# ELANDSFONTEIN COLLIERY EXTENSION AND CONSOLIDATION

**MP 30/5/1/2/2/63MR**

**MP 30/5/1/2/2/314MR**

**PREPARED FOR ELANDSFONTEIN COLLIERY (PTY) LTD.**

**JUNE 2021**

## ELANDSFONTEIN COLLIERY EXTENSION AND CONSOLIDATION

## PREPARED FOR ELANDSFONTEIN COLLIERY PTY LTD

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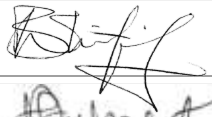
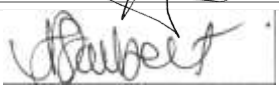
| **Reviewed:** | Brian Whitfield |  | 03/06/2021 |
| **Authorized:** | Adri Joubert |  | 07/06/2021 |

## REVISION AND AMENDMENTS

| Date | No. | Description of Revision or Amendment |
|---|---|---|
| **2021/06/07** | 0 | EIA Report for Public Review |
| | | |

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## Abbreviations and Definitions\

| aa | Description |
|---|---|
| AMD | Acid Mine Drainage |
| CBA | Critical Biodiversity Area |
| CMA | Catchment Management Agency |
| DEFF | Department of Environment, Forestry and Fisheries |
| DMRE | Department of Mineral Resources and Energy |
| DHSWS | Department of Human Settlements, Water and Sanitation |
| EAP | Environmental Assessment Practitioner |
| EIA | Environmental Impact Assessment |
| EIMS | Environmental Impact Management Services |
| ELWU | Existing Lawful Water Use |
| EMPr | Environmental Management Programme Report |
| ESA | Ecological Support Area |
| GA | General Authorisation |
| GHG | Greenhouse Gas |
| GN | Government Notice |
| GSW | Geo Soil and Water |
| HIA | Heritage Impact Assessment |
| I&AP | Interested & Affected Party |
| IBA | Important Bird Area |

| | |
|---|---|
| IWUL | Integrated Water Use License |
| LOM | Life of Mine |
| MAR | Mean Annual Runoff |
| MCM | Million Cubic Metres |
| MR | Mining Right |
| MWP | Mine Works Programme |
| MPRDA | Minerals and Petroleum Resources Development Act |
| NEMWA | National Environmental Management Waste Act |
| NEMA | National Environmental Management Act |
| NEMBA | National Environmental Management Biodiversity Act |
| NEMAQA | National Environmental Air Quality Act |
| NHRA | National Heritage Resources Act |
| NWA | National Water Act |
| OC | Opencast |
| PCD | Pollution Control Dam |
| PHRA | Provincial Heritage Resources Authority |
| PPP | Public Participation Process |
| RoM | Run of Mine |
| SAHRA | South African Heritage Resources Agency |
| SANS | South African National Standards |
| SEIR | Scoping and Environmental Impact Report |

| | |
|---|---|
| SEA | Strategic Environmental Assessment |
| SLP | Social & Labour Plan |
| SWMP | Stormwater Management Plan |
| UG | Underground |
| WMA | Water Management Area |
| WUL | Water Use Licence |

# EXECUTIVE SUMMARY

Elandsfontein Colliery (Pty) Ltd (hereafter referred to as the applicant) has appointed Geo Soil and Water cc (GSW) as the Environmental Assessment Practitioner (EAP) to assist with undertaking the necessary Environmental Authorisation and amendment processes for Elandsfontein Colliery.

The Elandsfontein Colliery comprises of 2 distinct mining rights (MR314 and MR63). The applicant plans to consolidate the two mining right areas into a single mining right with associated consolidated EMPr. In addition, the applicant wishes to expand their existing mining operations to include additional mineral resource areas (i.e.: new opencast & underground areas within the consolidated mining right boundary).

The proposed project includes inter alia the following application processes with associated activities:

- New Integrated Environmental Authorisation and Waste Management Licence (Scoping and Environmental Impact Report (S&EIR));
- Renewal of Integrated Water Use Licence (IWUL) with new water uses applied for;
- Section 102 consolidation of mining rights as well as consolidation of EMPr's into one holistic EMPr.

The proposed new mining operations will necessitate additional infrastructure including new Pollution Control Dams (PCD), internal haul roads, stockpiles, etc.

An application for the amendment to the existing Mine Works Programme (MWP), Social and Labour Plan (SLP) and EMPr, through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is therefore required to support an application for environmental authorisation (EA) / waste management licence (WML) as applicable. A new (or amendment to the existing) water use licence application (WULA) for the relevant new water use triggers associated with the proposed project is also being undertaken.

# PURPOSE OF THE EIA REPORT

The Scoping Phase of the EIA process identified potential issues associated with the proposed project, and defined the extent of the studies required for the EIA Phase. The Scoping Phase also identified potentially sensitive areas within the study site.

The EIA Phase addresses those identified potential environmental impacts and benefits (direct, indirect, and cumulative impacts) associated with all phases of the project including design, construction, operation, decommissioning and closure. The EIA Phase recommends appropriate mitigation measures for potentially significant environmental impacts.

The EIA Phase aimed to achieve the following:

- Provide an overall description and assessment of the social and biophysical environments affected by the proposed alternatives put forward as part of the project
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed project.
- Comparatively assess identified feasible alternatives put forward as part of the project.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&AP are afforded the opportunity to participate, and that their issues and concerns are recorded.

# PUBLIC PARTICIPATION PROCESS

The Public Participation Process (PPP) for the proposed project has been undertaken in accordance with the requirements of the MPRDA, and NEMA in line with the principles of Integrated Environmental Management (IEM). The PPP commenced on the 20th of July 2018 with an initial notification and call to register for a minimum period of 30 days. This EIA report was made available for public review and comment for a period of 30 days in line with the legislative timeframes (13th July 2020 to the 14th August 2020). The comments received from I&AP's to date have been captured in a Public Participation summary table included in this report and appended in detail in the Public Participation Report.

This EIA Report, including an EMPr, has been compiled and presented for public comment as part of this EIA process during which time further stakeholder engagement will take place. The review period for the EIA report is from 25 June 2021 to 26 July 2021.

A Public Participation Plan (PP Plan) was prepared in accordance with the requirements of the National Environmental Management Act (Act 107 of 1998-NEMA), and the Directions issued by the Department of Environment, Forestry and Fisheries (GN 650 of 5 June 2020) in terms of the Disaster Management Act (Act 57 of 2002) in order to present proposed mechanisms to be undertaken for the remainder of the of the public participation process (Scoping and EIA Phase). The public participation plan was approved by the Department of Mineral Resources and Energy prior to the commencement of the Scoping Phase public review period.

# MAIN FINDINGS FROM IMPACT ASSESSMENT

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the negative impacts caused by the mine, it must be considered that there are positive impacts as well, mostly based on the economic contributions, skills development and SLP initiatives. Based on the nature and extent of the proposed project and the predicted impacts as a result of the construction, operation, decommissioning and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed project can be mitigated to an acceptable level and the project should be authorized. The main conclusions from each of the specialist studies are presented below.

**Terrestrial Ecology:** The final significance rating for the opencast has been scored a "Medium negative" prior to mitigation, implementation of mitigations, resulted in a "Low negative" significance. The significance rating for underground operations was only rated a "High" negative" due to the consideration of possible subsidence during the operational phase, and after the decommissioning and rehabilitation phases, however due to the nature of subsidence it remains a stochastic event. The final significance rating for the surface infrastructure, stockpiles and their respective associated activities. has been scored a "Medium negative" prior to mitigation, implementation of mitigations, resulted in a "Low negative". It is recommended that the proposed opencast mining areas (Seam 2) be amended to adhere to the delineated high and medium sensitivity areas and that the underground mining areas (Seam 1) be moved to stay outside of the delineated wetlands to ensure avoidance. No fatal flaws were identified for the project should the proposed mitigation measures be implemented. It is the opinion of the specialist that the Elandsfontein project, may be favourably considered. All recommendations and mitigation measures prescribed herein must be considered by the issuing authority.

**Aquatic Ecology and Wetlands:** It is the specialist's recommendation that the project does not present any fatal flaws. In the event that underground mining is authorised, it is recommended that the subsidence assessment prescribe measures be implemented to avoid subsidence of the mined-out areas below the wetlands and buffer zones. In the event that opencast mining of Seam 2 is authorised, it is recommended that the extent of the opencast area be amended to adhere to the buffer zone. Due to the expected loss and degradation of rivers and wetlands as a result of the project , it is further recommended that on-site rehabilitation of the area be implemented to allow for some level of wetland compensation, this should be informed by an offset strategy. If all recommendations made are met, it is the specialist's opinion that no fatal flaws exist and that the proposed activities can proceed as long as no-go areas are avoided by opencast mining.

A buffer zone of 106 m in size has been calculated for all the wetlands on-site due to the high level of threats associated with opencast mining. In certain areas approval has been obtained from DHSWS for reduction of the wetland buffer to 42m. No buffer zones are required for the underground mining activities due to the fact that very little to no surface impacts are associated with underground mining activities as well as the fact that the opencast mining's calculated buffer zone will conserve the wetland for any mining activity.

**Surface Water:** The Elandsfontein mining operations occur on both sides of Grootspruit tributary along most of its length. The upper reaches are dammed with pollution control and water supply dams. The natural tributary has a poorly defined water course but is generally heavily reeded. The lower reaches have been modified and the stream is canalised for roughly half its length. The proposed opencast and underground operation will create significant impacts if unmitigated. Mitigation will reduce these impacts significantly. Post closure mine workings decant has the potential to create high long-term impacts on the Grootspruit and its tributary. If this decant water is treated and released, the impacts are likely to become positive.

**Groundwater:** The local groundwater quality is indicative of an impacted groundwater system and suggest coal mine pollution and acid mine drainage (AMD) conditions present. The latter is characterised by a low pH environment increasing the solubility and concentrations of metals, usually aluminium (Al), iron (Fe) and manganese (Mn).

The overall water quality of the upstream surface water samples is poor due to elevated levels of sulphate as well as heavy metals (Fe, Al and Mn) i.e. coal mine pollution indicators. The downstream water quality is unacceptable due to highly elevated levels of sulphate as well as heavy metals (Fe, Al and Mn) causing high salt loads. There is a definite deterioration of water quality evident in a downstream direction and suggest contaminated water ingress from potentially mine decant and interflow zones or seepage from mine discard dumps.

Model simulations for the proposed underground development suggest the average underground void dewatering is approximately 1440 $m^3$ /d with a maximum underground water ingress of approximately 2.0303 $m^3$/d for the duration of the simulation period. It is expected that the groundwater drawdown will range from 4.0m to ~ 30.0m below the static water level (mbsl) and the groundwater capture zone i.e. zone of influence extent will cover an estimated footprint of 643.8ha. It should be noted that the simulated impact zone extends slightly beyond the eastern and south-eastern perimeters of the mining right area, however, falls mainly within the mining properties. It is not expected that the underground operations will have a significant effect on the baseflow discharge to local drainages.

A mine post-closure scenario was simulated wherein hydraulic head recovery within the proposed opencast areas was evaluated. It is calculated that the backfilled opencast pit flooding and associated decant periods ranges between~5years to >20years depending on the geometry of the backfilled pit. Expected decant volumes for the backfilled opencast pits varies from 15.0$m^3$ /d to > 40.0$m^3$/d depending on the pit effective infiltration volumes. The combined decant volume is approximately 90.0$m^3$ /d. It should be noted that there are various decant points potentially discharging into the wetland drainage system traversing the site. The capture and treatment of this decant will be investigated.

A mine post-closure scenario was simulated wherein hydraulic head recovery within the existing underground voids as well proposed mining areas was evaluated. Simulated average groundwater ingress for the LOM underground operation was combined with the expected groundwater recharge reporting to the underground void and from these volumes it is estimated that under average rainfall conditions, the underground will be flooded in approximately 35 to 40 years after ceasing of mining activities. The proposed depth and geometry of the underground operations allows for the majority of the footprint to be flooded with a low risk of decant occurring.

Expected decant volumes for the underground voids are relatively low due to the presence of confining shale and mudstone layers restricting the downward filtration of rainwater recharge into the underground mine void(s) and ranges between 0.85$m^3$ /d to ~17$m^3$/d with a combined volume of approximately 50.0$m^3$/d.

A 50-year post-closure scenario was simulated and covers a total area of approximately 875.0ha, reaching a maximum distance of ~600.0 to 700.0m in a general south-western direction towards the lower laying drainage and wetland systems. The simulation indicates that, although the pollution plume extends beyond the mining properties, no neighbouring boreholes will potentially be impacted post-closure while the unknown tributary of the Grootspuit and associated wetland might potentially be impacted on.

A 100-year post-closure scenario was simulated and covers a total area of approximately 1030.0ha, reaching a maximum distance of 1100.0 to 1300.0m in a general south-western direction. The simulation indicates that, although the pollution plume extends beyond the mining properties, no neighbouring boreholes will potentially be impacted post-closure while the unknown tributary of the Grootspuit and associated wetland might potentially be impacted on. It is evident that sulphate concentrations for all monitoring boreholes stabilises to a maximum sulphate contribution load of between 1600.0 to 1800.0mg/l, which is above the SANS threshold.

Various alternative management and mitigation scenarios were simulated to evaluate the remedial options available. The preferred mitigation scenario entails establishment of scavenger boreholes down-gradient of waste facilities and backfilled opencasts in combination with rehabilitation of the southeastern discard dump. The combination of the mitigation effect of the negative groundwater gradient created as well as the reduction in waste footprints due to removal and rehabilitation of the existing southeastern discard damp, reduces the pollution plume footprint by >45.0% to ~607.0ha.

The preferred mitigation scenario entails implementation of down-gradient seepage capturing boreholes in combination with rehabilitation of the discard dump.

During the operational phase the environmental significance rating of groundwater quantity impacts on downgradient receptors are rated as medium negative without implementation of remedial measure and low negative with implementation of proposed mitigation measures.

Groundwater quality impacts from the discard dump, coal stockpile areas, PCD's and related waste facilities are rated as medium negative without implementation of remedial measures and medium/low negative with implementation of mitigation measures. Post closure phase impacts resulting from seepage and leachate from mine waste facilities on down-gradient receptors are rated as medium negative without the implementation of remedial measures and low negative with implementation of mitigation measures.

Groundwater modelling shows no significant advantage to disposal at surface disposal facility as opposed to in pit disposal ,therefore in pit disposal is recommended as the preferred option to deal with discard.

**Soil:** The planning, construction, operational, decommissioning and rehabilitation/closure phases have all been assessed during the impact assessment. For these phases, opencast and underground mining was considered respectively. The results from the impact assessment suggest that no final significance ratings higher than "Low" are expected during the planning, construction, decommissioning and

rehabilitation/closure phases. As for the operational phase, the opencast mining activities and underground mining activities have been scored "High" and "Medium" final significance ratings respectively. It is the specialist's opinion that all proposed activities may proceed as have been planned given the adherence to all recommendations and prescribed mitigation measures.

**Heritage and Fossils:** The HIA identified various heritage resources within the study area of which the burial grounds and graves and the palaeontology could be rated as having a High to Very High heritage significance and would require mitigation measures before the project can commence. Three sites comprising historical/recent structures were identified which could be rated as having a Low heritage significance and would not require mitigation measures.

