vegetation clearing and soil stripping will result in large areas of bare, compacted soils that will increase surface runoff volumes and velocities. Changes in runoff will be most significant during regular storm events and lead to increased sedimentation in receiving streams, increasing the erosive energy of flows and enhancing channel incision and lateral erosion. This will lead to further desiccation of the valley bottom wetlands. In addition, the increase of surface runoff volumes and velocities will increase sediment loads transported off the cleared area and into downslope wetlands. Where flows enter wetland areas, sediment will be deposited and changes in vegetation are likely to occur, with pioneer species such as <i>Typha capensis</i> and <i>Phragmites australis</i> likely to become dominant. The establishment of dense reed beds can, depending on their location, present significant flow obstacles during flood events and lead to channel switching.	M: Moderate D: Long term S: Site C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Areas in and around the wetlands should not be cleaned, graded and ditched/trenched more than a week before construction activities commence.</li> <li>Divert flows from upslope of the construction area around the cleared area.</li> <li>Regular low level humps will be installed along linear preferential flow paths such as construction roads/tracks that run perpendicular to the slope to slow down and disperse flows.</li> <li>Divert flows from upslope of the construction area around the cleared area.</li> <li>No washing of equipment or machinery in any waterbody or wetland on site.</li> <li>Store potential contaminants in designated areas with spill containment measures.</li> <li>Keep sufficient spill clean-up material on site to deal with small spills.</li> </ul>	M: Moderate D: Short term S: Site C: Low P: Possible St: Low (-)	Low
	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Water quality deterioration</b> During the construction phase, as activities are taking place within and adjacent to wetlands, there is a possibility that water quality can be impaired. Typically impairment will occur as a consequence of sediment disturbance resulting in an increase in turbidity. Water quality may also be impaired as a consequence of accidental spillages and the intentional washing and rinsing of equipment within the wetlands. It is likely that hydrocarbons will be stored and used on site, as well as cement and other potential pollutants.	M: Moderate D: Long term S: Site C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Develop emergency response procedures to deal with large spills.</li> <li>Compile and implement alien vegetation management plan to remove and control establishment and spread of alien species.</li> </ul>	M: Minor D: Medium term S: Site C: Low P: Possible St: Low (-)	Low
	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Establishment and spread of alien species</b> Areas disturbed during the construction process will be susceptible to invasion by alien vegetation, e.g. <i>Acacia mearnsii</i> (black wattle). These alien species could spread to the adjacent wetland areas and result in decreased flows, increased erosion and decreased biodiversity in these systems.	M: Moderate D: Long term S: Local C: Medium P: Possible St: Medium (-)	Medium		M: Minor D: Short term S: Site C: Low P: Possible St: Low (-)	Low
	Shaft Area and Surface Infrastructure	Loss and disturbance of wetland habitat	M: Major D: Long term S: Site C: Medium P: Definite St: High (-)	High	<ul style="list-style-type: none"> <li>Design of surface infrastructure areas should be optimised to minimise the size of the development footprint and to minimise encroachment into wetland habitat.</li> <li>All disturbance footprints must be separated from adjacent wetland habitat by a fence, either a security fence or as minimum a five-strand cattle fence (ideally not utilising barbed wire). The purpose of the fence is to clearly demarcate sensitive areas and prevent accidental vehicle and construction machinery access to these areas.</li> <li>All construction staff should be educated on the sensitivity of wetland areas and should be made aware of all wetland areas near the construction sites.</li> <li>Locate all temporary stockpiles, constructor's camps, laydown areas, ablution facilities etc. within the fenced off surface infrastructure footprint area.</li> <li>Develop and implement a construction stormwater management plan prior to the commencement of site clearing activities. Such a plan should aim to minimise the transport of sediment off site. Sediment traps and sediment barriers should be installed where</li> </ul>	M: Moderate D: Short term S: Site C: Medium P: Definite St: High (-)	High
		Increased erosion in wetlands	M: Moderate D: Medium term S: Site C: Medium P: Possible St: Medium (-)	Medium		M: Minor D: Medium term S: Site C: Low P: Unlikely St: Low (-)	Low
		Increased sedimentation in wetlands	M: Moderate D: Medium S: Site C: Medium P: Possible St: Medium (-)	Medium		M: Moderate D: Medium term S: Site C: Medium P: Unlikely St: Low (-)	Low

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		Increase in alien vegetation	Mt: Moderate D: Medium term S: Site C: Medium P: Possible St: Medium (-)	Medium	necessary, and storm water discharge points should be protected against erosion and incorporate energy dissipaters. <ul style="list-style-type: none"> <li>Erosion within the construction site must be minimised through the following: <ul style="list-style-type: none"> <li>Limiting the area of disturbance and vegetation clearing to as small an area as possible;</li> <li>Where possible, undertaking construction during the dry season;</li> <li>Phasing vegetation clearing activities and limiting the time that any one area of bare soil is exposed to erosion;</li> <li>Control of storm water flowing onto and through the site. Where required, storm water from upslope should be diverted around the construction site;</li> <li>Prompt stabilisation and re-vegetation of soils after disturbance and construction activities in an area are complete; and</li> <li>Protection of slopes. Where steeper slopes occur, these should be stabilised using geotextiles or any other suitable product designed for the purpose, where possible.</li> </ul> </li> <li>Sediment transport off the site must be minimised through the following: <ul style="list-style-type: none"> <li>Where possible, establishing perimeter sediment controls. This can be achieved through the installation of sediment fences along downslope verges of construction sites where surface flows leave the site. Where channelled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used (refer to US EPA guidelines on Stormwater Pollution Prevention);</li> <li>Discharge of storm water from the construction site into adjacent grassland. Discharged flows must be slow and diffuse; and</li> <li>Regular inspection and maintenance of sediment controls</li> </ul> </li> </ul>	Mt: Moderate D: Medium S: Site C: Medium P: Unlikely St: Low (-)	Low
		Increased turbidity and water quality deterioration in adjacent wetlands	Mt: Moderate D: Medium S: Site C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Ensure that no equipment is washed in the wetlands of the area, and if washing facilities are provided. No abstraction of water from the wetlands or pans should be allowed unless expressly authorized in the MULA.</li> <li>Potential contaminants used and stored on site should be stored and prepared on bunded surfaces to contain spills and leaks. Sufficient spill clean-up material must be kept on site at all times to deal with minor spills. Larger spills should be reported to the Environmental Co-ordinator and the relevant authorities (DWS) immediately, with specialists appointed to oversee the clean-up operations.</li> </ul>	Mt: Moderate D: Medium term S: Site C: Medium P: Unlikely St: Low (-)	Low



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
					<ul style="list-style-type: none"> <li>An alien vegetation management plan should be drawn up and implemented to limit the spread of alien vegetation into wetland habitat.</li> <li>All disturbed areas outside the direct development footprints should be rehabilitated and re-vegetated as soon as possible.</li> <li>A detailed procedure for the handling, storage and disposal of waste must be developed and fully implemented during construction.</li> <li>The construction servitudes should be regularly inspected for waste or littering, and clean-up operations initiated if required.</li> <li>Treated water discharged to the environment must not impact negatively on the Olifants River RQOs and be in line with DWS General Limits for treated sewage effluent.</li> <li>Where possible, Discharge point to be located at the bottom of the slope to minimise erosion. Monitor discharge point for any erosion damage over time.</li> </ul>		
Air Quality	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Increase in dust fallout, PM<sub>10</sub> and PM<sub>2.5</sub> particles affecting adjacent communities</b> The air quality specialist study modelled the daily and annual PM <sub>10</sub> and PM <sub>2.5</sub> Ground Level Concentrations (GLC) expected during the construction phase. In addition, the expected dustfall was also modelled. The simulated PM <sub>10</sub> and PM <sub>2.5</sub> frequency of exceedance (FOE) result in exceedance of their respective 4-day per-year South African National Air Quality Standards (SA NAAQS) outside the Elders boundary. The simulated maximum daily dustfall deposition rate result in exceedance of the National Dust Control Regulations (NDCR) residential limit (600 mg/m <sup>2</sup> -day) and non-residential limit (1200 mg/m <sup>2</sup> -day) outside the Elders boundary. The exceedance, pre-mitigation, will have a medium impact on the Middelkraal and Varkuilen community.	M: Minor D: Short term S: Local C: Low P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Clearing will be limited to the designed footprint.</li> <li>Water sprays on unpaved roads and well as the conveyor transfer point.</li> <li>Traffic control done through restriction of traffic volumes on internal roads and vehicle speeds.</li> <li>Vehicle speeds within the mining area will be limited to 40 km/h.</li> <li>Maintain a complaints register and capture the dust related complaints in the grievance mechanism. The grievance will be investigated by the applicable Elders Colliery representative in order for the complaint to be resolved and closed out.</li> <li>Implementation of a dust monitoring programme to monitor dust impacts.</li> </ul>	M: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
Noise	Construction of box-cut and associated infrastructure.	<b>General rise in ambient noise levels</b> During construction the modelled noise levels for daytime indicate that the increase in noise will be limited to the construction site. The Middelkraal community and adjacent farmstead are unaffected by increased noise levels. The model indicates that there will be no increase in ambient noise levels at both the Middelkraal community and the farmstead during daytime.  During night time the increase in ambient noise levels extends much further due to the very low baseline ambient noise levels. However, the Middelkraal community will remain unaffected and at the farmstead the increase will be insignificant. The model indicates that there will be a zero dBA increase at the Middelkraal community and the farmstead will have a 1 dBA increase during night time.	M: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low	<ul style="list-style-type: none"> <li>Ensure high level of equipment maintenance, especially intake and exhaust mufflers.</li> <li>Withdraw equipment for maintenance if change in noise emission characteristics is noticeable.</li> <li>Comply with the relevant standards with regards to construction noise.</li> <li>Maintain complaints and grievance register and act promptly to complaints regarding noise.</li> </ul>	M: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
Heritage	Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	<b>Impact on heritage resources</b> No sites, features or objects of cultural heritage significance were identified at the box-cut and associated infrastructure area. Therefore, in this area, there would be no impact from the proposed development.	No impact		As no cultural heritage significant features were found during the specialist study, no mitigation is required. However, should any features be found during the construction phase, a chance find procedure will be implemented to manage historical sites that may be identified during clearing activities.  Contractors will be informed of chance find procedure as part of environmental awareness and training.	No impact	



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Blasting	Construction of box-cut – blasting	<b>Ground vibration: Impact on surface infrastructure</b> The box-cut operation was evaluated for expected levels of ground vibration from future blasting operations. Review of the site and the surrounding surface infrastructure showed that structures vary in distances from the box-cut area. The structures identified range in distance from very close to very far for the box-cut area and could be problematic. The evaluation took mainly up to 1 500m from the mining areas into consideration. The closest structures found are the R35 Road. The Olifants and Viskule Rivers are relatively far from the proposed box-cut area at 914m to 1 197 m respectively and no impact from ground vibration is anticipated.	Mt: Moderate D: Short term S: Local C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Revisit the box-cut blast design and undertake a proper detail design. Manage ground vibration at the R35 and Middelkraal communities</li> <li>Maintain a minimum safe distance of 207 m (recommended is a minimum of 500m) from any blasting done. This may be greater but not less. The blaster has a legal obligation concerning the safe distance and will determine this distance prior to the construction phase.</li> <li>All persons within 500m from a blast will be cleared and where necessary evacuation will be conducted with all the required pre-blast negotiations.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
	Construction of box-cut – blasting	<b>Ground vibration: Human perception</b> Review of the maximum charge in relation to human perception has proven that people may experience levels of ground vibration as perceptible within a 3 500m area. At 1 250m the expected ground vibration levels are still less than the lower safe blasting limit – less than 6 mm/s but will be experienced by people as “unpleasant”. Distances closer than 950m will exceed the minimum 6 mm/s proposed safe limit for poorly constructed structures. There are no private houses, farmsteads or communities within a 1 000m radius but definitely within 1500m from the box-cut area. The Middelkraal community could potentially feel ground vibration of the blasts undertaken at the box-cut.	Mt: Moderate D: Short term S: Local C: Low P: Possible St: Low (-)	Low	<ul style="list-style-type: none"> <li>Ensure that ground vibration is within limits.</li> <li>The current proposed stemming lengths (4.1 m) as defined in the blast design will be maintained to ensure control on fly rock. Specific designs where distances and blast is known should be considered.</li> <li>Blasting should be undertaken when the road usage is low. Early mornings and late afternoons should be avoided.</li> <li>No blasting will take place in fog conditions.</li> <li>Blasting will not be undertaken during night time.</li> <li>Blasting will not be undertaken when strong winds are blowing.</li> <li>Blasting times will be fixed.</li> <li>Blasting notice boards will be setup at various routes around the project area, informing road users, farmers and communities of blasting dates and times.</li> <li>The Middelkraal and Vakkuien communities will be informed of planned blasting.</li> <li>Third party consultation and monitoring will be undertaken for all ground vibration and air blast monitoring work.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
	Construction of box-cut – blasting	<b>Ground vibration: Impact on R35</b> The R35 road is on the south western side of the box-cut area and is at closest 64m away from the planned box-cut area. Expected ground vibration levels at this road are higher than the recommended limits. The current maximum charge mass may not be used at the nearest point to the road as the ramp down into the box-cut is sloping down deeper away from the road. This means that at closest point to the road the required blasting will be much less than the maximum or minimum charge. Specific designs will be required to determine the actual possible influence at the road and only then can the exact possible levels be determined and course of action decided upon.	Mt: Major D: Short term S: Local C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Blasting parameters applied to blasting activity will ensure that ground vibration levels are within acceptable standards near the R35.</li> <li>Close the R35 during blasts.</li> <li>Obtain required authorisations from the roads agency/department to close road and blast in close proximity to R35.</li> <li>Notification of road closures will be communicated prior to the blasting activities.</li> <li>Monitoring will be undertaken during blasting activities</li> <li>Roads will be cleared after blasting should any material have landed on the road.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
	Construction of box-cut – blasting	<b>Airblast: Impact on surface infrastructure</b> Air blast predicted for the maximum charge ranges between 114.5 and 117 dB where structures are of concern. The predictions indicate that air blast levels at nearest house structures are low and not expected to have any significant influence or reason for damage concern. Complaints from air blast are normally based on the actual effects that are experienced due to rattling of roofs, windows, doors etc. These effects could startle people and raise concern of possible damage.	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low	Mitigation measures for Ground vibration: Human perception and Ground vibration: Impact on R35	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		The possible negative effects from air blast are expected to be less than that of ground vibration. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. This box-out is located such that "free blasting" – meaning no controls on blast preparation – will not be possible.					
	Construction of box-out – blasting	<b>Fly rock: Impact on surface infrastructure</b> After review of the factors that contribute to fly rock it is certain that if no stemming control is exerted there will be fly rock from blasting. A stemming length of 4.1 m as defined in the blast design is expected to yield fly rock that could travel as far as 207 m. Further reduction of stemming length will certainly see fly rock travelling further. Optimal throw distance is also observed at 45 degree angles of departure and at the elevated levels of blasting care must be taken on fly rock as travel distance may be further than anticipated. Careful attention will need to be given to stemming control to ensure that fly rock minimised as much as possible. A 207 m exclusion zone is recommended.	Mt: Major D: Short term S: Local C: Medium P: Definite St: Medium (-)	Medium	Mitigation measures for Ground vibration: Human perception and Ground vibration: Impact on R35 • Remove fallen rocks from topsoil stockpiles.	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low
Traffic	Trucking of interburden and coal Development of the box-out and other surface infrastructure	<b>Additional traffic generated on the road network</b> The construction and operations of the proposed Elders Mine will generate additional traffic on the surrounding road network within the study area. The existing road network is operating at well below its capacity even during the critical AM and PM commuter peak periods. As such, the road network has sufficient capacity to handle the low volume of additional traffic that will be generated by the proposed construction and operations.	Mt: Minor D: Short term S: Regional C: Medium P: Definite St: Medium (-)	Medium	The TIA (Appendix G11) has analysed all critical intersection with the mine generated traffic. Intersection upgrades are to be provided as recommended in this TIA. The upgrade of the intersections will provide additional capacity on the road network.	Mt: Minor D: Short term S: Regional C: Medium P: Definite St: Medium (-)	Medium
		<b>Pedestrians and cyclists generated by the mine</b> The additional traffic that will be generated by the construction and the operation activities of the proposed Elders Mine will have a minimal impact on the existing space available for pedestrians and cyclists. There is no major conflict between pedestrians and vehicles within the study area. The additional traffic volumes will not result in any conflict.  There will be negligible pedestrians or cyclists generated by the proposed Elders mine. The unskilled construction workers will travel to and from the mine in contracted transport services and be picked up and dropped off at the mine. The skilled workers will travel to the proposed site by private vehicles. It is unlikely that many of the workers will commute to work on foot.	Mt: Minor D: Long S: Site C: Medium P: Unlikely St: Low (-)	Low	The TIA has analysed all critical intersection with the mine generated traffic. Intersection upgrades are to be provided as recommended in this TIA. The upgrade of the intersections will provide additional capacity on the road network.	Mt: Minor D: Long S: Site C: Medium P: Unlikely St: Low (-)	Low
		<b>Additional heavy vehicles generated on the road network impacting road condition.</b> The haulage trucks to and from Elders and the processing plants will have a minor impact on the condition of the road network. Currently, the existing road network varied from poor to good condition. The volume of traffic proposed to be generated by the mine is low. Majority of the of the surrounding industries are also generating heavy traffic on the local road network. The road network will be able to carry the additional volumes of heavy traffic that will be generated by the proposed mine. Hence, the impact of the additional heavy vehicle traffic on the existing condition of the road network is expected to be low.	Mt: Minor D: Long S: Regional C: Medium P: Possible St: Medium (-)	Medium	The road authority is to provide maintenance and rehabilitation on all roads.	Mt: Minor D: Long S: Regional C: Medium P: Possible St: Medium (-)	Medium
Socio-Economic	Development of the Elders Colliery	<b>Conflict with communities within the Primary ZOI should expectations to benefit from economic opportunities and improved living conditions not be met</b> The Vlakkuilen and Middelkraal communities are the closest communities to the mine and are having expectations that the development of the mine will improve their living conditions in terms of employment and poverty alleviation. However, due to	Mt: Major D: Medium term S: Local C: Medium P: Possible St: Medium (-)	Medium	• Compile and implement the management measures detailed in the SLP. • Prioritise the employment of the communities residing within the Primary ZOI for semi-skilled and unskilled job opportunities during construction;	Mt: Moderate D: Medium term S: Local C: Medium P: Possible St: Medium (-)	Medium



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<p>the fact that most of the local community members do not have the required skills and education levels required for these employment opportunities, it is possible that people from outside of the project area might benefit from these opportunities ahead of local people.</p> <p>It has also been established that the area surrounding the Elders Colliery project is already experiencing influx that is not related to mining; as a result it is possible that local communities could associate this influx with the Elders Colliery. Similarly, if they do not access any job opportunities, they might blame the mine for hiring people who do not belong to the local areas, thus resulting in conflicts with the mine.</p> <p>Levels of services in the Primary Zol are also poor, leading to expectations for the mine to contribute towards the improvement of these services. Having established during the focus group meetings that the Middelkraal community is distancing itself from local government because they refer to themselves as private landowners, it is possible that the mine would be expected to play the role of government in local service delivery. While it is acknowledged that local service delivery is not the competency of the mine, it is important for Elders Colliery to manage this expectation through their stakeholder engagement protocol, and to continue making sure that all Elders employees (including contractors) interfacing with communities provide consistent messages regarding this.</p>			<ul style="list-style-type: none"><li>Enforce the contractor management plan, especially relating to local recruitment and procurement; and,</li><li>Where possible, engage with the Govan Mbeki Local Municipality and Gert Sibande District Municipality to identify opportunities of collaboration and capacity building for the provision of social services to the communities within the Primary Zol.</li></ul>		
	Development of the Elders Colliery	<p><b>Influx of people and construction workers leading to increased pressure on social services and infrastructure, social pathologies and disruptions, resulting in spontaneous settlements</b></p> <p>The development of a substantial mining project can mean a high public profile even before project activities commence. Such speculation raises expectations of, and interest in, the potential benefits of a project (IFC, 2009). It is possible that as potential jobseekers and contractors start moving into the project area in expectation of economic benefits from the project, spontaneous settlements could develop to cater for their housing needs.</p> <p>While it is unlikely that the jobseekers could establish their housing within the Primary Zol (Makkuilen and Middelkraal), it is likely that Emzini, and Mhlahini within the Secondary Zol and Thubelihle in the Tertiary Zol might experience a further growth of informal housing. It is anticipated that influx and opportunistic settlement will peak during the construction phase of the mine when demand for unskilled local labour is at its highest. Engagements with key informants in 2015 have raised influx of mineworkers into the area as a concern, mostly in relation to the competition for services. On the other hand, the renting out of backyard shacks and rooms in Emzini provides for income for the households. It was also gathered during focus group meetings at Middelkraal that the households also used to rent out outside rooms to the employees of Middelkraal (Umabo) Mine, before it was closed in June 2015. However, it seems as if the employees have now vacated the area, suggesting that influx for construction workers may be temporary. It is therefore possible that should there be a need for housing of employees close to the project area, this community will continue to earn incomes from renting out their outside rooms. However, this will only be for the construction period of 18 months, after which it is assumed that the construction workers will move to potential new areas of development in the region.</p>	M: Moderate D: Long term S: Local C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"><li>Develop a clear and concise employment and recruitment policy that prioritizes local recruitment. Ensure that contractors adhere to this policy;</li><li>Identify and support community development programmes that address challenges raised by population influx and spontaneous settlement;</li><li>Enforce the relevant Contractor Management Plan, which should in addition address accommodation, living standard, transport and health and safety standards of contractors;</li><li>Enforce the Anglo American principles regarding employee and contractor behaviour;</li><li>Continuously monitor the housing and living conditions of employees receiving living out allowances;</li><li>Support local government capacity for integrated development planning;</li><li>Participate in the local government's strategy to address issues related to and potentially enhanced by project-induced influx. This strategy will be developed in order to clearly define how participants, including AAC, local government and relevant stakeholders, intend to manage the impacts caused by influx where possible; and,</li><li>Compile and implement the community health and safety initiatives of the Community Health and Safety Plan (CHSP), such as education and awareness programs that address social pathologies in neighbouring communities through established government departments.</li></ul>	M: Moderate D: Long term S: Local C: Medium P: Possible St: Medium (-)	Medium

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Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<p>The development of spontaneous settlements could potentially lead to an increase in the current social pathologies currently experienced, particularly prostitution and alcohol abuse, due to the presence of construction workers. Influx is already occurring in these settlements. It has been confirmed through discussions with key informants in 2015 that these social pathologies have been increasing in the area. There will be no contractor accommodation on site, it is anticipated that construction workers will be self-accommodated or sourced in Bethal, Emzini, Kriel and Thubelihle.</p> <p>An influx of people into the area will increase the demand for existing services and infrastructure that are already under pressure to deliver adequate services to the local population. This impact, if not adequately managed, will exacerbate and worsen poor service delivery in the area.</p> <p>With the levels of unemployment in the area being so high, there is also a potential for the communities within the Primary Zol (Vakkuilen and Middelkraal) to rent out backrooms to mine contractors and employees to make additional income. Middelkraal households have provided accommodation to mine workers on the Middelkraal Mine (Umabo). Vakkuilen has not experienced an influx, despite the announcement of the Elders project since as early as 2005. These communities already have limited access to services, and the rental income gained will further reduce access to these resources.</p> <p><i>This impact will continue throughout the operation phase</i></p>					
	Development of the Elders Colliery	<p><b>Benefits resulting from employment and income opportunities created by Elders Colliery</b></p> <p>Employment and a secure income provide many socio-economic benefits to employees and their dependents, including:</p> <ul style="list-style-type: none"> <li>Improved material wealth and standard of living;</li> <li>Enhanced potential to invest in and improve access to social services such as education, health services, etc. (which may be provided directly by the company to employees and/or employees may now have the funds to pay for these services); and,</li> <li>Employment and training of unskilled workers facilitates skills development and improves the future employment prospects of such workers.</li> </ul> <p>Secure wage employment can also contribute towards a sense of independence, freedom, and pride, and it may promote a good work ethic.</p> <p>The mine will create various types of employment:</p> <ul style="list-style-type: none"> <li>Direct employment for the workforce</li> <li>Indirect employment at the supplier companies (procurement); and</li> <li>Induced employment</li> </ul> <p>The local employment generated or sustained during the construction phase is expected to have an impact of moderate magnitude and short-term duration. It is also expected to impact at a local scale as it is likely that earnings will benefit extended family and commercial networks.</p> <p>Local employment benefits may be further increased by sourcing as many goods and services as possible from within the study area. However, due to technical requirements and constrained local supply that limit procurement options, the scope to expand local employment and procurement is limited. The Anglo American local procurement policy supports sustainable, responsible local procurement that positively contributes to a</p>	<p>M: Moderate D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low	<ul style="list-style-type: none"> <li>Enforce the Anglo American Contractor Management Plan, which should in addition address accommodation, living standard, transport and health and safety standards of contractors;</li> <li>Develop a clear and concise employment policy prioritizing local employment;</li> <li>Implement vocational training programs to promote local workforce capacity as per the Labour and Human Resources Plan (LHRP);</li> <li>Employ local workers if qualified applicants with the appropriate skills are available. Formalize this policy in company Human Resources guidelines and contractors' agreements;</li> <li>Purchase goods and services at a local level, if available. Formalize this policy in company purchasing guidelines and contractors' agreements;</li> <li>Work closely with the local communities before and during the project to identify and communicate required skills and resources that the local community could provide;</li> <li>Provide or facilitate training of local people in mining and general business skills before and during mining activities, such as through internships, scholarships, and/or vocational and skills training programs;</li> <li>Prepare a detailed vocational training program in consultation with the local community to be implemented during the construction phase; and,</li> <li>Through the stakeholder engagement process ensure that expectations are managed around employment opportunities and practices.</li> </ul>	<p>M: Moderate D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		resilient supply chain and the economic and social development of the communities in which they operate. While Elders Colliery had not provided their procurement strategy at the time of writing the report, it is expected that they will adhere to the Anglo American local procurement policy.  <i>This impact will continue throughout the operation and closure phases.</i>					
	Development of the Elders Colliery	<b>Dissatisfaction over employment opportunities and conditions of procurement which could potentially lead to community protests and unrests, as well as conflicts within communities</b> The Social Impact Assessment report identified poverty, unemployment and low education and skills levels in the local areas as potential deterrents of employment for local communities. As a result, the majority will not benefit and will therefore continue living off alternative methods, such as social grants, rental income, small-scale commerce etc. Many of these activities are expected to yield a lower and more uncertain income than that associated with mine employment. It is generally perceived that people who will benefit most from mining employment are those with the highest levels of education and experience, leaving behind those with the lowest education qualifications. Any new development similar to the Elders project, where surrounding communities are characterised by abject poverty, high expectations for employment and low levels of skills, has a potential to contribute to the marginalization of specific groups within a community, specifically the poorly educated and women (particularly those with children). If not properly managed, this could result in increasing economic disparity, where people who are not successful in getting employment cannot maintain the same living standard as people who are employed. This could further contribute to a number of changes, such as: <ul style="list-style-type: none"> <li>Diminished social cohesion as some members of the community can afford more goods and/or adopt different lifestyles;</li> <li>A change in social values away from community centered values towards individual-centred values; and,</li> <li>A change in local power structures in line with earning power.</li> </ul>	Mt: Major D: Short term S: Local C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Develop a clear and concise employment policy prioritizing local employment and communicate this through established communication protocols;</li> <li>Enforce the Anglo American Contractor Management Plan, which should in addition address local procurement;</li> <li>Employ staff from across community groups and the Project area and keep recruitment and employment records, distributing short-term opportunities to as many as possible; and,</li> <li>Develop an SLP that considers integrated development of communities impacted by the Project.</li> </ul>	Mt: Moderate D: Short term S: Local C: Low P: Possible St: Low (-)	Low
	Development of the Elders Colliery	<b>Improved employment and enterprise development opportunities through skills development and capacity building initiatives</b> Preferential employment and skills development opportunities for local communities are some of the key concerns raised by stakeholders particularly communities within the Primary and Secondary Zol in the 2013 and 2015 stakeholder engagement meetings. However, according to the baseline, the levels of skills and education in the areas surrounding the proposed Elders Colliery are low. This will make it difficult for these communities to gain any meaningful employment opportunities from the project and result in conflict situations should people from other areas benefit from these opportunities that are generally perceived to belong to local communities. While skills development for local communities is not mentioned in the Elders SLP, Elders Colliery has a skills development strategy for their existing employees, which is based on the following:	Mt: Moderate D: Short term S: Local C: Low P: Possible St: Low (+)	Low	<ul style="list-style-type: none"> <li>In order to promote skills development and capacity building initiatives to both employees and the broader population and, in particular amongst youth, the SLP should focus on enterprise development and capacity building;</li> <li>Support local government in their skills development and training initiatives;</li> <li>Furthermore, AAC's closure plan will aim to reinforce the objectives of the SLP by reducing the reliance on AAC for employment by promoting skills transfer to enable alternative livelihoods; and,</li> <li>Develop a clear and concise employment policy prioritizing local employment.</li> </ul>	Mt: Moderate D: Short term S: Local C: High P: Possible St: Low (+)	Low



Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<ul style="list-style-type: none"> <li>Providing the opportunity for all employees to obtain a minimum educational level equivalent to ABET Level 4;</li> <li>Ensuring that the operation has the required skills and competencies within the workforce to enable us to achieve our business and operating mandate; and,</li> <li>Providing a conducive environment for employees to develop and pursue clear career paths within the organisation as a whole.</li> </ul> <p>Furthermore, Anglo American Coal SA manages a bursary scheme designed to provide feedstock for the core and critical skills required by the organisation. In terms of this scheme, bursaries are awarded to candidates (sourced both from local communities and elsewhere) to study in key disciplines such as Mining Engineering, Electrical and Mechanical Engineering, Geology, Survey, Metallurgy, Human Resources and Finance. Upon successful completion of their studies the graduates are placed across the various operations to complete a training (internship) period.</p> <p>While there are opportunities regarding the planned upskilling of communities surrounding the mine, it is important to note that these opportunities might not be available directly from the Elders Colliery's intervention. However, in order to make some contribution towards skills development in the surrounding areas, AAC could potentially contribute towards government's training and skills development initiatives.</p>					
	Development of the Elders Colliery	<p><b>Improved infrastructure in the study area due to social investment activities</b></p> <p>Elders Colliery has developed an SLP which has the potential to promote and support community development, capacity building and empowerment, which includes job creation, skills and SME development and infrastructure development. Projects identified in their SLP, derived from the GVLMI DP document, have the potential to improve the quality of life of people living in the project area.</p> <p>The development and implementation of these activities requires consultation with local development partners including local government, Non-Governmental Organisations (NGOs), and CBOs.</p> <p>The impact will be most significant during the operations phase of the mine. While benefits will cease with mine closure, sustainable projects and infrastructure will endure post closure.</p>	<p>Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low	<ul style="list-style-type: none"> <li>Implement management and enhancement measures as per the SLP.</li> </ul>	<p>Mt: Moderate D: Short term S: Local C: Low P: Definite St: Medium (+)</p>	Medium
	Development of the Elders Colliery	<p><b>Increased direct revenue to local government, resulting in local government's ability to provide services to communities</b></p> <p>During construction, income to the government is mostly expected to result from import duties as well as taxes on locally procured services and goods. The construction phase is expected to have a minor (positive) impact of short term duration and local scale (due to the relatively limited contribution) on government revenue. This impact is one of the downstream socio-economic effects directly resulting from the operation of the mine and mitigation of this impact is very difficult. The Extractive Industries Transparency Initiative (EITI) is an initiative to improve the transparency of the payment and spending of revenues from the extractive sector so as to improve development outcomes, reduce the potential for corruption or large scale embezzlement of funds by host governments and stimulate debate about the uses to which these revenues are put. Anglo American supports and is a participant in the process. The EITI sets a global standard for transparency in the oil, mining and gas sectors. This coalition between governments,</p>	<p>Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low	<ul style="list-style-type: none"> <li>Support, participate and report on the payment and spending of revenues to government according to the EITI principles and guidelines.</li> </ul>	<p>Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		companies and civil society endeavours to make natural resources benefit everyone by providing a standard for companies to publish what they pay and for governments to disclose what they receive. However, it is difficult to rate this impact without any financial information.					
	Development of the Elders Colliery	<p><b>Improved relations with local communities and stakeholders</b></p> <p>AAC has developed a relationship with the Vakkuien Community dating back to 2005 when original consultation commenced. It is important for this relationship to continue, especially if the community will not be relocating as per previous mine plans. Stakeholder comments from this community in 2013 and 2015 indicate that the relationship with Elders is gradually deteriorating (See Table 2-6). However, transparent and regular consultation with the Vakkuien community, will not only prevent potential future conflict but will also benefit the community and improve AAC's social license to operate.</p> <p>The Middelkraal community, relocated in 2007 by Umcebo Mine, has not previously been considered as the primary zone of influence by the Elders Colliery. However, since the changes to the mine footprint, they are the neighbouring community to the Elders project and closest to the infrastructure. As a result, it is important that Elders Colliery starts engaging regularly with this community to ensure that they are well apprised about all issues pertaining to the mine development. Considering the previous relocation of this community by Umcebo Mine, and the dissatisfactions related to this relocation process as was gathered during the focus group meeting with this community, it is imperative for Elders to exercise caution when engaging with this community, and also to ensure that expectations are properly managed.</p> <p>Consideration should be given to other external factors beyond the control and responsibility of Elders, which could potentially affect Elders Colliery's best intentions to improve stakeholder relations with its communities. Some of these could be:</p> <ul style="list-style-type: none"> <li>Political influences;</li> <li>Unpredictability of human behaviour;</li> <li>Unmet expectations from previous engagements with mines in general</li> <li>Unmanaged expectations for benefits from mining;</li> <li>Lack of delivery of social and infrastructure services from the Local Municipality.</li> </ul> <p>Based on the factors above, our level of confidence in assessing level is low.</p>	Mt: Minor D: Medium term S: Local C: Low P: Possible SI: Low (+)	Low	<ul style="list-style-type: none"> <li>Include affected communities in the decision making processes of the project, particularly around potential Corporate Social Investment (CSI) opportunities, and SLP projects;</li> <li>Ensure that all stakeholder engagement includes women, youth and vulnerable groups;</li> <li>Provide regular and transparent feedback to the Vakkuien and Middelkraal communities specifically;</li> <li>Discuss and manage issues, concerns, changes and impacts related to the project as soon as they arise;</li> <li>Monitor and implement the Grievance Management Mechanism;</li> <li>Involve Local Ward Councillors and keep them informed about project developments, and included in all stakeholder engagement processes. Their involvement will assist with the successful development of relationships between the mine, the municipality and the communities;</li> <li>Regularly consult with local government through the GMLM around issues of community development, employment, co-operation and project activities;</li> <li>Where possible CSI initiatives and SLP projects with the GMLM DP with the goal of improving both sustainability and feasibility (this would only occur once the mine was operational);</li> <li>Durable participatory and consultative structures should be in place pre-closure to mitigate the impacts of closure.</li> </ul>	Mt: Minor D: Medium term S: Local C: Low P: Possible SI: Low (+)	Low
	Development of the Elders Colliery	<p><b>Dissatisfactions emanating from unmet expectations for the relocation of the Vakkuien community and a potential loss of social license</b></p> <p>In 2007 an ESIA and EMP was completed for the proposed project but not submitted to the authorities for approval. During the assessment 23 households located on the farm Vakkuien 76 IS were identified for potential physical displacement resulting from strip mining (i.e. open cast mine).</p> <p>Due to the anticipated construction of the opencast pit, it was unavoidable that the Vakkuien Community would have to be resettled. Resettlement activities began in 2007.</p> <p>Additional consultations, including a census and asset inventory, were conducted in 2012 following the revised Project description. In 2014, the mine plans were revised again and it was confirmed that the Vakkuien community would not need to relocate at all as the impacts could be avoided. Due to the out-</p>	Mt: Major D: Short term S: Local C: Medium P: Definite SI: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Continue the monthly discussion with the Vakkuien community until the rezoning to a rural residential area has been completed.</li> <li>Continue engaging the community and Ward Councillor to provide information about the project progress; and,</li> <li>Monitor and implement the Grievance Management Mechanism.</li> </ul>	Mt: Moderate D: Short term S: Local C: Low P: Possible SI: Low (-)	Low

Assessment of potential impacts of the Elders Colliery during the Construction Phase							
Environmental Aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<p>off date that was determined as October 2012, this community was not allowed to make any improvements on their properties and as a result, were living in houses that were not maintained due to the imminent resettlement that never happened since 2007.</p> <p>AAIC acknowledges the negative impact of not relocating the Vakkuien community, and is putting strategies in place to compensate the households for some of the issues listed above. AAIC met with the community to explain the changes in mine plan and the impact on the community (July 2015). AAIC has set up a Working Group with the community and the local Ward Councilor to discuss three major topics: land management, graves and water.</p> <p>In addition, in September 2015, SRK Consulting was appointed to do another household census and asset inventory to assess if there have been any changes to the living conditions of this community since 2012. Based on the comments raised by the Vakkuien Community during stakeholder engagement meetings in 2013 and 2015, it seems as if AAIC's relationship with the Vakkuien community has been neglected during this period. However, it has been noted that AAIC has re-established the Vakkuien Community Working Group, and is continuing to meet with this community. The working group includes the local municipality and is set up to discuss the way forward and strategies. If AAIC continues to properly engage with this community, this relationship can improve, but if not, this relationship can deteriorate, resulting in a potential loss of a social licence to operate. This could be manifested through local unrests and demonstrations at the mine. Transparency and openness in relation to what Elders can or cannot deliver regarding livelihoods restoration is important for managing expectations with this community.</p> <p>The confidence level for this impact is low, based on the difficulties related to the management of impacts that arose from the relocation that was unmet.</p>					



Table 18-4 provides an assessment of potential impacts of the Elders Colliery during the Operational Phase

**Table 18-4: Assessment of potential impacts of the Elders Colliery during the Operational Phase**

Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Topography	Underground mining of No. 2 and No. 4 seams Underground mining of 4 Seam first	<b>Potential subsidence due to underground mining activities</b> The underground mining activities will remove the No. 2 and No. 4 coal seams by means of bord and pillar mining methods. The removal of the seams could potentially lead to surface subsidence.	Mt: Major D: Long term S: Local C: High P: Possible Sl: High (-)	High	<ul style="list-style-type: none"> <li>Maintain recommended pillar size/safety factor that will ensure that no surface subsidence occurs.</li> <li>Mining will not take place in the weathered zone.</li> <li>No total pillar extraction mining method.</li> </ul>	Mt: Minor D: Long term S: Local C: Medium P: Unlikely Sl: Low (-)	Low
Soils	Operation of box-cut and associated surface infrastructure	<p><b>Loss of utilisable resource (sterilisation and erosion), compaction, de-nutritification and contamination</b></p> <p>The operation of the mining venture (underground bord and pillar) and its associated activities (hauling and stockpiling of materials) will see the impact of transportation of materials into and out of the complex, the potential for spillage and contamination of the in-situ and stockpiled materials, contamination due to dirty water run-off and/or contaminated dust deposition/dispersion, the de-nutritification of the stockpiled soils due to excessive through flow of rain water on unconsolidated and poorly protected soils and the flushing of the nutrient pool from the stockpiled materials if not well protected.</p> <p>While the potential for compaction of the in-situ materials by uncontrolled vehicle movement and the loss to the environment (down-wind and downstream) of soil by wind and water erosion over un-protected ground are also possible if not well managed.</p> <p>In summary, the operation will potentially result in:</p> <ul style="list-style-type: none"> <li>The sterilisation of the soil resource on which the facilities are constructed. This will be an on-going loss for the duration of the operation;</li> <li>The creation of dust and the possible loss (erosion) of utilisable soil down-wind and/or downstream, and the potential for contamination of the soils from dust fallout and dirty water runoff;</li> <li>The compaction of the in-situ and stored soils and the potential loss of utilisable materials from the system;</li> <li>The contamination of the soils by dirty water run-off and/or spillage of hydrocarbons from vehicle and machinery;</li> <li>Contamination of soils by use of dirty water for road wetting (dust suppression) and irrigation of the stockpile vegetation;</li> <li>Potential contamination of soils by chemical spills of reagents being transported to site;</li> <li>Sterilization and loss of soil nutrient pool, organic carbon stores and fertility of stored soils;</li> <li>Impact on soil structure and soil water balance.</li> <li>Unmanaged soil stockpiles and soil that is left uncovered/unprotected will be lost to wind and water erosion, will lose the all-important, albeit moderately poor nutrient content and organic carbon stores (fertility) and will be prone to compaction.</li> <li>Contamination of in-situ and/or stored soils by release of un-treated water (from WTP), spillage or leakage from raw water dams or sewage works and or impacts</li> </ul>	Mt: Moderate D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Effective soil cover and adequate protection from wind (dust) and dirty water contamination – vegetate and/or rock cladding;</li> <li>Regular servicing of all vehicles in well-constructed and bunded areas to reduce spillage and contamination;</li> <li>Soil replacement and the preparation of a seed bed to facilitate and accelerate the re-vegetation programme and to limit potential erosion on all areas that become available for rehabilitation (temporary servitudes);</li> <li>Topsoil stockpiles will be shaped in such a manner to prevent erosion. The natural seedbank will germinate covering the dump and, should it be required, overseeding will be done.</li> <li>Management of soils as per the soil management plan.</li> <li>Regular servicing of all vehicles in well-constructed and bunded areas to reduce spillage and contamination;</li> <li>Regular cleaning and maintenance of conveyancing routes and service ways, drains and storm water control facilities;</li> <li>Containment and management of hydrocarbon and dirty water spillage;</li> </ul>	Mt: Moderate D: Long term S: Local C: Medium P: Possible Sl: Medium (-)	Medium

Assessment of potential impacts of the Elders Colliery during the Operational Phase																			
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)													
		of dried sewage sludge and/or salts from unprotected waste storage piles by wind.																	
Soils	Operation of underground mine	<b>Contamination of soil resources during operations</b> It anticipated that during the operation of the Elders Colliery, there is the potential of spillage of carbonaceous material and contamination of soils. Contamination by dirty water run-off and/or spillage of hydrocarbons and/or chemicals is also expected from operations vehicles and machinery, as well as dust and emissions from the process. The impact of the Elders Colliery on the soil resource will have a negative medium significance. Although the magnitude will be minor, the impact will last for the life of the operation (long term) and will be permanent to irreversible if not rehabilitated.	Mt: Minor D: Long term S: Site specific C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"><li>Develop a hydrocarbon and carbonaceous leak/spill procedure for all possible areas of leaks/spillages.</li><li>Spill kits will be provided for on site for spill clearing.</li><li>Spills will be cleared and remediated immediately as per the mine's Leak/Spill Procedure.</li></ul>	Mt: Minor D: Short term S: Site specific C: Low P: Possible St: Low (-)	Low												
Biodiversity	Operation of underground mine	<b>Permanent loss of habitat for flora and fauna</b> As per "Permanent loss of habitat for flora and fauna Section" in the construction phase.																	
	Operation of underground mine	<b>Habitat fragmentation</b> As per "Habitat fragmentation Section" in the construction phase.																	
	Operation of underground mine	<b>Loss of species of concern</b> As per "Loss of species of concern" in the construction phase.																	
Surface water	Discharge of mine water to the natural watercourses	<b>Pollution of surface water resources</b> The water balance modelling indicates that the mine will have an average water surplus over the LOM of approximately 500m <sup>3</sup> /day, after re-use on site. The assumed water quality used in this assessment is given in the table below (as estimated by JVA Consulting in 2015): <table><tr><th>Parameter</th><th>Most likely operational quality</th><th>Possible high concentration</th></tr><tr><td>pH</td><td>6.1–8.1</td><td>5.5</td></tr><tr><td>TDS</td><td>800–110mg/l</td><td>6 500mg/l</td></tr><tr><td>SO<sub>4</sub></td><td>350–800mg/l</td><td>4 500mg/l</td></tr></table> The potential impact on in-stream aquatic life and downstream users is assessed as follows: The potential impact on aquatic life or downstream users of water within the rivers is highly dependent on the pH of the water discharged. This is because acidic conditions will result in mobilisation of metals, and this would be a major contributing factor to the potential toxicity of the water. Based on the assumption that the water is unlikely to be acidic during the operational phase, the following is predicted: <ul style="list-style-type: none"><li>It is possible that metals such as Fe and Al, will be present in significantly elevated concentrations (values of &lt;1 to 10 mg/l and &lt;1 to 5 mg/l predicted respectively).</li><li>An increase in electrical conductivity and overall salinity such that the water is unfit for potable use, as well as informal drinking.</li><li>Sulfate levels could be significantly elevated to the point that there is a risk of developing diarrhoea in infants that may drink the water. Miscarriages in cattle will also be possible at the higher levels of around 4 500mg/l.</li></ul>	Parameter	Most likely operational quality	Possible high concentration	pH	6.1–8.1	5.5	TDS	800–110mg/l	6 500mg/l	SO <sub>4</sub>	350–800mg/l	4 500mg/l	Mt: Major D: Long term S: Regional C: High P: Definite St: High (-)	High	<ul style="list-style-type: none"><li>Containment of all dirty water generated on the mine in a lined POD, sized to have a risk of spill of 2% or less in any one year. The POD will be designed to accommodate at least a 1:50 year flood event.</li><li>Provision of a water treatment plant to treat dirty water generated at the mining operations.</li><li>Treatment of excess dirty water for re-use at the Elders operations, including supply of domestic and service water requirements.</li><li>Water will be treated to achieve both drinking water standards (SANS 241:2011) and the Interim Resource Water Quality Objectives (IRWQO) for the Olifants River. Surplus treated water that cannot be reused in the operations will be discharged to the Olifants River system.</li><li>Alternative storage or use at Elders will need to be considered for excess water that cannot be treated or reused. Should the opportunity to create underground storage compartments arise during the mining of the 2 Seam, surplus water will be stored in the underground workings at Elders.</li><li>Provision of water management facilities with a risk of spill that is lower than 2% in any one year.</li><li>A surface water quality monitoring programme will be implemented, to detect any impacts.</li><li>A water balance monitoring programme will be implemented to enable calibration of the water balance.</li></ul>	Mt: Moderate D: Medium term S: Regional C: High P: Unlikely St: Low (-)	Low
Parameter	Most likely operational quality	Possible high concentration																	
pH	6.1–8.1	5.5																	
TDS	800–110mg/l	6 500mg/l																	
SO <sub>4</sub>	350–800mg/l	4 500mg/l																	



Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<ul style="list-style-type: none"> <li>SAR (Sodium Adsorption Ratio) levels may be impacted on, the Target Water Quality Range <math>\leq 2.0</math> mg/l. It is possible that the SAR levels will be significantly elevated, making the water unsuitable for irrigation without some form of mitigation, with Na levels of around 45 mg/l, but possibly as high as 250 mg/l, predicted.</li> </ul> <p>The potential impact in terms of salt loading on dams is assessed as follows:</p> <p>The salt loading within the Witbank catchment is critical, particularly in terms of sulfate. Based on an average surplus water make of some 500 m<sup>3</sup>/day, and a sulfate concentration of around 4 500 mg/l (the worst case predicted by JVA (in 2015) for the operational period), the mine could generate an average of 2.3 tonnes SO<sub>4</sub> per day.</p>					
	Operation of box-cut area and associated infrastructure	<p><b>Pollution of surface water resources</b></p> <p>The mine surface infrastructure will be constructed at the start of mining and will remain in place for the duration of mining.</p> <p>The wash bays, offices, and workshop areas have the potential to generate poor quality runoff due to contact of the water with coal, hydrocarbons and waste material.</p> <p>Impacts associated with the incline shaft area would be as a result of runoff entering the underground workings and coming in contact with carbonaceous material.</p> <p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Contaminated storm water runoff, as well as wash down water and hydrocarbon spills that discharge from the site, with resultant deterioration in water quality within the Olifants River catchment, associated with increased suspended solids, hydrocarbons (oils and greases), siltation of carbonaceous materials, increase in salinity and potential decrease in pH in the watercourses.</li> <li>Leakage of contaminated water from pipelines, poorly maintained storm water channels, sumps, sediment traps and oil skimmers, etc.</li> <li>Erosion at the clean canal discharge points could result in the formation of erosion gullies on surface, with elevated suspended solids in the runoff water, potentially impacting on the water quality in the watercourses in terms of suspended solids and deposition of silt.</li> <li>Increase in sulfate, turbidity, suspended solids and TDS due to runoff entering the box-cut and becoming contaminated.</li> <li>Runoff coming into contact with carbonaceous material in and around the box-cut.</li> </ul>	<p>Mt: Major D: Long term S: Regional C: High P: Definite St: High (-)</p>	High	<ul style="list-style-type: none"> <li>All facilities with the potential to generate dirty storm water runoff, effluent or wash down water will be located within the designated dirty water area.</li> <li>Clean runoff will be diverted around the designated dirty areas by means of cut-off canals, sized to accommodate at least the 1:50 year peak flow event.</li> <li>Adequate erosion protection will be provided at the clean canal discharge locations.</li> <li>All spills will be contained within dedicated bunded areas (at wash bays, workshops, waste handling areas, etc.).</li> <li>Both general and hazardous wastes will be stored in skips until removed from the site. The hazardous skips in turn will be located under in bunded areas.</li> <li>There will be capacity to store a maximum of 132 m<sup>3</sup> of general waste in waste bins during the life of the project.</li> <li>The storage period will be less than 90 days before removal from the site by an appropriately licensed waste removal contractor and disposed of at a licensed general waste facility.</li> <li>Hazardous waste will be stored according to the applicable regulations under the National Environmental Management: Waste Act (Act 59 of 2008) and the DWS Minimum Requirements.</li> <li>The hazardous waste storage area will, as a minimum, be paved with concrete, covered and provided with bunds and drainage facilities to collect and contain any spills or adversely affected runoff.</li> <li>Waste oil will be stored in drums in a bunded storage area and opportunities for recycling investigated.</li> <li>Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil.</li> <li>All contaminated runoff and spills that escape bunded areas will be collected and contained in the POD.</li> <li>All pipeline routes will be inspected regularly to enable early detection of leaks. Leak detection technology on pipelines</li> <li>All dirty storm water and wash down water will be collected in the POD.</li> </ul>	<p>Mt: Moderate D: Short term S: Regional C: Medium P: Unlikely St: Low (-)</p>	Low

Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
					<ul style="list-style-type: none"> <li>Washdown and waste water from the workshops will be passed through oil skimmers before discharging to the storm water system for containment in the POD and eventual treatment for reuse, or pumping to underground storage.</li> <li>An inspection and maintenance plan will be implemented on the storm water system to ensure that all oil skimming and sediment handling facilities are maintained and that storm water canals and pipelines remain unblocked and free flowing—monthly inspections will be carried out.</li> <li>Spill-sorb or a similar type product must be kept on site and used to clean up hydrocarbon spills in the event that they should occur.</li> <li>Contain all dirty water from the box-cut area.</li> <li>A surface water quality monitoring programme will be implemented to detect any impacts.</li> </ul>		
	Operation of sewage treatment plant	<p><b>Pollution of surface water resource</b></p> <p>Water from the ablution facilities will contain organic matter, which is high in nitrogen and could therefore cause eutrophication if enters the water resource.</p> <p>The sewage treatment plant will be located adjacent to the POD. During operations, the effluent from the STP will be discharged to the Main POD. Excess effluent that cannot be sent to the Main POD will be treated to the Special Effluent Standards as published in GNR 991 on 18 May 1984, as amended, and will be jointly discharged with effluent from the WTP to the Olifants River system.</p> <p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Discharge of untreated sewage into the watercourse.</li> <li>Discharge of treated water not meeting the specified discharge standards into the watercourse.</li> </ul>	<p>Mt: Moderate D: Long term S: Regional C: High P: Possible St: High (-)</p>	High	<ul style="list-style-type: none"> <li>All domestic waste water will be treated in the STP.</li> <li>Sewage water will be treated IRVQOs standards set for the Olifants River.</li> <li>Sludge will be deposited in drying beds within the designated dirty water area and removed by a licensed waste contractor.</li> <li>An inspection and maintenance plan will be implemented to ensure that the STP always operates within specification.</li> <li>A surface water quality monitoring programme will be implemented to detect any impacts.</li> </ul>	<p>Mt: Minor D: Short term S: Regional C: Low P: Unlikely St: Low (-)</p>	Low
	Operation of POD—storage of contaminated water	<p><b>Pollution of surface water resources</b></p> <p>The water in the PODs will be of poor quality, with potential to impact on the downstream water resources, primarily in terms of increased salinity (particularly sulfate) and potentially reduced pH if there are spillages or leaks from the dams.</p> <p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Inadequate sizing or lining system on the dams.</li> <li>Poor maintenance resulting in loss of storage capacity due to sediment build-up in the dams</li> <li>Spilling/overflow from POD into the Olifants River system</li> </ul>	<p>Mt: Major D: Long term S: Regional C: High P: Definite St: High (-)</p>	High	<ul style="list-style-type: none"> <li>The PODs will be engineered to have sufficient capacity to limit the risk of spill to less than 2% in any one year. The POD will be designed to accommodate at least a 1:50 year flood event.</li> <li>In line with best practice, the PODs will be operated as empty as possible at all times to ensure that sufficient storm water retention capacity is available at all times.</li> <li>In the event that there is insufficient available capacity in the main POD during extreme rainfall conditions, excess storm water will be pumped to the Elders underground storage compartments (if available).</li> <li>The PODs will be equipped with geomembrane liners to minimise leakage of contaminated water to the surface or ground water systems.</li> <li>The lining system on the PODs will include a sub-surface drainage layer to detect any leakages, as well as to prevent the build-up of hydrostatic pressure beneath the geomembrane liner. Water collected in the sub-surface drainage system will be discharged to a sump and pumped back into the POD.</li> <li>A silt trap will be constructed at the POD to remove sediment before entering the POD. The silt trap will be cleaned regularly.</li> </ul>	<p>Mt: Moderate D: Short term S: Regional C: Medium P: Unlikely St: Low (-)</p>	Low

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Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
					<ul style="list-style-type: none"><li>An inspection and maintenance plan will be implemented to ensure that the dams are kept in good working order and to monitor sediment build-up. When sediment levels reach a pre-determined level, sediment will be removed to ensure that sufficient storm water storage capacity is maintained at all times.</li><li>A surface water quality monitoring programme will be implemented to detect any impacts.</li></ul>		
	Dust and fire suppression with contaminated water	<b>Pollution of surface water resources</b> Dust and fire suppression systems will be provided along haul roads. These will involve spraying of water onto coal handling areas, as well as a deluge system in case of fire. This water will become contaminated once it comes into contact with the coal. Impacts may arise from: <ul style="list-style-type: none"><li>Spraying of dust suppression or fire water could potentially enter the watercourse resulting in deterioration in water quality, in terms of elevated salinity, particularly sulfate.</li></ul>	Mt: Minor D: Short term S: Site C: Low P: Possible Sl: Low (-)	Low	<ul style="list-style-type: none"><li>Excess water will drain via the dirty storm water system to the POD and will be pumped back to the WTP or reuse in the mining operations.</li></ul>	Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low
	Operation of water treatment plant	<b>Pollution of surface water</b> Water will be drawn from the POD and treated in the water treatment plant (WTP) for reuse in the mining operations, with surplus being discharged to the Olifants River. The WTP will comprise a combination of filtration and Reverse Osmosis (RO). Impacts may arise from: <ul style="list-style-type: none"><li>Spillage of chemical additives, which could result in deterioration of water quality in the watercourses.</li><li>Spillage of the water treatment waste products, in the form of brine and gypsum to the receiving environment.</li><li>Discharge of water that does not meet the discharge standards, or untreated water during upset conditions at the WTP.</li></ul>	Mt: Major D: Long term S: Regional C: High P: Possible Sl: High (-)	High	<ul style="list-style-type: none"><li>The WTP will be isolated within a designated dirty water area. All runoff and spills from the treatment plant will be collected in a sump, from which water will be pumped to the POD.</li><li>Water will be treated to achieve both drinking water standards (SANS 241:2011) and the Interim Resource Water Quality Objectives (IRWQO) for the Olifants River for discharge. Surplus treated water that cannot be reused in the operations will be discharged to the Olifants River. System.</li><li>All chemicals and additives will be stored in dedicated bunded areas, where any spills will be contained.</li><li>An inspection and maintenance plan will be implemented to ensure that the water treatment plant always operates within specification.</li><li>A surface water quality monitoring programme, will be implemented to detect any impacts.</li><li>Discharge water quality will be continuously monitored for early detection of discharge water quality problems.</li><li>Should upset conditions occur, or poor discharge water quality be detected, the WTP discharge will be directed to the POD.</li></ul>	Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low
	Handling and storing of brine and gypsum	<b>Pollution of surface water</b> The proposed water treatment plant will generate both liquid waste (brine), and solid waste in the form of a gypsum sludge. Impacts may arise from: <ul style="list-style-type: none"><li>Spillage of brine and gypsum onto the ground surface.</li><li>Inadequate lining systems, or leakage from the liners at the brine pond and gypsum drying bed.</li></ul>	Mt: Moderate D: Long term S: Regional C: High P: Possible Sl: High (-)	High	<ul style="list-style-type: none"><li>Initially one brine dam will be constructed, with a second to be constructed at a later stage, as the WTP's treatment capacity is increased.</li><li>The brine dams will be lined with compacted clay layer with a 2 mm thick HPDE geomembrane above and below a 6 mm hi-drain, to minimise seepage of contaminated water to the groundwater system. The brine dams will also be equipped with a leak detection sump.</li><li>The gypsum pads will be paved with concrete. The gypsum pad will be provided with concrete bunds to ensure no storm water runoff from the area. The storm water will be directed to a sump at the lower end of the gypsum area, from where water will be</li></ul>	Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low



Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
					<p>directed to the brine dam via a sloping pad and concrete lined channel.</p> <ul style="list-style-type: none"> <li>Gypsum will be removed from the site on a regular basis. This will occur in a timely manner to prevent overloading of the gypsum drying pad.</li> <li>Removal from site of gypsum will be undertaken by an appropriately licensed waste removal contractor.</li> <li>Disposal of gypsum will be at a licensed hazardous waste disposal facility, such as Holfontein Landfill. Alternative use for gypsum will be investigated.</li> <li>An inspection and maintenance plan will be implemented to ensure that the pipelines and dams are kept in good working order.</li> <li>A surface water quality monitoring programme will be implemented to detect any impacts.</li> </ul>		
	Discharge of treated water from the WTP	<p><b>Pollution of surface water resources</b></p> <p>Water will be drawn from the PCD and treated in the water treatment plant (WTP), with surplus treated water discharged to the Olifants River.</p> <p>The water treatment plant will have the capacity to treat up to 2.5 Ml/day. The release of surplus treated water into the catchment will influence the water quality of the receiving resource and erosion may occur at the discharge point.</p> <p>The baseline water quality shows that the Olifants River is already heavily impacted. The quality of water should therefore improve slightly in a localised area due to dilution effects.</p>	<p>Mt: Moderate D: Long term S: Regional C: High P: Possible St: High (+)</p>	High (+)	<ul style="list-style-type: none"> <li>Erosion protection measures at the discharge point.</li> <li>The quality of the water discharged will be closely monitored to ensure that it falls within the specified IRWQO at all times.</li> </ul>	<p>Mt: Moderate D: Long term S: Regional C: High P: Possible St: High (+)</p>	High (+)
	Discharge of treated water to the Olifants River system	<p><b>Alteration of flow patterns in watercourses</b></p> <p>The discharge of treated water to the river system will result in a net increase in the flow of water in the Olifants River system. While this has a net positive impact on the availability of water in the system, it has the potential to negatively impact on the aquatic ecology by changing the seasonal flow patterns in the river system.</p> <p>The water make at the Elders Colliery will be seasonal, with a consequent strong seasonality in the discharge of treated water to the Olifants River. The magnitude of the expected summer and winter discharges of treated water during the last year of mining (i.e. the year of maximum water make) have been compared with the natural stream flow in the Olifants River at DWS flow gauging station B1H018, located approximately 7 km downstream of the mine.</p> <p>The net percentage increase in flow during summer amounts to some 1.0% and in winter to around 2.7%. The net increase in MAR amounts to 1.4%.</p>	<p>Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low	<ul style="list-style-type: none"> <li>No mitigation as increase in yield is positive.</li> </ul>	<p>Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)</p>	Low
	Operation of underground mine	<p><b>Reduction in catchment yield</b></p> <p>The loss in yield associated with mining at the Elders Colliery will be primarily due to the mine infrastructure area, which will be isolated from the catchment, as well as potential ingress to shallow underground workings below the Viskuite and Vakkuijen wetland system.</p> <p>Percentage reduction:</p> <ul style="list-style-type: none"> <li>Elders mine infrastructure (at box-cut): 100%</li> <li>Viskuile &amp; Vakkuijen Rivers upstream of Olifants River: 2.27%</li> <li>Mining right area: 18.29%</li> </ul>	<p>Mt: Moderate D: Long term S: Regional C: High P: Definite St: High (-)</p>	High	<ul style="list-style-type: none"> <li>The site layout has been designed to minimise the dirty footprint, and therefore to minimise the impact on the catchment yield.</li> <li>A water treatment plant will be provided, which will treat excess mine water make to discharge quality, which will be returned to the Olifants River system.</li> </ul>	<p>Mt: Minor D: Long term S: Site C: Low P: Definite St: Medium (-)</p>	Medium

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Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<ul style="list-style-type: none"> <li>Olifants River downstream of mining right area: 1%</li> <li>Witbank dam: 0.38%</li> <li>Loskop dam: 0.12%</li> </ul> <p>It is evident that the impact on surface water yield to the watercourses is Moderate.</p>					
	Truck transport of coal and interburden from Elders Colliery to a processing plant	<b>Pollution of surface water resource</b> Transport of coal/interburden by truck has the potential to impact on watercourses and general runoff quality, primarily due to spillage of coal, as well as contaminated water from the truck itself and at transfer stations. Impacts may arise from: Spillage of water from truck load boxes	Mt: Moderate D: Short term S: Site C: Medium P: Definite SI: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Loading and offloading of trucks will take place only within the designated dirty water areas and Goedshoop.</li> <li>Loading of trucks will be carefully controlled to ensure that overloading will not take place.</li> <li>Truck load boxes will be covered with tarpaulins to prevent spillage of coal from the backs of trucks during transport.</li> </ul>	Mt: Moderate D: Short term S: Site C: Medium P: Unlikely SI: Low	Low
Groundwater	Storage of overburden material, overburden stockpile	<b>The formation of acid mine drainage (AMD) as a result of ingress water and oxygen into the stockpiled overburden</b> The potential impact of seepage water into shallow weathered aquifer from the overburden stockpile is considered to be moderate. Potential contaminants may impact on the groundwater usage, which includes domestic and agricultural use. Generally, overburden is considered inert and therefore does not have a great potential for AMD. However, during the removal of the overburden in the construction of the box-cut, there is the potential to remove some of the coal from the No. 2 and No. 4. This coal has AMD potential as per the results of the geochemical analysis of the coal. The AMD potential of the overburden stockpile is considered moderate in the long term as the overburden will be stockpiled for the LOM. The impact will be limited to the site.	Mt: Moderate D: Long term S: Site C: Medium P: Definite SI: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Verify AMD generation potential of the overburden only through sampling and analyses of core samples from the box-cut location.</li> <li>Include monitoring of boreholes around overburden stockpile in overall groundwater monitoring plan to identify any potential contamination of groundwater resources.</li> <li>Should pollution be identified in the groundwater resources, the source of the pollutants will be investigated and the applicable remediation measures will be implemented.</li> <li>Maintain compaction and shape to ensure free draining of surface run-off to minimise rainfall infiltration.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Unlikely SI: Low (-)	Low
	Groundwater quality impacts on the shallow weathered aquifer	<b>Stockpiling of overburden, storage of polluted water (PCDs) and brine (Brine dam)</b> The seepage plumes emanating from the PCDs, Brine dam and overburden stockpile will predominantly impact on the ambient groundwater quality of the shallow weathered aquifer. The predicted extents of the plumes are limited due to lining of the PCDs and Brine dam. The plume extents are foreseen to be confined to the immediate surroundings of the site and not impacting any groundwater user.	Mt: Moderate D: Long term S: Local C: Low P: Definite SI: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Continuous monitoring of pollution source and plume concentrations</li> <li>Adaptive management of plumes, i.e. hydraulic plume containment if and when required</li> </ul>	Mt: Minor D: Long Term S: Local C: Low P: Possible SI: Low	Low
	Underground mining of the No. 2 and No. 4 coal seams by means of bord and pillar mining methods	<b>Influx of groundwater into the mine workings</b> Influx of groundwater into box-cut, the No. 2 and No. 4 seams mine workings will result in the potential dewatering of the overlying aquifers, manifesting as a groundwater cone of depression in the water table which could influence the availability of groundwater. The average depths to the No. 2 and No. 4 seams are 40 and 60 metres respectively. Mining will take place below the weathered zone where the interaction between the wetlands and groundwater table takes place. Therefore it is unlikely that if the bord and pillar mining method is implemented, that influx of groundwater into the mine workings will take place.	Mt: Major D: Long term S: Local C: High P: Definite SI: High (-)	High	<ul style="list-style-type: none"> <li>Detailed geological mapping in order to identify geological features.</li> <li>Underground mining will take place by bord and pillar mining methods to ensure stability integrity of overlying strata.</li> <li>Mining will take place according to design mine stability safety factors, as per the WULS specifications.</li> <li>Mining will not take place in the weathered overlying strata.</li> <li>Identified deep boreholes within the underground mining area will be sealed to prevent inflow into the mine.</li> <li>Grouting of fissures to prevent excess groundwater entering the underground mining sections.</li> <li>Manage excess water make as part of the operational phase water balance.</li> </ul>	Mt: Moderate D: Long term S: Local C: Medium P: Definite SI: Medium (-)	Medium



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Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
					<ul style="list-style-type: none"> <li>Confirm private borehole users as part of hydro census and monitoring groundwater levels and yields.</li> <li>Continuous monitoring of underground mine inflows (daily quantity and quarterly quality) and water levels (quarterly) within the predicted zone of dewatering</li> <li>Excess water must be pumped to the surface water storage facilities (PODs) for re-use and/or treatment and environmentally acceptable disposal.</li> <li>Should an instance arise where groundwater be contaminated, this will be investigated and responded to accordingly to address the matter.</li> <li>Monitoring of GDEs, potential augmentation of groundwater flows or wetland off-sets, monitoring of surface water qualities up- and downstream of the underground mining area</li> </ul>		
	Underground mining of the No.2 and No. 4 coal seams by means of bord and pillar mining methods	<p><b>The formation of AMD in groundwater resources</b></p> <p>The formation of the AMD could occur as a result of the ingress of water and oxygen into strata containing sulfide minerals.</p> <p>As modelled by the groundwater specialist, the overall reactions of the rock matrix and the forming of secondary minerals will be overall in concurrence with the mineral reactions predicted in the modelling.</p> <p>Local patches of mine water in contact with only carbonaceous material will be acidic as the carbonate minerals are not efficient to neutralize the acid produced. As the mine gets flooded this acidic parts will come within contact with the neutral-alkaline drainage from the silicate minerals.</p> <p>Although the heterogeneity and the probable non-ideal mixing of different geochemically units give uncertainty to the exact quantification of the groundwater parameters, the average mine water will only be slightly acidic over the long term in the post-closure mine system under the conditions assumed in the modelling.</p> <p>No acidification will occur in the underground mines during the operational phase. In the box-out it will take about 17 years for the spoils to start acidify (pH &lt; 5.5).</p>	<p>Mt: Moderate D: Long term S: Site C: Medium P: Possible Sl: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Optimise storage of mine water make in mined out underground section to minimise exposure to oxygen.</li> <li>Develop a groundwater monitoring programme in order to assess the groundwater quality. Frequency of monitoring to take place as per the groundwater monitoring plan.</li> <li>Should pollution be identified within the groundwater resources, the source of the pollutants will be identified and the applicable remediation measures will be implemented.</li> </ul>	<p>Mt: Moderate D: Long term S: Site C: Medium P: Possible Sl: Medium (-)</p>	Medium
	Operation of POD	<p><b>Deterioration of groundwater quality due to seepage from POD, water treatment plant and sewage treatment plant (and associated infrastructure)</b></p> <p>The seepage on contaminated storm water through the POD into the sub-surface could lead to groundwater pollution.</p> <p>This contamination will be throughout the operational phase of the mine but will be limited to the site.</p>	<p>Mt: Moderate D: Long term S: Site C: Medium P: Possible Sl: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Suitable liner designs have been incorporated during the design phase and will be approved by DWS.</li> <li>Maintain underdrain system and dam integrity.</li> <li>Operate POD at lowest volumes as possible.</li> <li>An inspection and maintenance plan will be implemented to ensure that the POD, brine pond and gypsum pad operates within specifications.</li> </ul>	<p>Mt: Moderate D: Long term S: Site C: Medium P: Unlikely Sl: Low (-)</p>	Low
Wetland	Underground mining of the No.2 and No. 4 coal seams by means of bord and pillar mining methods	<p><b>Decreased flows in wetlands due to dewatering of groundwater aquifers</b></p> <p>Operation of the underground mine will result in a drawdown of the local groundwater table. Typically two groundwater aquifers exist on the Highveld, a shallow weathered aquifer and a second deeper aquifer. The deeper aquifer is not thought to play a role in supporting the wetlands on site, though further work in this regard is still being undertaken as part of the reserve study.</p> <p>The majority of wetlands on site, specifically the hillslope seepage wetlands, are however predominantly maintained by shallow perched water tables and the shallow</p>	<p>Mt: Minor D: Long term S: Local C: Medium P: Possible Sl: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Maintain recommended pillar size/safety factor that will ensure that no surface subsidence occurs under any of the wetlands on site.</li> <li>Identified deep boreholes within the underground mining area will be sealed to prevent inflow into the mine.</li> <li>Detailed geological mapping in order to identify geological features.</li> <li>Underground mining will take place by bord and pillar mining methods to ensure stability integrity of overlying strata.</li> </ul>	<p>Mt: Minor D: Long term S: Local C: Medium P: Possible Sl: Medium (-)</p>	Medium

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		<p>weathered aquifer that are generally separate from deeper groundwater and are thus considered unlikely to be affected by the dewatering.</p> <p>The large valley bottom wetlands, the Vlakkuilen Wetland and the Viskulle Wetland, are characterised by vertic clay soils that expand when wet and become almost impermeable. Surface flows within these wetlands are thus also likely to be largely unaffected by the groundwater draw down cone. This is supported by observations from other areas on the Highveld - shallow undermining and subsequent stopping of the Rietspruit floodplain on the Mpumalanga Highveld has not resulted in the desiccation of the system, but rather in the formation of numerous depressions on the floodplain where water accumulates and which are now characterised by increased wetness.</p>			<ul style="list-style-type: none"> <li>Mining will take place according to design mine stability safety factors, as per the WUL's specifications.</li> <li>Mining will not take place in the weathered overlying strata.</li> <li>Identified deep boreholes within the underground mining area will be sealed to prevent inflow into the mine.</li> <li>Grouting of fissures to prevent excess groundwater entering the underground mining sections.</li> <li>Manage excess water make as part of the operational phase water balance.</li> <li>Confirm private borehole users as part of hydro census and monitoring groundwater levels and yields.</li> </ul>		
	Operation of stockpiles	<p><b>Water quality deterioration and increased sedimentation in adjacent wetlands</b></p> <p>Various stockpiles will be required as part of the Elders Colliery operation, overburden and topsoil stockpiles. Stockpiles will be characterised by bare soil, steep side slopes that generate significant surface run-off. Run-off from these stockpiles is likely to be sediment rich. Where run-off from these stockpiles enters adjacent wetlands, water quality deterioration is likely to result, including increases in turbidity, sulfates and metal concentrations (e.g. Aluminium and Iron), and a drop in pH. Where sediment is deposited, changes in vegetation are also likely to occur with pioneer species such as <i>Typha capensis</i> and <i>Phragmites australis</i> likely to become dominant.</p>	<p>Mt: Moderate D: Long term S: Local C: Medium P: Definite St: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Run-off from topsoil stockpiles should enter a sediment trap prior to discharge to the environment.</li> <li>Topsoil stockpiles should ideally be vegetated to stabilise slopes and minimise sediment loss.</li> </ul>	<p>Mt: Minor D: Long term S: Local C: Low P: Possible St: Low (-)</p>	Low
	Operation of stockpiles	<p><b>Establishment and spread of alien species</b></p> <p>Stockpiles and cleared areas will be susceptible to invasion by alien vegetation, e.g. <i>Acacia mearnsii</i> (black wattle). These alien species could spread to the adjacent wetland areas and result in decreased flows, increased erosion and decreased biodiversity in these systems.</p>	<p>Mt: Moderate D: Long term S: Local C: Medium P: Definite St: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Implement alien vegetation management plan to remove and control establishment and spread of alien vegetation species.</li> </ul>	<p>Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)</p>	Low
	Shaft Area and Surface Infrastructure	Disturbance of wetland habitat and fauna	<p>Mt: Moderate D: Medium term S: Site C: Medium P: Possible St: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Implement the surface water management plan that will ensure effective clean and dirty water separation;</li> <li>Implement and maintain dirty water infrastructure around all sources of potential dirty water. Regular inspections of all water management infrastructures must be undertaken and detailed records of such inspections maintained;</li> <li>Minimise extent of dirty water areas;</li> </ul>	<p>Mt: Minor D: Medium term S: Site C: Low P: Unlikely St: Low (-)</p>	Low
		Deterioration in water quality due to seepage and leakage out of the dirty water area	<p>Mt: Moderate D: Medium term S: Local C: Medium P: Possible St: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>Ensure all clean water is diverted around dirty water areas and allowed to re-enter the environment;</li> <li>Where possible, clean water diversion canals must be constructed as vegetated swales rather than cement lined canals wherever possible;</li> <li>Implement dust suppression within areas where carbonaceous dust may be generated and areas of</li> </ul>	<p>Mt: Minor D: Medium term S: Site C: Low P: Unlikely St: Low (-)</p>	Low

Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		Decreased flow within wetlands adjacent to the infrastructure footprint	Mt: Moderate D: Medium term S: Local C: Medium P: Definite St: High (-)	High	<ul style="list-style-type: none"> <li>heavy vehicle traffic. Implement dust suppression on haul trucks;</li> <li>Implement water quality strategy;</li> <li>Compile an emergency response procedure for clean-up of any major spillages.</li> <li>All areas involving the handling of carbonaceous material and coal should be considered dirty water areas and should be isolated from the surrounding catchment. No run-off from the ROM stockpile should be discharged to the environment.</li> <li>Any dump or stockpile, if containing carbonaceous material, should be considered a dirty water area. No run-off from such stockpiles should be discharged to the environment without treatment.</li> <li>Where possible, the topsoil stockpile should be located within a clean water area and no contaminated water should come into contact with the topsoil stockpiles. Side slopes of the topsoil stockpiles should be kept as low as possible and should ideally be vegetated to minimise sediment loss and colonisation by alien/weed vegetation. All runoff from the topsoil stockpile should be conveyed through a sediment trap which is regularly cleaned and maintained. Clean storm water should ideally be conveyed in grassed swales rather than cement lined channels or excavated trenches. Clean water discharge points into the environment should be protected against erosion and be subjected to regular maintenance.</li> <li>All pollution control dams must be lined and designed according to industry best practice.</li> </ul>	Mt: Minor D: Medium term S: Site C: Low P: Possible St: Low (-)	Low
		Increased flow due to discharges	Mt: Moderate D: Medium term S: Site C: Medium P: Definite St: High (-)	Medium		Mt: Minor D: Medium term S: Site C: Low P: Definite St: Medium (-)	Medium
		Water quality impact due to discharges	Mt: Major D: Medium term S: Regional C: Medium P: Possible St: Medium (-)	Medium		Mt: Minor D: Medium term S: Local C: Low P: Unlikely St: Low (-)	Low
Wetland/Surface water	Operation of water treatment plant	<b>Altered flows within Olifants River</b> It is proposed that all water from the water treatment plant be discharged into the Olifants River system. At full capacity it is expected that a maximum of 5M/day will be discharged. Currently a single discharge point is proposed. The impact of such a discharge is likely to be insignificant during high flow events, but during low flow periods the impact is likely to be more significant. Increased flows could lead to increased erosion. However, shortly downstream of the infrastructure area the Olifants River enters a fairly confined reach characterised by a mostly rocky/bedrock stream bed. Channel erosion is thus considered unlikely to be a significant problem. Erosion at the point of discharge is likely to occur.	Mt: Moderate D: Long term S: Local C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Erosion protection measures at the discharge point.</li> <li>Ensure discharge water quality is always in line with the IRWQOs set for the Olifants River system.</li> <li>Implement recommended water quality monitoring and biomonitoring plan</li> </ul>	Mt: Minor D: Medium term S: Local C: Medium P: Possible St: Medium (-)	Medium
	Operation of water treatment plant	<b>Altered water quality within the Olifants River</b> Discharge of treated water into the Olifants River could lead to altered water quality within the river, impacting on the aquatic ecosystem. Water will be treated to be in line with the IRWQO set for the Upper Olifants River. Given the existing water quality impacts to the Olifants River, the discharge of treated water to the system could have a low and localised positive impact on the system if the treated water is of such a quality as to dilute the water within the system. Such a positive impact is only likely to be realised during low flow periods. During high flow periods the impact is likely to be insignificant. If discharge water is however of a poor quality and contributes to further water quality deterioration in the system, the impact would be negative.	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (-)	Low (-)		Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)	Low (+)



Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
	Operation of water treatment plant	<b>Water quality deterioration</b> Seepage, leakage or overflow of contaminated water out of the brine ponds and/or sludge dams will likely enter the downslope wetlands and lead to water quality deterioration unless contained.	Mt: Major D: Long term S: Local C: High P: Possible Sl: High (-)	High	<ul style="list-style-type: none"> <li>All brine ponds and sludge dams should be lined. A suitable engineered multiple liner should be installed in the brine ponds and sludge dams to ensure zero seepage of water out of the ponds.</li> <li>Leak detection mechanisms should form part of the liner system.</li> <li>Ponds should be of sufficient capacity to ensure that no overflow occurs.</li> <li>Brine will be temporarily stored on site and disposed of offsite in a suitable facility.</li> <li>A surface water quality monitoring plan and biomonitoring program will be implemented to monitor downslope water resources for signs of pollution derived from the brine ponds and sludge dams.</li> </ul>	Mt: Moderate D: Long term S: Local C: Medium P: Unlikely Sl: Low (-)	Low
	Operation of sewage treatment plant	<b>Water quality deterioration</b> Discharge or spillages of water from the sewage treatment plant could lead to water quality deterioration within receiving wetlands, specifically the eutrophication of such systems and the loss of sensitive aquatic species. Discharge of untreated or poorly treated sewage could also pose a health risk to downstream water users.	Mt: Moderate D: Long term S: Regional C: High P: Possible Sl: High (-)	High	<ul style="list-style-type: none"> <li>Sewage water will be treated IRVQOs standards set for the Olifants River.</li> <li>Wetlands downslope of the treatment plant will be included in the water quality and biomonitoring plan for the mine.</li> <li>Regular inspections and maintenance activities will be undertaken on the treatment plant to ensure optimal operation at all times.</li> <li>Emergency response procedures will be developed to deal with sewage spills.</li> </ul>	Mt: Minor D: Long term S: Local C: Medium P: Unlikely Sl: Low (-)	Low
Air Quality	Operation of underground mine	<b>Increase in dust fallout, PM<sub>10</sub> and PM<sub>2.5</sub> particles</b> The air quality specialist study modelled the daily and annual PM <sub>10</sub> and PM <sub>2.5</sub> Ground Level Concentrations (GLC) expected during the operational phase. In addition, the expected dustfall was also modelled.  The simulated PM <sub>10</sub> and PM <sub>2.5</sub> FOE result in exceedance of their respective 4-day per-year SANAAQS outside the Elders boundary. However, the simulated annual average PM <sub>10</sub> and PM <sub>2.5</sub> GLCs does not result in exceedance of their respective SANAAQS value outside the Elders boundary. Exceedance of the 4-day per-year SANAAQS FOE and annual average SANAAQS for PM <sub>10</sub> and PM <sub>2.5</sub> was not simulated at the Middelkraal or Vlakkuilen communities.  The simulated maximum daily dustfall deposition rate result in exceedance of the sensitive receptor residential limit (600 mg/m <sup>2</sup> -day) and non-residential limit (1200 mg/m <sup>2</sup> -day) outside the Elders boundary. The exceedance does not impact on the Middelkraal or Vlakkuilen communities.	Mt: Minor D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Water sprays on unpaved roads and conveyor transfer points.</li> <li>Enclose the crusher and fit with a dust extraction or water spray system.</li> <li>Traffic control done through restriction vehicle speeds on roads.</li> <li>Vehicle speeds within the mining area will be limited to 40 km/h.</li> <li>Soil stockpiles will be vegetated or turfed.</li> <li>Implementation of recommended dust monitoring programme to monitor dust impacts.</li> <li>Maintain complaint and grievance register and act promptly to complaints regarding dust.</li> </ul>	Mt: Minor D: Long term S: Local C: Medium P: Unlikely Sl: Low (-)	Low
Noise	Operation of the box-cut	<b>General rise in ambient noise levels</b> The model indicates that there will be no increase in ambient noise levels at both the Middelkraal community and the farmstead during daytime. During night time the increase in ambient noise levels extends much further due to the very low baseline ambient noise levels. However, the Middelkraal community will remain unaffected and at the farmstead the increase will be insignificant. The model indicates that there will be a zero dBA increase at the Middelkraal community and the farmstead will have a 1 dBA increase during night time.	Mt: Minor D: Long term S: Local C: Medium P: Unlikely Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>Ensure high level of equipment maintenance, especially intake and exhaust mufflers</li> <li>Withdraw equipment for maintenance if change in noise emission characteristics is noticeable</li> <li>Maintain complaint and grievance register and act promptly to complaints regarding noise.</li> </ul>	Mt: Minor D: Long term S: Local C: Medium P: Unlikely Sl: Low (-)	Low

Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Heritage	Operation of the Elders Colliery	<b>Impact on heritage resources</b> No sites, features or objects of cultural heritage significance were identified at the box-out and associated infrastructure area	No Impact		As no cultural heritage significant features were found during the specialist study, no mitigation is required. However, should any features be found during the operations phase, a chance find procedure will be implemented.	No Impact	
Traffic	Trucking of interburden and coal to a processing plant	<b>Additional traffic generated on the road network</b> The construction and operations of the proposed Elders Mine will generate additional traffic on the surrounding road network within the study area. The existing road network is operating at well below its capacity even during the critical AM and PM commuter peak periods. As such, the road network has sufficient capacity to handle the low volume of additional traffic that will be generated by the proposed construction and operations.	Mt: Minor D: Short term S: Regional C: Medium P: Definite St: Medium (-)	Medium	The TIA (Appendix G11) has analysed all critical intersection with the mine generated traffic. Intersection upgrades are to be provided as recommended in this TIA. The upgrade of the intersections will provide additional capacity on the road network.	Mt: Minor D: Short term S: Regional C: Medium P: Definite St: Medium (-)	Medium
		<b>Pedestrians and cyclists generated by the mine</b> The additional traffic that will be generated by the construction and the operation activities of the proposed Elders Mine will have a minimal impact on the existing space available for pedestrians and cyclists. There is no major conflict between pedestrians and vehicles within the study area. The additional traffic volumes will not result in any conflict.  There will be negligible pedestrians or cyclists generated by the proposed Elders mine. The unskilled construction workers will travel to and from the mine in contracted transport services and be picked and dropped off at the mine. The skilled workers will travel to the proposed site by private vehicles. It is unlikely that many of the workers will commute to work on foot.	Mt: Minor D: Long S: Site C: Medium P: Unlikely St: Low (-)	Low	The TIA has analysed all critical intersection with the mine generated traffic. Intersection upgrades are to be provided as recommended in this TIA. The upgrade of the intersections will provide additional capacity on the road network.	Mt: Minor D: Long S: Site C: Medium P: Unlikely St: Low (-)	Low
		<b>Additional heavy vehicles generated on the road network impacting road condition.</b> The haulage trucks to and from Elders and the processing plants will have a minor impact on the condition of the road network. Currently, the existing road network varied from poor to good condition. The volume of traffic proposed to be generated by the mine is low. Majority of the of the surrounding industries are also generating heavy traffic on the local road network. The road network will be able to carry the additional volumes of heavy traffic that will be generated by the proposed mine. Hence, the impact of the additional heavy vehicle traffic on the existing condition of the road network is expected to be low.	Mt: Minor D: Long S: Regional C: Medium P: Possible St: Medium (-)	Medium	The road authority is to provide maintenance and rehabilitation on all roads.	Mt: Minor D: Long S: Regional C: Medium P: Possible St: Medium (-)	Medium
Socio-economic	Operation of the Elders Colliery	<b>Conflict with communities within the Primary Zol should expectations to benefit from economic opportunities and improved living conditions not be met</b> As per same section in the construction phase.	Mt: Major D: Medium term S: Local C: Medium P: Possible St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Compile and implement the management measures detailed in the SLP</li> <li>Prioritise the employment of the communities residing within the Primary Zol for semi-skilled and unskilled job opportunities during construction;</li> <li>Enforce the contractor management plan, especially relating to local recruitment and procurement; and,</li> <li>Where possible, engage with the Govan Mbeki Local Municipality and Gert Sibande District Municipality to identify opportunities of collaboration and capacity building for the provision of social services to the communities within the Primary Zol.</li> </ul>	Mt: Moderate D: Medium term S: Local C: Medium P: Possible St: Medium (-)	Medium
	Operation of the Elders Colliery	<b>Influx of people and construction workers leading to increased pressure on social services and</b>	Mt: Moderate D: Long term S: Local	Medium	<ul style="list-style-type: none"> <li>Develop a clear and concise employment and recruitment policy that prioritizes local recruitment. Ensure that contractors adhere to this policy;</li> </ul>	Mt: Moderate D: Long term S: Local	Medium



Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		infrastructure, social pathologies and disruptions, resulting in spontaneous settlements As per same section in the construction phase.	C: Medium P: Definite SI: Medium (-)		<ul style="list-style-type: none"><li>Identify and support community development programmes that address challenges raised by population influx and spontaneous settlement;</li><li>Enforce the relevant Contractor Management Plan, which should in addition address accommodation, living standard, transport and health and safety standards of contractors;</li><li>Enforce the Anglo American principles regarding employee and contractor behaviour;</li><li>Continuously monitor the housing and living conditions of employees receiving living out allowances;</li><li>Support local government capacity for integrated development planning;</li><li>Participate in the local government's strategy to address issues related to and potentially enhanced by project-induced influx. This strategy will be developed in order to clearly define how participants, including AAC, local government and relevant stakeholders, intend to manage the impacts caused by influx where possible; and,</li><li>Compile and implement the community health and safety initiatives of the Community Health and Safety Plan (CHSP), such as education and awareness programs that address social pathologies in neighbouring communities through established government departments.</li></ul>	C: Medium P: Possible SI: Medium (-)	
	Operation of the Elders Colliery	<b>Benefits resulting from employment and income opportunities created by Elders Colliery</b> Employment and a secure income provide many socio-economic benefits to employees and their dependents, including: <ul style="list-style-type: none"><li>Improved material wealth and standard of living;</li><li>Enhanced potential to invest in and improve access to social services such as education, health services, etc. (which may be provided directly by the company to employees and/or employees may now have the funds to pay for these services); and,</li><li>Employment and training of unskilled workers facilitates skills development and improves the future employment prospects of such workers.</li></ul> Secure wage employment can also contribute towards a sense of independence, freedom, and pride, and it may promote a good work ethic. The mine will create various types of employment: <ul style="list-style-type: none"><li>Direct employment for the workforce</li><li>Indirect employment at the supplier companies (procurement); and</li><li>Induced employment</li></ul> During operations, it is expected that skilled labour will be moved from Goedehoop Colliery to Elders in an attempt to reduce retrenchments as operations close at Goedehoop. As such, the local employment generated during the operation phase is expected to have a minimal impact to the Elders local communities, apart from maintaining jobs at Goedehoop.	M: Minor D: Medium term S: Regional C: Low P: Possible SI: Low (+)	Low	<ul style="list-style-type: none"><li>Enforce the relevant Contractor Management Plan, which should in addition address accommodation, living standard, transport and health and safety standards of contractors;</li><li>Develop a clear and concise employment policy prioritizing local employment;</li><li>Implement vocational training programs to promote local workforce capacity as per the Labour and Human Resources Plan (LHRP);</li><li>Employ local workers if qualified applicants with the appropriate skills are available. Formalize this policy in company Human Resources guidelines and contractors' agreements;</li><li>Purchase goods and services at a local level, if available. Formalize this policy in company purchasing guidelines and contractors' agreements;</li><li>Work closely with the local communities before and during the project to identify and communicate required skills and resources that the local community could provide;</li><li>Provide or facilitate training of local people in mining and general business skills before and during mining activities, such as through internships, scholarships, and/or vocational and skills training programs;</li><li>Prepare a detailed vocational training program in consultation with the local community to be implemented during the construction phase; and,</li><li>Through the stakeholder engagement process ensure that expectations are managed around employment opportunities and practices.</li></ul>	M: Minor D: Medium term S: Regional C: Low P: Possible SI: Low (+)	Low

Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
	Operation of the Elders Colliery	<b>Dissatisfaction over employment opportunities and conditions of procurement which could potentially lead to community protests and unrests, as well as conflicts within communities</b> As per same section in the construction phase.	Mt: Major D: Short term S: Local C: Medium P: Definite St: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Develop a clear and concise employment policy prioritizing local employment and communicate this through established communication protocols;</li> <li>Enforce the relevant Contractor Management Plan, which should in addition address local procurement;</li> <li>Employ staff from across community groups and the Project area and keep recruitment and employment records, distributing short-term opportunities to as many as possible; and,</li> <li>Develop an SLP that considers integrated development of communities impacted by the Project.</li> </ul>	Mt: Moderate D: Short term S: Local C: Low P: Possible St: Low (-)	Low
	Operation of the Elders Colliery	<b>Improved employment and enterprise development opportunities through skills development and capacity building initiatives</b> As per same section in the construction phase.	Mt: Moderate D: Medium term S: Local C: Medium P: Possible St: Medium (+)	Medium	<ul style="list-style-type: none"> <li>Implement and monitor the SLP;</li> <li>Support local government in their skills development and training initiatives;</li> <li>Develop a clear and concise employment policy prioritizing local employment; and,</li> <li>Furthermore AAC's closure plan should aim at reinforcing the objectives of the SLP by reducing the reliance on AAC for employment by promoting skills transfer to enable alternative livelihoods.</li> </ul>	Mt: Major D: Medium term S: Local C: Medium P: Definite St: Medium (+)	Medium
	Operation of the Elders Colliery	<b>Improved infrastructure in the study area due to social investment activities</b> As per same section in the construction phase.	Mt: Minor D: Short term S: Local C: Low P: Possible St: Low (+)	Low (+)	Implement management and enhancement measures as per the SLP.	Mt: Moderate D: Short term S: Local C: Low P: Definite St: Medium (+)	Medium (+)
	Operation of the Elders Colliery	<b>Increased direct revenue to local government, resulting in local government's ability to provide services to communities</b> During operations, income to the government is mostly expected to result from royalties, dividends and duties and taxes paid on locally procured services and goods. The operations phase is expected to have a medium (positive) impact of medium-term duration and local scale (due to the relatively limited contribution) on government revenue. Government income is determined by tax regimes and world market prices for commodities. It is however difficult to rate this impact without any financial information.	Mt: Moderate D: Long term S: Local C: Medium P: Definite St: Medium (+)	Medium	<ul style="list-style-type: none"> <li>Support, participate and report on the payment and spending of revenues to government according to the EITI principles and guidelines.</li> <li>Support, participate and report on the payment and spending of revenues to government according to the EITI principles and guidelines.</li> </ul>	Mt: Moderate D: Long term S: Local C: Medium P: Definite St: Medium (+)	Medium

Assessment of potential impacts of the Elders Colliery during the Operational Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
	Operation of the Elders Colliery	<b>Improved relations with local communities and stakeholders</b> As per same section in the construction phase.	Mt: Minor D: Medium term S: Local C: Low P: Possible Sl: Low(+)	Low	<ul style="list-style-type: none"> <li>Include affected communities in the decision making processes of the project, particularly around potential Corporate Social Investment (CSI) opportunities, and SLP projects;</li> <li>Ensure that all stakeholder engagement includes women, youth and vulnerable groups;</li> <li>Provide regular and transparent feedback to the Vekkuilen and Middelkraal communities specifically;</li> <li>Discuss and manage issues, concerns, changes and impacts related to the project as soon as they arise;</li> <li>Monitor and implement the Grievance Management Mechanism;</li> <li>Involve Local Ward Councillors and keep them informed about project developments, and included in all stakeholder engagement processes. Their involvement will assist with the successful development of relationships between the mine, the municipality and the communities;</li> <li>Regularly consult with local government through the GVLMI around issues of community development, employment, co-operation and project activities;</li> <li>Where possible CSI initiatives and SLP projects with the GVLMI IDP with the goal of improving both sustainability and feasibility (this would only occur once the mine was operational);</li> <li>Durable participatory and consultative structures should be in place pre-closure to mitigate the impacts of closure.</li> </ul>	Mt: Minor D: Medium term S: Local C: Low P: Possible Sl: Low(+)	Low

Table 18-5 provides an assessment of potential impacts of the Elders Colliery during the Closure Phase