Eight burial grounds are present on the property (EFN001, EFN002, EFN003, EFN004, EFN007, EFN008, EFN010, EFN011). All of these sites are located inside the two proposed mining rights areas, and three (EFN004, EFN007, EFN011) are situated within or just outside the footprints for the planned UG or OC mining activities. Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating.

The pre-mitigation Environmental Risk impact significance is rated as negative High, but with the implementation of the required mitigation measures the post-mitigation ER impact can be reduced to Medium. The overall Environmental significance will be Medium negative.

If any of the eight burial grounds will be impacted directly by the planned mining activities, they. must be relocated after completion of a detailed grave relocation process, that includes a thorough stakeholder engagement component, adhering to the requirements of s36 of the NHRA and its regulations as well as the National Health Act and its regulation. Any graves or burial grounds that will not be impacted must be avoided and retained in situ with a buffer zone of 100m.

An overall medium palaeontological sensitivity is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Elandsfontein mining upgrade will be of a medium significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources. The combined considered opinion of the heritage specialists is that the potential impacts on identified heritage resources could be mitigated sufficiently to allow the project to continue.

**Air Quality:** The conclusion from the impact assessment is that cumulative impacts due to the planned mining operations would have a "Medium negative" significance on the surrounding environment and human health during the operational phase, even after mitigation is applied, due to the increased mining and production rates and the close proximity of AQSR (Clewer) to the planned mining operations. The proposed Project operations should not result in significant ground level concentrations or dustfall levels at the nearby receptors provided the design mitigation measures are applied effectively. From an air quality perspective, the proposed project can be authorised permitted the recommended mitigation measures are applied.

**Traffic:** The traffic and transport implications of the combining of separate mining rights into a single mining right are considered minimal and easily mitigated by the traffic engineering specialist. It is recommended that the applicant's request be approved from a traffic and transportation perspective on condition that the proposed mitigation measures are implemented.

**Subsidence:** If the recommended guidelines are applied and mining is not conducted in areas in which sinkhole formation could be expected (based on the rock engineering investigations which would have to be conducted in more detail for each shallow mining area) none of the future underground mining areas should / would be considered high risk.

**Blasting:** The evaluation of effects yielded by blasting operations was evaluated over an area as wide as 3500 m from the proposed mining areas. The range of structures observed includes typical roads (tar and gravel), low income housing, corrugated iron structures, brick and mortar houses, boreholes and heritage sites.

The location of structures around the Pit areas is such that the charge evaluated showed possible influences due to ground vibration. The closest structures observed are the road, power lines/pylons, railway line, heritage sites, houses, sewer works, boreholes, industrial structures and buildings/structures. Ground vibrations predicted for all pit areas ranged between low and very high. The expected levels of ground vibration for some of these structures are high and will require specific mitigations in the way of adjusting charge mass per delay to reduce the levels of ground vibration. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage.

Air blast predicted showed the same concerns for opencast blasting. High air blast levels may contribute to effects such as rattling of roofs, door or windows with limited points that are expected to be damaging and others could lead to complaints. The current accepted limit on air blast is 134 dBL. Damages are only expected to occur at levels greater than 134dB. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pits are located such that "free blasting" – meaning no controls on blast preparation – will not be possible.

On charges considered, it is expected that air blast will be greater than 134 dB at a distance of 110 m and closer to pit boundary. The structures inside the Pit areas are expected to be relocated and will then not be of concern as it is currently inside the pit area. Infrastructure at the pit areas such as roads, heritage sites, power lines/pylons and Hydrocencus boreholes are present but air blast does not have any influence on these installations.

Fly rock remains a concern for blasting operations. Based on the drilling and blasting parameters,the value for a possible fly rock range with a safety factor of 2 was calculated to be 447 m. The absolute minimum unsafe zone is then the 447 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded. Best practices should be implemented at all times. The occurrence of fly rock can be mitigated but the possibility of the occurrence thereof can never be eliminated. There are boreholes that are in proximity of the blasting areas and could be potentially affected by blasting.

Specific actions will be required for the pit areas such as Mine Health and Safety Act requirements when blasting is done within 500 m from structures and mining with 100 m for structures. The Road, Railway Line, Power Lines/Pylons, Houses, Boreholes, Heritage Sites and buildings/structures falls within the 500 m range from the various pit areas.

The pit areas are located such that specific concerns were identified and addressed in the blast impact report. The greatest concern is area south of Clever. Opencast operations will be significantly restricted, and it may lead to areas not minable. This is mainly due to the location of this area closer than 100 m to the Clever township and the restrictions with regards to ground vibration, air blast and fly rock.

Calculated minimum safe distance is 447m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance. There is no reason to believe that this operation cannot continue if attention is given to the recommendations made.

**Impact Statement:** Overall, the findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the understanding of the significance level of potential environmental

impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the negative impacts caused by the mine, it must be considered that there are positive impacts as well, mostly based on the economic contributions, skills development and SLP initiatives. Based on the nature and extent of the proposed project and the predicted impacts as a result of the construction, operation, decommissioning and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed project can be mitigated to an acceptable level and the project should be authorized.

# ENVIRONMENTAL IMPACT ASSESSMENT

## 1 INTRODUCTION

Elandsfontein Colliery Pty Ltd (hereafter referred to as the applicant) has appointed Geo Soil and Water cc (GSW) as the Environmental Assessment Practitioner (EAP) to assist with undertaking the necessary Environmental Authorisation and amendment processes for Elandsfontein Colliery.

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The proposed project includes inter alia the following application processes with associated activities:

- New Integrated Environmental Authorisation and Waste Management Licence (Scoping and Environmental Impact Report (S&EIR));
- New Integrated Water Use Licence (IWUL) with renewal of existing IWUL; and
- Section 102 consolidation of mining rights as well as consolidation of EMPr's into one holistic EMPr.

The proposed new mining operations will necessitate additional infrastructure establishment including Pollution Control Dams (PCD), internal haul roads, stockpiles, etc. An application for the amendment to the existing Mine Works Programme (MWP), Social and Labour Plan (SLP) and EMPr, through an MPRDA Section 102 Application, and a full Environmental Impact Assessment (EIA) for the proposed new mining area is therefore required to support an application for environmental authorisation (EA) / waste management licence (WML) as applicable. A new (or amendment to the existing) water use licence application (WULA) for the relevant water use triggers associated with the proposed project will also be undertaken.

The proposed project is located on a portion of the remaining extent of portion 8; remaining extent of portion 1; a portion of the remaining extent of portion 6; portion 44; portion 14 and the remaining extent of portion 7 of the Farm Elandsfontein 309 JS, located in Emalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province. The site is ~4km south of Kwa-Guqa and ~16k west of Emalahleni. The centre point of the site is 25°53'05.01"S and 29°05'36.57"E.

The current land use of the proposed mine expansion area consists of arable (mostly maize) and grazing land. Several roads and power lines run through the area. The region has been largely affected by historical mining. Agriculture is the predominant land use in the areas surrounding project area. The main crop is dryland cultivation of maize with some pasture. Subsistence vegetable farming and rearing of chickens and livestock is associated with settlements near the mine.

In terms of the mineral resource and further to the need and motivation of the project, the quality of the coal dictates that the coal will be used in the power generation sector whilst export quality coal also occurs. Elandsfontein will beneficiate the ROM coal from the underground No. 1 resources to produce coal products with the split between the products being approximately 60 % for the export market and 40% for the domestic market. The underground coal resources from the No. 1 Seam will be washed and the primary product will be for the export market. The secondary product will be blended with the coal resources from the No. 2 Seams from the opencast pit that will be crushed and screened and sold as a domestic product to Eskom. Up to now the No. 1 Seam, No. 2 Seam and the No. 4 Seam have been the main target of exploitation. The planned future mining is to be based on the remaining No. 1 Seam (underground operation) and the No. 2 Seam (open-cast operation).

## 1.1 REPORT STRUCTURE

This report has been compiled in accordance with the 2014 NEMA EIA Regulations (as amended). A summary of the report structure, and the specific sections that correspond to the applicable regulations, is provided in

**Table 1** below.

**Table 1:** Report Structure.

| Environmental Regulation | Description – NEMA Regulation 982 (2014) as amended | Section in Report |
|---|---|---|
| **Appendix 3(a):** | Details of –<br>i. The EAP who prepared the report; and<br>ii. The expertise of the EAP, including a curriculum vitae; | Section 1.2 |
| **Appendix 3(b):** | The location of the activity, including:<br>(i) the 21-digit Surveyor General code of each cadastral land parcel;<br>(ii) where available, the physical address and farm name;<br>(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties on which the activity is to be undertaken; | Section 2 |
| **Appendix 3(c):** | A plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is -<br>(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;<br>(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken; | Figure 9<br>Figure 10 |
| **Appendix 3(d):** | A description of the scope of the proposed activity, including<br>(i) all listed and specified activities triggered and being applied for; and<br>(ii) a description of the associated structures and infrastructure related to the development; | Section 4.1.2 |
| **Appendix 3(e):** | A description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context; | Section 4 |
| **Appendix 3(f):** | A motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location; | Section 5 |
| **Appendix 3(g):** | A motivation for the preferred development footprint within the approved site; | Section 6.1 |
| **Appendix 3(h):** | A full description of the process followed to reach the proposed development footprint within the approved site, including:<br>(i) details of the development footprint alternatives considered;<br>(ii) details of the public participation process undertaken in terms of regulation 41 of the | (i) Section 6.1<br>(ii) Section 7<br>(iii) Section 7<br>(iv) Section 8 |

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| | Regulations, including copies of the supporting documents and inputs;<br>(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;<br>(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;<br>(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts<br>(aa) can be reversed;<br>(bb) may cause irreplaceable loss of resources; and<br>(cc) can be avoided, managed or mitigated;<br>(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;<br>vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;<br>(viii) the possible mitigation measures that could be applied and level of residual risk;<br>(ix) if no alternative development locations for the activity were investigated, the motivation for not considering such; and<br>(x) a concluding statement indicating the preferred alternative development location within the approved site; | (v) Section 9<br>(vi) Section 9.1<br>(vii) Section 9.3<br>(viii) Section 9.3<br>(ix) Section 6.1<br>(x) Section 12.2 |
| **Appendix 3(i)** | A full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred location through the life of the activity, including<br>(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and<br>(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures; | Section 9 |
| **Appendix 3(j)** | An assessment of each identified potentially significant impact and risk, including<br>(i) cumulative impacts;<br>(ii) the nature, significance and consequences of the impact and risk;<br>(iii) the extent and duration of the impact and risk;<br>(iv) the probability of the impact and risk occurring;<br>(v) the degree to which the impact and risk can be reversed;<br>(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and<br>(vii) the degree to which the impact and risk can be mitigated; | Section 9 |

| | | |
|---|---|---|
| **Appendix 3(k):** | Where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report; | Section 12 |
| **Appendix 3(l):** | An environmental impact statement which contains<br>(i) a summary of the key findings of the environmental impact assessment:<br>(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; and<br>(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives; | (i) Section 12.3<br>(ii) Figure 39<br>(iii) Section 12.1 |
| **Appendix 3(m)** | Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation; | Section 12.4 |
| **Appendix 3(n)** | The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment; | Section 12.2 |
| **Appendix 3(o)** | Any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation; | Section 12.4 |
| **Appendix 3(p)** | Description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed; | Section 13 |
| **Appendix 3(q)** | A reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation; | Section 12.3 |
| **Appendix 3(r)** | Where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised; | N/A |
| **Appendix 3(s)** | An undertaking under oath or affirmation by the EAP in relation to:<br>(i) the correctness of the information provided in the reports;<br>(ii) the inclusion of comments and inputs from stakeholders and I&APs;<br>(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and<br>(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties; | Section 14 |
| **Appendix 3(t)** | where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts; | Section 10<br>Refer to Closure and Rehab Plan included as part of EMPr in **Appendix E.** |
| **Appendix 3(u)** | An indication of any deviation from the approved scoping report, including the plan of study, including | N/A |

| | | |
|---|---|---|
| | (i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and<br>(ii) a motivation for the deviation; | |
| **Appendix 3(v)** | Any specific information that may be required by the competent authority; and | N/A |
| **Appendix 3(w)** | Any other matters required in terms of section 24(4)(a) and (b) of the Act | N/A |

## 1.2 DETAILS OF THE EAP

GSW was founded in 2008 and has steadily grown to be a significant player in the Environmental Management Consulting industry in South Africa. GSW and its resources have been involved with many EIA projects and offers access to a broad body of knowledge and experience with the various Integrated Environmental Management tools (EIA; EMPr; EMP; SEA; EMF; etc.). GSW is responsible for project management and the compilation of the relevant reports for the Elandsfontein project. Details of the EAP are provided below:

- EAP Name: Adri Joubert
- SACNASP Registration Number: 400058/01
- Contact no: 082 926 8460
- Email address: adri@geosoilwater.co.za

## 1.3 EXPERTISE OF THE EAP

### 1.3.1 QUALIFICATIONS OF THE EAP

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

1) Objective and independent;
2) Has expertise in conducting EIA's;
3) Comply with the NEMA, the Regulations and all other applicable legislation;
4) Takes into account all relevant factors relating to the application; and
5) Provides full disclosure to the applicant and the relevant environmental authority.

The declaration of independence of the EAP and the Curriculum Vitae (indicating the experience with environmental impact assessments and relevant application processes) are attached as **Appendix A.**

### 1.3.2 SUMMARY OF THE EAP'S PAST EXPERIENCE

GSW is a private and independent environmental management-consulting firm that was founded in 2008. GSW has significant experience in conducting EIAs, including many EIA's for mines and mining related projects. Please refer to the GSW website (www.geosoilwater.co.za) for examples.

Adri Joubert is the sole owner and project manager at GSW and has been involved in numerous significant projects over the past 20 years. She has extensive experience in Project Management as well as with undertaking Environmental Impact Assessments and Environmental Auditing. Adri has acted as Project Manager and Quality Reviewer for several mining related projects.

### 1.3.3 SPECIALIST CONSULTANTS

Specialist consultants will provide discipline specific input during the EIA phase and the following specialist disciplines are proposed at this stage:

- Air Quality;
- Terrestrial and Aquatic Biodiversity;
- Wetlands;
- Heritage and Palaeontology;
- Hydrogeology;
- Blasting and Vibration;
- Hydropedology;
- Traffic Study;
- Hydrology; and
- Soils.

In line with NEMA GNR 982 Appendix 6, the details of the relevant specialists, a summary of their expertise as well as their declarations of independence are included in their respective reports in Appendix D.

# 2 DESCRIPTION OF THE PROPERTY

Elandsfontein Colliery is situated in the Emalahleni Local Municipality, immediately west of the village of Clewer. **Table 2** provides a summary of the properties that fall within the mining right areas and those affected by this application.