**Table 18-5: Assessment of potential impacts of the Elders Colliery during the Closure Phase**

Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Soils	Demolishment of surface infrastructure	<p><b>Potential for compaction and contamination from heavy vehicles usage and spillage of hydrocarbons, reagents (from infrastructure and machinery), raw materials and dirty water runoff, and the loss of soil due to erosion by wind and or water.</b></p> <p>The impact will remain the net loss of the soil resource if no intervention or mitigating strategy is implemented. The magnitude of impact will remain moderate and negative for all of the activities if there is no active management (rehabilitation and intervention) in the decommissioning phase, and closure will not be possible.</p> <p>This will result in an irreversible impact that is continuous. However, with interventions and well planned management, there will be a net positive impact on the rehabilitated area (soils are replaced and fertilization of the soils is implemented after removal of the infrastructure). The land capability will likely be reduced to grazing status.</p>	Mt: Moderate D: Medium term S: Site C: Medium P: Definite S: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Re-instatement of the stored soils onto areas of disturbance where infrastructure has been demolished and removed.</li> <li>Contour and stabilise slopes to be free draining and limit/control vehicle movement and dirty water outflows, vehicle maintenance and assessment of risk of contamination from infrastructure prior to demolition.</li> <li>Cultivate, amelioration and oxygenation of growing medium, the planting of required vegetative cover and irrigation if required, will reduce/mange erosion, decrease compaction and stabilise the land form. This will once cover has been obtained, effectively see the sites returned to a grazing land capability rating.</li> </ul>	Mt: Moderate D: Medium term S: Site C: Medium P: Possible S: Medium (-)	Medium
	Rehabilitation of box-cut areas	<p><b>Net loss of soil volumes and utilisation potential due to change in material status (physical and chemical) and loss of nutrient base.</b></p> <p>The impacts on the soil resource during the decommissioning and closure phase will potentially have both a positive and a negative effect, with:</p>	Mt: Moderate D: Medium term S: Site C: Medium P: Possible	Medium	<ul style="list-style-type: none"> <li>Replace soils on rehabilitated areas as per the soils management plan.</li> <li>The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining.</li> </ul>	Mt: Moderate D: Medium term S: Site C: Medium	Medium



Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<ul style="list-style-type: none"> <li>The loss of the soils original nutrient store and organic carbon by leaching of the soils while in storage;</li> <li>Erosion and de-oxygenation of materials while stockpiled;</li> <li>Compaction and dust contamination due to vehicle movement while rehabilitating the shaft site and conveyor servitude;</li> <li>Contamination of replaced soils by use of dirty water for plant watering and dust suppression on roadways;</li> <li>Hydrocarbon or chemical spillage from contractor and supply vehicles.</li> <li>Positive impacts of reduction in areas of disturbance and return of soil utilisation potential, uncovering of areas of storage and rehabilitation of compacted materials.</li> <li>Erosion management/reduction due to slope stabilization and re-vegetation of disturbed.</li> </ul>	Sl: Medium (-)		<ul style="list-style-type: none"> <li>Newly seeded/planted areas must be protected against compaction and erosion (Velvet hedges etc.).</li> <li>Traffic should be limited where possible while the vegetation is establishing itself.</li> <li>Plants should be weeded as required on a regular and managed basis where possible and practical.</li> <li>Should natural germination not occur, fertilise, hydro seeded and grassing should be considered</li> <li>Repair any damage caused by erosion.</li> </ul>	P: Possible S: Medium (-)	
Biodiversity	Rehabilitation of box-cut areas	<p><b>Re-vegetation of rehabilitated areas</b></p> <p>Re-vegetation of areas where demolition and clearing of surface infrastructure has taken place will positively impact on the biodiversity of the area. Strict rehabilitation management measures should be implemented to ensure establishment of indigenous vegetation of rehabilitated areas.</p> <p>Should no rehabilitation and re-vegetation take place during the closure phase, it is anticipated that erosion and further loss of biodiversity will be eminent. The cleared areas will encourage infestation of alien invasive species that will further degrade the natural occurring biodiversity.</p>	Mt: Moderate D: Long term S: Site C: Medium P: Definite Sl: Medium (-)	Medium (-)	<ul style="list-style-type: none"> <li>Only regionally, biome specific indigenous species should be used in the landscaping and rehabilitation of the box-cut area.</li> <li>A suitably qualified biodiversity team will assist with the rehabilitation and landscaping plans.</li> <li>The mine will inspect vegetation establishment.</li> <li>Ensure the removal of the alien and weed species encountered on the rehabilitated area.</li> </ul>	Mt: Moderate D: Long term S: Site C: Medium P: Definite Sl: Medium (+)	Medium (+)
Groundwater	Backfilling of box-cut void	<p><b>The formation of AMD in backfilled box-cut area</b></p> <p>The backfilling of the overburden material into the box-cut during closure could potentially result in the formation of AMD. This will be as a result of ingress of water and oxygen into strata containing sulfide minerals.</p> <p>As the overburden is considered to be inert, as all coal would have been removed during the construction phase, this impact is rated as unlikely and a low significance.</p>	Mt: Minor D: Long term S: Site C: Medium P: Unlikely Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>Verify AMD generation potential of the overburden through sampling and analyses of core samples from the box-cut location.</li> <li>Ensure that backfilled box-cut is shaped in order to be free-draining.</li> <li>Continue with monitoring (including quality and levels) of boreholes around backfilled box-cut identify any potential contamination of groundwater resources.</li> <li>Should pollution be identified in the groundwater resources, the source of the pollutants will be investigated and the applicable remediation measures will be implemented.</li> </ul>	Mt: Minor D: Long term S: Site C: Medium P: Unlikely Sl: Low (-)	Low
	Groundwater Quality	<p><b>The shallow aquifer groundwater quality due to seepage from MRDs</b></p> <p>With the assumed removal of the PCDs and Brine dam and rehabilitation of the overburden stockpile at mine closure, the source strengths are eliminated or significantly reduced, resulting in dissipating seepage plumes from these footprints. While the seepage plumes associated with the PCDs and Brine dam are likely to disperse to below 10% of the initial source concentrations within 25 years, the seepage plume from the overburden stockpile continues to migrate up to 700m northwards under the new post closure water levels and gradients. However, associated concentrations are low.</p>	Mt: Moderate D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Monitoring of natural plume attenuation</li> <li>Adaptive management of plume, i.e. hydraulic plume containment if and when required</li> </ul>	Mt: Minor D: Long term S: Local C: Low P: Possible Sl: Low (-)	Low
	Closure of the underground mine	<p><b>The formation of AMD in underground workings</b></p> <p>Post closure, groundwater abstractions cease and the underground mine voids act no longer as groundwater sinks, allowing contaminants from previously exposed</p>	Mt: Major D: Long term S: Local	High	<ul style="list-style-type: none"> <li>Optimise storage of mine water in mined-out underground sections.</li> </ul>	Mt: Major D: Long term S: Local	High

Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		sulphide bearing minerals (acid rock drainage) to be released into the groundwater and migrate according to the new hydraulic gradients. While the source concentrations should gradually (decades) improve as the system is starved of oxygen and the sulphide sulphur content depleted, the model predictions assumed conservatively constant source concentrations 100 years post closure. They represent therefore a worst case scenario.	C: High P: Definite Sl: High (-)		<ul style="list-style-type: none"> <li>Install high pressure seal in the box-out underground development to the No. 2 seam workings.</li> <li>The box-out will be sealed, backfilled and made free draining.</li> <li>The underground workings will be left to fill to a pre-determined environmental safe level (below decant level) before active water level management is implemented.</li> </ul>	C: High P: Definite Sl: High (-)	
	Closure of the underground mine	<p><b>Surface decant of AMD</b></p> <p>When underground (70 years) and opencast (box-out) (35 years) mining sections reach full flooding post closure, the potential for surface decant of mine water is possible. The decant mechanism is uncomplicated and simply comprise the outflow of water from the mine workings when the water pressure in the mine reaches an elevation which is higher than the surface elevation at the discharge point. Typical discharge points are at adit or shaft entrances and/or at the lowest surface elevation in a rehabilitated box-out or open cast mine. The mine voids as such provide the preferential flow path for decant. For the Elders project, two relevant decant points have been identified (refer to Appendix G7, JMA Consulting report, 2015).</p> <p>The actual physical decant point at Elders will be where the underground workings exit into the box-out and then where the box-out perimeter actually intersects the lowest surface point.</p> <p>The lowest surface elevation point within the proposed mining area is located along the Viskule Spruit. The surface elevation at this point is 1 575 mamsl. This elevation represents the critical elevation for flooding in the mine as no decant will occur unless this flooding elevation is reached. However, none of the mine voids directly surface at this elevation and therefore this point merely represents a theoretical surface decant elevation.</p> <p>The box out was selected along the highest topographical part of the sub-catchment in which it is located, hence also representing the highest possible hydraulic head elevation in the catchment. This implies that decant from this point is actually theoretically impossible as there would not exist any hydraulic pressure in the sub-catchment that could force water out at this point. The post closure pressure in the mine cannot be at a head higher than the highest surface elevation in the catchment.</p>	Mt: Moderate D: Long term S: Regional C: High P: Possible Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Monitoring of water levels in the mine and the associated water quality is committed to. This will allow both calibration of the post mining water quality and water volumes.</li> <li>The water level in the workings will be actively managed to ensure it remains below the decant elevation.</li> <li>The rise of water will be closely monitored to ensure that the environmental safe level is not exceeded and that appropriate extraction works and treatment facilities are constructed in time to treat the surplus water once the environmental safe level is reached. The water will then be actively maintained at or below the environmental safe level.</li> <li>A detailed decant management plan will be developed at mine closure. Ultimately water treatment solutions, either passive or active, will be implemented.</li> <li>Monitoring of the water table rebound will continue post-closure and the modelling updated to quantify the long-term impacts. If necessary, the management measures should be revised based on the modelling results.</li> <li>Treated water will be discharged to the river system.</li> </ul>	Mt: Minor D: Long term S: Local C: Low P: Possible Sl: Low (-)	Low
	Closure of underground mine	<p><b>Influx of groundwater into the No. 2 and No. 4 seams leading to dewatering of the overlying aquifer</b></p> <p>During the closure of the underground operations, influx of groundwater into the No. 2 and No. 4 seam mine workings will take place. This will result in the potential dewatering of the overlying aquifers, manifesting as a groundwater cone of depression in the water table with negative consequences on the availability of groundwater.</p>	Mt: Minor D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>The bord and pillar mine plan will be followed for the underground operations.</li> <li>Ensure stability and integrity of the overlying strata, specifically the weathered zone.</li> <li>Mine according to the design mine stability safety factor</li> <li>Monitoring of water levels (quarterly) within mine voids to ensure no decant to surface occurs</li> <li>Adaptive Management of mine water levels should environmentally critical water levels be breached, i.e. decant to surface</li> </ul>	Mt: Minor D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium
Surface water	Demolishment of surface infrastructure and rehabilitation of cleared areas	<p><b>Pollution of surface water resources</b></p> <p>Impacts resulting from general rehabilitation and decommissioning works will be similar to those during the construction phase, with rehabilitation earthworks and movement of construction equipment on the site.</p>	Mt: Moderate D: Short term S: Site C: Low P: Possible	Low	<ul style="list-style-type: none"> <li>The footprint of disturbed areas will be minimised.</li> <li>The storm water management infrastructure, including the POD will be decommissioned last, to ensure adequate storm water management during the rehabilitation phase.</li> </ul>	Mt: Minor D: Short term S: Site C: Low P: Possible	Low



Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Erosion of soils during rainfall events, with elevated suspended solids in the runoff water.</li> <li>Resultant elevated suspended solids in the watercourses, as well as sedimentation in the watercourses and the adjacent pans.</li> <li>Hydrocarbon spillages from fuel storage, servicing areas or construction equipment itself, with resultant elevated hydrocarbon concentrations in runoff water, watercourses and the adjacent pans.</li> <li>Contaminated soils below the stockpiles area may have a long term impact in terms of leaching contaminants to the ground and surface water systems.</li> </ul> <p>These impacts are expected to be relatively small, with the resultant impact post decommissioning being positive in comparison with the operational phase.</p>	SI: Low (-)		<ul style="list-style-type: none"> <li>Servicing of heavy vehicles will take place only in dedicated areas that are equipped with drip trays.</li> <li>Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil.</li> <li>Spill-sorb or a similar type product will be kept on site and used to clean up hydrocarbon spills in the event that they should occur.</li> <li>Erosion protection measures will be implemented at steep areas.</li> <li>A waste management plan will be developed for the closure phase, which will include the handling of contaminated materials / soils found on site.</li> <li>All traces of hydrocarbons and residual waste will be removed before infrastructure is demolished.</li> <li>Contaminated soils will be excavated and placed on the discard facilities prior to their rehabilitation, or removed from site by an appropriately licensed waste contractor.</li> <li>An appropriate sewage management strategy will be implemented during the decommissioning phase, including decommissioning of the sewage treatment plant as late as possible in the process.</li> <li>Water quality monitoring will be undertaken downstream of the demolished areas, in order to detect any increase in suspended solids or turbidity.</li> <li>If erosion is evident or the water quality monitoring indicates an increase in suspended solids, water management around the decommissioning areas will be reviewed.</li> </ul>	SI: Low (-)	
	Decommissioning of water management infrastructure	<p><b>Pollution of surface water resources</b></p> <p>The water management berms and canals isolate active areas from the catchment by diverting upslope clean runoff around the active areas and containing runoff generated on the active areas. These can only be removed once the area has been rehabilitated, but may result in increased erosion if not properly planned.</p> <p>The POD will be used to contain affected runoff and from the mine infrastructure area until such time as the area becomes clean.</p> <p>Impacts may arise from:</p> <ul style="list-style-type: none"> <li>Erosion of soils during rainfall events, with elevated suspended solids in the runoff water.</li> <li>Resultant elevated suspended solids in the watercourses, as well as sedimentation in the watercourses and the adjacent pans.</li> </ul> <p>These impacts are expected to be relatively small, with the resultant impact post decommissioning being positive in comparison with the operational phase.</p>	<p>Mt: Moderate D: Short term S: Regional C: Medium P: Possible SI: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>This infrastructure will be decommissioned and rehabilitated last.</li> <li>Mitigation measures to be implemented as per 0.</li> </ul>	<p>Mt: Minor D: Short term S: Site C: Low P: Possible SI: Low (-)</p>	Low
Surface water/ Groundwater	Recovery of water levels and possible decant of groundwater	<p><b>Pollution of surface water resources</b></p> <p>Once the mining has ceased and the box-cut has been backfilled and re-shaped dewatering will cease and water levels will begin to recover in the workings.</p> <p>The underground workings will not fill to decant level during the decommissioning phase.</p>	<p>Mt: Moderate D: Medium term S: Regional C: Medium P: Definite SI: Medium (-)</p>	Medium	<ul style="list-style-type: none"> <li>The box-cut will be sealed, backfilled and made free draining.</li> <li>The underground workings will be left to fill to a pre-determined environmental safe level (below decant level) before active water level management is implemented.</li> <li>Monitoring of water levels in the mine and the associated water quality is committed to. This will allow both calibration of the post mining water quality and water volumes.</li> </ul>	<p>Mt: Minor D: Medium term S: Site C: Low P: Possible SI: Low (-)</p>	Low

Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
					<ul style="list-style-type: none"><li>The water level in the workings will be actively managed to ensure it remains below the decant elevation.</li><li>The rise of water will be closely monitored to ensure that the environmental safe level is not exceeded and that appropriate extraction works and treatment facilities are constructed in time to treat the surplus water once the environmental safe level is reached. The water will then be actively maintained at or below the environmental safe level.</li><li>A detailed decant management plan will be developed at mine closure. Ultimately water treatment solutions, either passive or active, will be implemented.</li><li>Monitoring of the water table rebound will continue post-closure and the modelling updated to quantify the long-term impacts. If necessary, the management measures should be revised based on the modelling results.</li><li>Treated water will be discharged to the river system.</li></ul>		
	Decant of mine water	<p><b>Pollution of surface water resources</b></p> <p>Post closure, the infrastructure areas will have been rehabilitated and made free draining.</p> <p>Two aspects have been considered here, namely, the volume of decant that could be generated, and the potential quality of decant.</p> <p>If the water levels in the underground workings are not controlled, the potential time to decant is estimated as follows:</p> <p>The rate of recharge to the mine areas is expected to vary, with groundwater inflows reducing as the water level increases within the mine due to a reduced hydraulic gradient towards the mined out areas. However, for the purposes of the calculation, recharge rates are assumed to be relatively constant over the period from cessation of dewatering until (without mitigation) decant reaches the potential decant level.</p> <p>If the decant is not managed, there could be an impact on both the downstream catchment and the downstream dams.</p> <p>This impact is quantified following the discussion of the potential decant qualities.</p> <p>It is considered valuable to assess the potential sulfate loading of the mine on the catchment. This assessment is based on the assumption that the entire water make were to be discharged to the catchment.</p> <p>The water balance at closure indicates that an average water make in the order of 2 600 m<sup>3</sup>/day can be expected. Using the expected post closure sulfate concentrations (from JVA Consulting) of 4 500 mg/l, this equates to around 11.7 tonnes SO<sub>4</sub> per day, or around 4 270 tonnes SO<sub>4</sub> per year.</p> <p>The estimates given above are proposed to be refined over the life of mine as follows:</p> <ul style="list-style-type: none"><li>On-going sampling and monitoring of parameters important to the final water quality and water volumes.</li><li>Quantification and verification of the groundwater model, the water balance model, and the geochemical model.</li></ul>	Mt: Major D: Long term S: Regional C: High P: Definite Sl: High (-)	High	<ul style="list-style-type: none"><li>The incline shaft will be backfilled, rehabilitated and made free-draining.</li><li>Monitoring of water levels in the mine and the associated water quality is committed to. This will allow both calibration of the post mining water quality and water volumes.</li><li>The water level in the workings will be actively managed to ensure it remains below the decant elevation.</li><li>The rise of water will be closely monitored to ensure that the environmental safe level is not exceeded and that appropriate extraction works and treatment facilities are constructed in time to treat the surplus water once the environmental safe level is reached. The water will then be actively maintained at or below the environmental safe level.</li><li>A detailed decant management plan will be developed at mine closure. Ultimately water treatment solutions, either passive or active, will be implemented.</li><li>Monitoring of the water table rebound will continue post-closure and the modelling updated to quantify the long-term impacts. If necessary, the management measures should be revised based on the modelling results.</li><li>Discharge of clean water to the river system</li></ul>	Mt: Minor D: Long term S: Regional C: Medium P: Unlikely Sl: Low (-)	Low

Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		<ul style="list-style-type: none"> <li>Evaluation and reassessment of alternative options for the final water use and required associated water quality, together with the technologies required to achieve the required quality.</li> </ul>					
Wetland	Demolishment of surface infrastructure and rehabilitation of cleared areas	<b>Disturbance of wetland habitat</b> Removal of surface infrastructure could result in disturbance to adjacent wetland habitat. Disturbed areas will subsequently be prone to erosion and establishment of alien vegetation, leading to overall wetland degradation.	Mt: Moderate D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>All decommissioning activities will be restricted to the disturbed footprint and make use of existing access routes and roads.</li> <li>Fences around wetland areas should be maintained until completion of decommissioning and closure activities.</li> <li>All solid waste should be removed from site and disposed of at suitable waste disposal sites offsite.</li> <li>Disturbance footprints should be revegetated as soon as possible following completion of demolition activities.</li> <li>Alien vegetation management plan should be implemented following re-vegetation to clear alien species.</li> <li>Inform all contractors and staff on the sensitivity and location of adjacent wetland areas.</li> <li>No access to wetland areas should be allowed unless infrastructure that needs to be removed is located within a wetland area.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low
	Demolishment of surface infrastructure and rehabilitation of cleared areas	<b>Increased sedimentation in adjacent wetland</b> The demolition of infrastructure, will expose extensive areas of bare soils to erosion by wind and water. Vehicle tracks are likely to create preferential flow paths along which runoff water concentrates, leading to gully erosion on site and extensive sediment deposition in the downslope wetlands. Areas of sediment deposition within the wetland are likely to become colonised by pioneer species as well as alien vegetation. Depending on the degree of saturation of the deposited sediments, species such as <i>Typha capensis</i> (permanent to near permanently saturated areas) are likely to dominate. In more temporary areas, deposited sediments are likely to be colonised by weeds such as <i>Conyza</i> , <i>Tagetes</i> , <i>Verbena</i> etc. The rehabilitated areas will be susceptible to erosion following rehabilitation, especially in areas that are sparsely vegetated or not vegetated at all. This will result in increased sediment loads in the downslope wetlands, leading to deteriorating water quality (increased turbidity and TSS) and changes in the aquatic fauna. Changes in wetland vegetation can also occur as sediment loving plants (e.g. <i>Phragmites australis</i> ) become dominant. Erosion of replaced soils on the box-out footprint will also decrease the likelihood of successful re-vegetation of the area.	Mt: Moderate D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>All decommissioning activities should be restricted to the disturbed footprint and make use of existing access routes and roads.</li> <li>Fences around wetland areas should be maintained until completion of decommissioning and closure activities.</li> <li>All solid waste should be removed from site and disposed of at suitable waste disposal sites offsite.</li> <li>Disturbance footprints should be revegetated as soon as possible following completion of demolition activities.</li> <li>Landscape disturbed area to the approximate natural landscape profile and to drain into the adjacent wetland as in the predevelopment state.</li> <li>Post mining landscape will avoid steep slopes and concentrated runoff.</li> <li>Re-vegetate replaced soils as soon as possible following placement using a suitable mix of indigenous species.</li> <li>Implement a long term management and monitoring plan.</li> <li>Repair erosion damage immediately.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Definite Sl: Low (-)	Low
	Demolishment of surface infrastructure and rehabilitation of cleared areas	<b>Water quality deterioration</b> Where activities have resulted in contamination of the underlying soils due to leaks or spills, decommissioning activities and the associated earthworks could result in mobilisation of the pollutants if the contaminated sediments are disturbed. Pollutants could then enter downslope wetlands via surface runoff.	Mt: Minor D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>Remove all solid waste and potentially polluting material from site.</li> <li>Areas where soils could potentially have been contaminated should be tested to determine contamination levels and appropriate remediation activities.</li> <li>Rehabilitate contaminated soils in situ if possible. If not possible, remove and dispose of off-site.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low



Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
	Demolishment of surface infrastructure and rehabilitation of cleared areas	<b>Establishment and spread of alien species</b> Following the completion of decommissioning, the recently placed and disturbed soils will be susceptible to invasion by alien vegetation, e.g. <i>Acacia mearnsii</i> (black wattle). These alien species could spread to the adjacent wetland areas and result in decreased flows, increased erosion and decreased biodiversity in these systems.	Mt: Moderate D: Long term S: Local C: Medium P: Possible Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Implement alien vegetation management plan to remove and control establishment and spread of alien species.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low
	Closure of Elders Colliery – potential decant of groundwater	<b>Water quality deterioration</b> The mined out areas are likely to fill with water following the completion of mining activities. Once pumping of groundwater stops, groundwater levels will recharge and, if left unmanaged, will eventually start decanting. Decanting water is likely to be acidic as well as metal and sulfate rich. Given the location of the proposed box-out, decant is likely to enter into the Olifants River if left unmitigated.	Mt: Major D: Long term S: Regional C: High P: Possible Sl: High (-)	High	<ul style="list-style-type: none"> <li>Operate a water treatment plant to treat water to the IRVQO standards for the Olifants River.</li> <li>Discharge treated water into the environment.</li> <li>Manage water levels within the mined out areas to prevent decant.</li> </ul>	Mt: Minor D: Long term S: Local C: Medium P: Possible Sl: Medium (-)	Medium
	Closure of Elders Colliery – potential decant of groundwater	<b>Loss of wetland habitat/establishment of acid seeps</b> Decant from the mined out areas is likely to occur within low-lying points in the landscape, typically in wetland areas, and take the form of acid seeps. Decanting water could become acidic as well as metal and sulfate rich, and will result in a die-off of the vegetation within the affected area. Such areas will then also be subject to erosion.	Mt: Moderate D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>Prevent decant from the mined out areas by actively managing water levels within the mined out areas.</li> <li>Operate a water treatment plant to treat water to the IRVQO standards for the Olifants River.</li> </ul>	Mt: Minor D: Short term S: Site C: Low P: Possible Sl: Low (-)	Low
Shaft Area and Surface Infrastructure		<b>Sediment movement into wetlands</b>	Mt: Moderate D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low	<p>During the decommissioning and closure phase the incline shaft will be closed and all surface infrastructures are to be removed from site. The site will be rehabilitated to approximate the current landscape profile and will be re-vegetated with locally occurring indigenous grasses. Additional mitigation measures include:</p> <ul style="list-style-type: none"> <li>Implement measures to manage storm water runoff from the rehabilitated site;</li> <li>Safely introduce runoff into adjacent areas at flow velocities that will not result in erosion and scour of receiving wetland systems;</li> <li>The alien vegetation management plan compiled by an ecologist during the construction/operational phase of the mine should be kept in place for several years following mine closure (minimum of five years). All species of alien invasive vegetation should be controlled and removed from site. No spread of alien vegetation into any wetlands or adjacent properties should be allowed;</li> <li>All disturbed and transformed areas should be landscaped to approximate the natural landscape profile, but should avoid steep slopes and concentrated run-off where possible;</li> <li>Compacted soils should be ripped and scarified;</li> <li>The rehabilitated areas should be re-vegetated as soon as possible following completion of the earthworks to minimise erosion;</li> <li>Regular long-term follow up of rehabilitated areas will be required to ensure the successful establishment of vegetation and to survey for any erosion damage on site. Erosion damage should be repaired immediately;</li> <li>The recommendations contained within the specialist vegetation and soils reports should be fully implemented to ensure successful rehabilitation; and</li> <li>Sediment traps should be placed in rehabilitated areas to avoid sedimentation.</li> </ul>	Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low
		<b>Establishment of alien vegetation</b>	Mt: Moderate D: Medium term S: Local C: Medium P: Possible Sl: Medium (-)	Medium		Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low
		<b>Increased flow velocities in wetlands</b>	Mt: Moderate D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low		Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low
		<b>Water quality deterioration</b>	Mt: Moderate D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low		Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low

Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
Air Quality	Demolishment of surface infrastructure and rehabilitation of cleared areas	<p><b>Increased nuisance dust affecting adjacent communities during closure</b></p> <p>Potential dust impacts from the Elders Colliery during decommissioning and closure will include demolition, land clearing, grading, bulldozing and compaction. This will result in an increase in nuisance dust and aesthetic impacts associated with fugitive dust emissions.</p> <p>However, the extent of the dust emissions is likely to be short term and varying depending on the level of activity and meteorological conditions. Dust impacts will also be site specific as clearing activities will be limited to the immediate footprint of the Elders Colliery and will only be during the decommissioning phase.</p>	Mt: Moderate D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>Continued implementation of a dust monitoring programme to monitor dust impacts.</li> <li>Inspection of vegetation establishment.</li> <li>Maintain a grievance and complaints register and capture the dust related complaints in the grievance mechanism. The grievance will be investigated by the applicable Elders Colliery representative in order for the complaint to be resolved and closed out.</li> </ul>	Mt: Minor D: Short term S: Local C: Low P: Possible Sl: Low (-)	Low
Noise	Closure of the Elders Colliery	<p><b>General rise in ambient noise levels</b></p> <p>The anticipated ambient noise levels for daytime and night time during the decommissioning and closure phase will be similar to noise levels modelled during construction.</p>	Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>Ensure high level of equipment maintenance, especially intake and exhaust mufflers.</li> <li>Withdraw equipment for maintenance if change in noise emission characteristics is noticeable.</li> <li>Comply with the relevant standards with regards to closure noise</li> <li>Maintain complaint and grievance register and act promptly to complaints regarding noise.</li> </ul>	Mt: Minor D: Short term S: Site C: Low P: Unlikely Sl: Low (-)	Low
Traffic	Closure of the Elders Colliery (until close-out is complete)	<p><b>Additional traffic generated on the road network</b></p> <p>The construction and operations of the proposed Elders Mine will generate additional traffic on the surrounding road network within the study area. The existing road network is operating at well below its capacity even during the critical AM and PM commuter peak periods. As such, the road network has sufficient capacity to handle the low volume of additional traffic that will be generated by the proposed construction and operations.</p>	Mt: Minor D: Short term S: Regional C: Medium P: Definite Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>The TIA (Appendix G11) has analysed all critical intersection with the mine generated traffic. Intersection upgrades are to be provided as recommended in this TIA. The upgrade of the intersections will provide additional capacity on the road network.</li> </ul>	Mt: Minor D: Short term S: Regional C: Medium P: Definite Sl: Medium (-)	Medium
		<p><b>Pedestrians and cyclists generated by the mine</b></p> <p>The additional traffic that will be generated by the construction and the operation activities of the proposed Elders Mine will have a minimal impact on the existing space available for pedestrians and cyclists. There is no major conflict between pedestrians and vehicles within the study area. The additional traffic volumes will not result in any conflict.</p> <p>There will be negligible pedestrians or cyclists generated by the proposed Elders mine. The unskilled construction workers will travel to and from the mine in contracted transport services and be picked and dropped off at the mine. The skilled workers will travel to the proposed site by private vehicles. It is unlikely that many of the workers will commute to work on foot.</p>	Mt: Minor D: Long S: Site C: Medium P: Unlikely Sl: Low (-)	Low	<ul style="list-style-type: none"> <li>The TIA has analysed all critical intersection with the mine generated traffic. Intersection upgrades are to be provided as recommended in this TIA. The upgrade of the intersections will provide additional capacity on the road network.</li> </ul>	Mt: Minor D: Long S: Site C: Medium P: Unlikely Sl: Low (-)	Low
		<p><b>Additional heavy vehicles generated on the road network impacting road condition.</b></p> <p>The haulage trucks to and from Elders and the processing plants will have a minor impact on the condition of the road network. Currently, the existing road network varied from poor to good condition. The volume of traffic proposed to be generated by the mine is low. Majority of the of the surrounding industries are also generating heavy traffic on the local road network.</p> <p>The road network will be able to carry the additional volumes of heavy traffic that will be generated by the proposed mine. Hence, the impact of the additional heavy</p>	Mt: Minor D: Long S: Regional C: Medium P: Possible Sl: Medium (-)	Medium	<ul style="list-style-type: none"> <li>The road authority is to provide maintenance and rehabilitation on all roads.</li> </ul>	Mt: Minor D: Long S: Regional C: Medium P: Possible Sl: Medium (-)	Medium



Assessment of potential impacts of the Elders Colliery during the Closure Phase							
Environmental aspect	Activity	Potential Impact	Significance rating (not mitigated)		Mitigation Measures	Significance rating (if mitigated)	
		vehicle traffic on the existing condition of the road network is expected to be low.					
Socio-economic	Rehabilitation and closure of mine	<b>Loss of employment and enterprise development opportunities due to closure of mine</b> During decommissioning and closure, all mining activities will cease and therefore employment opportunities will be limited. It is anticipated that there will be a negative effect on employees as a result of job losses.	Mt: Major D: Long term S: Local C: High P: Definite Sl: High (-)	High	<ul style="list-style-type: none"> <li>Develop and implement the Labour and Human Resources Plan (LHRP) that addresses the impacts associated with retrenchment, job losses and reduced demand for local goods and services; and,</li> <li>Develop a closure plan which will aim to reinforce the objectives of the SLP by reducing the reliance on AAC for employment by promoting skills transfer to enable alternative livelihoods.</li> </ul>	Mt: Moderate D: Long term S: Local C: Medium P: Definite Sl: Medium (-)	Medium
	Development of the Elders Colliery	<b>Improved infrastructure in the study area due to social investment activities</b> As per same section in the construction phase.	Mt: Minor D: Medium term S: Local C: Low P: Possible Sl: Low (+)	Low(+)	<ul style="list-style-type: none"> <li>Include affected communities in the decision making processes of the project, particularly around potential Corporate Social Investment (CSI) opportunities, and SLP projects;</li> <li>Ensure that all stakeholder engagement includes women, youth and vulnerable groups;</li> <li>Provide regular and transparent feedback to the Vlakkuilen and Middelkraal communities specifically;</li> <li>Discuss and manage issues, concerns, changes and impacts related to the project as soon as they arise;</li> <li>Monitor and implement the Grievance Management Mechanism;</li> <li>Involve Local Ward Councillors and keep them informed about project developments, and included in all stakeholder engagement processes. Their involvement will assist with the successful development of relationships between the mine, the municipality and the communities;</li> <li>Regularly consult with local government through the GMLM around issues of community development, employment, co-operation and project activities;</li> </ul> <p>Where possible CSI initiatives and SLP projects with the GMLM IDP with the goal of improving both sustainability and feasibility (this would only occur once the mine was operational);</p>	Mt: Minor D: Medium term S: Local C: Low P: Possible Sl: Low (+)	Low(+)

## 18.5 Soil Utilisation Plan

A summary of the soil utilisation/conservation plan for the construction, operation, decommissioning and closure phases of the proposed project is provided in Table 18-6.

**Table 18-6: Summary of the soil utilisation/conservation plan for the construction, operation, decommissioning and closure phases**

Construction phase		
Step	Factors to consider	Comments
Delineation of areas to be stripped		Stripping will only occur where soils are to be disturbed by activities that are described in the design report, and where a clearly defined end rehabilitation use for the stripped soil has been identified.
Reference to biodiversity action plan		It is recommended that grasses and shrubs that can be recovered be stripped and stored as part of the utilisable soil. However, the requirements for moving and preserving fauna and flora according to the biodiversity action plan should be consulted.
Stripping and handling of soils	Handling	Soils will be handled in dry weather conditions so as to cause as little compaction as possible. Where possible, utilisable soil (Topsoil and upper portion of subsoil B2/1) must be removed and stockpiled separately from the lower "B" horizon, with the calcrete and/or any ferricrete layer being separated from the soft/decomposed rock, and wet based soils separated from the dry soils if they are to be impacted.
	Stripping	The "Utilisable" soil will be stripped to a depth of 750mm or until hard rock/calcrete and/or ferricrete is encountered. These soils will be stockpiled together with any vegetation cover present (only large vegetation to be removed prior to stripping). The total stripped depth should be 750mm, wherever possible.
Delineation of stockpiling areas	Location	Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas.
	Designation of Areas	Soils stockpiles will be demarcated and, where practically possible, clearly marked to identify both the soil type and the intended area of rehabilitation.
Operations		
Step	Factors to consider	Comments
Stockpile management	Vegetation establishment and erosion control	Rapid growth of vegetation on the Soil Stockpiles will be promoted (e.g. by means of fertilisation). The purpose of this exercise will be to protect the soils and combat erosion by water and wind.
	Storm water control	Stockpiles will be established with storm water diversion berms to prevent run off erosion.
	Stockpile height and stability	Soil stockpile heights will be restricted, where possible, to <1.5m so as to avoid compaction and damage to the soil seed pool. Where stockpiles higher than 1.5m cannot be avoided, these will be benched to a maximum height of 15m. For storage periods greater than 3 years, vegetative cover is essential, and should be encouraged using fertilization and induced seeding with water. The stockpile side slopes should be stabilized at a slope of 1 in 3 This will promote vegetation growth and reduce run-off related erosion.
	Waste	No waste material will be placed on the soil stockpiles.
	Vehicles	Equipment movement on top of the soil stockpiles will be limited to avoid topsoil compaction and subsequent damage to the soils and seedbank.

Decommissioning and Closure		
Step	Factors to consider	Comments
Rehabilitation of disturbed land and restoration of soil utilisation	Placement of soils	Stockpiled soil will be used to rehabilitate disturbed sites either ongoing as disturbed areas become available for rehabilitation and/or at closure. The utilizable soil (500mm) removed during the construction phase or while opening up of open cast workings, shall be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the approved postmining land use (Low intensity grazing), and will attain a free draining surface profile. A minimum layer of 300mm of soil will be replaced.
	Fertilisation	A representative sampling of the stripped soils will be analysed to determine the nutrient status of the utilizable materials. As a minimum the following elements will be tested for: EC, CEC, pH, Ca, Mg, K, Na, P, Zn, Clay% and Organic Carbon. These elements provide the basis for determining the fertility of soil. based on the analysis, fertilisers will be applied if necessary.
	Erosion control	Erosion control measures will be implemented to ensure that the soil is not washed away and that erosion gulleys do not develop prior to vegetation establishment.
Pollution of soils	In-situ Remediation	If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of this option must be verified by an appropriate soils expert and by DWS, on a case by case basis, before it is implemented.
	Off-site disposal of soils	If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAf 1998) and disposed at an appropriate, permitted, off-site waste facility.

## 18.6 Cumulative impacts

Localised cumulative impacts have been identified as part of the specialists' investigations conducted for the proposed Elders Colliery Project. The localised cumulative impacts are those where the magnitude of the combined impacts is greater than the sum of the individual effects.

Cumulative effects or aspects thereof generally uncertain and therefore difficult to quantify, due to limited data availability and accuracy, and uncertainty about the status, description, technical details and management measures in place or planned for neighbouring projects in the area.

The cumulative impacts identified for the proposed Elders Colliery Project include:

- Surface water:** The proposed Elders Colliery Project's area of surface disturbance will be very small in relation to the other activities in the area that could potentially impact on surface water. Such activities include other mining operations both upstream and downstream of Elders Colliery. There are numerous coal mines in the Olifants River catchment, with mining being most intensive downstream of the Elders. In addition, surrounding agricultural activities also potentially impact on the water quality and quantity in the catchment  
 The treatment and discharge of clean water at the proposed Elders Colliery will have a positive impact on both surface water quality and quantity. The annual flow in the Olifants River will be increased by an estimated 1.4% through the discharge of treated water. This will help to mitigate the loss of yield during the operational period, but also the loss of yield due to other mining and agricultural activities in the catchment. In addition, the good quality of the water will have a dilution effect (albeit a small one), potentially improving the water quality in the Olifants River
- Soils:** Continued loss of soil utilisation due to sterilisation from the proposed Elders Colliery Project infrastructure and associated infrastructure if not stripped and stockpiled.
- Biodiversity:** The following cumulative impacts were identified by the biodiversity specialist -
  - Transformation of natural habitat elsewhere in the landscape to compensate for the loss of cultivated land

- Increased exploitation of the remaining natural veld for grazing by livestock, whether domestic or game due to the limited extent of grazing land in the landscape
- Increase in dust during the construction and operation phase due to blasting and movement of mining vehicles and equipment. The dust covers the vegetation reducing their palatability for primary consumers (including cattle and phytophagous invertebrates) and therefore lowers the grazing capacity/ stocking rates of the remaining natural vegetation, resulting in the over utilisation of the remaining vegetation not affected by dust
- Certain species are sensitive to noise and the presence of other animals, which results in them leaving the area. This displacement of species will result in a decrease in local biodiversity and an increase in competition for resources somewhere else in the landscape. In addition, rare or sensitive species may be outcompeted by other species more resilient to displacement impacts;
- **Social:** The social specialist identified both positive and negative cumulative impacts which the project will have on the surrounding socio-economic aspect.  
The positive cumulative impacts were -
  - Secure jobs, incomes and social security
  - Increased disposable income among employees and local multipliers
  - Local business opportunities arising from procurement of goods and services
  - Use of external suppliers due to depressed local economy, leading to export of funds and skills development
  - Increase in business confidence and attraction of investors;
  - Increased involvement of and cooperation with local government.
 The negative cumulative impacts identified for the proposed project were -
  - Social division over limited jobs and perceived preferential access
  - Demand for housing, with impacts on markets (construction, resale, and rental)
  - Increased demand for privately and publicly provided social services
  - Social division over limited jobs and perceived preferential access
    - Increased risk of communicable diseases with influx of workers and opportunity seekers; and
- **Air Quality:** In terms of air quality, there was no ambient baseline concentrations, thus the cumulative pollutants concentration could not be determined. Refer to Section 19 for the air quality recommendation with regards to the cumulative impact of the proposed Elders Colliery Project.

## 19 Specialist recommendations

Several specialist studies were undertaken to inform the impact assessment and develop the associated management measures which has been included in Section 18 and Section 28 (Appendix G Specialist Studies). Specialist recommendations which specifically informed the final site layout or design is listed in Table 19-1.

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**Table 19-1: Summary of specialist recommendation which informed the final site layout or design of the proposed infrastructure**

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
<b>Air Quality</b> Airshed Planning Professional	<ul style="list-style-type: none"> <li>The implementation of emission controls for the management of significant emission sources, most significantly, emissions from crushing processes</li> <li>It is recommended that the Elders ambient air quality monitoring campaign be continued as part of the project's air quality management plan. This should be undertaken throughout the life of the project to provide air quality trends and adequate data for cumulative impacts on AQSRs</li> <li>The Elders Colliery falls within the HPA footprint and it will contribute to the pollution within the Highveld airshed. It is recommended that the management plan for the Highveld Priority Area as published by the DEA be included in all management plans employed for the project</li> </ul>	<b>X</b>	Recommendations have been included as part of the management measures for the impacts identified by each specialist. These management measures will form part of the conditions of the environmental authorization if the project is approved. Refer to Section 18.4 for the management measures for each of the project phase
<b>Biodiversity</b> EkoInfo	<ul style="list-style-type: none"> <li>Removal of vegetation should be restricted to the relevant infrastructure footprints only</li> <li>Topsoil should be stored separately to be used in rehabilitation and landscaping</li> <li>No off-road driving into the natural remaining vegetation should be allowed especially by heavy machinery</li> <li>The development of erosion gullies should be monitored and managed</li> <li>Transformation of natural areas should exclude any areas designated as having high or very high sensitivities</li> <li>Prevent any and all effluent from the mining activities of entering the wetland habitat</li> <li>Prevent contamination of all natural habitat from any source of pollution (air, soil and water)</li> <li>Prevent all open fires, provide fire-safe zones, facilities and suitable fire control measures</li> <li>Preference should be given to all ready transformed areas</li> <li>The movement of mammals through the landscape is vital; underpasses/culverts should be mandatory at all linear structures</li> <li>Remaining areas of natural vegetation, irrespective of their ecological state (poor or good) should be inspected for the presence of species of concern during the optimal time prior to construction by a registered</li> </ul>	<b>X</b>	

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<p>and experienced biodiversity team. This might require a number of visits over a number of months.</p> <ul style="list-style-type: none"> <li>• Employees at the mine should be educated about the environment, the species of concern present and how to deal with them. Ignorance paves the way for prejudice</li> <li>• Employees should not be allowed to harvest, utilise, manage or control any natural resource (water, soil, flora, fauna) unless it is done within the framework of a biodiversity action plan</li> <li>• No alien invasive plant or feral animal (domestic or wild) should be introduced into the area or be allowed to establish or spread in the area. Alien invasive or feral species already in the areas should be managed and controlled within the framework of a biodiversity action plan</li> <li>• Only regionally, biome specific indigenous species should be used in the landscaping and rehabilitation. The seed and seedlings can be obtained by effectively managing the topsoil prior to construction. A professionally registered biodiversity team consisting of pedologists, botanists and zoologists should assist with the rehabilitation and landscaping plans</li> <li>• No animal may be hunted, trapped, snared or captured for any purpose whatsoever. Fences and boundaries should be patrolled weekly in order to locate and remove snares and traps. Fences should be made visible, especially for flying fauna, specifically avifauna</li> <li>• Vehicular traffic should not be allowed after dark in order to limit accidental killing of nocturnal animals</li> <li>• Speed of vehicles should be limited to allow for sufficient safety margins</li> </ul>		
<p><b>Groundwater</b> JMA Consulting</p>	<p><u>2015 Recommendations</u></p> <ul style="list-style-type: none"> <li>• Shape stockpiles to optimize run-off and re-vegetate to minimize rainfall infiltration</li> <li>• The soil stockpiles do not need to be provided with a liner system as leachate is expected to be inert</li> <li>• Verify AMD generation potential through sampling and analyses of actual overburden excavated</li> <li>• Place the overburden on a properly prepared and compacted footprint This will optimize lateral drainage of percolated water and minimize infiltration into the sub-surface</li> </ul>	<p><b>X</b></p>	

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• A civil engineering design, incorporating footprint preparation, leachate control and storm water management, must nevertheless be done for the Overburden Stockpile and submitted to DWS for approval</li> <li>• The cone of depression can be minimized by sealing the box-cut walls with shotcrete/gunite which will allow groundwater levels to re-establish and the cone of depression to become smaller. However, the maximum distance of groundwater lowering around the box-cut was calculated as 208 m which is insignificant in terms of a groundwater availability impact</li> <li>• Maintain compaction and shape to ensure free draining of surface run-off to minimize rainfall infiltration</li> <li>• Do not deviate from the planned bord and pillar mining and ensure stability integrity of overlying strata</li> <li>• Mine according to design mine stability safety factor</li> <li>• Optimize storage of mine water make in mined out underground sections</li> <li>• Monitor groundwater quality</li> <li>• Maintain underdrain system and dam integrity</li> <li>• Monitor groundwater quality and level in backfilled box-cut during closure</li> <li>• Abstract water from boreholes around backfilled box-cut and treat before discharge into surface resources if quality requires it</li> </ul> <p><u>2021 Recommendations</u></p> <ul style="list-style-type: none"> <li>• Pumping tests of proposed abstraction (ESW-25, ESW-42, ESW-43) and selected monitoring boreholes, with a clear priority for abstraction boreholes</li> <li>• Pump testing of 3 monitoring boreholes targeting dolerite dykes bisecting the mining area: ESW-1, ESW-7, ESW-18, ESW-19, ESW-20, ESW-21, ESW-22, ESW-40, ESW-41, ESW-42 and ESW-43 (note that the latter two are also planned abstraction boreholes)</li> </ul> <p>Retrieve overburden material samples, preferably from within the box-cut area, from available core (if fresh) or by drilling</p>		
<b>Surface Water</b> Jones & Wagener	<ul style="list-style-type: none"> <li>• “No-go” zones will be delineated for construction plant and personnel</li> <li>• Appropriate storm water management measures will be implemented, including the temporary diversion of upstream run-off from the construction and laydown areas</li> </ul>	<b>X</b>	

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• Surface water management measures, such as storm water canals, sediment traps and PCDs are to be constructed first to ensure that runoff and dirty water spills are contained</li> <li>• A waste management plan will be developed for the construction phase</li> <li>• An appropriate sewage management strategy will be implemented during the construction phase</li> <li>• Water quality monitoring will be undertaken downstream of the construction areas, before and during construction where practical, in order to detect any increase in suspended solids or turbidity</li> <li>• The storm water runoff from the overburden stockpile will be caught in a clean water cut off channel. The channel will convey the water to a silt trap from where it will discharge into the proposed clean water channel at the office area and conveyed into the veld</li> <li>• Containment of all dirty water generated on the mine in a lined PCD, sized to have a risk of spill of 2% or less in any one year</li> <li>• Provision of a water treatment plant to treat a maximum of 5.0 Ml/day of dirty water generated at the mining operations</li> <li>• Water will be treated to achieve both drinking water standards (SANS241:2011) and the IRWQO for the Olifants River. Surplus treated water that cannot be reused in the operations will be discharged to the Olifants River system</li> <li>• Excess water that cannot be treated or reused will be pumped to storage in underground compartments at around 2025, when storage becomes available at Elders 2 Seam underground sections. Prior to storage becoming available underground, should a review of the LOM plan not enable the early provision of storage on the 2 Seam</li> <li>• Provision of water management facilities with a risk of spill that is lower than 2% in any one year</li> <li>• A surface water quality monitoring programme will be implemented detect any impacts</li> <li>• A water balance monitoring programme will be implemented to enable calibration of the water balance</li> <li>• All facilities with the potential to generate dirty storm water runoff, effluent or washdown water will be located within the designated dirty water area</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• Clean runoff will be diverted around the designated dirty areas by means of cut-off canals, sized to accommodate at least the 1:50 year peak flow event</li> <li>• Adequate erosion protection will be provided at the clean canal discharge locations</li> <li>• All spills will be contained within dedicated bunded areas (at wash bays, workshops, waste handling areas, etc.)</li> <li>• Both general and hazardous wastes will be stored in skips until removed from the site. The hazardous skips in turn will be located under cover, in bunded areas, to prevent ingress of direct rainfall</li> <li>• There will be capacity to store a maximum of 132 m3 of general waste in waste bins during the life of the project</li> <li>• The storage period will be less than 90 days before removal from the site by an appropriately licensed waste removal contractor and disposed of at a licensed general waste facility</li> <li>• Hazardous waste will be stored according to the applicable regulations under the National Environmental Management: Waste Act (Act 59 of 2008) and the DWS Minimum Requirements</li> <li>• The hazardous storage area will, as a minimum, be paved with concrete, covered and provided with bunds and drainage facilities to collect and contain any spills or adversely affected runoff</li> <li>• Waste oil will be stored in drums in a bunded storage area.</li> <li>• Bunded containment and settlement facilities will be provided for hazardous materials, such as fuel and oil</li> <li>• All contaminated runoff and spills that escape bunded areas will be collected and contained in the PCD</li> <li>• All pipeline routes will be inspected regularly to enable early detection of leaks</li> <li>• All storm water and wash down water will be collected in the PCD</li> <li>• Washdown and waste water from the workshops will be passed through oil skimmers before discharging to the storm water system for containment in the PCD and eventual treatment for reuse, or pumping to underground storage</li> <li>• An inspection and maintenance plan will be implemented on the storm water system to ensure that all oil skimming and sediment handling facilities are maintained and that storm water canals and pipelines</li> </ul>		



List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<p>remain unblocked and free flowing – monthly inspections will be carried out</p> <ul style="list-style-type: none"> <li>• Spill-sorb or a similar type product must be kept on site and used to clean up hydrocarbon spills in the event that they should occur</li> <li>• Contain all dirty water from the shaft area</li> <li>• All domestic waste water will be treated in the sewage treatment plant</li> <li>• The sewage water will be treated in the plant to acceptable effluent standards</li> <li>• Sludge will be deposited in drying beds within the designated dirty water area and removed by a licensed waste contractor</li> <li>• An inspection and maintenance plan will be implemented to ensure that the sewage treatment plant always operates within specification</li> <li>• The pollution control dams will be engineered to have sufficient capacity to limit the risk of spill to less than 2% in any one year</li> <li>• In line with best practice, the PCDs will be operated as empty as possible at all times to ensure that sufficient storm water retention capacity is available at all times</li> <li>• In the event that there is insufficient available capacity in the main PCD during extreme rainfall conditions, excess storm water will be pumped to the Elders underground storage compartments</li> <li>• The pollution control dams will be equipped with geomembrane liners to minimise leakage of contaminated water to the surface or ground water systems</li> <li>• The lining system on the PCDs will include a sub-surface drainage layer to detect any leakages, as well as to prevent the build-up of hydrostatic pressure beneath the geomembrane liner. Water collected in the sub-surface drainage system will be discharged to a sump and pumped back into the PCD</li> <li>• An inspection and maintenance plan will be implemented to ensure that the dams are kept in good working order and to monitor sediment build-up. When sediment levels reach a pre-determined level, sediment will be removed to ensure that sufficient storm water storage capacity is maintained at all times</li> <li>• All dust and fire suppression will take place within the designated dirty water areas</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>Excess water will therefore drain via the dirty storm water system to the PCD and will be pumped back to the water treatment plant for reuse in the mining operations</li> <li>The WTP will be isolated within a designated dirty water area. All runoff and spills from the treatment plant will be collected in a sump, from which water will be pumped to the PCD</li> <li>All chemicals and additives will be stored in dedicated bunded areas, where any spills will be contained</li> <li>An inspection and maintenance plan will be implemented to ensure that the water treatment plant always operates within specification</li> <li>Discharge water quality will be continuously monitored for early detection of discharge water quality problems</li> <li>Should upset conditions occur, or poor discharge water quality be detected, the WTP discharge will be directed to the PCD</li> <li>Initially one brine dam will be constructed, with a second to be constructed at a later stage, as the WTP's treatment capacity is increased</li> <li>The brine dams will be lined with 300mm compacted clayey layer with a 1.5 mm thick HPDE geomembrane above and below a 6 mm hi-drain, to minimise seepage of contaminated water to the groundwater system. The brine dams will also be equipped with a leak detection sump</li> <li>The gypsum pads will be paved with concrete. The concrete slabs will be underlain by a 1.5 mm thick HDPE geomembrane liner. The gypsum pad will be provided with concrete bunds to ensure no storm water runoff from the area. The storm water will be directed to a sump at the lower end of the gypsum area, from where water will be directed to the brine dam via a sloping pad and concrete lined channel</li> <li>Gypsum will be removed from the site on a regular basis. This will occur in a timely manner to prevent overloading of the gypsum drying pad</li> <li>Removal from site of gypsum will be undertaken by an appropriately licensed waste removal contractor</li> <li>Disposal of gypsum will be at a licensed hazardous waste disposal facility, such as Holfontein Landfill</li> <li>The gypsum pad will be bunded to prevent clean storm water from entering the pad and to contain all storm water generated on the pad</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<p>itself. Storm water from the pad will be collected in a sump and pumped to the PCD</p> <ul style="list-style-type: none"> <li>• An inspection and maintenance plan will be implemented to ensure that the pipelines and dams are kept in good working order</li> <li>• A surface water quality monitoring programme will be implemented to detect any impacts. The WTP will be isolated within a designated dirty water area. All runoff and spills from the treatment plant will be collected</li> <li>• Erosion protection measures at the discharge point</li> <li>• The quality of the water discharged will be closely monitored to ensure that it falls within the specified IRWQO at all times.</li> <li>• Monitoring will be implemented downstream of all watercourse crossings to detect any impacts</li> <li>• Loading and offloading of trucks will take place only within the designated dirty water areas</li> <li>• Loading of trucks will be carefully controlled to ensure that overloading will not take place</li> <li>• Truck load boxes will be covered with tarpaulins to prevent spillage of coal from the backs of trucks during transport</li> <li>• The storm water management measures, including the PCD will be decommissioned last, to ensure adequate storm water management during the rehabilitation phase</li> <li>• A waste management plan will be developed for the closure phase, which will include the handling of contaminated materials / soils found on site</li> <li>• All traces of hydrocarbons and residual waste will be removed before infrastructure is demolished</li> <li>• All coal will be removed from the stockpiles prior to rehabilitation.</li> <li>• Contaminated soils will be excavated and placed on the discard facilities prior to their rehabilitation, or removed from site by an appropriately licensed waste contractor</li> <li>• An appropriate sewage management strategy will be implemented during the decommissioning phase, including decommissioning of the sewage treatment plant as late as possible in the process</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>Water quality monitoring will be undertaken downstream of the demolished areas, in order to detect any increase in suspended solids or turbidity</li> <li>If erosion is evident or the water quality monitoring indicates an increase in suspended solids, water management around the decommissioning areas will be reviewed</li> <li>The incline shaft will be sealed, backfilled and made free draining</li> <li>The underground workings will be left to fill to a pre-determined environmental safe level (below decant level) before active water level management is implemented</li> <li>Monitoring of water levels in the mine and the associated water quality is committed to. This will allow both calibration of the post mining water quality and water volumes</li> <li>The water level in the workings will be actively managed to ensure it remains below the decant elevation</li> <li>The post closure mine water make will be pumped from the mine workings and treated in a water treatment plant, which will remain operational post closure. This may be the same treatment plant as used in the operational phase, or a regional treatment plant</li> <li>Treated water will be discharged to the river system</li> <li>The incline shaft will be backfilled, rehabilitated and made free-draining</li> <li>Monitoring of water levels in the mine and the associated water quality is committed to. This will allow both calibration of the post mining water quality and water volumes</li> <li>The water level in the workings will be actively managed to ensure it remains below the decant elevation</li> <li>The post closure mine water make will be pumped from the mine workings and treated in a water treatment plant, which will remain operational post closure</li> <li>Discharge of clean water to the river system</li> </ul> <p>The following recommendations were made based on the updated Water Balance conducted in November 2020:</p> <ul style="list-style-type: none"> <li>A maximum treatment rate of 7 200 m<sup>3</sup>/day should be allowed for, as per Scenario 1-A, provided the efficiency of the treatment plant can be increased such that the brine volumes are not recirculated in the system</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>Based on the aforementioned treatment rate, the Main PCD should be sized at a capacity of at least 29 000 m<sup>3</sup></li> <li>The groundwater model should be calibrated, to increase the level of confidence in the expected inflows to the underground. The inputs of the calibrated model should be fed back into the water balance model to confirm the treatment rates and storage capacity required</li> </ul>		
<b>Heritage</b> Johnny van Schalkwyk	It is recommend that if archaeological sites or graves are exposed during development activities, it should immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made	X	
<b>Noise</b> FMAC	<ul style="list-style-type: none"> <li>Ensure high level of equipment maintenance, especially intake and exhaust mufflers</li> <li>Withdraw equipment for maintenance if change in noise emission characteristics is noticeable</li> <li>Comply with the the relevant standards with regards to construction and closure noise</li> <li>Maintain noise complaint register and act promptly to complaints</li> <li>Ensure high level of equipment maintenance, especially intake and exhaust mufflers</li> </ul>	X	
<b>Soils, land use and land capability</b> Earth Science Solutions	It is recommended that the Soil Utilisation Plan (Section 18.5) be implemented. The plan gives recommendations on the stripping and handling of the soils throughout the life of the development along with recommendations for the utilisation of the soils for rehabilitation at closure	X	
	<p>In terms of maintenance the following is recommended:</p> <ul style="list-style-type: none"> <li>The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining;</li> <li>Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.);</li> <li>Traffic should be limited were possible while the vegetation is establishing itself;</li> <li>Plants should be weeded as required on a regular and managed basis were possible and practical;</li> <li>Check for pests and diseases at least once every two weeks and treat if necessary;</li> </ul>	X	



List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>Should natural vegetation not grow naturally, disturbed area should be fertilised, hydro seeded and grassed, and</li> <li>Repair any damage caused by erosion.</li> </ul>		
<b>Wetland</b> Wetland Consulting Services	<ul style="list-style-type: none"> <li>Fence off all wetland areas outside the direct development footprint. Include a 50m buffer zone around all wetlands within the fenced off area. Where fencing of the wetlands is not practical/desirable, the proposed development footprint should be fenced off and all activities contained within the fenced off area.</li> <li>Clearly demarcate the proposed development footprints and limit all activities to the demarcated area.</li> <li>Minimise the size of the proposed development footprints through optimising the design.</li> <li>Locate all temporary stockpiles, constructor's camps, laydown areas, ablution facilities etc. a minimum of 50m from any delineated wetland area.</li> <li>Develop and implement a construction stormwater management plan prior to the commencement of site clearing activities.</li> <li>Rehabilitate and re-vegetate all disturbed areas as soon as possible following disturbance.</li> <li>Phase vegetation clearing and soil stripping activities to minimise the extent of bare soil areas exposed at any one time.</li> <li>Areas in and around the wetlands should not be cleaned, graded and ditched/trenched more than a week before construction activities commence.</li> <li>Where construction is proposed to take place within a wetland or its catchment, this should take place during the low flow (winter) months where possible, in order to minimise the risk to the hydrology of the systems as well as to prevent excessive sediment and debris being washed into wetland areas</li> <li>Divert flows from upslope of the construction area around the cleared area.</li> <li>Concentrate soil stripping activities to the dry season as far as possible.</li> <li>No washing of equipment or machinery in any waterbody or wetland on site.</li> </ul>	X	

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• Discharge stormwater runoff into terrestrial grassland areas rather than directly into wetlands.</li> <li>• Store potential contaminants in designated areas with spill containment measures.</li> <li>• Keep sufficient spill clean-up material on site to deal with small spills</li> <li>• Develop emergency response procedures to deal with large spills.</li> <li>• Locate laydown area at least 50m from any delineated wetland area.</li> <li>• Fence off laydown area and restrict all activities to fenced off area.</li> <li>• Inform contractors regarding the location and sensitivity of all wetland areas</li> <li>• Compile and implement alien vegetation management plan to remove and control establishment and spread of alien species.</li> <li>• Concentrate within wetland activities in the dry season as far as possible.</li> <li>• No stockpiling of materials or placement of temporary construction infrastructure in the wetlands or within 50m of the wetlands.</li> <li>• No materials should be stockpiled within the wetland areas along the route and driving within the wetland areas should be kept to an absolute minimum. Clearly defined access routes should be used.</li> <li>• Use existing farm tracks and roads for access, as well as for service road as far as possible.</li> <li>• Minimise the construction footprint within the wetland area. Clearly demarcate the required construction servitude and maintain all activities within the demarcated area.</li> <li>• Post construction all alien invasive vegetation should be removed from site. This will also require long-term follow up to ensure establishment of natural vegetation in all disturbed areas.</li> <li>• Install erosion prevention measures prior to the onset of construction activities</li> <li>• Locate all stockpiles, laydown areas and temporary construction infrastructure at least 50m from the edge of delineated wetlands.</li> <li>• Service road crossings over valley bottom wetlands should be via low level bridges – low flows should be accommodated via culverts and flood flows should overtop the low level bridge.</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• Culvert capacity should be such to prevent impoundment upslope of the crossing and flow concentration downslope.</li> <li>• Limit cleared areas to as small an area as possible at any one time</li> <li>• Revegetate and rehabilitate areas as soon as possible after completion of construction.</li> <li>• Maintain a pillar size/safety factor that will ensure that no surface subsidence occurs under any of the wetlands on site.</li> <li>• Minimise blasting activities underground.</li> <li>• Stockpiles containing carbonaceous material should be classified as dirty water areas and isolated from the surrounding catchment. No run-off from these areas should be discharged.</li> <li>• Run-off from topsoil stockpiles should enter a sediment trap prior to discharge to the environment.</li> <li>• Topsoil stockpiles should ideally be vegetated to stabilise slopes and minimise sediment loss.</li> <li>• Gantries/decking should be installed at all wetland crossings to prevent spillages directly entering wetlands.</li> <li>• All vehicular and machinery movement along the servitude must be restricted to the service road. No off-road driving.</li> <li>• Protect discharge point against erosion and incorporate energy dissipaters.</li> <li>• Investigate opportunities of reintroducing water into the environment using alternative means, e.g. irrigation.</li> <li>• Ensure discharge water quality is always in line with the RQO's set for the Olifants River</li> <li>• Implement a water quality monitoring and biomonitoring plan</li> <li>• Only treated water to be discharged.</li> <li>• All brine ponds and sludge dams should be lined. A suitable engineered multiple liner should be installed in the brine ponds and sludge dams to ensure zero seepage of water out of the ponds.</li> <li>• Leak detection mechanisms should form part of the liner system.</li> <li>• Ponds should be of sufficient capacity to ensure that no overflow occurs.</li> <li>• Brine should be temporarily stored on site and disposed of offsite in a suitable facility.</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• A surface water quality monitoring plan and biomonitoring program should be implemented to monitor downslope water resources for signs of pollution derived from the brine ponds and sludge dams.</li> <li>• All treated sewage water should be reused on site within the mining operations.</li> <li>• No discharge of treated or untreated sewage should be allowed.</li> <li>• Wetlands downslope of the treatment plant should be included in the water quality and biomonitoring plan for the mine.</li> <li>• Regular inspections and maintenance activities should be undertaken on the treatment plant to ensure optimal operation at all times.</li> <li>• Emergency response procedures will be developed to deal with sewage spills.</li> <li>• All decommissioning activities should be restricted to the disturbed footprint and make use of existing access routes and roads.</li> <li>• Fences around wetland areas should be maintained until completion of decommissioning and closure activities.</li> <li>• All solid waste should be removed from site and disposed of at suitable waste disposal sites offsite.</li> <li>• Disturbance footprints should be revegetated as soon as possible following completion of demolition activities.</li> <li>• Alien vegetation management plan should be implemented following re-vegetation to clear alien species.</li> <li>• All solid waste should be removed from site and disposed of at suitable waste disposal sites offsite.</li> <li>• Remove all solid waste and potentially polluting material from site.</li> <li>• Areas where soils could potentially have been contaminated should be tested to determine contamination levels and appropriate remediation activities.</li> <li>• Rehabilitate contaminated soils in situ if possible. If not possible, remove and dispose of off-site.</li> <li>• Limit decommissioning activities to the disturbed footprint.</li> <li>• No access to wetland areas should be allowed unless infrastructure that needs to be removed is located within a wetland area.</li> <li>• Landscape disturbed area to the approximate natural landscape profile and to drain into the adjacent wetland as in the predevelopment state.</li> </ul>		