**Table 2:** Property description

| Property Info | Details | | | | | |
|---|---|---|---|---|---|---|
| **Farm Name** | Mining Right holder<br>Elandsfontein Colliery (Pty) Ltd. is the holder of a Mining Right in respect of certain properties of the farm Elandsfontein 309 JS. | | | | | |
| **Application Area (Ha)** | The mining footprint, existing and future infrastructure cover an area of ~830 hectares (ha) (GIS). | | | | | |
| **Magisterial District** | The Elandsfontein Colliery is situated in the Emalahleni Local Municipality, situated in the Nkangala District Municipality. | | | | | |
| **Distance and direction from nearest town(s)** | The Elandsfontein Colliery is situated west and directly adjacent to Clewer and ~5 km south of Kwa-Guqa. | | | | | |
| **21-digit Surveyor General Code for each Portion** | Properties within approved Mining Right areas | | | Properties affected by this Application | | |
| | Farm Name: | Portion: | SG Codes: | Farm Name: | Portion: | SG Codes: |
| | Elandsfontein 309 JS | 1 | T0JS00000000030900001 | Elandsfontein 309 JS | 1 | T0JS00000000030900001 |
| | Elandsfontein 309 JS | 6 | T0JS00000000030900006 | Elandsfontein 309 JS | 7 | T0JS00000000030900007 |
| | Elandsfontein 309 JS | 7 | T0JS00000000030900007 | Elandsfontein 309 JS | 8 | T0JS00000000030900008 |
| | Elandsfontein 309 JS | 8 | T0JS00000000030900008 | Elandsfontein 309 JS | 14 | T0JS00000000030900014 |
| | Elandsfontein 309 JS | 14 | T0JS00000000030900014 | Elandsfontein 309 JS | 44 | T0JS00000000030900044 |
| | Elandsfontein 309 JS | 44 | T0JS00000000030900044 | | | |

## 2.1 LOCALITY MAP

**Figure 1** below illustrates the existing NEMA/WUL approved mining areas in relation to the approved mining right area as well as the proposed future mining areas which form the basis of this integrated EIA application.

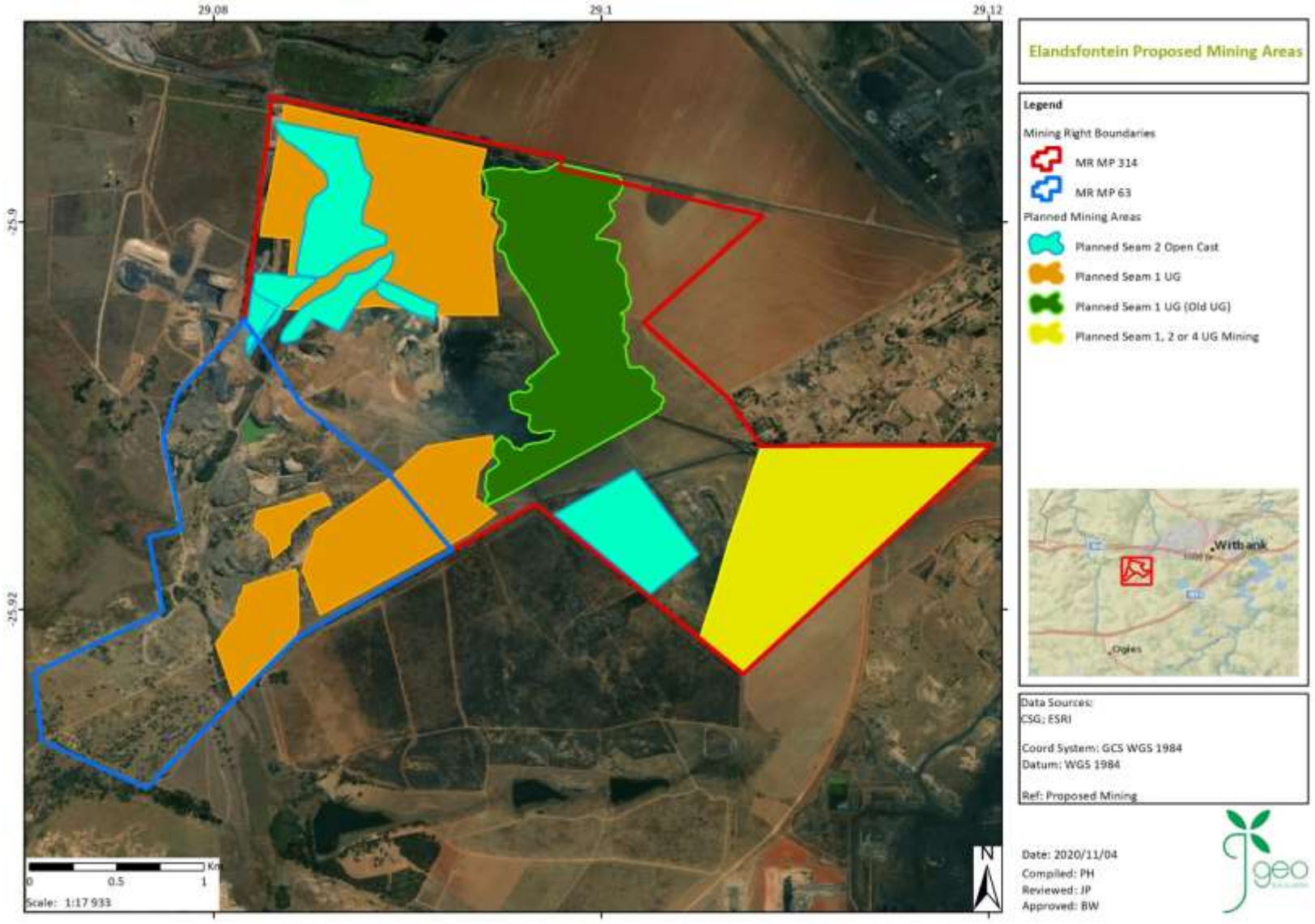



**Figure 1:** Locality map of Elandsfontein Colliery and relevant existing and proposed future mining areas

# 3 DESCRIPTION AND SCOPE OF THE PROPOSED ACTIVITY

This section provides a detailed description of the current and proposed activities on the Elandsfontein Colliery. Much of the key information presented in this Section was obtained from the latest Mine Works Programme (MWP) for Elandsfontein Colliery as well as updated layout information provided in August 2020. The aim of the project description is to indicate the activities that are currently being undertaken at Elandsfontein as well as the proposed future activities and amendments that are being applied for in this application. Furthermore, the detailed mine/project description is designed to facilitate the understanding of the project related activities which result in the impacts identified and assessed, and for which management measures have been proposed. It is the intention of this report to provide the necessary information regarding the proposed extension of the mining areas (opencast and underground) as well as to address the proposed amendments to certain existing conditions contained in the EA/EMPr/WUL.

## 3.1 MINING OPERATIONS OVERVIEW

Elandsfontein Colliery is an existing mine with opencast and underground sections. Elandsfontein Colliery holds two mining rights, namely MP 314 MR (~593 ha) and MP 63 MR (~237 ha). It produces coal for the local and the export market, at a rate of ~500 000 tons/annum. Coal has been produced historically from the No. 1 Seam (underground bord and pillar operation) and an opencast operation on the No. 4 Seam and on the No. 2 Seam.

The roll over strip mining method is utilised to extract coal from the shallower No.2 coal seam. The existing opencast operations have an approximate extent of 257 ha (some of this area has already been mined and other areas are currently being mined in accordance with the previous approved mine plan) while the applicant wishes to authorise an additional 69.47 ha of opencast mining. Deeper coal will be extracted by underground bord and pillar mining using decline shafts to access the No. 1 coal seam. The historical underground footprint covers an area of approximately 190 ha, while Elandsfontein Colliery wishes to authorise an additional 378 ha of underground mining and 69.47 ha of opencast mining. Associated infrastructure consists of a discard dump, coal RoM stockpiles, overburden stockpiles, pollution control dams (PCD) and slurry dam.

Elandsfontein Colliery is planning to add additional opencast and underground mining areas within the existing mining right areas to extend the life-of-mine (LoM). As such a MPRDA S102 amendment process is being undertaken by the mine, supported by the integrated EIA/WML and WULA applications. The EIA process will result in a consolidation of the numerous authorisation processes that have been undertaken to date to produce a single overarching EMPr for holistic management of the Colliery going forward. Elandsfontein Colliery will be applying for the relevant approvals to cover their extended LoM which will include future opencast and underground mining operations and associated infrastructure. Various amendments to the existing EA/EMP as well as IWUL will also be applied for to align the specific conditions with the current status of the mine as well as to provide more clarity on certain conditions.

**Figure 2** indicates the typical opencast mining sequence and can be summarized as initial topsoil removal with subsequent removal of the overburden which will then be stockpiled behind the mining area to ensure it can be replaced back in the initial box cut. The physical mining of the coal seam follows, which is then placed into trucks to be taken to the processing facility. From here discard coal and rock will be extracted and replaced in the bottom of the opencast pit (northern discard area), while the product will be taken to the weighbridge via trucks and then removed off site. The overburden is replaced back into the pit as mining progresses leaving a minimum area open at a single time. The topsoil which was stripped and stockpiled separately before mining commenced is then replaced and rehabilitated to ensure the environment can be restored.

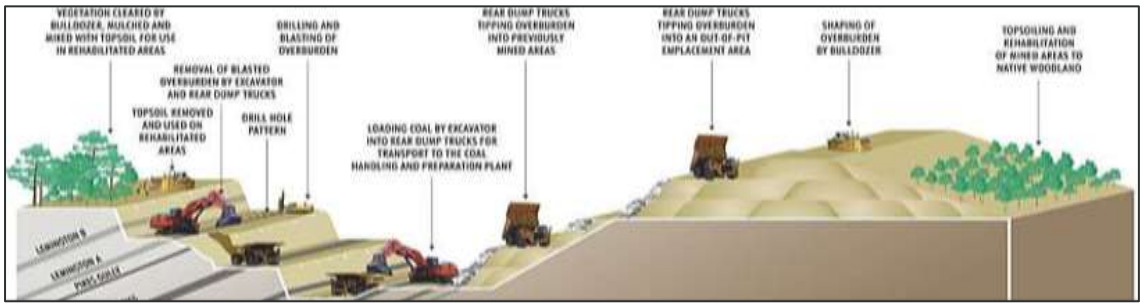



**Figure 2:** Typical coal surface mining opencast sequence indicating rollover backfill rehabilitation methodology.

The following rights, authorisations and approvals are currently in place and have been considered in the compilation of the report:

- Mining Right 63 MR renewal, granted to Elandsfontein Colliery (Pty) Ltd, in terms of Section 24 (3) of the MPRDA on 6 August 2019 which covers the following portions of the farm Elandsfontein 309 JS: Portion of the RE of Portion 6, Portion of the RE of Portion 8 and RE of Portion 1.
- Mining Right 314 MR renewal, granted to Elandsfontein Colliery (Pty) Ltd, in terms of Section 24 (3) of the MPRDA on 6 August 2019 which covering the following portions of the farm Elandsfontein 309 JS: RE of Portion 7, Portion of the RE of Portion 8, Portion 44 and Portion 14;
- An amended EMPr dated August 2017;
- Approved IWUL, File No. 16/2/7/B100/C11 granted on 20 October 2015 for various S21 (g), (c) and (i) which covers Portions 1, 7, 8 and 14 of Elandsfontein 309 JS (amended 23 July 2019).

The existing approved surface infrastructure at Elandsfontein Colliery consists of the following:

- Opencast pits;
- Underground mining areas;
- Stockpiles (hard/ soft overburden, topsoil, product, and discard);
- Offices;
- Beneficiation Plant area (crushing and screening);
- Contractors yard;
- Weighbridge;
- Access and haul roads;
- Security point and fencing;
- Pumps and sumps;
- Clean water trenches;
- Dirty water trenches;
- 3 PCD's; and
- Storm water control trenches.

Existing surface infrastructure is shown in **Figure 3**.

## 3.2 GENERAL INFRASTRUCTURE

The required infrastructure for the opencast mining at Elandsfontein Colliery is in place. For the underground mining operations existing shafts will be utilised, and where the existing shafts are not adequate new shafts will be constructed. The minimum infrastructure required are offices and workshops for the machinery and these are in place. A beneficiation plant is in operation and haul roads exists. Pumping and drainage management, plans and layouts are in operation. Access to the underground for the No. 1 Seam into Resource Block D and E will be gained from a decline to be developed from the final highwall of the opencast in Resource Block G. Access to the underground for the No. 1 Seam into Resource Block B and C will be gained from the old underground Hayford Shaft. Access to the underground for the No. 1 Seam in Resource Block A will be gained from the existing shaft and underground workings. Access to the underground for the No. 1 Upper Seam in Resource Block A will be gained from the existing No. 1 Seam workings by means of an inclined access to the No. 1 Upper Seam reserves.

## 3.3 HAZARDOUS GOODS STORAGE

Existing diesel storage represents the largest volume of hazardous material on site and it is adequately bunded according to regulatory requirements. Explosives are currently delivered as and when required from offsite locations. Oils and other lubricants and/or chemicals are also stored in approved bunded areas for use in the maintenance of plant and machinery. The relevant Health and Safety Standards for the handling and storage of these goods will be strictly adhered to. Average diesel consumption for mine is 4 000 L/ day (mining operation and wash plant). The storage facility consists of two 23 000 L storage tanks. Total storage capacity is 46 000 L.

No authorisation is required for hazardous industrial waste as the volumes on site is maintained at less than 35 $m^3$. This is a relatively small waste site and the mine has appointed a waste removal contractor to remove this waste on a regular basis.

## 3.4 HAUL ROADS

An approved haul road network is in place. No new planned haul road network is required as access to new mining areas is already in place. Upgrades to existing roads may be required.

## 3.5 SITE ACCESS AND CONTROL

The Elandsfontein Colliery can be accessed from the N4 National Road via the secondary provincial road (R547) through Clewer. All visitors to the mine are required to sign in at the security checkpoint at the mine's offices.

## 3.6 CURRENT APPROVED MINING OPERATIONS AND PITS

The current approved operations are described below and represented spatially in **Figure 3** (as per the 2017 Digby Wells EMPr).

- Historic opencast: There is an old opencast area on MR63 that has been rehabilitated previously and current drilling and test pits have been created there. Some historic opencast mining has also taken place in the northern sections of MR314 (Opencast Pit 2).
- Opencast Pit 1: This is where mining of the No. 2 seam and No. 1 seam is currently taking place.
- Opencast Pit 3: This is an approved mining area for Pit 3 and where an excavation (box cut) has been dug within the 100m buffer zone of the wetland. An approved haul road has been constructed to connect the Pit 1 and Pit 3 with the mining section to the north.

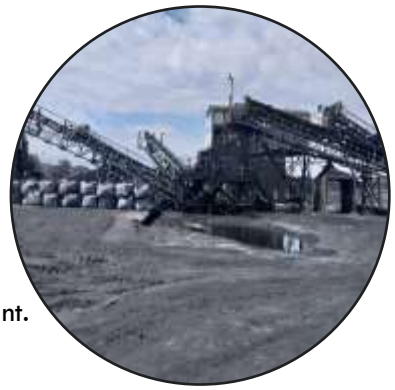
Historic underground mining has taken place at MR 314 and in the eastern section of the MR63 area as indicated in **Figure 9**. New opencast and underground mining areas are proposed as part of the Elandsfontein EIA application. Both the mining option (Activity Alternative A1) and the no-go option (Activity Alternative A2) are assessed in the EIA phase. Where proposed mining areas are marked as either Opencast (Process Alternative P3a) or Underground (Process Alternative P3b) - both options are assessed in the EIA phase.