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>Post mining landscape should avoid steep slopes and concentrated runoff.</li> <li>Re-vegetate replaced soils as soon as possible following placement using a suitable mix of indigenous species.</li> <li>Implement a long term management and monitoring plan.</li> <li>Repair erosion damage immediately.</li> <li>Construct and operate a water treatment plant during closure to treat water to acceptable levels (RQO).</li> <li>Discharge treated water into the environment.</li> <li>Manage water levels within the mined out areas to prevent decant.</li> <li>Prevent decant from the mined out areas by actively managing water levels within the mined out areas.</li> </ul>		
<b>Blasting</b> Blast Management & Consulting	<b>Blast Design and Initiation</b> A typical box-cut blast design was applied for this report. It is strongly recommended that the box-cut blast design be revisited and a proper detail design is done for the box-cut that will take these variables into consideration. In this design the initiation can be designed in such a way that ground vibration levels are managed at the points of concern identified.	X	
	<b>Safe blasting distance</b> A minimum safe distance of 207 m is required but recommended is that a minimum of 500 m must be maintained from any blast done. This may be greater but not less. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance.	X	
	<b>Evacuation</b> All persons and animals within 500 m from a blast must be cleared and where necessary evacuation must be conducted with all the required pre-blast negotiations.	X	
	<b>Road Closure</b> The R35 road is on the south western side of the box-cut area and is at closest 64m away from the planned box-cut area. Expected ground vibration levels at this road are higher than the recommended limits. Changed blasting parameters will have to be applied to ensure levels are within accepted norms. The road will also have to be closed during the time of blasting. The necessary authorisations from the roads agency / department will be required when blasting is done in the box-cut. It is	X	



List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	recommended as well that all necessary precautions be taken for cleaning of the road should there be any material landing on the road.		
	<b>Stemming length</b> The current proposed stemming lengths as defined in the blast design must be maintained to ensure control on fly rock. Specific designs where distances and blast is known should be considered with this.	X	
	<b>Recommended ground vibration and air blast levels</b> General ground vibration and air blast levels are recommended for blasting operations in the box-cut area, as per Table 22 in the blasting report (Appendix G5)	X	
	<b>Blasting times</b> Blasting times should consider the times where the road usage is low. This will reduce the impact on travellers using the road when road closure for blasting is done. A further consideration of blasting times is when weather conditions could influence the effects yielded by blasting operations. Recommended is not to blast too early in the morning when it is still cool or the possibility of inversion is present or too late in the afternoon in winter as well. Do not blast in fog. Do not blast in the dark. Refrain from blasting when wind is blowing strongly in the direction of an outside receptor. Do not blast with low overcast clouds. These 'do not's stem from the influence that weather has on air blast. The energy of air blast cannot be increased but it is distributed differently to unexpected levels where it was not expected. It is recommended that a standard blasting time is fixed and blasting notice boards setup at various routes around the project area that will inform road users and farming community of blasting dates and times.	X	
	<b>Third party monitoring</b> Third party consultation and monitoring should be considered for all ground vibration and air blast monitoring work. Additionally assistance may be sought when blasting is done close to the highways. This will bring about unbiased evaluation of levels and influence from an independent group. Monitoring could be done using permanent installed stations. Audit functions may also be conducted to assist the mine in maintaining a high level of performance with regards to blast results and the effects related to blasting operations.	X	
<b>Socio-Economic</b> SRK Consulting	<ul style="list-style-type: none"> <li>Compile and implement the management measures detailed in the SLP.</li> </ul>	X	

List of studies undertaken	Recommendations of specialist reports	Recommendations included in the EIA report	Reference
	<ul style="list-style-type: none"> <li>• Prioritise the employment of the communities residing within the Primary Zol for semi-skilled and unskilled job opportunities during construction.</li> <li>• Develop a clear and concise employment and recruitment policy that prioritizes local recruitment. Ensure that contractors adhere to this policy.</li> <li>• Identify and support community development programmes that address challenges raised by population influx and spontaneous settlement.</li> <li>• Compile and implement the community health and safety initiatives of the Community Health and Safety Plan (CHSP), such as education and awareness programs that address social pathologies in neighbouring communities through established government departments.</li> <li>• Work closely with the local communities before and during the project to identify and communicate required skills and resources that the local community could provide;</li> <li>• Through the stakeholder engagement process ensure that expectations are managed around employment opportunities and practices.</li> <li>• In order to promote skills development and capacity building initiatives to both employees and the broader population and, in particular amongst youth, the SLP should focus on enterprise development and capacity building;</li> <li>• Include affected communities in the decision making processes of the project, particularly around potential Corporate Social Investment (CSI) opportunities, and SLP projects;</li> <li>• Provide regular and transparent feedback to the Vlakkuielen community specifically;</li> <li>• Monitor and implement the Grievance Management Mechanism;</li> <li>• Continue the discussions with and planning for the livelihoods restoration for the Vlakkuielen community;</li> <li>• Furthermore AAIC's closure plan should aim at reinforcing the objectives of the SLP by reducing the reliance on AAIC for employment by promoting skills transfer to enable alternative livelihoods.</li> </ul>		
Traffic		X	

List of studies undertaken	Recommendations of specialist reports				Recommendations included in the EIA report	Reference
Aurecon	The infrastructure upgrade requirements for the scenarios analysed in this TIA (Appendix G11) are summarised in Table below:					
	<b>Scenario</b>	<b>Intersection</b>	<b>Upgrade Required</b>	<b>Responsibility</b>		
	<b>Existing Analysis without any Development Traffic</b>	R555 / R575	Signalized	Road Authority		
		R35 / N4 North Ramp	Assign north and south approaches as major roads	Road Authority		
		R35 / N4 South Ramp	Assign north and south approaches as major roads	Road Authority		
	<b>Horizon Year plus Elders Colliery Operational Traffic to Elandspruit Colliery</b>	R555 / Road to Elandspruit Colliery	Signalized	Cost share between Elders, Road Authority and surrounding latent developments		

## 20 Environmental Impact Statement

The impact assessment as detailed in Section 18 assessed the types of impact, duration of impacts, likelihood of potential impacts occurring and the significance of impacts.

Assuming all phases of the project adhere to the conditions stated in the EMPr (Section 18) it is believed that the impacts associated with the proposed Expansion Project can be appropriately managed.

The key impacts that relate to the proposed Elders Colliery Project and are rated as having a high significance prior to mitigation and a low to medium impact after mitigations have been implemented (Table 20-1).

**Table 20-1: Summary of impacts and significant ratings pre and post implementation of management commitments**

Activity	Potential Impact	Aspects	Phase	Significance pre-mitigation	Significance post-mitigation
Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	The loss of utilisable resource (sterilisation and erosion), compaction and contamination or salinisation.	Soils	Construction	SI: High (-)	SI: Medium (-)
Site clearing and grubbing of the footprint areas associated with the box-cut and associated surface infrastructure. Construction of box-cut and associated surface infrastructure.	Loss and disturbance of wetland habitat	Wetland	Construction	SI: High (-)	SI: Medium (-)
Underground mining of No. 2 and No. 4 seams	Potential subsidence due to underground mining activities	Topography	Operations	SI: High (-)	Low (-)
Discharge of mine water to the natural watercourses	Pollution of surface water resources due to discharge of mine water to natural watercourses	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of box-cut area and associated infrastructure	Pollution of surface water resources due to operation of box-cut and associated surface area	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of sewage treatment plant	Pollution of surface water resource	Surface water	Operations	SI: High (-)	SI: Low (-)

Activity	Potential Impact	Aspects	Phase	Significance pre-mitigation	Significance post-mitigation
Operation of PCD – storage of contaminated water	Pollution of surface water resource	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of water treatment plant	Pollution of surface water resource	Surface water	Operations	SI: High (-)	SI: Low (-)
Handling and storing of brine and gypsum	Pollution of surface water	Surface water	Operations	SI: High (-)	SI: Low (-)
Operation of underground mine	Reduction in catchment yield	Surface water	Operations	SI: High (-)	SI: Medium (-)
Underground mining of the No.2 and No. 4 coal seams by means of bord and pillar mining methods	Influx of groundwater into the mine workings	Groundwater	Operations	SI: High (-)	SI: Medium (-)
Underground mining of the No.2 and No. 4 coal seams by means of bord and pillar mining methods	Loss of surface water to groundwater	Groundwater	Operations	SI: High (-)	SI: Low (-)
Operation of water treatment plant and sewage treatment plant	Water quality deterioration	Wetland/ Surface water	Operations	SI: High (-)	SI: Low (-)
Closure of underground mine	The formation of AMD in underground workings	Groundwater	Closure	SI: High (-)	SI: High (-)
Closure of the underground mine	Surface decant of AMD	Surface water	Closure	SI: High (-)	SI: Low (-)
Closure of the underground mine	Loss of employment and enterprise development opportunities due to closure of mine	Socio-economic	Closure	SI: High (-)	SI: Medium (-)

## 20.1 Final site map

A map which superimposes the proposed infrastructure associated with the proposed Elders Colliery Project on the environmental sensitivities of the proposed location of the infrastructure, including buffers is provided in Appendix H.

## 20.2 Positive and negative associated with the proposed activity and alternatives

Refer to Section 18 for positive and negative impacts identified for the proposed project.

## 21 Proposed impact management objectives

The impacts associated with the proposed Elders Colliery Project and the identified management measures are provided in Section 18. The significance rating of each impact has been re-evaluated post-implementation of management commitments to provide an indication of the effectiveness of the



management measures. Through the implementation of the management measures, AAIC will aim to achieve the management objectives associated with the proposed Elder Colliery Project. The closure objectives are detailed in Section 29.1.

The purpose of the EMPr is to provide relevant management measures to conduct activities with due care and diligence, as well as avoid/ limit any adverse impacts of the mining operation. The EMPr is compiled to help control impacts that may occur to meet acceptable standards, both as a legal and social responsibility to the environment within which the activities take place.

The objective of the EMPr is to create management structures that address the comments of stakeholders with regards to the development, establishes a method of monitoring and auditing environmental management practices during all phases of the activity and ensures that safety recommendations are complied with. Additionally, the EMPr provides a method to ensure performance and compliance with all the relevant regulatory authority provisions and guidelines while monitoring of the commitments allows for continual feedback and opportunities to improve.

## **21.1 Final proposed alternatives**

There are no additional alternatives to those identified and assessed through the impact assessment process are proposed for the mine development.

## **21.2 Aspects for inclusion as conditions of authorisation**

Over and above the management measures detailed Section 18. The conditions presented below should be included in the authorisation.

To ensure compliance with and implementation of the EMPr by:

- Appointing of a suitably qualified individual to oversee implementation of the EMPr during all phases of the project
- Appointing a suitably qualified Environmental Control Officer/Superintendent to undertake audits on a regular basis

To ensure that all staff, contractors and sub-contractors are aware of and understand the requirements of the EMPr and environmental issues in relation to their individual areas of work by:

- Developing an induction and training program covering the EMPr, environmental awareness, dealing with environmental incidents and waste management
- Advising staff commissioned during pre-construction and construction, including sub-contractors, of EMPr requirements through the induction program as well as on notice boards at the contractor's camps during construction and notice boards during operation. These notice boards should cover the EMPr, environmental awareness, dealing with emergencies and waste management

To be able to manage all environmental incidents and emergencies relating to all activities in accordance with the EMP and to identify root causes of incidents and to implement prevention plans by:

- Implementing an Environmental Emergency preparedness procedure and the non-conformance and compiling the corrective action procedure for Elders Colliery. This is to be implemented in emergency situations such as Oil or fuel leaks and spills, fires, sewage spillage. The Emergency preparedness procedure must include requirements to contact the Environmental Coordinator following an emergency or incident

## 21.3 Description of any assumptions, uncertainties and gaps in knowledge.

The assumptions, limitations and constraints highlighted in Table 21-1 were considered as part of the EIA for the proposed Elders Colliery Project.

**Table 21-1: Assumptions, limitations and constraints**

Study	Assumption/limitation/constraint
General assumptions	<ul style="list-style-type: none"> <li>All the technical data, project description and information provided by the proponent to the EAP and specialists are accurate and up-to-date. The EAP and specialists have identified all possible impacts based on the information provided and these have been assessed and rated accordingly</li> <li>All specialist modelling undertaken for this authorisation process is predictive modelling and therefore will need to be updated once quantitative data becomes available during the construction and operation phase</li> <li>The public participation process has been sufficiently effective in identifying the critical issues that needed to be addressed through specialist investigations and/or by the EAP. Specialist input has thus been appropriately scoped to investigate the critical issues</li> <li>The public participation process has sought to involve key stakeholders and individual landowners. It is assumed that where participation has been sought from the organizational representative/s, that these parties have the authority to comment on behalf of their organisation</li> <li>The public participation process provided ample opportunity for stakeholders to express any issues and concerns. It has thus been effective in identifying critical issues that the specialist investigations and/or EAP needed to address</li> <li>All comments received from the authorities are informed and considered</li> <li>AAIC and its contractors will implement the management measures contained in the EMPr</li> <li>A monitoring and evaluation system, including auditing, will be established, in line with this EMPr, to track the implementation of this specific EMPr to ensure that management measures are effective to avoid, minimize and mitigate impacts; and that corrective action is being undertaken to address shortcomings and/or non-performances</li> <li>AAIC will adopt a process of continual improvement when managing and/or mitigating negative environmental impacts arising from the project. The EMPr will be used as the basis of environmental management and will be improved and refined regularly</li> <li>The monitoring required of the project will determine the validity and accuracy of the predictions made. Any exceedances of parameters or complaints from stakeholders will be investigated and remedied by the mine when required to do so</li> </ul>
Air Quality	<p>The assumptions applicable to the air quality specialist study are as follows:</p> <ul style="list-style-type: none"> <li>The quantification of existing sources of emission was restricted to Elders Colliery operations</li> <li>Particulates including TSP, PM10 and PM2.5 were regarded the main pollutant of concern with no gaseous emissions quantified as part of the study</li> <li>Information required to quantify emissions from fugitive dust sources for Elders Colliery was provided by SRK personnel and the information is assumed to be correct and accurate. Where information was lacking assumptions were based on similar studies done in the area</li> </ul> <p>The data limitations can be summarised as follows:</p> <ul style="list-style-type: none"> <li>No on-site meteorological data was available for the site and use was made of Eskom's Elandsfontein weather station data. The assessment utilized meteorological data for a period of three years (2011 to 2013)</li> <li>Emissions rates calculated reflect only normal operating conditions and non-routine operations are not accounted for</li> <li>The dispersion model cannot compute real-time mining and production processes; and planned throughputs were therefore used. Operational locations and periods were selected to reflect the representative worst-case scenarios</li> </ul>

Study	Assumption/limitation/constraint
Biodiversity	<p>Field investigations commonly employed for EIA studies are normally limited by time and budget and scientific approaches generally have to be adapted to allow for these limitations. Ecology and biodiversity are growing fields of science and much is still unknown. As always, information on the herpetofauna and invertebrates of the region and farms is lacking in detail and significant information gaps exist in this regard.</p> <ul style="list-style-type: none"> <li>Findings, results, observations, conclusions and recommendations presented in the biodiversity report are based on the authors' best scientific and professional knowledge as well as the interpretation of information available to them at the time of compiling this report</li> <li>Due care and diligence is exercised by the authors, consultants and/or specialist investigators in rendering services and preparing this document. The consultants and/or specialist investigators accept no liability for conclusions, suggestions, limitations and recommendations made in good faith, based on available information, or based on data that was obtained from surveys</li> <li>Results presented in the biodiversity report are based on a snapshot investigation of the study area and not on detailed and long-term investigations of all environmental attributes and the varying degrees of biological diversity that may be present in the study area</li> <li>Rare and endemic species normally do not occur in great densities and, because of customary limitations in the search and identification of Red Listed species, the detailed investigation of these species was not possible. Results are ultimately based on estimations and specialist interpretation of imperfect data</li> <li>It is emphasised that information, as presented in the biodiversity report, only have bearing on the site as indicated on accompanying maps. This information cannot be applied to any other area, however similar in appearance or any other aspect, without proper investigation</li> <li>Furthermore, additional information may become known during a later stage of the process or development. The authors therefore reserve the right to modify aspects of the biodiversity report including the recommendations should new information may become available from ongoing research or additional work in this particular area, or pertaining to this investigation</li> <li>The biodiversity report should always be considered as a whole. Reading and representing portions of the report in isolation could lead to incorrect conclusions and assumptions. In case of any uncertainty, the authors should be contacted to clarify any viewpoints, recommendations and/ or results</li> </ul>
Blasting	<p>Considering the stage of the project, the data observed was sufficient to conduct an initial study. Surface surroundings change continuously and this should be taken into account prior to any final blast design and review of this report. This report is based on data provided and international accepted methods and methodology used for calculations and predictions</p>
Groundwater	<p>The Aquifer Dewatering Assessment:</p> <ul style="list-style-type: none"> <li>The aquifer dewatering assessment was done through utilizing empirical and analytical calculation techniques to calculate the maximum steady state cone of depression above and/or around the proposed underground mining areas, as well as around the box-cut</li> <li>The following assumptions are made:</li> <li>The hydraulic parameters used in the calculations (obtained from site specific testing, the JMA data base on shallow weathered zone Karoo aquifers and literature) are representative of the groundwater zone overlying and surrounding the underground mining sections</li> <li>The maximum dewatering impact will manifest at the conclusion of mining prior to re-flooding of the underground workings and the box-cut</li> <li>These assumptions will result in a conservative answer as regarding the lateral and depth extents of the cones of dewatering likely to manifest above and around the proposed underground mining sections as well as the box-cut</li> </ul> <p>The Generation of AMD from Overburden Stockpiles and in Mined Out Areas:</p> <ul style="list-style-type: none"> <li>The geochemical assessment for potential AMD generation from overburden stockpiles as well as in the mined out underground sections, was conducted</li> </ul>

Study	Assumption/limitation/constraint
	<p>using data and information generated through a site specific geochemical sampling and analyses program</p> <ul style="list-style-type: none"> <li>• The following standard assumptions are applicable:</li> <li>• Samples taken are representative of the overburden to be stockpiled as well as of material left/present in and adjacent to the underground sections</li> <li>• Average material composition is assumed (no heterogeneity)</li> <li>• All material will come into contact with percolating process/rain water</li> <li>• All neutralization minerals are available for reaction</li> <li>• Pyrite is the only sulphide present</li> <li>• A rainfall recharge value for overburden stockpiles is assumed based on literature values</li> <li>• Oxygen infiltration into the overburden and into the underground mined sections is often the rate limiting step for acid-mine drainage (AMD) generation. The oxygen infiltration is also assessed based on assumptions such as overburden porosity, moisture and pyrite content</li> </ul> <p>The Groundwater Migration Assessment:</p> <ul style="list-style-type: none"> <li>• The groundwater migration assessment was done through utilizing analytical calculation techniques to calculate the steady state lateral groundwater flux rates</li> <li>• The following assumptions are made: <ul style="list-style-type: none"> <li>○ The hydraulic parameters used in the calculations (obtained from site specific testing, the JMA data base on shallow weathered zone Karoo aquifers and literature) are representative of the groundwater zone surrounding the assessment areas</li> <li>○ These assumptions will result in a conservative answer as regarding the lateral sub-surface migration of potentially contaminated water/leachates originating from the identified potential groundwater pollution sources</li> </ul> </li> </ul> <p>The Mine Groundwater Balance:</p> <ul style="list-style-type: none"> <li>• The mine groundwater balance is done with a spreadsheet model</li> <li>• The following assumptions are made: <ul style="list-style-type: none"> <li>○ Mining will be conducted in accordance with the proposed mine layouts</li> <li>○ Mining will occur according to the proposed mining schedule</li> <li>○ The recharge rate from the overlying aquifer is varied depending on surface conditions (vegetation, wetland areas, rocky outcrops, dolerite intrusions, etc.)</li> <li>○ The No.2 seam will be mined first and the overlap time between the No.2 seam and the No.4 seam mining will be restricted to 4 years</li> <li>○ The No.2 seam workings will be available for storage of mine water during mining of the No.4 seam</li> </ul> </li> </ul> <p>Uncertainties</p> <ul style="list-style-type: none"> <li>• Uncertainties with respect to the calculations and modelling performed for the groundwater impact assessments relate to the following: <ul style="list-style-type: none"> <li>○ Representativeness of geohydrological and geochemical data. Both the geohydrological and geochemical regimes in the mining environment possess significant degrees of heterogeneity. The number of samples taken will in the end determine the statistical validity of the values used during modelling. The more samples taken, the more representative the data used would be</li> <li>○ The validity of assumptions. Assumptions were made to result in conservative outcomes</li> <li>○ With reference to the water balance, uncertainties relate primarily to the allocated recharge rates for varying surface conditions over the project area</li> </ul> </li> </ul>

Study	Assumption/limitation/constraint
	<ul style="list-style-type: none"> <li>○ In order to cater for these potential uncertainties it is recommended that the mine/groundwater balance, be updated annually as a routine matter during the operational and decommissioning phases of the mining activities. This will require ongoing sampling, analyses and monitoring</li> </ul> <p>Knowledge gaps</p> <ul style="list-style-type: none"> <li>• No significant knowledge gaps are deemed to exist and the groundwater base line description and impact assessment are considered to represent a high level of accuracy and integrity. Quantitative information was available for all the critical geological, geochemical and geohydrological parameters which are relevant to this study for the Elders Reserve</li> <li>• The following should be noted:               <ul style="list-style-type: none"> <li>○ The geohydrological base line description is based on a wealth of quantitative, site specific information that was generated over an extended time period during comprehensive geological exploration, hydro census and geohydrological drilling, profiling, sampling, testing and monitoring programmes</li> <li>○ Furthermore the study was informed by a detailed project description and therefore no significant knowledge gaps are deemed to exist in either the data sets or the proposed activities which could cause groundwater impacts</li> <li>○ The proposed mining comprises underground bord and pillar mining, the associated geohydrological impacts of which are clearly definable, can be accurately quantified and which can be managed effectively through the application of proven technologies</li> </ul> </li> </ul>
Heritage	<p>It is assumed that the description of the proposed project, provided by the client, is accurate.</p> <ul style="list-style-type: none"> <li>• It is assumed that the public consultation process undertaken as part of the EIA is sufficient and that it does not have to be repeated as part of the heritage impact assessment</li> <li>• The unpredictability of archaeological remains occurring below the surface</li> <li>• This report does not consider the palaeontological potential of the project site, as this is to be addressed by an appropriately qualified specialist</li> </ul>
Soils	<ul style="list-style-type: none"> <li>• It has been assumed that the total area of possible disturbance was included in the area of study, that the mining plan as tabled has documented and catered for all actions and activities that could potentially have an impact on the soils land use and land capability, and that the recommendations made, and impact ratings tabled will be re-assessed if the development plan changes</li> <li>• Limitations to the accuracy of the pedological mapping (as recognised within the pedological industry) are accepted at between 50% (reconnaissance mapping) and 80% (detailed mapping), while the degree of certainty for the soils physical and chemical (analytical data) results has been based on "composite" samples taken from the dominant soil types mapped in the study area</li> <li>• The area in question has been mapped on a comprehensive reconnaissance base, the degree and intensity of mapping and geochemical sampling being considered and measured based on the complexity of the soils noted in field during the field mapping, and the interplay of geomorphological aspects (ground roughness, slope, aspect and geology etc.)</li> </ul>
Surface Water	<p>By their nature, models are theoretical estimates of natural phenomena that are too complex to be derived exactly. It is inevitable that there will be variations in the actual flows when compared to the predicted flows. This can only be addressed by the recalibration of modelled data with measured data, from which more reliable estimates of extreme and average water make and runoff volumes can be developed</p>
Wetlands	<p>The baseline wetland assessment is based on existing information from the 2006 study (WCS, 2006) as well as field work undertaken in October/November 2012 and August 2015</p> <p>Wetland boundaries reflect the ecological boundary where the interaction between water and plants influences the soils, but more importantly the plant communities. The depth to the water table where this begins to influence plant communities is</p>



Study	Assumption/limitation/constraint
	<p>approximately 50 centimetres. This boundary, based on plant species composition, can vary depending on antecedent rainfall conditions, and can introduce a degree of variability in the wetland boundary between years and/or sampling period. The wetlands systems were mapped from the most recent aerial imagery available at a scale of 1:5000 wherever possible and where the imagery is of sufficient resolution for this purpose. Due to the extent of the area and the mapping scale used, the actual extent of the boundaries of these systems may be underestimated or overestimated in places. This may range from metres to tens of metres but generally is regarded as being of sufficient accuracy for the purposes of this study.</p> <ul style="list-style-type: none"> <li>• Detailed groundtruthing was undertaken in areas of expected surface disturbance, i.e. the proposed surface infrastructure areas. Outside of these areas the wetlands within the entire mining rights area were delineated using a combination of desktop mapping with targeted field verification. As a result, not every wetland boundary was walked and/or verified in the field</li> <li>• The temporary zones of especially hillslope seepage wetlands were extensively cultivated and transformed on site, precluding the use of vegetation indicators in determining wetland boundaries in these areas and thus reducing the confidence of the delineation accuracy in those areas where cultivation (past and present) extends into the wetlands</li> <li>• Reference conditions are unknown. This limits the confidence with which the present ecological category (PES) is assigned</li> </ul>

## **22 Reasoned opinion as to whether the proposed activity should or should not be authorised**

The environmental authorisation process associated with the proposed Elders Colliery Project was undertaken in terms of the relevant environmental authorisation requirements as detailed in Section 5. The environmental authorisation process was underpinned by a stakeholder engagement process with consultation undertaken through various forms of engagement as detailed in Section 13.

The specialists' studies as detailed in Section 14 were undertaken and the findings took into account and addressed (as far as practically possible) the project-specific issues which were raised.

In terms of the locality of the proposed project-related infrastructure, areas of sensitivity were taken into consideration during the design phase and were avoided as far as practically possible. Where avoidance could not be achieved in terms of the design requirements of the proposed infrastructure, appropriate mitigation measures were developed. These will be implemented to reduce the impacts on the environment, as detailed in Section 18. The proposed mitigation measures were developed based on the nature, duration, severity and probability of the impact and based on the recommendations made by the specialists, as presented in Section 18.

In addition, no fatal flaws have been identified for the proposed Elders Colliery Project thus far in the Integrated EIA process. However, several environmental and social impacts are envisaged from the construction phase through to post-closure, which require careful mitigation and monitoring. It is the opinion of the EAP that all major impacts have been identified and have been assigned appropriate management measures. Most HIGH negative impacts with mitigation, are reduced to a MEDIUM or LOW significance, and can be managed accordingly.

It is recommended by the EAP that the proposed Elders Colliery Project is allowed to proceed, on the assumption that the environmental and social management commitments included in this Integrated EIA/EMP are adhered to, the project description remains as per the description provided in this document and considering the positive social impacts associated with the project.

### **22.1 Period for which the environmental authorisation is required**

Environmental authorisation will be required for the following periods:

- Construction = 2 years;
- Operation = 14 years;
- Closure = 2 years; and
- Post-closure = 5 years

If any of the above-mentioned timeframes change, the department will be notified of such change.

## 23 Financial provision

The infrastructure and activities associated with the proposed Elders Colliery Project will increase the existing liability by an amount of R 45 258 786.77 (SRK, 2019).

Anglo Operations (Pty) Ltd will provide for the closure liability associated with the Proposed Elders Colliery Project either through a contribution to a Trust Fund or the purchase of a Bank Guarantee or a combination of the two methods as allowed by Regulation 527 of the MPRDA.

### 23.1 Explain how aforesaid amount was derived

The liability has been estimated using the approach documented in the “DMR Guideline” (Guideline Document for the Evaluation of the Quantum of Closure-Related Financial Provision Provided by a Mine – 2005). Rates have been annually updated with the prevailing Consumer Price Index (CPI) as obtained from StatsSA. The rates included are those relevant for the assessment.

## 24 Deviations from the approved Scoping Report and plan of study

The acceptance of the final Scoping Report letter received from the DMRE had two of the farm portions property description missing. This was not in line with what was originally submitted in the application form. SRK has sent through a formal email to the case officer Ms Mashuda Mulengwe to amend the acceptance letter. To date no feedback has been received. SRK requests that the acceptance of final Scoping Report be updated to include the two missing farm portions. And highlighted in red below:

**ACCEPTANCE OF THE SCOPING REPORT SUBMITTED IN TERMS OF REGULATION 21 OF THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 FOR THE MINING RIGHT IN RESPECT OF PORTIONS 3 AND 10 OF THE FARM ELANDSFONTEIN 75 IS, PORTION 1 AND 2 OF THE FARM GELUK 226 IS, PORTION RE/2,RE/3, PORTION OF PORTION 4,12/3 AND 13/3 OF THE FARM HAFGEWONNEN 190 IS, PORTION 5/1,6/1,7/1, 16/5 AND 17/5 OF THE FARM LEGDAAR 78 IS, PORTION RE, RE/3,5,6/3,8/3 OF THE FARM MIDDELKRAAL 50 IS, PORTION RE/7,12/5,13/5,14/6,22/10,RE/26,27/26 and 28/26 OF THE FARM SCHUVEKOP 227IS AND PORTION RE OF THE FARM VLAKKUILEN 76 IS, SITUATED WITHIN THE MAGISTERIAL DISTRICT OF GERT SIBANDE DISTIC MUNICIPALITY: MPUMALANGA REGION.**

## **25 Other information required by the Competent Authority**

Currently no additional information has been required by the Competent Authority.

DRAFT



## **26 Impact on the socio-economic conditions of any directly affected person**

All impacts on socio-economic condition are assessed in the Social Impact Assessment (Appendix G10). Specific Socio-Economic impact have been included in Table 18-3 to Table 18-5.

DRAFT

## **27 Other matters required in terms of Sections 24(4)(a) and (b) of the Act**

Based on the information available, discussions with stakeholders, discussions with the applicant and discussions with authorities, the EAP has not identified any other authorisation processes currently being undertaken within or adjacent to the site.

DRAFT

## 28 Part B: Environmental Management Programme report

The structure of the EMPr in terms of Appendix 4 of the 2014 NEMA Regulations, as amended is provided in Table 28-1.

**Table 28-1: Structure of the EMPr report in terms of Legislation Requirements as detailed in Appendix 4 (contents of an EMPr of GNR 982)**

Appendix 4	Legislated requirements as per the NEMA GNR 982 in Appendix 4	Relevant Report Section
(1)(a)	details of-	
	(i) the EAP who prepared the EMPr	Section 2.1
	(ii) the expertise of the EAP, including a curriculum vitae;	Section 2.2
(1)(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description	Section 6
(1)(c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers;	Figure 1-1 and Figure 28-1
(1)(d)	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	Section 18
	(i) planning and design;	
	(ii) pre-construction activities;	
	(iii) construction activities;	
	(iv) rehabilitation of the environment after construction and where applicable post closure; and	
	(v) where relevant, operation activities;	
(1)(e)	Removed from Appendix 4 during 2017 NEMA Regulations Amendment and included in 1 (f) below	
(1)(f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	Sections 18 and 23
	(i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	
	(ii) comply with any prescribed environmental management standards or practices;	
	(iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	
	iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable	
(1)(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 30
(1)(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	

Appendix 4	Legislated requirements as per the NEMA GNR 982 in Appendix 4	Relevant Report Section
(1)(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	
(1)(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	
(1)(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	
(1)(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations	
(1)(m)	an environmental awareness plan describing the manner in which-	Section 30.7
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	
	(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	
(1)(n)	any specific information that may be required by the competent authority	Section 30.8
(2)	Where a government notice gazette by the minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.	Not Applicable

## 28.1 Draft environmental management programme

### 28.1.1 Details of EAP

Refer to Section 2.1 for the details of the EAP.

### 28.1.2 Description of the aspects of the activity

Refer to Section 6 of the report that detailed the aspects related to this activity.

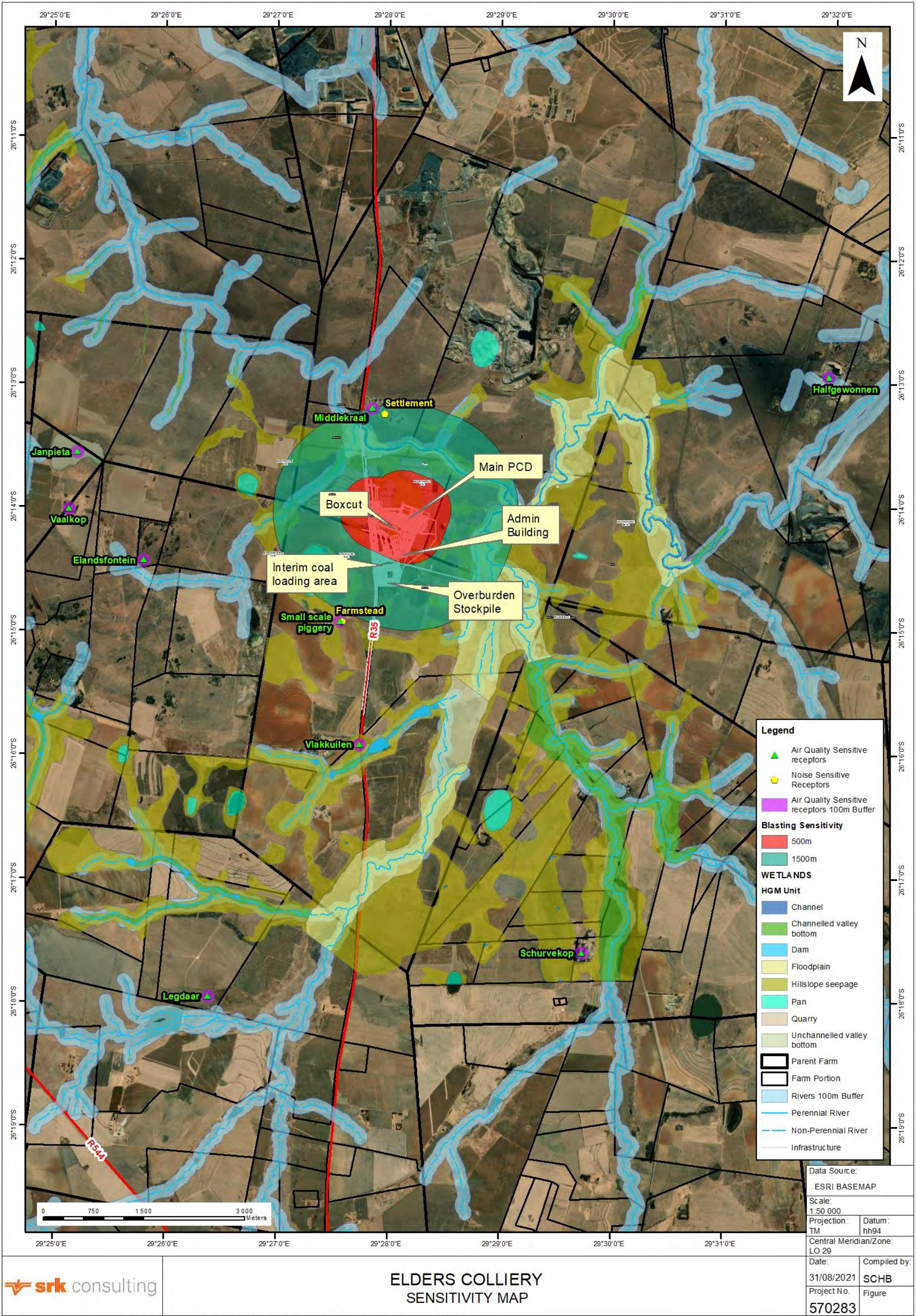
### 28.1.3 Composite map highlighting sensitive areas

The broad placement of the surface infrastructure was informed by mapping the environmental sensitivities which considered the location of all known sensitive physical, social and environmental features within the mining rights and surface lease areas (Figure 28-1). The environmental sensitivities that were taken into account have been included in Table 28-2.

**Table 28-2: Environmental sensitivities**

Sensitive feature	Description
Noise sensitive receptors	<p>There are two sensitive noise receptors within the area of the proposed Elders Colliery Project namely, the settlement (Middlekraal) which is north of the proposed project area and a farmstead to the North West of the proposed project area.</p> <p>Based on the assessment conducted in 2015, majority of the noise created as part of the operations will be confined to the proposed Elders Colliery Project area as well as the original noise from the existing road (R35)</p>
Wetland	<p>Extensive wetland systems occur within the general area of the proposed boreholes and associated 500m buffer. Most notably these wetland systems include the floodplain wetland habitat associated with the Olifants River, the Viskule and the Vlakkulenspruit, with the confluence of these three large wetland systems occurring within the study area. A large Pan wetland also occurs to the west of the R35.</p> <p>Four hydro-geomorphic wetland types were identified within the 500m radius of the various boreholes:</p> <ul style="list-style-type: none"> <li>• Floodplain wetlands</li> <li>• Pan wetland</li> <li>• Hillslope Seepage wetlands</li> <li>• Unchannelled Valley Bottom wetlands</li> </ul>
Air Quality (dust sensitive receptors)	<p>The current usage of land surrounding the mine includes agriculture (mainly farming) and coal mines. The Goedehoop Colliery is situated approximately 10 km to the north-west, however, this has subsequently been closed. In addition to this there are three other collieries within a 6 km radius from the proposed Elders Colliery Project.</p> <p>The proposed mining area is surrounded by power stations with the nearest one, Kriel, approximately 22 km to the west of the proposed Elders Colliery Project. Both Komati and Hendrina Power Stations are about 25 km away, with Komati to the north and Hendrina to the north-east. Duvha Power Station is located further away (~50 km) to the north-northwest, near Emalahleni.</p> <p>In addition to these, farmsteads and settlements were identified. These included the nearby communities of Middlekraal, which is located about 1.5 km away to the north; Vlakkulien is located about 4 km away to the south; while Elandsfontein, Vaalkop and Janpieta are located about 5 to 8 kms away to the east. A small scale piggery is located about 1 km to the southeast of the box-cut.</p>
Blasting	<p>High sensitive area of 500 m area around the mining area. Normally the 500 m buffer is considered an area that should be cleared of all people and animals prior to blasting. Levels of ground vibration and air blast are also expected to be higher closer to the blast area. Secondly an area of 500 m to 1500 m around the blast area that can be considered as medium sensitive. In this area the possibility of influence is still expected but definitely lower impact.</p>





Data Source:	
ESRI BASEMAP	
Scale:	
1:50 000	
Projection:	Datum:
TM	hh94
Central Meridian/Zone:	
LO 29	
Date:	Compiled by:
31/08/2021	SCHB
Project No.	Figure
570283	



## **28.2 Description of impact management objectives including management statements**

### **28.2.1 Determination of closure objectives**

The overall closure objective for the proposed Elders Colliery Project area is to re-instate an area that is safe, stable, and non-polluting with the final landform not adversely affecting water resources.

The above overall goal is underpinned by the more specific objectives listed below:

- Decommissioning all surface infrastructure that has no beneficial post-closure use;
- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;
- Rehabilitate disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;
- Rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage; and
- Rehabilitate all disturbed land to a state where post-closure management is minimised.

## **28.3 Alignment of objectives with baseline environment**

The closure objective are largely developed to manage residual and latent risks and establish post closure land uses aligned with the pre-mining land capability, established during the baseline investigation. The current status quo relating to pre-mining land capability is that the area influenced by the proposed Elders Colliery is limited in terms of the land capability classes present (as defined by the Chamber of Mines Guideline, 1991), with the area soils derived from rocky outcrop of sedimentary parent rock, or ferricrete/laterite "C" horizon at differing depths with a land capability rated as low intensity grazing land or wilderness status. Areas of wet base soils (wetland land capability as per the Chamber of Mine classification) surround the mine, but these areas will not be significantly directly influenced by the construction of infrastructure.

Given that the majority of the area influenced by the proposed Elders Colliery is limited grazing potential, the post closure land use objectives will be implemented in a manner whereby rehabilitation activities are undertaken to develop post closure land capabilities that will support grazing activities once the proposed Elders Colliery has relinquished responsibility for the management of the footprint after a closure certificate has been issued.

Besides being aligned with the baseline land capability of the area, the above post closure land use objective is aligned with the baseline vegetation conditions, which will be influenced by the construction of project infrastructure.

### **28.3.1 Process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity**

Through the implementation of the management measures by the relevant responsible persons, any potential environmental impact associated with undertaking listed activities associated with the proposed project will be managed accordingly.

The sources which could potentially impact on water resources are outlined in Table 28-3.

**Table 28-3: Potential pollution sources**

Potential pollution source	Description	Potential mechanism of impact
<b>CONSTRUCTION PHASE</b>		
General earthworks	Stripping of topsoil and civil works undertaken	Increased turbidity and suspended solids enter watercourses
Construction vehicles	Movement of construction vehicles through watercourses	Increased turbidity and suspended solids
	Servicing of construction vehicles close to watercourses	Increase in hydrocarbon concentrations
Borrow pits	Establishment of borrow pits within or close to watercourses	Increased turbidity and suspended solids enter watercourses
Box-cut	Dewatering of water accumulated in box-cut	Discharge or spillage into watercourses result in increases suspended solids, turbidity, as well as sulphate and TDS when coal is exposed
<b>OPERATIONAL PHASE</b>		
Advancing mine workings	Potential decant points	Seepage to aquifers or decant into surface water
	Storage of dirty water in underground workings	
	Underground workings located close to or within wetland areas	Potential destruction of or damage to sensitive wetlands
Pollution control dams and associated silt traps	Lined facilities	Seepage to aquifers if liner integrity is compromised Spillage will be captured in dirty water management system and could result in an impact if not contained
Overburden stockpile	Non carbonaceous material stockpiled on compacted area with drainage	Seepage into aquifers and contaminated run-off entering watercourses
Dirty water conveyance system	Concrete lined canals	Seepage to aquifers if integrity is compromised Potential spillage into watercourses if design capacity is breached due to lack of maintenance
Sewage treatment plant	Package plant with effluent to watercourses	Seepage to aquifers through leakages Discharge of affected water to watercourse during upset conditions

Potential pollution source	Description	Potential mechanism of impact
Sludge drying beds at sewage treatment plant	Concrete facilities with liner	Seepage to aquifers if liner integrity is compromised Contaminated run-off if storage capacity is exceeded
Workshops	Oil and silt traps	Local hydrocarbon impact if compromised
Bulk oil storage facilities	Bunded areas	Local hydrocarbon impact if compromised
Salvage yards	Various waste streams	Seepage to aquifers or contaminated run-off if adequate protection (e.g. lining/bunding) is not provided
Coal transport from box-cut via existing roads	Spillage of carbonaceous material into watercourses along route	Increased turbidity, suspended solids, sulphate and TDS
Water used for dust suppression	Pre-treated water used for dust suppression on haul roads and internal roads	Seepage into aquifer and runoff into surface water resources
Discharge from water treatment plant and sewage treatment plant	Effluent from WTP and STP discharged into Olifants River system	Deterioration in water quality if discharge standards are not met
Spill from PCD	In excess of 1:50 year flood event	Deterioration in water quality
<b>CLOSURE PHASE</b>		
Removal of infrastructure	All material and infrastructure removed for reuse, or for disposal at an appropriately licensed facility. Rehabilitation of the footprint.	Increased turbidity and suspended solids
Construction vehicles	Movement of construction vehicles through watercourses	Increased turbidity and suspended solids
	Servicing of construction vehicles close to watercourses	Increase in hydrocarbon concentrations
Discharge from water treatment plant	Effluent from WTP discharged into Olifants River system	Deterioration in water quality if discharge standards are not met
<b>POST CLOSURE PHASE</b>		
Decant	Decant of impacted water from mined out areas	Increase in sulphate and TDS

### 28.3.2 Potential risk of acid mine drainage

The initial geochemical assessment of the Elders project was augmented with seven (7) fresh overburden material and coal samples obtained from six recently drilled percussion boreholes. Sample Coal 1 was composed only from borehole EGW-BH7, while sample Coal 2 was composited from coal intersections in boreholes EGW-BH1, EGW-BH2, EGW-BH3 and EGW-BH4. The remaining composite samples Carb. Sandstone (SS) 20-35m, Mudstone/Siltstone 5-15m, Carb. Siltstone 30-40m, Carb. Sandstone (SS) 30-50m and Mud & Sandstone Mix 10-40m were composed from boreholes EGW-BH1 to EGW-BH5. Furthermore, two samples were submitted for kinetic testing, a combination of Coal 1 and Coal 2 (Coal 1+2) and sample Carb. Sandstone (SS) 30-50m.

The acid-base accounting (ABA) screening procedure by Sobek et al. (1978) was used to determine the acid-neutralising potential (assets) and acid-generating potential (liabilities) of the rock samples thus resulting in the net neutralising potential, equity being calculated.

Based on a combined evaluation of the samples, the seven (7) tested material samples (excluding one duplicate analysis) were classified as follows with regard to their acid generating potential:

- Non-acid generating:
  - Carb. Sandstone (SS) 20-35m
  - Mud & Sandstone Mix 10-40m;
- Inconclusive, and potentially acid generating conditions if preferentially exposed:
  - Mudstone / Siltstone 5-15m;
  - Carb. Siltstone 30-40m
  - Carb. Sandstone (SS) 30-50m; and
- Potentially Acid generating (long term):
  - Coal 1
  - Coal 2.

### Waste classification

In addition to the ABA being conducted for the 7 samples a waste classification was also conducted for the samples. According to the Government Notices R. 634, 635 and 636 (Government Gazette No. 36784, 23/08/2013), the exceedance of a threshold value for any element or chemical substance determines the overall waste classification of the sample. The following observations are made based on the total concentrations:

- The total concentrations of barium exceeded in all tested samples the TCT0, but not the TCT1 threshold;
- The total concentrations of copper exceeded in all tested samples the TCT0, but not the TCT1 threshold; and
- The total concentrations of lead exceeded in all but sample Coal 1 the TCT0, but not the TCT1 threshold.

No threshold was exceeded in the distilled water (1:20 ratio) leachable concentrations (LC < LCT0). The final waste classification (based on the exceedances above) and the theoretically required landfill design are given in Table 28-4.

**Table 28-4: Final waste classification of tested materials**

Sample	TCT	LCT	Waste Type	Landfill design class
Coal 1	< TCT1	< LCT0	3	C
Coal 2	< TCT1	< LCT0	3	C
Carb. Sandstone (SS) 20-35m	< TCT1	< LCT0	3	C
Mudstone / Siltstone 5-15m	< TCT1	< LCT0	3	C



Sample	TCT	LCT	Waste Type	Landfill design class
Carb. Siltstone 30-40m	< TCT1	< LCT0	3	C
Carb. Sandstone (SS) 30-50m	< TCT1	< LCT0	3	C
Mud & Sandstone Mix 10-40m	< TCT1	< LCT0	3	C

### 28.3.3 Water use licence requirements

A water use licence was submitted previously for the water uses indicated in Table 28-5.

**Table 28-5: List of water uses for the Elders Colliery (Jones and Wagener, 2015)**

Section 21 Water Use	Description of water use
<b>Section 21(a):</b> Taking water from a water resource	<ul style="list-style-type: none"> <li>Abstraction of water from boreholes ESW25, ESW42 and ESW43</li> <li>Abstraction from box-cut and underground workings and treatment in WTP for re-use</li> <li>Abstraction from Goedehoop Colliery Block 8 workings for construction purposes</li> </ul>
<b>Section 21(c):</b> Impeding or diverting the flow of water in a watercourse <b>and/or</b> <b>Section 21(i):</b> altering the bed, banks, course or characteristics of a watercourse	<ul style="list-style-type: none"> <li>Mining underneath wetlands</li> <li>Infrastructure development within wetlands, or within 500 m of wetlands: Box-cut and incline shaft, shaft area infrastructure and fence line</li> <li>Infrastructure development within wetland: Discharge point from WTP &amp; STP</li> <li>Infrastructure development within wetland: Discharge from Main PCD</li> <li>Crossing of watercourse with new conveyor between Elders Colliery and Goedehoop Colliery Block 20: Crossings 1 - 12</li> <li>Re-establishment of watercourse crossing within existing conveyor route: Crossing 13</li> <li>Crossing of watercourse with new conveyor between Goedehoop Colliery Hope Shaft and Goedehoop Colliery Processing plant: Crossing 14 and 15</li> <li>Infrastructure development within/close to wetland: Sump at conveyor Transfer 1</li> <li>Infrastructure development within wetland: Sump at conveyor Transfer 2</li> <li>Borrow pit 1 within wetland</li> <li>Borrow pit 2 within 500 m from wetland</li> </ul>
<b>Section 21(g):</b> Disposal of waste in a manner that could detrimentally impact on a water course	<ul style="list-style-type: none"> <li>Silo and crusher PCD</li> <li>Main PCD</li> <li>Brine dams at WTP</li> <li>Gypsum storage area at WTP</li> <li>Sludge drying beds at STP</li> <li>Overburden stockpile</li> <li>Storage of water in underground section</li> <li>Dust suppression on roads at shaft area and on service road within conveyor servitude</li> <li>Conservancy tank at guard house</li> <li>Conservancy tanks during construction phase</li> <li>9 Ml Storage tank at WTP</li> <li>1.7 Ml Storage tank at WTP (partially treated water)</li> <li>Sump at transfer point 1</li> <li>Sump at transfer point 2</li> <li>Sump at transfer point 3</li> <li>Sump at silo and crusher area</li> </ul>
<b>Section 21(j):</b> removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people	<ul style="list-style-type: none"> <li>Abstraction from box-cut and underground workings</li> </ul>

### 28.3.4 Impacts to be mitigated in their respective phases

The impact assessment in Section 18 details the potential impacts associated with proposed Elders Colliery Project during the construction, operational and closure phases.

### 28.3.5 Impact management outcomes

In addition to the implementation of the management measures detailed in Sections 18 the compliance standards, that are applicable to the identified impacts are included in Table 28-6.

**Table 28-6: Compliance standards to be achieved with regards to social and environmental aspects**

Environmental aspect	Phase/Time period	Standard to be achieved	Compliance with standards
Soils, Land Use and Land Capability Terrestrial Ecology	Continuous during construction, operations and closure.	To prevent soil contamination by implementation of: <ul style="list-style-type: none"> <li>Inspection and maintenance Plan;</li> <li>Leak/Spill Procedure'</li> <li>Emergency Preparedness Plan;</li> <li>Waste Management</li> </ul>	Manage soils in line with the requirements of the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 37603 No 331). Thungela Resources Policies and Guidelines to manage and remediate spills.
	Continuous during construction, operations and closure.	To demonstrate active stewardship of land and biodiversity by: <ul style="list-style-type: none"> <li>Identifying and removing relevant species if necessary;</li> </ul>	Thungela Resources Biodiversity Performance Standards Manage soils in line with the requirements of the National Norms and Standards for the Remediation of Contaminated Land and Soil Quality (GN 37603 No 331). Thungela Resources Policies and Guidelines to manage and remediate spills. GNR 893 Minimum Emission Standards.
Surface water	Continuous during construction, operations and closure.	To avoid or where not possible, minimise and remedy pollution of water <ul style="list-style-type: none"> <li>Implementing a Leak/Spill Procedure;</li> <li>Continuously implementing the surface water monitoring programme;</li> <li>Compiling monitoring report;</li> <li>Implementing Stormwater Management Plans; and</li> <li>Responding to complaints and implementing a grievance mechanism.</li> <li>Compliance to WUL</li> </ul>	Water Quality Objectives as specified in the Water Use License issued by DWS Thungela Resources Policies and Guidelines to manage and remediate spills.
Groundwater	Continuous during construction, operations and closure.	No dirty water spillage to the catchment thereby preventing contamination of waterbodies downstream by: <ul style="list-style-type: none"> <li>Continuously implementing the groundwater monitoring programme and model; and</li> </ul>	Thungela Resources Policies and Guidelines to manage and remediate spills. Water Quality Objectives as specified in the Water Use License issued by DWS

Environmental aspect	Phase/Time period	Standard to be achieved	Compliance with standards
		<ul style="list-style-type: none"> <li>Responding to complaints and implementing a grievance mechanism with regards to groundwater.</li> <li>Compliance to WUL</li> </ul>	
Air Quality	Continuous during construction, operations and closure.	<p>To minimise the entrapment potential of dust.</p> <ul style="list-style-type: none"> <li>To keep PM<sub>10</sub> (and in the future, PM<sub>2.5</sub>) and dust fallout levels at key receptor sites around the project area within guideline levels. As the guidelines vary depending on the priority area and year, the South African Air Quality Information System (<a href="http://www.saaqis.org.za/">http://www.saaqis.org.za/</a>) will be consulted for the most recent guidelines.</li> </ul> <p>These aforementioned standards will be achieved by:</p> <ul style="list-style-type: none"> <li>Continuously implementing the dust monitoring programme; and</li> <li>Appropriate dust suppression techniques.</li> </ul>	<p>GNR 893 Minimum Emission Standards.</p> <p>Thungela Resources Air Quality Performance Standards.</p>
Noise	Continuous during construction, operations and closure.	<p>To minimise noise impacts on sensitive receptors by:</p> <ul style="list-style-type: none"> <li>Developing a complaints register to record complaints regarding noise.</li> <li>To maintain noise levels at the standards for suburban areas (SANS 10103) as far as practicable.</li> </ul>	<p>Compliance with SANS 10103 Acceptable Ambient Levels and SANS 10210 of 2004, the national standard for the calculating and predicting of road traffic noise</p> <p>SANS 10328 of 2008 Noise Control Regulations – General Notice R154 of 10 January 1992</p>
Heritage	Continuous during construction, operations and closure.	To ensure heritage resources are not damaged during the mining process	Ordinance on Excavations (Ordinance no. 12 of 1980) (replacing the old Transvaal Ordinance no. 7 of 1925).
Social	Continuous during construction, operations and closure	<p>To enhance benefits from the development of the Project;</p> <ul style="list-style-type: none"> <li>To maximize opportunities for local residents;</li> <li>To facilitate employment of local labour on the Mine; and</li> <li>To avoid creating unrealistic expectations.</li> </ul> <p>These standards will be achieved by the implementation of the SLP and Social Management Plan, SED Plan, Stakeholder Engagement Plan and other Social Performance policies, procedures and plans.</p>	<p>Thungela Resources Closure Toolbox.</p> <p>Thungela Resources SHE policy and ESG framework</p>

## 29 Financial provision and closure plan

The information provided in this section is sourced from the closure plan developed for the proposed Elders Colliery Project.

The infrastructure and activities associated with the proposed Elders Colliery project will increase the existing liability by an amount of R 45 258 786.77 (SRK, 2019).

Anglo Operations (Pty) Ltd will provide for the closure liability associated with the proposed Elders Colliery Project either through a contribution to a Trust Fund or the purchase of a Bank Guarantee or a combination of the two methods as allowed by Regulation 527 of the MPRDA.

### 29.1 Closure objectives

The overall closure objective for the proposed Elders Colliery Project area is to re-instate an area that is safe, stable, and non-polluting with the final landform not adversely affecting water resources.

The above overall goal is underpinned by the more specific objectives listed below:

- Decommissioning all surface infrastructure that has no beneficial post-closure use;
- Identify potential post-closure uses of the land occupied by mine infrastructure in consultation with the surrounding land owners and land users. Should a suitable use for mine infrastructure not be found, it will be removed;
- Rehabilitate disturbed land to a state that is suitable for its post-closure uses;
- Rehabilitate disturbed land to a state that facilitates compliance with applicable environmental quality objectives (air quality objectives and water quality guidelines);
- Reduce the visual impact of the site through rehabilitation of all disturbed land and residue deposits;
- Rehabilitation that results in landforms that emulate the surroundings and would facilitate drainage; and
- Rehabilitate all disturbed land to a state where post-closure management is minimised.

### 29.2 Consultation with landowners and interested and affected parties

The objectives in relation to closure as detailed in Section 29.1 and rehabilitation will be made available for landowner and public consultation as part of the public participation process.

Post closure land use (PCLU) is normally determined in consultation with stakeholders so that the PCLU meets the requirements of the stakeholders, within the context of the closure plan. This activity is normally undertaken for the whole mine lease area affected by mining activities and integrates stakeholder requirements with risk mitigation.

For purposes of current planning and liability costing, the assumption is made that post rehabilitation and closure, the land use and capability that existed prior to the development, will be returned.

### 29.3 Rehabilitation action plan

The rehabilitation actions that the mine intends undertaking at the end of the life of the proposed Elders Colliery Project are described below. These actions are designed to comply with the requirements of this rehabilitation plan's objectives, as well as the requirements of Best Practice Guidelines (BPG).

#### 29.3.1 Infrastructure

All infrastructure for which there is no agreement in place for third party post closure use will be decommissioned and the footprints rehabilitated for the establishment of vegetation. Infrastructure where there is a third-party use will be legally transferred to the relevant parties.

Material inventories will be managed near the end of operations to minimize any surplus materials at closure. Fuel, lubricants and other materials needed to support the closure activities will be utilized during the closure period. The majority of the fuel storage facility will be closed during the first year of closure activities, but some fuel storage capacity will be required until all equipment has been demobilized from the site at the end of the closure period.

All equipment will be rinsed with raw water and rinsate will be captured in the internal water management infrastructure for evaporation.

Where practicable, equipment and materials with value not needed for post-closure operations will be sold and removed from the site. All other equipment will be demolished and disposed of on-site. Equipment with scrap or salvage value will be removed from the plant and stored either in the existing salvage yard or in a facility designated for this purpose during the closure period.

A soil contamination investigation will be conducted on completion of demolition activities, particularly in excavations remaining open following decommissioning. The purpose of this is to identify areas of possible contamination and design and implement appropriate remedial measures to ensure that the soil closure criteria are obtained.

Excavations remaining following demolition and foundation and slab removal and those where contamination remediation has been undertaken will be filled with waste rock and covered with 300 mm of growth medium.

Closure actions will include:

- All power and water services to be disconnected and certified as safe prior to commencement of any demolition works;
- All remaining inert equipment and demolition debris will be placed in the base of the box cut or failing this into the nearest general waste disposal facility;
- Salvageable equipment will be removed and transported offsite prior to the commencement of demolition;
- All fittings, fixtures and equipment within buildings will be dismantled and removed to designated temporary disposal yards;
- All tanks, pipes and sumps containing hydrocarbons to be flushed or emptied prior to removal to ensure no hydrocarbon/chemical residue remains;
- All above ground electrical, water and other service infrastructure and equipment to be removed and placed in box cut or the designated temporary salvage yards;
- All pond liners (PCD, Brine Dam and Gypsum Pad) to be removed for disposal in designated landfills;
- Electrical, water and other services that are more than 400 mm below ground surface will remain;
- All pipes and structures deeper than 400 mm need to be sealed to prevent possible ingress and ponding of water;
- Concrete slabs and footings will be broken and buried in situ. This concrete (and metal) will be broken up and disposed of in the box cut;
- All concrete below 500 mm depth will remain underground with the invert of all structures broken/sealed to prevent possible ingress and ponding of water;
- Soils beneath the plant, storage tanks and chemical storage areas will be sampled. Any contaminated soils found will be removed for disposal;
- All excavations resulting from demolition of plant, buildings, roads, conveyor platforms, etc. and earth structures will be left in a safe manner; and
- All telecommunication towers and dishes will be dismantled and removed.

The yard areas (e.g. platforms created for buildings, laydown areas, salvage yards, and other disturbed areas) will be closed and regraded to control storm water runoff and erosion. Once the structures and foundations are demolished, removed, or buried, the yard areas will be inspected for



any areas of hydrocarbon contamination. Any hydrocarbon contaminated soils will be managed as per Section 29.4.1.

Growth medium covers will be placed with the thickness of the covers dependent on the PCLU as well as on the volume of material available for closure.

### 29.3.2 Boxcut

Closure will entail the backfilling of the box cut with overburden stripped ahead of mining. It is likely that with the bulking of the overburden as it is excavated, the “bulked” volume available for backfill will exceed the volume of the mining void (estimated to be 1.6 million m<sup>3</sup>). However, all overburden will be replaced into the void and the final surface reshaped to simulate surrounding topography while ensuring that the surface is free draining.

Once backfilling is complete a growth medium cover will be placed and vegetation will be established. There may be a requirement to include sacrificial erosion protection measures on the surface while vegetation is being established.

### 29.3.3 Underground workings

The underground workings will be decommissioned through the implementation of the following actions:

- All salvageable equipment and plant is to be removed as the miners retreat on closure of mining operations;
- All tanks, pipes and sumps containing hydrocarbons or any other fluids to be flushed or emptied prior to removal or abandonment once underground mine is sealed off;
- All power and water services to be disconnected and certified as safe. Where practicable cabling containing copper is to be brought to surface;
- Surface openings (air vents, shafts, portals, etc.) will be sealed with a steel or concrete cover that attaches to the existing concrete collar. The entrance area immediately behind access portals to be backfilled with rock as a further deterrent. The seal to the box cut will be engineered to with stand potential pressure exerted on the seal from water as the working fill during groundwater rebound; and
- All surface openings (air vents, shafts, portals, etc.) to be sealed with a steel or concrete cover that attaches to the existing concrete collar.