### 3.6.1 MINERALS PROCESSING

The throughput of the Elandsfontein Colliery Coal Handling and Processing Plant (CHPP) is 300 tons per hour. The plant is run at an efficiency of 70 %.

The CHPP can be divided into different sections.. These sections are as follows:

- RoM transfer point and reclaim system;
- RoM crushing system;
- Transfer conveyor to overland conveyor to plant RoM stockpile;
- RoM feed conveyor;
- Dense medium cyclone plant;
- Fines treatment plant;
- Stockpiling of final product and fines spiral plant; and
- Conveying of discard to a bin with overflow facility located at the plant.



The RoM feed material is reduced in size to <300mm diameter with a feeder breaker. Thereafter the coal is conveyed to a coal sizing station. The -300mm coal passes through a secondary sizer (roll crusher) and the coal is reduced to a 120mm top size. Only the +50mm to -120mm material is fed to the tertiary sizer. The coal is then reduced to -50mm. The material is then fed into the dense medium separation plants. The material is passed over a de-sliming screen that removes the -1.4mm fraction from the feed. The remainder is then routed to the coarse dense medium cyclones. The -1.4mm fraction reports to the fine coal processing circuit.

The overflow of the de-sliming screen reports to the primary large diameter cyclone. Here waste is removed through high density separation. The underflow reports to the discard bin. The overflow from the primary cyclone is pumped to the secondary large diameter cyclone for further beneficiation. All product and waste streams run over drain- and rinse screens to ensure maximum water and magnetite recovery. The products are placed on product stockpiles and the discard is returned to the mining void (northern discard area).

The floats of the fines reflux classifiers are passed through a filter press from where the excess moisture is removed. The sinks are thrown on the rejects belt. The ultra-fines cyclone floats are dewatered and placed on the product stockpile. The filter cake is added to the reject conveyor. All rejects are placed on the rejects conveyor that feeds the reject bin for collection to be discarded in the mining void.

The plant process described above is well-known technology used by many coal operations in South Africa. The plant is based on the premise that the coal can be separated from the waste rock by means of their respective densities. A current licensed Dense Medium Separation (DMS) Plant with a filter press is available at Elandsfontein. The existing wash plant present at the Elandsfontein Colliery and approved under the existing EMP can be utilised to process the ROM Coal. The plant has a capacity approximately 100 000 tons per month. The plant has a capacity of approximately 100 000 tons per month. The plant consumes 35 000 L/hour of water. All this process water is sourced from the current dirty water storage facilities.

### 3.6.2 POWER SUPPLY

The open pit mining equipment does not require electrical power as they will be diesel operated. The underground mining, wash plant, crushing station, conveyors, pumps and mine infrastructure area will largely be electrically powered (~22MVA). Existing power supply is in place.

### 3.6.3 RESIDUE STOCKPILES

This section provides information on the various current residue stockpiles at Elandsfontein Colliery.

#### 3.6.3.1 RUN OF MINE STOCKPILES

The run of mine (ROM) coal is conveyed by haul trucks to the Elandsfontein Colliery RoM tipping point. The RoM is crushed and conveyed by conveyors into the DMS plant where it is beneficiated, and the product is placed on the product stockpiles. The product is reclaimed by front end loaders and loaded on haul trucks. It is then transported either to Oosbank siding (for export market) or to the inland customers. The discard is transported by haul trucks to the existing discard dumps and dumped back into the northern discard facility. A single ROM and product stockpile area has been approved as part of the 2017 EMPr and the optimization (reduction in size) of the current stockpile area is being assessed in this application.

#### 3.6.3.2 NON-CARBONACEOUS STOCKPILES

Overburden comprising of both hards and softs are stockpiled, mostly on top of backfilled, mined out areas. This stockpiling will continue until the face length comprises the entire resource width and all waste material can be rolled over back into the pit as part of the normal mining operation. Hards will be stockpiled separately. There are two large existing approved overburden stockpile sites on MR63 and several smaller stockpile sites approved on MR 314 (**Figure 3**).

#### 3.6.3.3 CARBONACEOUS STOCKPILES

Surface carbonaceous stockpiles will be minimised as far as possible, and the aim will be to place such carbonaceous rock and discard directly back into the northern pit. The mine historically disposed of carbonaceous discard to a dedicated un-lined co-disposal facility located to the south east of MR314. No further waste material is currently being or planned to be disposed of in this location and this facility is in the final stages of being reprocessed and decommissioned. At present the mine disposes of all carbonaceous discard, slurry and wastes to the northern pit. A south eastern discard dump has previously been reclaimed via the beneficiation plant.

#### 3.6.3.4 SOIL STOCKPILES

Stripped soils – topsoil and sub soil are stockpiled separately until the roll over mining method is in equilibrium. Separation of topsoil and subsoil ensures that the characteristics of soil stockpiles are suitable for the prevailing landscape and drainage conditions once they are replaced. Several existing topsoil stockpile areas are located at the site.

### 3.6.4 WASTE

Domestic, hazardous, industrial, mining, and sewerage waste streams are currently, and will continue to be generated at Elandsfontein Colliery. These waste streams are discussed in more detail in the subsections below.

#### 3.6.4.1 DOMESTIC WASTE STREAMS

Domestic waste generated will be collected and stored onsite in clearly marked skips. All domestic waste skips will be transported offsite by a registered waste removal contractor for final disposal at a registered facility. Waste disposal certificates will be required from contractors to ensure appropriate waste disposal. Sewage is collected in septic tanks on site and there is therefore no sewage treatment plant located on site. The sewage is removed by tanker for off-site disposal on a need basis. For general waste, no authorisation is required as the waste site is kept to less than 100 $m^3$ and no waste is disposed of on site. The removal of waste is managed on a daily basis to ensure that the limit is not exceeded.

#### 3.6.4.2 HAZARDOUS WASTE STREAMS

Hydrocarbon and other dangerous good and/or contaminated wastes generated (including used oil, diesel, grease, lubricants and explosive emulsions) will be stored in clearly marked skips for solid hazardous waste and containers for liquid waste. Hazardous waste will be stored in bunded areas or on hard, impervious surfaces. When full, the containers will be collected and transported offsite by a registered waste removal contractor for final disposal at a registered facility. Waste disposal certificates will be required from contractors to ensure appropriate waste disposal. No authorisation is required for hazardous industrial waste as the volumes on site is maintained at less than 35 $m^3$.

#### 3.6.4.3 INDUSTRIAL AND MINING WASTE STREAMS

Industrial wastes (including metals, rubber, tyres and conveyor belt sheets) will be separated and stored in clearly marked skips. Materials may occasionally be salvaged for re-use but will generally be traded to registered recycling companies who will collect and transport material offsite for re-use or final disposal at a registered facility. Waste disposal certificates will be required from contractors to ensure appropriate waste disposal.

Two general forms of mineralised waste are currently, and will be, generated at Elandsfontein Colliery namely plant discards and coal falling off articulated dump trucks on the way to the RoM stockpile. Coal falling from trucks will be periodically collected and transported to the wash plant. Fines will be channelled to the PCDs where water will be recycled, and the fines eventually cleared from a silt trap and transported to disposal in the northern void.

#### 3.6.4.4 POLLUTION CONTROL DAMS AND ASSOCIATED DIRTY WATER MANAGEMENT

The following PCDs are already located at Elandsfontein

- PCD 1 – 25 000 $m^2$ Volume – 32 006 $m^3$;
- PCD 2 – 9 814 $m^2$; Volume - 19 955 $m^3$; and
- PCD 3 – 7 024 $m^2$; Volume – 19 575 $m^3$.

Refer to **Figure 3** for a current infrastructure map indicating the position of the existing PCDs. The storm water is diverted by means of cut-off trenches around and away from the mine and berms are used to separate clean and dirty water areas. This ensures that clean water is not contaminated by mining activities and therefore removed from the catchment. Dirty water is collected in PCDs from where it is used for different activities e.g. dust suppression at the Colliery. These 3 PCDs are not lined and this has been addressed in the updated SWMP included in this application.

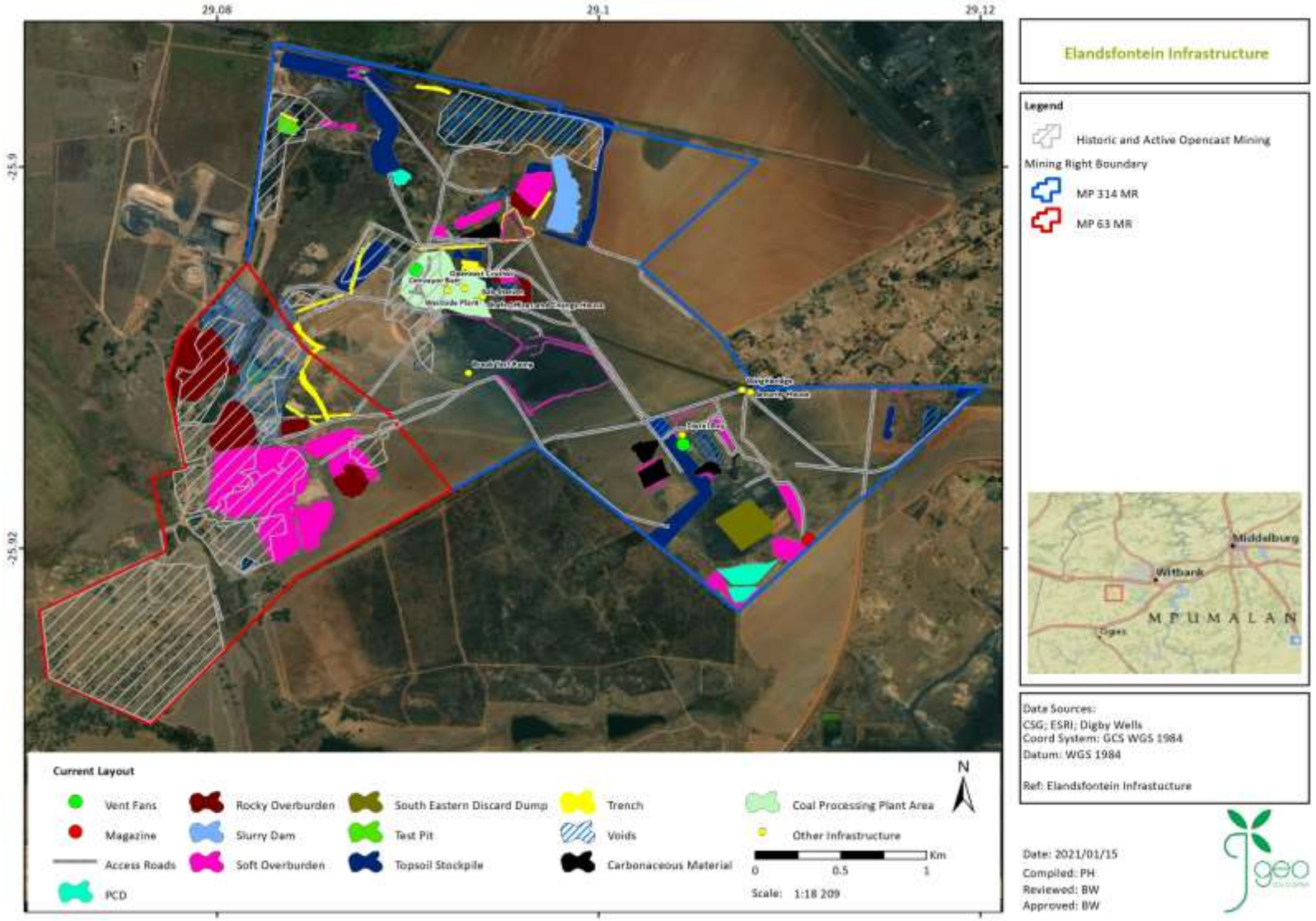



**Figure 3:** Current infrastructure map.

## 3.7 DESCRIPTION OF ACTIVITIES TO BE UNDERTAKEN

This section describes the current authorization process activities. The proposed project includes *inter alia* the following application processes with associated activities:

- New Integrated Environmental Authorisation (Scoping and Environmental Impact Report (S&EIR)) for:
    - New opencast and underground mining areas;
    - New PCDs and stormwater management infrastructure;
    - New residue deposits and/or residue stockpiles (requiring Waste Management Licence); and
    - Various activities including the primary processing of a mineral resource related to the extended LoM.
- Renewal of Integrated Water Use Licence (IWUL) and application for new water uses for:
    - Residue stockpiles/deposits;
    - Dewatering of pits and underground areas;
    - New PCD's and stormwater management infrastructure; and
    - GN704 exemptions.
- MPRDA Section 102 Amendment:
    - Revised Mine Works Programme;
    - Revised Social and Labour Plan;
    - Revised Regulation 2.2 Plan; and
    - Revised consolidated EMPr.

The sub-sections below provide a detailed description of the proposed mining operations which will require review, assessment and authorisation. LoM schedules are shown in **Figure 5** and **Figure 6**.

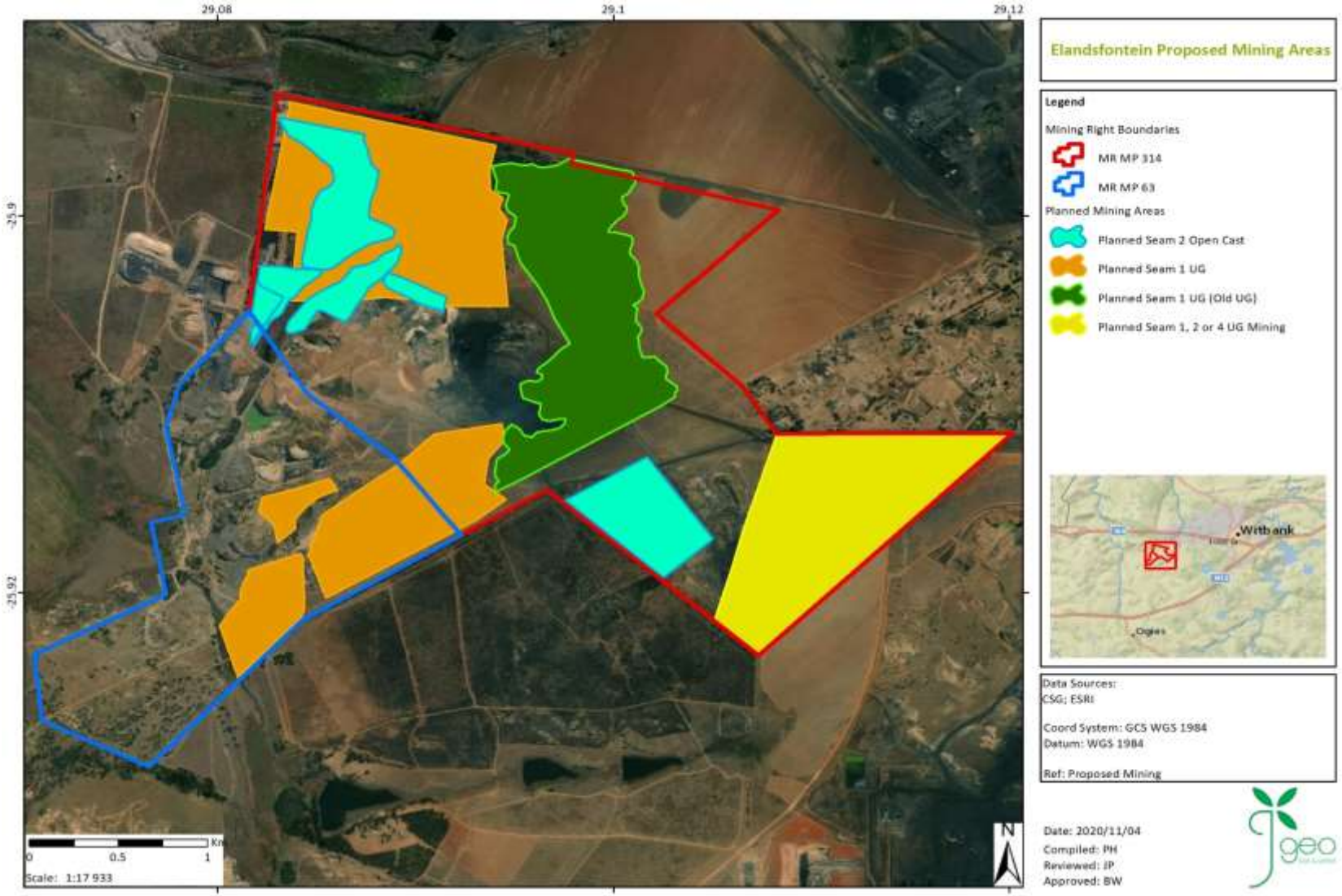



**Figure 4:** Planned new mining areas that form part of this application.

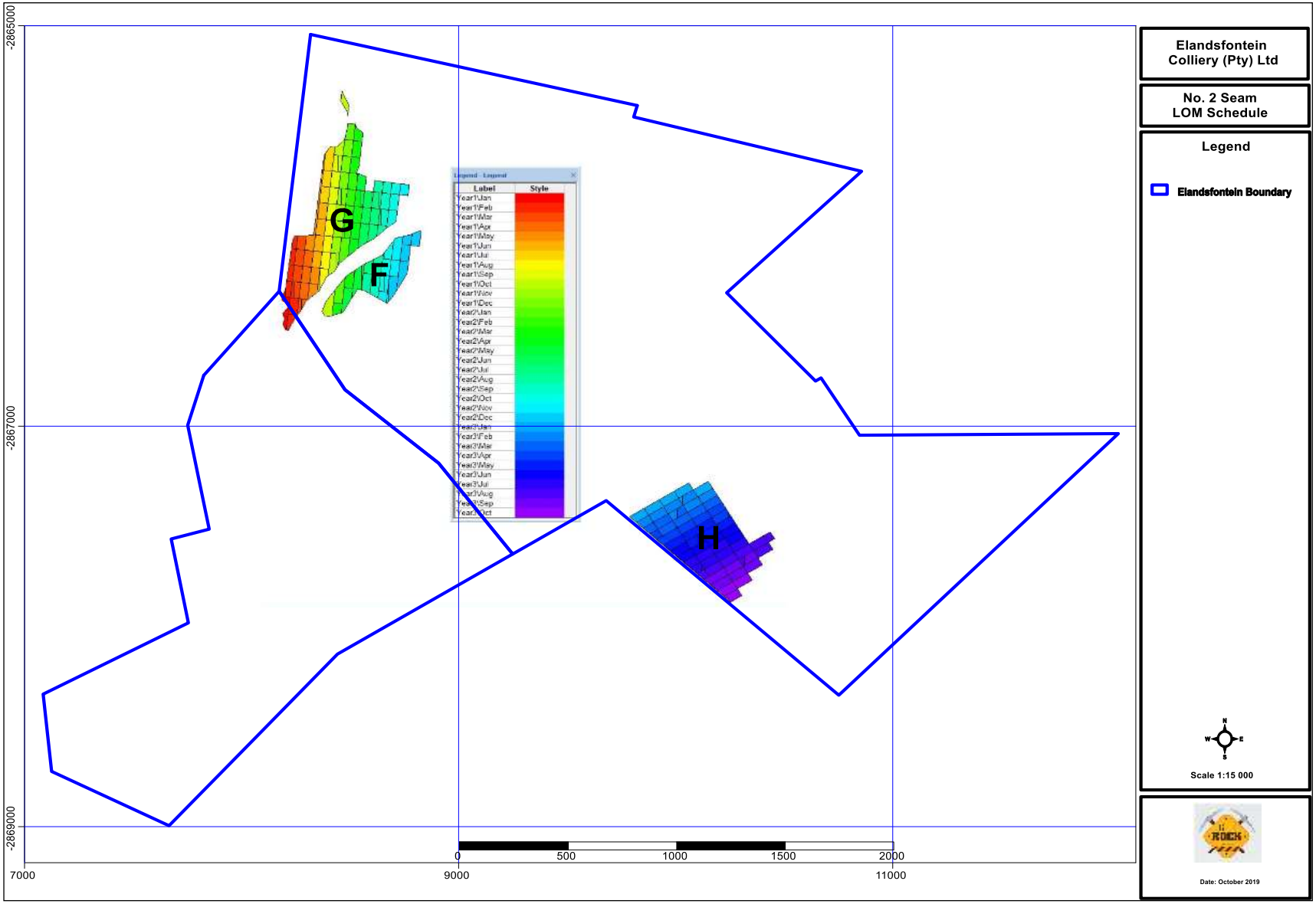



**Figure 5**: Seam 2 Opencast LoM schedule.

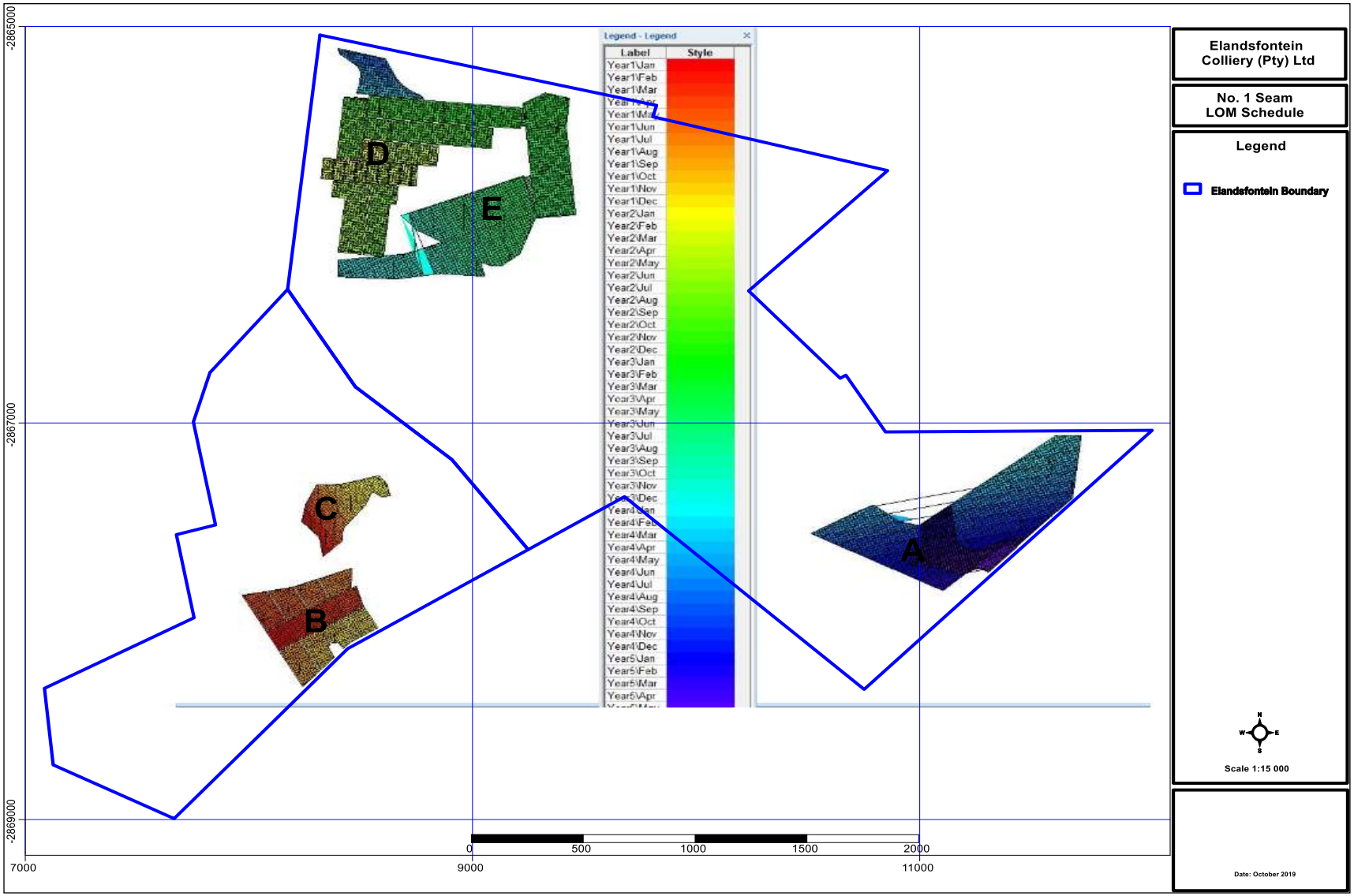



**Figure 6**: Seam 1 Underground LoM schedule.

### 3.7.1 RESIDUE STOCKPILES

This section provides information on the various planned residue stockpiles at Elandsfontein Colliery.

#### 3.7.1.1 NON-CARBONACEOUS STOCKPILES

A new overburden stockpile of 5ha in size and up to 20m high is required (for hards only). The location of the new stockpile is indicated in **Figure 10** and is in the same area as the south-eastern discard dump which is in the process of being reclaimed via further processing.

#### 3.7.1.2 CARBONACEOUS STOCKPILES

For the disposal of carboniferous wastes (carbonaceous shales or interburden, wash plant waste rock, slurry and possibly filter cake), the option of disposal of carboniferous waste to pit (Process Alternative P1d) and disposal to a lined surface waste disposal facility located on a rehabilitated mine area (Process Alternative P1a) have been modelled and comparatively assessed by the groundwater specialist. There are historic areas where carbonaceous material is deposited that will be actively cleaned up and collected and disposed of at the dedicated discard facility during rehabilitation.

#### 3.7.1.3 SOIL STOCKPILES

Stripped soils – topsoil and sub soil will be stockpiled separately until steady state roll over mining is achieved. Separation of topsoil and subsoil will ensure that the characteristics of soil stockpiles are suitable for the prevailing landscape and drainage conditions once they are replaced. Several existing topsoil stockpile areas are located at the site (**Figure 3**). Planned new topsoil stockpile locations are indicated in **Figure 10**.

#### 3.7.1.4 WATER TREATMENT PLANT

Treatment of excess mine affected water will be required. Treated water must meet the DHSWS resource quality objectives specification for discharge. A new Water Treatment Plant (WTP) is proposed and the location included in the layout map in **Figure 10**. The following inflows from the mine will contribute to the PCD, whereafter it is treated by the WTP:

- Direct rainwater and surface runoff (from dirty areas);
- Pit and underground dewatering;
- Washing and screening of product;
- Pit decanting (including historic mine area decants);
- Precipitation infiltration for ROM (Run of Mine) and product stockpile area;
- Runoff from discard dump; and
- Seepage from rehabilitated areas.

The WTP is predominantly built off-site and installed via skid mounted units. The plant is built in modules of 2 Ml/day where additional capacity is added to the system when and if required. In Elandsfontein's case, the plant will make use of 3 x 2Ml/day modules to meet the required 5.3Ml/day. The National Water Act, 1998 (Act No.36 of 1998) Classes And Resource Quality Objectives Of Water Resources For The Olifants Catchment will determine the acceptable parameters for discharging into the environment. The treated water will be discharged into the watercourse to the immediate northwest of the proposed WTP location.

### 3.7.2 SITE ACCESS AND CONTROL

The Elandsfontein Colliery can be accessed from the N4 National Road via the secondary provincial road (R547) through Clewer. All visitors to the mine are required to sign in at the security checkpoint at the mine's offices.

### 3.7.3 HAUL ROADS

An approved internal haul road network is in place. One new haul road towards the west of MR63 is required as well as an associated river crossing. required as access to new mining areas is already in place. Upgrades to existing roads may also be required.

### 3.7.4 WATER SUPPLY

A water use license is in place for sourcing water from water sources as stipulated in the WUL as well as approval of the required water storage facilities. Elandsfontein is in the process of updating its water use licence. Potable water is used in the mine offices, workshops and change house facilities and is sourced from Emalahleni Local Municipality. All water to be used for dust suppression and other mining related processes will be drawn from available process water facilities. Water for dust suppression will either need to be obtained from dirty water containment facilities (Process Alternative P2a) or available natural surface water resources (Process Alternative P2b). Both options will be assessed in the EIA phase.

### 3.7.5 CLEAN AND DIRTY WATER SYSTEMS

Management of clean and dirty water systems is required for effective pollution control. Pollution control will be maximised through facilitating the following:

- Controlling run-off and seepage entering the mining area;
- Controlling run-off emanating from stockpiles; and
- Controlling and separating the mixing of clean water and polluted water which is contained in the PCDs.

The collection of dirty water and diversion of clean water would typically be achieved with earthen channels and berms. These systems would be designed so that clean water is effectively diverted from dirty water and allowed to pass through to other downstream users. Clean and Dirty Water will be separated by means of trapezoidal channels and compacted earth diversion berms which include associated culverts at road interception points. **Figure 6** below indicates a cross section of a typical earthen channel.

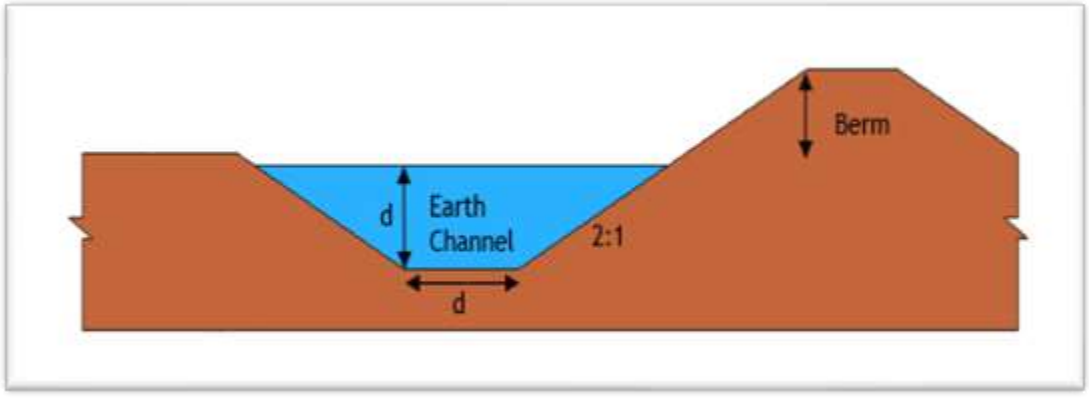



**Figure 7:** Cross section of typical earthen channel.

As the clean water from the area is expected to be carrying sediments, the channel for clean water diversion would most likely include a gravel bed which will trap the sediments.