### 29.3.4 Roads and parking areas

Mine roads that are not needed for closure and post-closure uses at the site (e.g. security and monitoring) will be closed. Closure actions will include:

- Removal of all signage, fencing, shade structures, traffic barriers, etc.;
- All ‘hard top’ surfaces to be ripped and bitumen/concrete removed along with any culverts and concrete structures;
- All concrete lined drainage channels and sumps will be broken up and removed;
- All excavations or vertical walls resulting from removal of foundations or structures are to have sides slopes battered to 1V:2H and are to be made safe pending final rehabilitation work;
- All potentially contaminated soils are to be identified and demarcated for later remediation; and
- All haul routes that have been treated with saline dust suppression water need to be treated as “sealed” roads with the upper surface ripped and removed to designated contaminant disposal areas.

### 29.3.5 Pollution control dam

The PCD will be reclaimed and the area shaped to form a stable landform congruent with the surrounding landscape.

The PCD will however be retained during the majority of the closure period to provide water for closure activities as well as to capture any residual seepage and contact water which may be generated on the site. The expectation is that as rehabilitation of the shaft footprint is implemented, the size of the contact water catchment reduces until there is no further need for the PCD. During the reduction in catchment size, the contained contact water will be evaporated as runoff and seepage to the PCD diminishes, with the result that there will not be a need to manage excess inventory in the PCD at closure. Closure actions for the PCD will include:

- Demolish all concrete structures;
- Remove any silt that accumulated in the dam in line with the Hazardous waste management strategy for the operation;
- Remove liners and following waste classification testing dispose appropriately;
- Backfill excavations with material removed during construction which will be located adjacent to the PCD; and
- Profile footprint to be free draining with no low points to accumulated water.

### 29.3.6 Groundwater management

As indicated in Section 14.9, there is the potential that ARD may be generated in the underground workings. However, the topography of the area around the proposed Elders Colliery is such that there is a low likelihood that there will be ARD that decants on surface. There may however, be the lateral movement of groundwater from the workings and the backfilled box cut as the groundwater table recovers and water levels rebound. However, once the box cut void and underground workings have filled, the rate of ARD generation may diminish as the oxygen available for pyrite oxidation and ARD generation is depleted.

As numerical models have an inherent associated uncertainty, the closure action will be to utilise operational ground and surface water monitoring data to determine whether there will be a post closure requirement to install a mechanism to maintain water levels and to treat these before discharge to the environment. As the potential to affect the aquifer after closure is expected to occur approximately 70 years after closure, no abstraction or treatment technology is included in the PMCP, if indeed required, as there is currently no indication of what this technology will be in the 22nd Century. Definite actions that will be implemented will include:

- Monitor groundwater quality and level in backfilled box cut;
- Optimize storage of mine water make in mined out underground sections;
- Monitor the flooding of the No.2 seam workings; and
- Monitor the flooding of the No.4 seam workings.

### 29.3.7 Stormwater management

Prior to closure a water management plan will be prepared to identify which structures are required at closure and which can be decommissioned. Ditches decommissioned will be closed by backfilling the excavations with the material removed, and placed adjacent to the structures, during construction. Bunds not required will be flattened by redistributing the material across the footprint used to borrow the material for construction.

### 29.3.8 Fuel storage and dispensing

Closure of these facilities will focus on physical closure and investigation of potential subsurface contamination from petroleum products. Closure of these facilities will include:

- Removing remaining fuel inventory;
- Decontaminating equipment including tanks, piping, and dispensing equipment, as needed;
- Removing equipment;

- Demolishing all storage tanks and buildings;
- Removing any appurtenances including piping and electrical;
- Breaking walls and foundations to grade;
- Hauling non-hazardous demolition debris to box cut;
- Sampling soils beneath and surrounding the facility;
- Classifying and removing any contaminated soils identified and treating them on site to acceptable standards or disposing of them to a licensed facility if hazardous; and
- Re-grading the footprints in line with adjacent yard footprints.

A portion of the fuel inventory will be used during closure. Near the end of the closure period, after the primary earthwork is complete, the fuel storage and dispensing facilities will be decommissioned.

### **29.3.9 Fencing and walling**

Various areas at the site are enclosed by a perimeter fencing and walls. Due to the maintenance costs associated with retaining a fence, it will be removed as the areas are reclaimed. Service roads providing access to the fences will be rehabilitated.

## **29.4 Remediation of contaminated areas**

### **29.4.1 Hydrocarbon contamination**

- All soil, contaminated with hydrocarbons, will be identified, excavated, if possible, to at least 200 mm below the contaminated zone and then treated by land farming;
- All tanks, pipes and sumps containing hydrocarbons will be flushed or emptied; and
- Removed soils will be managed as determined by the nature and extent of the contamination.

### **29.4.2 Chemical contamination**

- The proposed Elders Colliery will flush or empty all tanks, sumps and pipes containing non-biodegradable chemicals (liquid solid or gas) to ensure that chemical residues are removed from the site;
- Liquid storage tanks (including septic tanks) will be emptied, the structure demolished and sub-surface holes filled; and
- All equipment and plant in which chemicals have been stored or transported will be cleaned and disposed of in a suitable disposal facility.

### **29.4.3 Vegetation and wildlife**

Successful revegetation will help control erosion of soil resources, maintain soil productivity and reduce sediment loading in streams utilizing non-invasive plants that fit the criteria of the habitat (e.g. soils, water availability, slope and other appropriate environmental factors). Invasive species will be avoided and the area will be managed to control the spread of these species in accordance with the Biodiversity Action Plan (BAP) (Appendix I)

The slopes at the mine residue facilities are likely to be susceptible to erosion, even after vegetation establishment. To counter the effects of erosion, naturally occurring grassland species will be planted on the slopes and tops of the facilities. At this time, these species will provide soil holding capacity and reduce runoff velocity. The composition of the natural species and their planting strategy will be detailed in the BAP.

The flatter areas will be re-vegetated with the objective of creating a sustainable ecosystem similar to an analogues reference plot.

## 30 Mechanisms for monitoring compliance

Internal and external environmental monitoring is undertaken on an ongoing basis at Elders Colliery as required. Details associated with the compliance monitoring is provided in the sections below.

### 30.1 Monitoring of impact management actions

A performance assessment against this Integrated EIA/EMPr will be undertaken every year to assess compliance with the management measures.

The monitoring of impacts and reporting frequency will be different for the various environmental aspects. Table 30-1 details the environmental aspects to be monitored, the component of the aspect and the frequency of data collection and reporting.

Table 30-1 to Table 30-5 lists the proposed monitoring points for the proposed Elders Colliery Project.

**Table 30-1: Environmental components to be monitored and frequency of monitoring**

Aspect	Component	Parameters	Standard	Data collection frequency	Reporting frequency
Surface water	Water quality	pH, DO, TDS, EC, suspended solids, turbidity, alkalinity, B, Ca, Cl, F, Na, K, SAR, SO <sub>4</sub> , DOC, Fe, Mg, Mn, Al, Cr, NH <sub>3</sub> , NO <sub>3</sub> , PO <sub>4</sub> , P, N	Elders WUL conditions Interim Resource Water Quality Objectives (RWQO) Management Unit 8 SANS for drinking water	Monthly sampling	Quarterly reporting
Groundwater	Water quality	pH, EC, Temperature, Redox-Potential (mV), Ca, Mg, Na, K, Total Alkalinity, SO <sub>4</sub> , NO <sub>3</sub> , Cl, TDS, Al, As, B, Ba, Cr, Cu, F, Fe, Mn, Mo, Ni, Pb	SANS for drinking water South Africa Water Quality Guidelines (SAWQG) for domestic use	Quarterly monitoring	Quarterly reporting
	Borehole level	mbgl	N/A	Annually	Annual reporting
Biomonitoring	Biomonitoring in wetlands and tributaries.	SASS5, IHAS,	N/A	Annually	Annual reporting
Air quality	Air quality	Dust fallout, PM <sub>10</sub> PM <sub>2.5</sub>	South African (SA) National Ambient Air Quality Standards (NAAQS)	Monthly sampling	Annual reporting
Noise	Decibel readings of machinery and vehicles	dB	SANS 10103: typical ambient noise levels	Random readings will be taken	Annual reporting
	Updating of baseline noise information			Random readings will be taken	Every two years, or when complaint is received

Aspect	Component	Parameters	Standard	Data collection frequency	Reporting frequency
Blasting	Air blast and vibrations	dB	United States Bureau of Mines (USBM) criteria for safe blasting	During each blast	After each blast

### 30.2 Responsible persons for implementation of management actions

The responsible persons for the implementation of the management measures, as listed in Section 30.1, and the monitoring of environmental compliance at the proposed Elders Colliery Project is provided in Table 2-5

In addition to this, an Environmental Coordinator/Superintendent will be responsible for ensuring that all necessary environmental monitoring required for the Elders Colliery is undertaken as per the monitoring programmes.

### 30.3 Time period for implementation of management actions

The monitoring of impacts and reporting frequency will be different for the various environmental aspects. Table 30-1 details the environmental aspects to be monitored, the component of the aspect and the frequency of data collection and reporting.

Table 30-2 to Table 30-5 lists the proposed monitoring points for the Elders Colliery.

### 30.4 Specific environmental monitoring requirements

Elders Colliery will implement an ongoing monitoring programme for its proposed operations as recommended ensuring environmental requirements stipulated in this EMP are complied with. The following impacts and environmental components are being monitored:

- Blasting;
- Surface water;
- Groundwater;
- Terrestrial ecology;
- Air quality; and
- Noise.

#### 30.4.1 Surface

##### Monitoring locations

In order to detect impacts attributable to an activity, water quality monitoring would usually be carried out upstream and downstream of the site. Portions of the proposed mine (mine infrastructure and the shaft area) drain either directly or via minor, unnamed tributaries to the Olifants River. A large portion of the proposed underground workings will be beneath the Vlakkuijen and Viskuille Rivers. Surface water quality monitoring will therefore be required on the minor tributaries, the Olifants River and the Vlakkuijen and Viskuille Rivers.

The proposed monitoring locations for the proposed Elders Colliery Project are shown in Table 30-2.



**Table 30-2: Details of surface water quality monitoring locations**

Monitoring location	Description	Co-ordinate
EP 01	At the Pan downstream	X : 2903338.084 Y: -45540.273
EP 02	At the Pan upstream to the east of the Vlakkuijen River	X: 2906949.854 Y: -48297.872
EP 09	Along the Olifants River downstream of the workings	X: 2901166.105 Y: -46197.032
EP 10	Along Vlakkuijen River upstream of the workings	X: 908368.320 Y: -46231.212
EP 11	Along Viskuije River upstream of the workings	X: 908923.838 Y: -50076.867
EP 12	Along Viskuije River upstream of the workings	X: 907434.531 Y: -50872.659
EP 13	Along Viskuije River upstream of the workings	X: 2906258.18 Y: -49398.56
EP 14	Along Viskuije River downstream of the workings	X: 2903065.150 Y: -48122.063
EP 15	Tributary of the Olifants River upstream of the workings	X: 2903038.933 Y: -51425.841
EP 16	Along the Olifants River upstream of the workings.	X: 2901478.832 Y: -49424.521
EP 18	Along a tributary of the Vlakkuijen River	X: 2906159.72 Y: -46213.53
EP 19	Along the Olifants River, near the discharge point of the sewage treatment plant and PCD	X: 2903075.46 Y: -47820.79
EP 20	At the PCD overflow outlet	X: 2903092.18 Y: -47818.69

Samples will be grab samples, which will include:

- Filtered and unfiltered samples;
- Acid preservation of samples for metals analysis; and

All samples will be analysed by an accredited laboratory.

### Water quantity monitoring (water balance monitoring)

For efficient management of water on the site, a good understanding of the site water balance will be required. To achieve this, the following monitoring will be needed:

- Rainfall – to be measured daily on the site;
- Evaporation – this is not essential but would be useful for calibration of the water balance model;
- Dam water levels – to be measured weekly; and
- Flows – including the following, to be measured weekly -
  - Make-up water drawn from all systems (raw water and potable water)
  - Water pumped from the mine workings
  - Water pumped to storage in the mine workings
  - Inflows to the Pollution Control Dams
  - Water pumped from the Pollution Control Dams

- Water treated
- Brine generation
- Gypsum generation and moisture content
- Service water pumped to the underground workings
- Dust suppression water
- Sewage volumes.

### 30.4.2 Groundwater

The system response monitoring network relates to the predicted drawdown of groundwater levels due to mine dewatering and the rebound thereof once dewatering ceases post closure. A number of monitoring boreholes were strategically sited within the predicted cone of dewatering and potential future decant areas to monitor these responses during life of mine and post closure.

A list of groundwater parameters to be monitored is given in Table 30-3.

**Table 30-3: List of groundwater monitoring parameter.**

Description	Parameter	Comments
Potential heads	Static groundwater levels	Measured in metres below ground level (mbgl) and converted into metres above mean seal level (mamsl). Collar elevations of the boreholes need to be considered.
Physico-chemical parameter, field	pH, Electrical Conductivity (EC), Temperature, Redox-Potential (mV), colour and smell (if any)	Parameters to be measured during sampling in the field, should stabilize before sample is retrieved
Physico-chemical parameter, laboratory	pH, Electrical Conductivity (EC), Temperature, Redox-Potential (mV)	To assess deviations from field measurements
Major elements	g, Na, K, Total Alkalinity, SO <sub>4</sub> , NO <sub>3</sub> , Cl, Total Dissolved Solids (TDS)	
Trace elements	Al, As, B, Ba, Cr, Cu, F, Fe, Mn, Mo, Ni, Pb	Samples to be filtered and acidified on-site.

The borehole locations should be refined based on site specific geophysical investigations and ground truthing regarding potential infrastructure conflicts. Table 30-4 indicates the proposed groundwater monitoring points.

**Table 30-4: List of coordinates for the proposed monitoring boreholes.**

Name	X	Y	Comment (depth)
ESW20	47207.29	-2906435.03	Background Monitoring
ESW24	464367.81	-2902704.75	Background Monitoring
ESW26	48195.48	-2902078.66	Background Monitoring
ESW27	49203.61	-2902112.36	Background Monitoring
ESW29	50546.3	-2902218.35	Background Monitoring
ESW30	50798.8	-2903061.39	Background Monitoring
ESW31	49469.89	-2904079.89	Background Monitoring
ESW32	49089	-2905754.03	Background Monitoring
ESW39	45361.72	-2903924.57	Background Monitoring
ESW40	45871.34	-2905520.18	Background Monitoring
ESW41	45878.64	-2904797.1	Background Monitoring

Name	X	Y	Comment (depth)
ESW42	46188.88	-2902412.92	Background Monitoring
ESW43	46238.28	-2902434.35	Background Monitoring
ESW44	45917.98	-2902017.92	Background Monitoring
ESW45	49944.38	-2902191.86	Background Monitoring
ESW46	49876.16	-2903336.46	Background Monitoring
ESW47	49503.09	-2904136.56	Background Monitoring
ELDWCH2	47314	-2902752	Background Monitoring
VKN-7	47010.92	-2903568.21	Background Monitoring
VKN-8	47330.15	-2903706.75	Background Monitoring
HGN-4	49958.768	-2903998.676	Background Monitoring
HGN-5	49666.96	-2903772.01	Background Monitoring
<b>Newly proposed boreholes*</b>			
E-1	46775	-2903310	Overburden Stockpile
E-2	46840	-2903405	Overburden Stockpile
E-3	46900	-2902420	PCD / Brine Dam
E-4	50549	-2903478	Impact Drawdown (60 mbgl)
E-5	51387	-2904200	Impact Drawdown
E-6	51200	-2903385	Impact Drawdown
E-7	48419	-2904109	Impact Post Closure
E-8	49900	-2901380	Impact Post Closure
E-9	48150	-2902290	Impact Post Closure
E-10	47630	-2906040	Impact Post Closure (60 mbgl)
E-11	46314	-2905204	Impact Post Closure
E-12	50200	-2905305	Impact Post Closure (60 mbgl)
E-13	46430	-2904325	Impact Post Closure (60 mbgl)

### 30.4.3 Biomonitoring

The proposed Elders Colliery Project is situated within a wetland network and while not directly impacting wetlands there is a possibility that the colliery may indirectly impact the wetlands. Due to this, Table 30-5 outlines the monitoring points are required in order to identify impacts.

**Table 30-5: Proposed biomonitoring points for the Elders Colliery**

Site No.	Type of waterbody	Description	Coordinates	
			South	East
Wetlands				
E7	Wetland	Upper Vlakkuiilen immediately downstream of the R35 road bridge between Bethal and Middelburg.	26°17'07.8"S	29°27'46.9"E
E9	Wetland	Lower Vlakkuiilen near confluence with Viskuille	26°15'42.2"S	29°28'45.8"
E8	Wetland	Viskuile, near upper boundary of proposed mine	26°16'08.6"S	29°29'41.2"E
E13	Wetland	Viskuile 1.9 km downstream of Site E8	26°15'11.3"S	29°29'15.3"E

Site No.	Type of waterbody	Description	Coordinates	
			South	East
E15	Wetland	Viskuile near confluence with Olifants River	26°14'02.9"S	29°28'56.2"E
<b>Olifants River</b>				
E10	River	Olifants River immediately downstream of the confluence with the Viskuele and Vlakkuielen, and downstream of a small weir	26°13'49.8"S	29°29'03.0"E
E14	River	Olifants River between R35 road bridge and gauging weir B1H018	26°13'21.8"S	29°27'46.7"E
<b>Pans</b>				
D	Pan	Large semi-permanent pan (about 28 ha)	26°14'41.4"S	29°27'22.0"E
F	Pan	Large temporary pan (about 17 ha)	26°16'35.1"S	29°28'59.7"E

### 30.4.4 Air quality monitoring

Ambient air quality monitoring can serve to meet various objectives, such as:

- Compliance monitoring;
- Validate dispersion model results;
- Use as input for health risk assessment;
- Assist in source apportionment;
- Temporal and spatial trend analysis;
- Source quantification; and
- Tracking progress made by control measures.

It is recommended that the Elders dustfall monitoring campaign be continued as part of the project's air quality management plan. This should be undertaken throughout the life of the project to provide air quality trends and adequate data for cumulative impacts on AQSRs.

It is also recommended that a gravimetric PM<sub>10</sub>/PM<sub>2.5</sub> monitor be installed at Middlekraal. This will provide adequate data on cumulative PM<sub>10</sub> and PM<sub>2.5</sub> concentrations from the Elders Colliery and other mines/industries in the region.

Recommended monitoring locations are presented in Table 30-6.

**Table 30-6: Elders Colliery monitoring locations and parameters**

Location No.	Description	Pollutant(s) to be Sampled	Coordinates	
			South	East
1	Near crusher	Dustfall	26°14'2.68"S	29°27'45.15"E
2	South of the Middelkraal community and north of the main operations	Dustfall/PM <sub>10</sub> /PM <sub>2.5</sub>	26°13'36.93"S	29°27'51.57"E
3	East of the main operations	Dustfall	26°13'54.11"S	29°28'37.85"E
4	South of the main operations	Dustfall	26°15'6.76"S	29°27'44.84"E
5	West of the main operations	Dustfall	26°14'14.73"S	29°27'13.71"E

### 30.4.5 Soils

Nutrient requirements reported herein are based on the monitoring and sampling of the soils at the time of the baseline survey. These values will definitely alter during the storage stage and will need to be re-evaluated before being used during rehabilitation. Ongoing evaluation of the nutrient status of the growth medium will be needed throughout the life of the project and into the rehabilitation phase.

During the rehabilitation exercise preliminary soil quality monitoring should be carried out to accurately determine the fertiliser requirements that will be needed. Additional soil sampling should also be carried out until the levels of nutrients are at the required levels for sustainable growth. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling is increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.

Monitoring should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.

Soils should be sampled and analysed for the following parameters:

- pH (H<sub>2</sub>O) Phosphorus (Bray I);
- Electrical conductivity Calcium mg/kg;
- Cation exchange capacity Sodium mg/kg; ;
- Magnesium mg/kg; Potassium mg/kg Zinc mg/kg; and
- Clay Organic matter content (C %).

The following maintenance is recommended:

- The area must be fenced, and all animals kept off the area until the vegetation is self-sustaining;
- Newly seeded/planted areas must be protected against compaction and erosion (Vetiver hedges etc.);
- Traffic should be limited where possible while the vegetation is establishing itself;
- Plants should be weeded as required on a regular and managed basis where possible and practical;
- Check for pests and diseases at least once every two weeks and treat if necessary;
- Should natural vegetation not occur the fertilise, hydro seeded and grassing of area should be considered, and
- Repair any damage caused by erosion.

### 30.4.6 Closure and post closure period

Following the implementation of the closure actions described in Section 29, it is necessary to have measurable criteria against which to assess the effectiveness of the plan and its implementation. These criteria will assist AAIC in identifying when the standard of closure achieved is sufficient to relinquish responsibility for a specific area. The site specific relinquishment criteria for the proposed Elders Colliery are documented in Table 30-7. Also included in the table are the indicators required to demonstrate achievement with the relinquishment criteria and the reporting requirements. The reporting requirements are those that are expected to fulfil the monitoring requirements set out by legislation.

**Table 30-7: Relinquishment criteria**

Category	Closure criteria	Indicators	Reporting requirements
Ground and Surface water	Compliance with the WUL	Downstream/gradient water quality monitoring	Monitoring report
Air	Compliance with the standards as per the National Environmental Management: Air Quality (Act 39 of 2004)	Records of air quality measurements for PM10 and PM2.5	Monitoring report
Soil quality	Soil quality as assessed against the Norms and Standards to support Chapter 8 of NEM:WA	Soil quality in areas where contamination is identified	Results of soil quality and risk assessment



Category	Closure criteria	Indicators	Reporting requirements
Land productivity	Land capability and productivity similar to that which existed prior to mining	Land capability and productivity	Comparison to analogue areas and pre-mining aerial photographs
			Socio-economic survey with the focus on understanding the achieved productivity on closed areas that the communities may be utilising
Erosion	Implementation or construction of erosion control measures	Engineered structures to control water flow	Evidence in rehabilitation report that required structures are in place and functioning
		Establishment of vegetation	See Vegetation row in this table
Safety / stability	The site is safe for use by humans and animals, including in the foreseeable future	Geotechnical and hydrological studies of existing structures - outer batter slopes of tailings storage facilities, pit stability	Evidence in rehabilitation report that appropriate risk assessment has been undertaken and control measures are in place
Aquatic ecosystem	Wetland and aquatic macro invertebrate populations at crossing using appropriate biomonitoring techniques	Species and composition	Monitoring report
Vegetation	Establishment of self-sustaining vegetation population which stabilizes soils and is not invasive to the region.	Species cover and composition	Monitoring report

### 30.5 Post-rehabilitation monitoring and maintenance

The objective of the monitoring programme will be to track the recovery of the site towards the long-term post-closure land use goals, in accordance with the overall closure objectives. The monitoring programme will be designed to collect information to demonstrate that the Relinquishment criteria have been achieved. The anticipated monitoring will include:

- **Surface water:** Quality monitoring against parameters as required by the WUL. Sampled monthly for a three-year post-closure period;
- **Groundwater:** Quality monitoring of both the shallow and deep aquifers against the parameters required by the WUL. Sampled quarterly for a three year post-closure period;
- **Erosion monitoring:** This will take the form of developing a representative reference site on the disturbed footprints and undertaking visual and topographic assessments to determine erosion rate, using standard erosion monitoring techniques. This will be undertaken once a year at the end of the wet season for a three year post-closure period;
- **Vegetation establishment:** Vegetation condition will be monitored using standard field techniques to determine whether the vegetation has been established with a species composition and density similar to that of a reference analogue site established in a similar ecotype, for a three year post-closure period;
- **Bio-monitoring:** upstream and downstream of the mining activities. A long-term bio-monitoring programme will be implemented to monitor physico-chemical and biological components of the aquatic ecosystems within the mining area. Appropriate biological index will be included in order to quantify and classify the longer-term changes in biotic integrity;
- **Rehabilitation Performance Monitoring:** rehabilitation performance monitoring will be undertaken using standardized approaches. This will consist of comparing the reclaimed areas to analogue sites of pre-mining vegetation where vegetation and soil chemical and physical properties are measured; and

- Photographic records should be maintained together with findings, follow up actions and close out records as part of the AAP Environmental Management System.

Annual reports will be prepared to document the results of the monitoring during the closure and post-closure phases. These reports will provide important information required to manage the on-going closure activities, with the data and reports being used to:

- Provide recommendations for improving subsequent rehabilitation activities;
- Indicate where rehabilitation and closure activities have not been successful, requiring a potential change in design criteria;
- Provide information where care and maintenance is required during the post-closure period; and
- Indicate if relinquishment criteria have been achieved.

### **30.5.1 Continuous maintenance**

The mine will undertake continuous maintenance on infrastructure that has the potential to affect the environment. This infrastructure includes pipelines, roads and infrastructure traversing watercourses. The maintenance is a result of planned inspections on these facilities where specific requirements for maintenance on the above infrastructure is required and is conducted in line with a maintenance schedule.

## **30.6 Frequency of the submission of the performance assessment report**

The EMP performance assessment must be undertaken every year, or as required by the Minister, by an external auditor and a report must be compiled and submitted.

Operational internal environmental inspections will need to be done once a month by the mine's Environmental personnel. An internal peer audit is done at least once a year by Thungela Resources Environmental Services. This involves environmental personnel from other mines coming to audit the mine on the Environmental Management Systems (EMS) and other environmental parameters.

## **30.7 Environmental awareness plan**

### **30.7.1 Information employees of environmental risks**

Environmental conditions are included in any operational contracts, thereby making contractors aware of the potential environmental risks associated with the project and the necessity to prevent accidental spillages by the implementation of good housekeeping practices.

The following principles will apply to the Environmental Awareness Plan (safety, health and environmental (SHE) training):

- All personnel are as a minimum, undergo general SHE induction and awareness training;
- An Environmental Management Systems (EMS) coordinator has been appointed;
- The EMS coordinator will identify the SHE training requirements for all Thungela Resources personnel and contractors. The training requirements are recorded in a training needs matrix indicating particular training that must be undertaken by identified personnel and contractors. The training matrix is administered by the Environmental Co-ordinator/Superintendent;
- Development of Training Programme; and
- General Awareness Training.

### **Personnel**

All employees, current, new and contractors are to undergo induction, a part of which is environmental awareness training. At the end of this training, personnel are required to complete the awareness test and the level of awareness assessed by the Training Department. Re-testing or induction may be required.

All personnel performing tasks which can cause significant or major environmental impacts shall be competent on the basis of training, education and/or experience. This applies to, but is not limited to, supervisor level and above – i.e. operators, artisans.

## Type

Awareness training will include the potential consequences of departure from specified operating procedures as well as significant environmental impacts, actual or potential, of their work activities.

Training is appropriate to the activity of individual employees.

Monthly environmental topics are generated to raise awareness of employees on environmental issues.

## Evaluation

Evaluation of awareness and competency training are carried out through questionnaires or post-training tests conducted during training sessions and are also done through questioning of employees during audits.

### 30.7.2 Manner in which risks are handled to avoid pollution or the degradation of the environment

Prior to the commencement of construction, Thungela Resources will compile an Emergency Preparedness Response Plan (EPRP) for the proposed Elders Colliery. The EPRP provides guidance on emergency procedures and should be updated for the operational phase following detailed engineering design of the project. The operational EPRP needs to provide comprehensive and site-specific measures and information for successful response to, and management of, emergencies arising from either internal or external factors. The EPRP applies to emergencies within the Elders Colliery project area, and as such encompasses incidents affecting the facilities, infrastructure and operations. It further pertains to transportation of goods, raw material and finished products to and from the Elders Colliery mining area. The scope of the EPRP also extends to natural disasters, as well as to manmade and third-party events with potential to impact on health and safety within the mine area. It furthermore covers emergencies arising from all mine phases, namely the construction, operation, closure and post-closure.

The EPRP will be subject to annual review and updating with records being retained of key changes, and those responsible for changes. A protocol for distribution and accessibility of components of the plan will need to be developed should aspects of the plan require confidentiality, such as for security reasons.

A description of the ongoing monitoring and management measures to be implemented, to provide the early warning systems necessary to avoid environmental emergencies.

Sound environmental management is a priority for Elders Colliery. A key component of implementing strong environmental practice will be the development of an environmental management system, which includes the EPRP and Occupational Health and Safety Plan (OHSP). In the event of an environmental emergency, these plans link to each other with actions commencing in terms of the relevant individual business unit emergency preparedness plans and procedures and escalating upwards to the corporate level.

Standard operating procedures (SOPs) should be developed for the following potential risk sources: accidents involving mine vehicles resulting in human injuries, accidental leaks and chemical and/or hydrocarbon spills. These SOPs should be reviewed annually to:

- Determine their effectiveness;

- Injuries or fatalities during all mining phases;
- Fires and/or explosions due to the lack of hydrocarbon management;
- Failure of the overburden facility;
- Subsidence of land; and
- Flooding of the mine.

Training will be an important activity supporting the implementation of a management system in the form of induction training on general environmental management and job specific training such as control and clean-up of hydrocarbon spills. The objective of an environmental training program should be to develop a culture of environmental awareness, accountability, responsibility and prevention. Personnel at all levels should have sufficient knowledge and authority to proactively identify and prevent a situation that could potentially result in an environmental or safety emergency.

In addition, figures of the site layout with emergency response information for key areas will be made available to all personnel. Furthermore, a generic description of the dangers associated with being exposed to hazardous chemicals or materials will be developed as well as a description on the procedures to be implemented to help control hazardous substance releases.

Emergency response procedures will be developed for:

- Flammable and combustible materials;
- Corrosive materials;
- Oxidizing materials;
- Reactive materials;
- Biological and infectious materials; and
- Gaseous releases.

Environmental and social emergency planning and response requires the involvement of local communities, authorities and other external stakeholders in the EPRP. At present there is likely to be a very limited level of resources and capacity within the local communities and amongst local authorities in the greater project area to deal with emergency response.

### **30.8 Specific information required by the competent authority**

In terms of Section 41, Regulations 53 and 54 of the Mineral and Petroleum Resources Development Act (Act 28 of 2002), Elders Colliery is required to make financial provision for the interim and final rehabilitation activities on the site. This provision is reviewed annually for adequacy and amended to compensate for new activities and/or inflation. During the annual review, confirmation will be provided that this amount can be provided for from operating expenditure.

Elders Colliery, will provide for the closure liability either through a contribution to a Trust Fund or the purchase of a Bank Guarantee or a combination of the two methods as allowed by Regulation 527 of the MPRDA.

### 30.9 Undertaking

I Natasha Anamuthoo, Registered EAP, South Africa herewith confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and Interested and Affected parties;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.



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Signature of the EAP

DATE 5 October 2021

I Michelle Miles, Registered EAP, South Africa herewith confirm:

- The correctness of the information provided in the reports;
- The inclusion of comments and inputs from stakeholders and Interested and Affected parties;
- The inclusion of inputs and recommendations from the specialist reports where relevant; and
- The acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.



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DATE: 5 October 2021



## 31 Statement of SRK independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no prior association with Elders Colliery in regard to the mineral assets that are the subject of this Report. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the Report.

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Darryll Kilian

Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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