### 3.7.5.1 POLLUTION CONTROL DAMS AND ASSOCIATED DIRTY WATER MANAGEMENT

New PCD dams will be required for the new mining areas and the existing PCDs will be decommissioned. The current mining areas contain various dirty areas which would necessitate a total of 2 new lined PCD's as part of this application: PCD 1 with two silt traps and PCD 2 with one silt trap (**Figure 10**). By doing this side by side design, the dam safety risk is minimised. The volumes for the new PCDs are as follows:

- PCD 1: Two parallel PCD compartments with a combined capacity of 68 149m$^3$; and
- PCD 2: Capacity of 12 916m$^3$.

The location of the new PCDs and their associated catchments are indicated in **Figure 10**.

### 3.7.5.2 OPERATIONAL WATER BALANCE

Process water within the mining operation is obtained from various sources which are shown in the summarised water balance in **Figure 8**

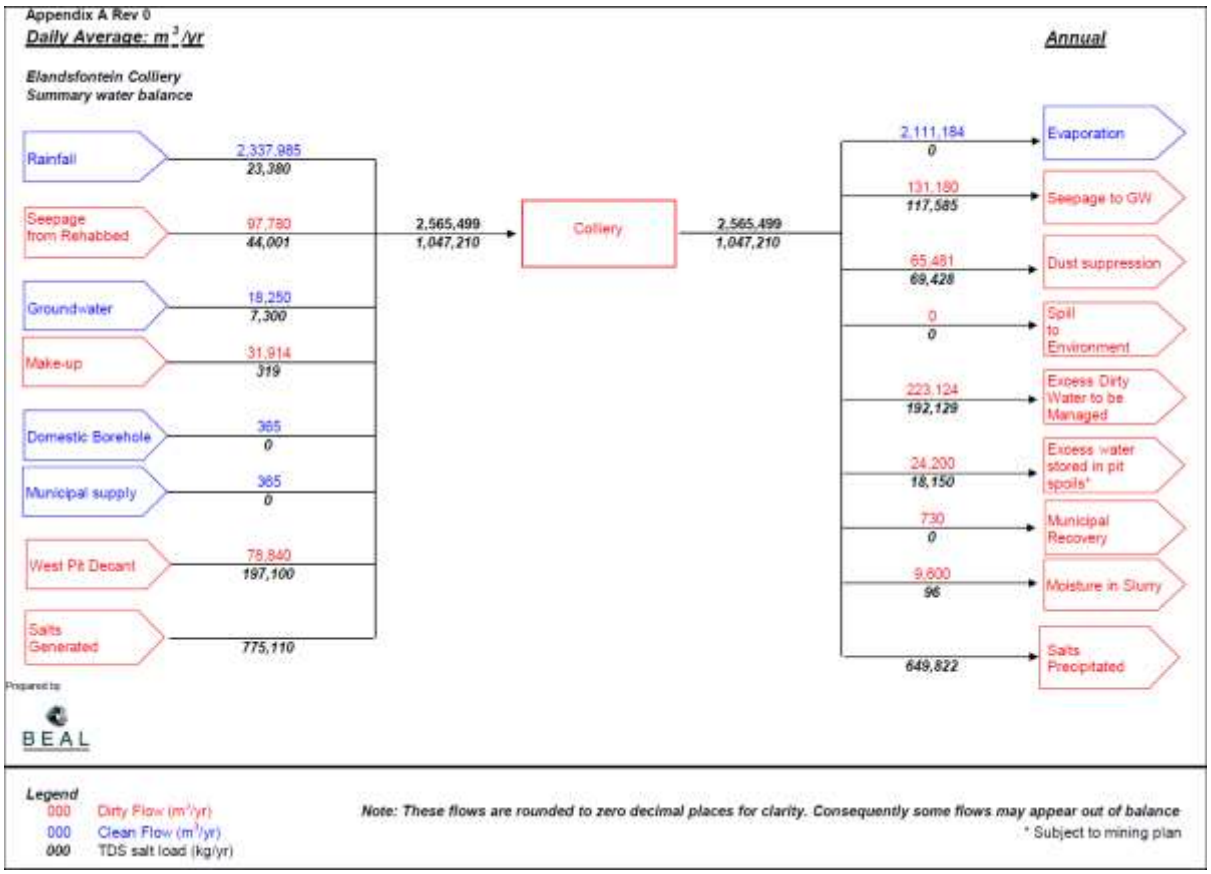



**Figure 8:** Annual water balance summary

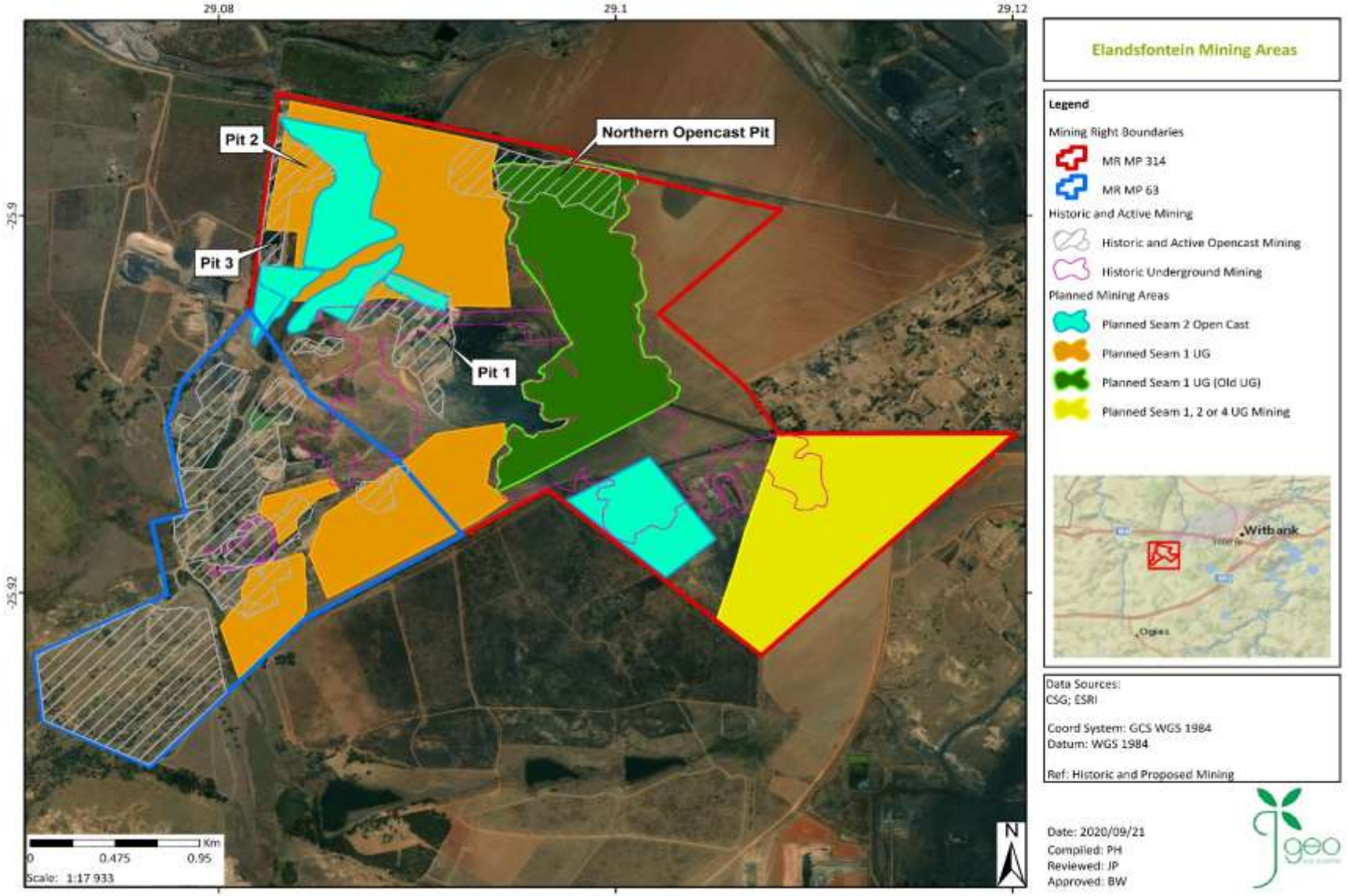



**Figure 9:** Layout Map indicating historic, current and proposed mining areas.

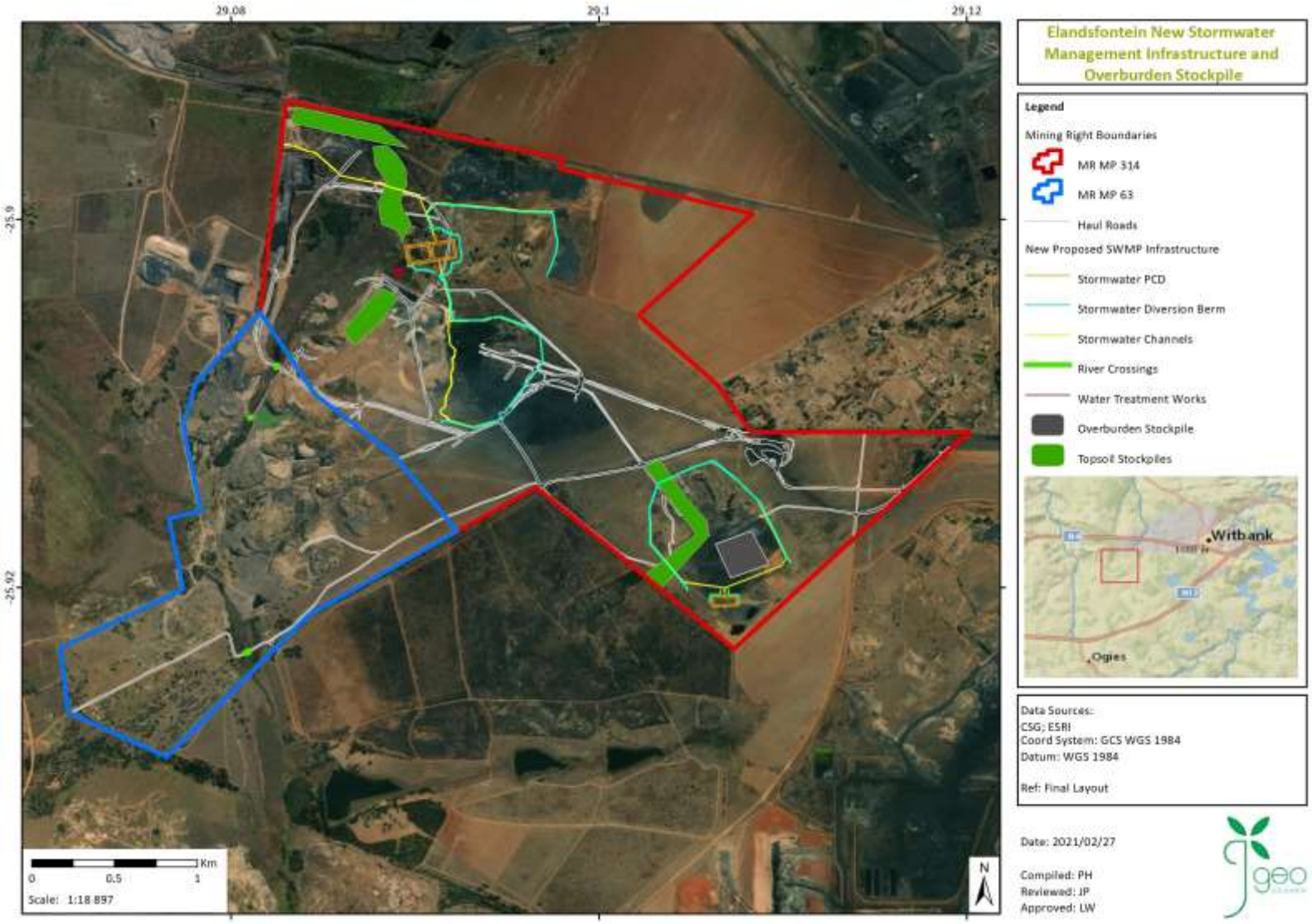



**Figure 10**: Updated Layout Map indicating new stormwater management infrastructure proposed as part of the Elandsfontein application as well as location of new overburden stockpile and topsoil stockpiles

# 4 POLICY AND LEGISLATIVE CONTEXT

This section provides an overview of the governing legislation identified which may relate to the proposed project. A summary of the applicable legislation is provided in Table 3 below. The primary legal requirement for this project stems from the need for an EA to be granted by the competent authority, which is the DMRE, in accordance with the requirements of both the NEMA and MPRDA. In addition, there are numerous other pieces of legislation governed by many acts, regulations, standards, guidelines and treaties on an international, national, provincial and local level, which should be considered to assess the potential applicability of these for the proposed activity. More detail on the legislative framework is presented in Section 4.1 below.

**Table 3:** Applicable Legislation and guidelines overview

| Applicable Legislation and Guidelines | Reference Where Applied |
|---|---|
| **APPLICABLE LEGISLATION** | |
| Constitution of the Republic of South Africa, Act 108 of 1996<br><br>The constitution of any country is the supreme law of that country. The Bill of Rights in chapter 2 section 24 of the Constitution of South Africa Act (Act 108 of 1996) makes provisions for environmental issues and declares that: "Everyone has the right -<br><br>(a) to an environment that is not harmful to their health or well-being; and<br><br>(b) to have the environment protected, for the benefit of present and future<br><br>generations, through reasonable legislative and other measures that:<br><br>(i) prevent pollution and ecological degradation;<br><br>(ii) promote conservation; and<br><br>(iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development"<br><br>Therefore, the EIA is conducted to fulfill the requirement of the Bill of Rights. | Throughout the SR and EIR process |
| National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) and the EIA Regulations (2014) thereunder:<br><br>The NEMA (1998) requires that a project of this nature (inclusive of a Mining Right) must undergo a Scoping and Environmental Impact Assessment; an Environmental Management Programme must also be compiled. Regulations applicable to this project include the following:<br><br>EIA Regulations R.982 (2014) in terms of NEMA.<br><br>Listing Notice 1: R.983 (2014) in terms of NEMA.<br><br>Listing Notice 2: R.984 (2014) in terms of NEMA.<br><br>Listing Notice 3: R.985 (2014) in terms of NEMA. | Throughout the SR and EIR process |
| Minerals and Petroleum Resources Development Act (MPRDA) (Act no 28 of 2002), as amended and Mineral and Petroleum Resource Development Regulations, 2004 as amended:<br><br>The MPRDA (2002) requires an applicant who wishes to proceed with a mining project to obtain a Mining Right, part of which requires the applicant to obtain Environmental Authorisation in terms of the NEMA (1998). | Throughout the SR and EIR process |
| National Water Act (NWA) (Act 36 of 1998): | Throughout the process – all water related aspects |

| | |
|---|---|
| The NWA recognizes that water is a scarce and unevenly distributed national resource which must managed encompassing all aspects of water resources.<br><br>In terms of Chapter 4 of the NWA, activities and processes associated with the proposed mine extension and associated infrastructure, are required to be licensed by the Department of Human Settlements Water and Sanitation (DHSWS). An Integrated Water Use License Application (IWULA) will be lodged with the DHSWS in terms of Section 21 of the NWA, which lists several water uses requiring authorisation. Furthermore, an amended Integrated Water and Waste Management Plan (IWWMP) will be compiled and submitted in support of the IWULA. | |
| National Heritage Resources Act, 1999 (Act no 25 of 1999):<br><br>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. Due to the extent of the project, it is possible that some heritage resources and palaeontological features are likely to occur within the project boundary area. | Heritage specialist study and Palaeontological, EIA, EMP. |
| Occupational Health and Safety Act, 1993 (Act no 85 of 1993):<br><br>The Occupational Health and Safety Act aims to provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work. Regulations applicable to this project include the following:<br><br>Explosives Regulations R.109 (2003) in terms of the OHS Act. | Throughout the process – all blasting and explosives management related aspects |
| Specific Environmental Management Acts (SEMAs):<br><br>The SEMAs refer to specific portions of the environment where additional legislation over and above the NEMA (1998) is applicable. SEMAs relevant to this application include the following:<br><br>National Environmental Management: Biodiversity Act, 2004 (Act no 10 of 2004).<br><br>National Environmental Management: Air Quality Act, 2004 (Act no 39 of 2004).<br><br>National Environmental Management: Waste Act, 2008 (Section 4.1.4) (Act no 59 of 2008). | Specialist studies, Baseline description and EMPr. Permits to be applied for if any protected tree species are to be removed from the site. |
| **APPLICABLE GUIDELINES** | |
| Integrated Environmental Management Information Guidelines series:<br><br>This series of guidelines was published by the Department of Environmental Affairs (DEA), and refers to various environmental aspects. Applicable guidelines in the series include:<br><br>Guidelines 5: Companion to NEMA EIA Regulations of 2010.<br><br>Guideline 7: Public Participation.<br><br>Guideline 9: Need and desirability.<br><br>Additional guidelines published in terms of the NEMA EIA Regulations, in particular:<br><br>Guideline 3: General Guide to Environmental Impact Assessment Regulations, 2006.<br><br>Guideline 4: Public Participation in support of the Environmental Impact Assessment Regulations, 2006. | The guidelines will be used throughout the Scoping and Environmental Impact Report process. |

| | |
|---|---|
| Guideline 5: Assessment of alternatives and impacts in support of the Environmental Impact Assessment Regulations, 2006. | |
| Best Practice Guideline (BPG) series:<br><br>The BPG series is a series of publications by the then Department of Water Affair and Forestry (now DHSS – Department of Human Settlements, Water and Sanitation) providing best practice principles and guidelines relevant to certain aspects of water management. Best practice guidelines relevant to this project include the following:<br><br>BPG A4: Pollution Control Dams.<br><br>BPG H1: Integrated Mine Water Management.<br><br>BPG H2: Pollution Prevention and Minimisation of Impacts.<br><br>BPG H3: Water Reuse and Reclamation.<br><br>BPG H4: Water treatment.<br><br>BPG G1: Storm Water Management.<br><br>BPG G2: Water and Salt balances.<br><br>BPG G3: Water Monitoring Systems.<br><br>BPG G4: Impact Prediction | Surface water and groundwater specialist studies, EIA and EMP. |

## 4.1 APPLICABLE NATIONAL LEGISLATION

The legal framework within which the Elandsfontein Colliery operates is governed by many Acts, Regulations, Standards and Guidelines on an international, national, provincial and local level. Legislation applicable to the project includes (but is not limited to):

### 4.1.1 THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT

The MPRDA aims to "make provision for equitable access to, and sustainable development of, the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and petroleum rights in South Africa. The MPRDA governs the sustainable utilisation of South Africa's mineral resources. The MPRDA aims to "make provision for equitable access to and sustainable development of the nation's mineral and petroleum resources". The MPRDA outlines the procedural requirements that need to be met to acquire mineral and hydrocarbon rights in South Africa. The MPRDA also requires adherence with related legislation, chief amongst them is the National Environmental Management Act (Act No. 107 of 1998, NEMA) and the National Water Act (Act No. 36 of 1998, NWA).

Several amendments have been made to the MPRDA. These include, but are not limited to, the amendment of Section 102, concerning amendment of rights, permits, programmes and plans, to requiring the written permission of the Minister for any amendment or alteration; and the section 5A(c) requirement that landowners or land occupiers receive twenty-one (21) days' written notice prior to any activities taking place on their properties. One of the most recent amendments requires all mining related activities to follow the full NEMA process as per the 2014 EIA Regulations, which came into effect on 4 December 2014. Section 102 applications for amendment of both the existing EMPr, MWP and SLP for Elandsfontein Colliery will be completed as part of the project.

In support of the amendment to the mining right submitted be Elandsfontein Colliery, the applicant is required as to conduct a Scoping Report, EIA /EMP and I&AP consultations that need to be submitted to the DMRE for adjudication. This report has been compiled in accordance with Regulation 49 of the MPRDA to satisfy the criteria for a EIA Report. Pending presentation of the results of the study and inclusion of comment from I&APs, the Final EIA Report will be submitted

to the DMRE for review. The dates of the review and commenting period for the draft EIA/EMPr will be determined at a later date and communicated to all registered I&AP's.

### 4.1.2 THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT

The main aim of the National Environmental Management Act, 1998 (Act 107 of 1998) (NEMA) is to provide for co-operative governance by establishing decision-making principles on matters affecting the environment. In terms of the NEMA Environmental Impact Assessment (EIA) regulations, the applicant is required to appoint an environmental assessment practitioner (EAP) to undertake the EIA, as well as conduct the public participation process. In South Africa, EIA became a legal requirement in 1997 with the promulgation of regulations under the Environment Conservation Act (ECA). Subsequently, NEMA was passed in 1998. Section 24(2) of NEMA empowers the Minister and any MEC, with the concurrence of the Minister, to identify activities which must be considered, investigated, assessed and reported on to the competent authority responsible for granting the relevant environmental authorisation. On 21 April 2006 the Minister of Environmental Affairs and Tourism promulgated regulations in terms of Chapter 5 of the NEMA. These regulations, in terms of the NEMA, were amended in June 2010 and again in December 2014. The December 2014 NEMA regulations are applicable to this project. Mining Activities officially became governable under the NEMA EIA in December 2014.

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

In accordance with the provisions of Sections 24 (5) and Section 44 of the NEMA the Minister has published Regulations (GN R. 982) pertaining to the required process for conducting EIA's to apply for, and be considered for, the issuing of an EA. These Regulations provide a detailed description of the EIA process to be followed when applying for EA for any listed activity. The Regulations differentiate between a simpler Basic Assessment Process (required for activities listed in GN R. 983 and 985) and a more complete EIA process (activities listed in GN R. 984). In the case of this project there are activities triggered under GN R. 983, 984 and 985 and as such a full EIA process is necessary. Table 6 presents all the anticipated listed activities under the NEMA EIA Regulations (2014) that are applicable to this project.

Approval is sought for the following activities:

- Construction of pollution control dams and dirty water storage reservoirs with a combined capacity of 50 000m$^3$ or more. The dam wall height falls below 5m;
- Construction of access roads and haul roads where the road is wider than 8m;
- Extending of existing farm roads/ haul roads by more than 1km;
- Physical alteration of vacant agricultural land for mining. The total area to be transformed exceeds 20 hectares;
- Construction of fuel storage facilities and activities within 32m of a watercourse; and
- Construction of clean and dirty water canals in and around the mining areas .

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

impacts. Figure 11 below provides a graphic representation of all the components of a full EIA process.

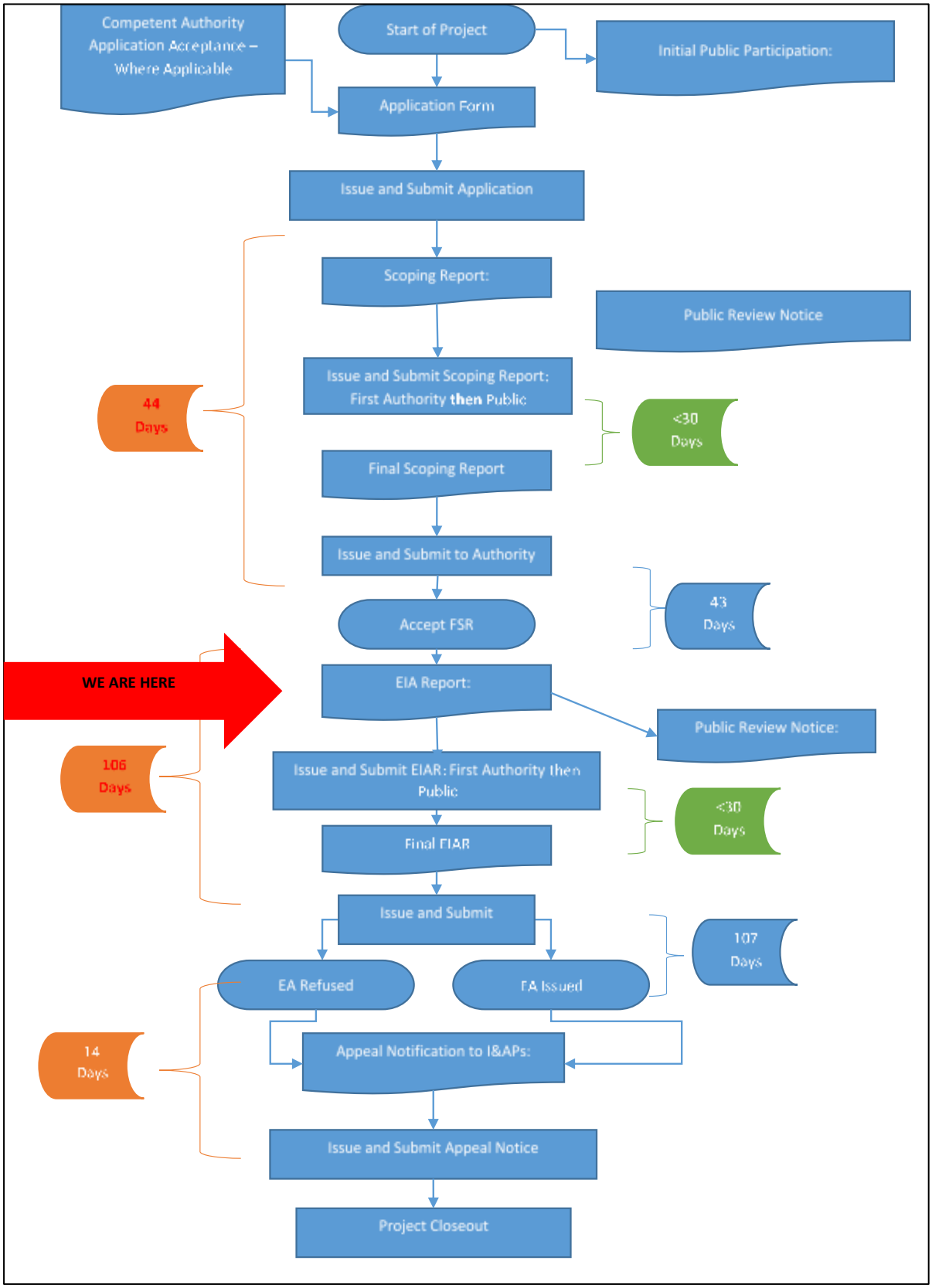



**Figure 11:** EIA process diagram.

Section 24 P of the NEMA requires that an applicant for an environmental authorisation relating to prospecting, mining or production must, before the Minister responsible for mineral resources issues the environmental authorisation, comply with the prescribed financial provision for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts. Therefore, the potential environmental liabilities associated with the proposed activity must be quantified and indicate the method of financial provision in line with the National Environmental Management Act (1998): Regulations pertaining to the financial provision for prospecting exploration, mining and production, (2015). The requirement for existing mining operations to comply with the NEMA financial provisioning regulations becomes effective as from June 2022. As such, the update of Elandsfontein's closure costing as per the NEMA guidelines will be presented in the EIA report. y.

**Table 4** below indicates the listed activities in terms of the NEMA Regulations that are applicable to the proposed extension of the Elandsfontein Colliery.

**Table 4:** Listed activities in terms of the NEMA Regulations

| Name of activity | Aerial extent of the activity | Listed Activity | Applicable listing notice |
|---|---|---|---|
| Water pipelines<br>"The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—<br>(i) with an internal diameter of 0,36 metres or more; or<br>(ii) with a peak throughput of 120 litres per second or more;<br>excluding where—<br>(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or<br>(b) where such development will occur within an urban area." | Approximately 500m of new stormwater channels | 9 | GN983 |
| Pollution Control Dams (PCD)<br>"The development of—<br>(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or<br>(ii) infrastructure or structures with a physical footprint of 100 square metres or more;<br>where such development occurs—<br>(a) within a watercourse;<br>(b) in front of a development setback; or<br>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —<br>excluding—<br>(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;<br>(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;<br>(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; | PCD 1: 68 148m$^3$<br><br>PCD 2: 12 516m$^3$ | 12 | GN983 |

| Name of activity | Aerial extent of the activity | Listed Activity | Applicable listing notice |
|---|---|---|---|
| (dd) where such development occurs within an urban area;<br>(ee) where such development occurs within existing roads, road reserves or railway line reserves; or<br>(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared. " | | | |
| PCD<br>The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014. | PCD 1: 68 148$m^3$<br><br>PCD 2: 12 516$m^3$ | 13 | GN983 |
| Diesel Storage Facilities<br>The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic metres or more but not exceeding 500 cubic metres. | 100$m^3$ | 14 | GN983 |
| The development and related operation of facilities for the desalination of water with a design capacity to produce more than 100 cubic metres of treated water per day. | The water treatment plant (500$m^2$ footprint) will make use of 3 x 2Ml/day modules to meet the required 5.3Ml/day | 16 | GN983 |
| Infilling/deposition during upgrade/expansion of bridges/river crossings.<br>"The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;<br>but excluding where such infilling, depositing, dredging, excavation, removal or moving—<br>(a) will occur behind a development setback;<br>(b) is for maintenance purposes undertaken in accordance with a maintenance management plan;<br>(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;<br>(d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or<br>(e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies. " | 3 new road crossings required:<br>Crossing 1: 24m in length, 5m wide<br><br>Crossing 2: 15m in length, 5m wide<br><br>Crossing 3: 26m in length, 13m wide | 19 | GN983 |
| PCDs<br>The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2000 cubic metres but less than 15000 cubic metres. | PCD 1: 68 148$m^3$<br><br>PCD 2: 12 516$m^3$<br><br>The water treatment plant (500$m^2$ footprint) | 25 | GN983 |

| Name of activity | Aerial extent of the activity | Listed Activity | Applicable listing notice |
|---|---|---|---|
| | will make use of 3 x 2Ml/day modules to meet the required 5.3Ml/day | | |
| Mining (industrial) development<br>Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:<br>(i) will occur inside an urban area, where the total land to be developed is bigger than 5 hectares; or<br>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;<br>excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes. | Up to 830 ha | 28 | GN983 |
| Possibility of utilization of existing pipelines<br>The expansion of infrastructure for the bulk transportation of water or storm water where the existing infrastructure—<br>(i) has an internal diameter of 0,36 metres or more; or<br>(ii) has a peak throughput of 120 litres per second or more; and<br>(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or<br>(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;<br>excluding where such expansion—<br>(aa) relates to transportation of water or storm water within a road reserve or railway line reserve; or<br>(bb) will occur within an urban area. | Approximately 500m of new stormwater channels required, some of these may utilize existing channels where possible | 45 | GN983 |
| Internal roads - Upgrades to existing roads for transport of RoM to minerals processing complex<br>"The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre-<br>(i) where the existing reserve is wider than 13,5 meters; or<br>(ii) where no reserve exists, where the existing road is wider than 8 metres;<br>excluding where widening or lengthening occur inside urban areas." | 2..5km of road to be upgraded. Roads will be 8m wide. | 56 | GN983 |
| General mining activities<br>Phased activities for all activities—<br>(i) listed in this Notice, which commenced on or after the effective date of this Notice or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;<br>excluding the following activities listed in this Notice-<br>17(i)(a-d); 17(ii)(a-d); 17(iii)(a-d); 17(iv)(a-d); 17(v)(a-d); 20; 21; 22; 24(i); 29; 30; 31; 32; 34; 54(i)(a-d); 54(ii)(a-d); 54(iii)(a-d); 54(iv)(a-d); 54(v)(a-d); 55; 61; 64; and 65; or | 70 ha of new opencast mining<br><br>378 ha of new underground mining | 67 | GN983 |

| Name of activity | Aerial extent of the activity | Listed Activity | Applicable listing notice |
|---|---|---|---|
| (ii) listed as activities 5, 7, 8(ii), 11, 13, 16, 27(i) or 27(ii) in Listing Notice 2 of 2014 or similarly listed in any of the previous NEMA notices, which commenced on or after the effective date of such previous NEMA Notices;<br>where any phase of the activity was below a threshold but where a combination of the phases, including expansions or extensions, will exceed a specified threshold." | | | |
| PCD inflow may exceed 2000 cubic meters / day<br>"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, excluding–<br>(i) activities which are identified and included in Listing Notice 1 of 2014;<br>(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;<br>(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or<br>(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day. " | PCD 1: 68 148$m^3$<br><br>PCD 2: 12 516$m^3$ | 6 | GN984 |
| Dewatering opencast and/or underground<br>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, excluding–<br>(i) activities which are identified and included in Listing Notice 1 of 2014;<br>(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies;<br>(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2 000 cubic metres or less; or<br>(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day. | Dewatering of old voids: 525 600$m^3$/year<br><br>Northern pit: 93 805$m^3$/year<br><br>Main pit: 93 805$m^3$/year<br><br>Western opencast pit: 40 000$m^3$ / month | 7 | GN984 |

| Name of activity | Aerial extent of the activity | Listed Activity | Applicable listing notice |
|---|---|---|---|
| All infrastructure and opencast and underground mining extension<br>"The clearance of an area of 20 hectares or more of indigenous vegetation, excluding where such clearance of indigenous vegetation is required for-<br>(i) the undertaking of a linear activity; or<br>(ii) maintenance purposes undertaken in accordance with a maintenance management plan." | Up to 100ha of indigenous vegetation will be removed. | 15 | GN984 |
| PCDs<br>"The development of a dam where the highest part of the dam wall, as measured from the outside toe of the wall to the highest part of the wall, is 5 metres or higher or where the high-water mark of the dam covers an area of 10 hectares or more." | PCD 1: 68 148$m^3$<br><br>PCD 2: 12 516$m^3$ | 16 | 984 |
| General mining activities<br>"Any activity including the operation of that activity which requires a mining right as contemplated in section 22 of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), including—<br>(a) associated infrastructure, structures and earthworks, directly related to the extraction of a mineral resource; or<br>(b) the primary processing of a mineral resource including winning, extraction, classifying, concentrating, crushing, screening or washing;<br>but excluding the secondary processing of a mineral resource, including the smelting, beneficiation, reduction, refining, calcining or gasification of the mineral resource in which case activity 6 in this Notice applies. | Up to 830 ha | 17 | 984 |
| Infrastructure and mine extension<br>The clearance of an area of 300 square meters 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.<br>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 | 18ha overlap with identified CBA and ESA areas, although these areas have been degraded. | 12 | GN985 |
| PCDs and Wastewater treatment plant.<br>The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage. | WTP: 500$m^2$<br><br>PCD 1: 68 148$m^3$<br><br>PCD 2: 12 516$m^3$ | B1 | GN921 |
| PCDs<br>The recovery of waste including the refining, utilisation, or co-processing of the waste at a facility that processes in excess of 100 tons of general waste per day or in excess of 1 ton of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises. | PCD 1: 68 148$m^3$<br><br>PCD 2: 12 516$m^3$ | B3 | GN921 |

| Name of activity | Aerial extent of the activity | Listed Activity | Applicable listing notice |
|---|---|---|---|
| Residue deposits / carbonaceous waste to pit<br>The disposal of any quantity of hazardous waste to land. | 378ha | B7 | GN921 |
| PCDs and WTP<br>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). | WTP: 500m$^2$ with 2 Ml/day volume<br><br>PCD 1: 68 148m$^3$<br><br>PCD 2: 12 516m$^3$ | B 10 | GN921 |
| Dumps & stockpiles<br>The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). | New overburden dump: 5ha | B 11 | GN921 |
| Storage of hazardous waste in a PCD.<br>The storage of hazardous waste at a facility that has the capacity to store in excess of 80m$^3$ of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste. | PCD 1: 68 148m$^3$<br><br>PCD 2: 12 516m$^3$ | C 1 | GN921 |

### 4.1.3 THE NATIONAL WATER ACT

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

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

These processes are described in **Figure 12.**

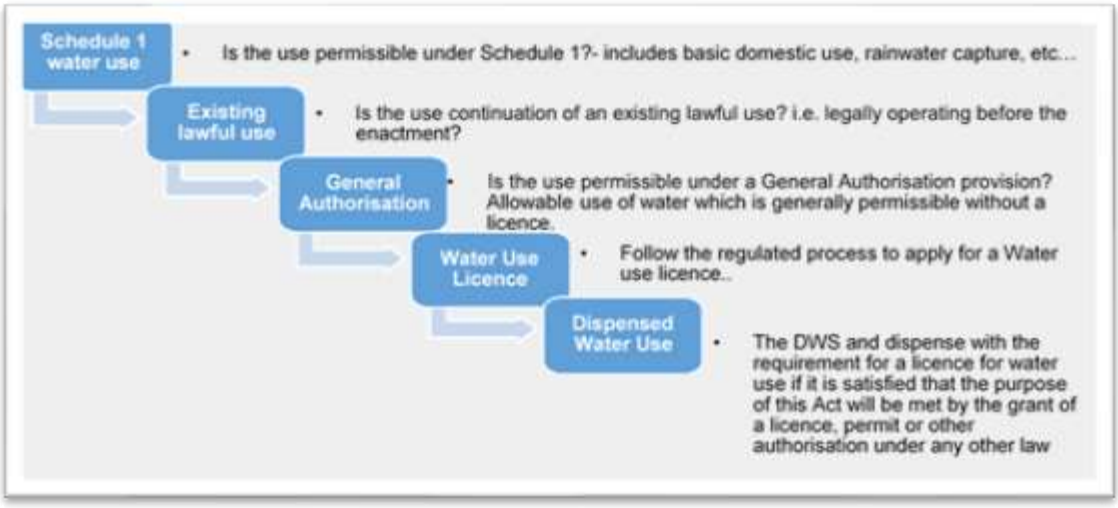



**Figure 12:** Authorization Process for new water uses

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

a) taking water from a water resource;

b) storing water;

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

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

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

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

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

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

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

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

k) using water for recreational purposes.

Elandsfontein Colliery was granted an Integrated Water Use Licence (IWUL) in terms of Chapter 4 of the NWA, Licence No: 04/B20G/CGI/3843 dated 20 October 2015 – amended 23 July 2019, for the following water uses:

Section 21(c): Impeding or diverting the flow of water in a watercourse;

Section 21(g): Disposing of waste in a manner which may detrimentally impact on a water resource;

Section 21(i): altering the bed, banks, course or characteristics of a watercourse; and

Section 21(j): Removing, discharging or disposing of water found underground.

The mine is applying for renewal of the existing IWUL as well as certain amendments and additional water uses to incorporate the proposed changes to the MWP and associated new water uses. The water uses triggered are presented in **Table 5.**

**Table 5:** Water uses applicable to mine expansion

| Activity # | Listed Activity Description | Reason for Inclusion |
|---|---|---|
| **NWA Activities** | | |
| **Section 21(a)** | Taking water from a water resource | Potable water purposes from borehole(s) for use as drinking water. |
| **Section 21(g)** | Disposing of waste in a manner which may detrimentally impact on a water resource; and | PCD, waste stockpiles (discard dumps, filter cake and possibly waste rock dumps), dust suppression, wash bay consumption. |
| **Section 21(j)** | Removing, discharging or disposing of water found underground. | Dewatering of opencast and underground mining areas |
| **Section 21 (c) and 21 (i)** | 21(c) Impeding or diverting the flow of water in a watercourse; and<br>21(i) Altering the Bed, Banks, Course or Characteristics of a Water Course | Watercourse crossings and culverts |

An important regulation under NWA is the GN704 (1999). This is for the implementation of regulations on use of water for mining and related activities aimed at the protection of water resources. Various GN704 exemptions have been applied for as part of the WULA.

#### 4.1.3.1 MINE WATER MANAGEMENT POLICY POSITION (DRAFT - 2017)

Acid Mine Drainage (AMD) and related mine water impacts have in the past decade evolved to become a major environmental challenge. Whilst the challenge is limited to the mining sector during operations, it eventually becomes externalised during mining downturn, and is especially pertinent post-mining closure, especially if mine closure does not proceed according to regulatory-approved recommendations.

To deal with this challenge at a very high level, an Inter-Ministerial Committee (IMC) comprising the Ministers of Mineral Resources, Water and Environmental Affairs, Science and Technology, and the Minister in the Presidency: National Planning Commission was established. Mine water impacts, including AMD, are phenomena that plague all countries with rich mineral deposits. Depending on the geology/ mineralogy of a region, the terms Acid Rock Drainage (ARD), Acid Mine Drainage (AMD), Neutral Mine Drainage (NMD), and Saline Drainage (SD) are the characteristic nomenclature for reporting different mine water types. Given the long history of mining in south Africa, and the mineral wealth still locked across various parts of South Africa, and the potential this deposit has for local economic development and attracting foreign investment, it is prudent that the DHSWS formulates a policy principle to support its response to mine water challenges.

The draft policy document's purpose is to provide the position of the DHSWS on mine water management, including AMD. Furthermore, it aims to provide measures on protection of water

resources from prospective, operational and historical mine activities that have negative water quality impacts. Based on the formulation of this policy document, it is clear that the DHSWS intends to focus more heavily on ensuring that the mining sector in particular, undertakes every possible action to prevent the deterioration of the surrounding water quality.

#### 4.1.3.1 CATCHMENT MANAGEMENT STRATEGIES

Catchment Management Agencies (CMAs) are tasked with coordinating the water demands, interests and responsibilities of all relevant government departments, institutions and water users within a specific CMA. This is to ensure that on a regional scale, water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit of all persons. The main instrument that guides and governs the activities of a CMA is the Catchment Management Strategy (CMS) which, while conforming to relevant legislation and national strategies, provides detailed arrangements for the protection, use, development, conservation, management and control of the region's water resources. According to DHSWS' water management areas delineations, the Elandsfontein Colliery mining right area falls within the Olifants Water Management Area, delineated as water management area No, 4, which subsequently falls under the B Primary drainage area.

### 4.1.4 THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT

The applicable waste act is no. 59 of 2008: National Environmental Management: Waste Act, 2008 (NEMWA). On 2 June 2014 the National Environmental Management: Waste Amendment Act came into force. Waste is accordingly no longer governed by the MPRDA but is subject to all the provisions of the National Environmental Management: Waste Act, 2008 (NEMWA).

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

A holder of waste must, within the holder's power, take all reasonable measures to-

a) "Avoid the generation of waste and where such generation cannot be avoided, to minimise the toxicity and amounts of waste that are generated;

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

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

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

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

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

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

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

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

Hazardous waste: means "any waste that contains organic or inorganic elements or compounds that may, owning to the inherent physical, chemical or toxicological characteristic of that waste, have a detrimental impact on health and the environment and includes hazardous substances, materials or objects within business waste, residue deposits and residue stockpiles."

Residue deposits: means "any residue stockpile remaining at the termination, cancellation or expiry of a prospecting right, mining right, mining permit, exploration right or production right."

Residue stockpile: means "any debris, discard, tailings, slimes, screening, slurry, waste rock, foundry sand, mineral processing plant waste, ash or any other product derived from or incidental to a mining operation and which is stockpiled, stored or accumulated within the mining area for potential re-use, or which is disposed of, by the holder of a mining right, mining permit or, production right or an old order right, including historic mines and dumps created before the implementation of this Act."

General waste: means "waste that does not pose an immediate hazard or threat to health or to the environment, and includes – domestic waste; building and demolition waste; business waste; inert waste; or any waste classified as non-hazardous waste in terms of the regulations made under Section 69."

**Table 6** below presents the anticipated NEMWA listed activities for the mine extension project which require authorisation.

**Table 6:** Anticipated NEMWA Listed Activities requiring authorisation.

| Activity # | Listed Activity Description | Reason for Inclusion |
|---|---|---|
| **NEMWA listed activities - Government Notice R921** | | |
| **B1** | The storage of hazardous waste in lagoons excluding storage of effluent, wastewater or sewage. | PCD's |
| **B3** | The recovery of waste including the refining, utilisation, or co-processing of the waste at a facility that processes in excess of 100 tons of general waste per day or in excess of 1 ton of hazardous waste per day, excluding recovery that takes place as an integral part of an internal manufacturing process within the same premises. | PCD's |
| **B7** | The disposal of any quantity of hazardous waste to land. | Residue deposits / carbonaceous material back to pit. |
| **B10** | 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). | The construction of PCD's and the water treatment plant. |
| **B11** | The establishment or reclamation of a residue stockpile or residue deposit resulting from activities which require a mining right, exploration right or production right in terms of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002). | Dumps & stockpiles are residue deposits resulting from activities which require a mining right. |
| **C1** | The storage of hazardous waste at a facility that has the capacity to store in excess of 80m3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste. | Storage of hazardous waste in a PCD. |

#### 4.1.4.1 NEMWA PLANNING AND MANAGEMENT OF RESIDUE STOCKPILES AND RESIDUE DEPOSITS REGULATIONS, 2015 (GN R 632)

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

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

In terms of the amended regulations (21 September 2018), a competent person must recommend the pollution control measures suitable for a specific residue stockpile or residue deposit on the basis of a risk analysis. The planning, management and reporting of residue stockpiles and residue deposits is shown schematically in **Figure 13** below.

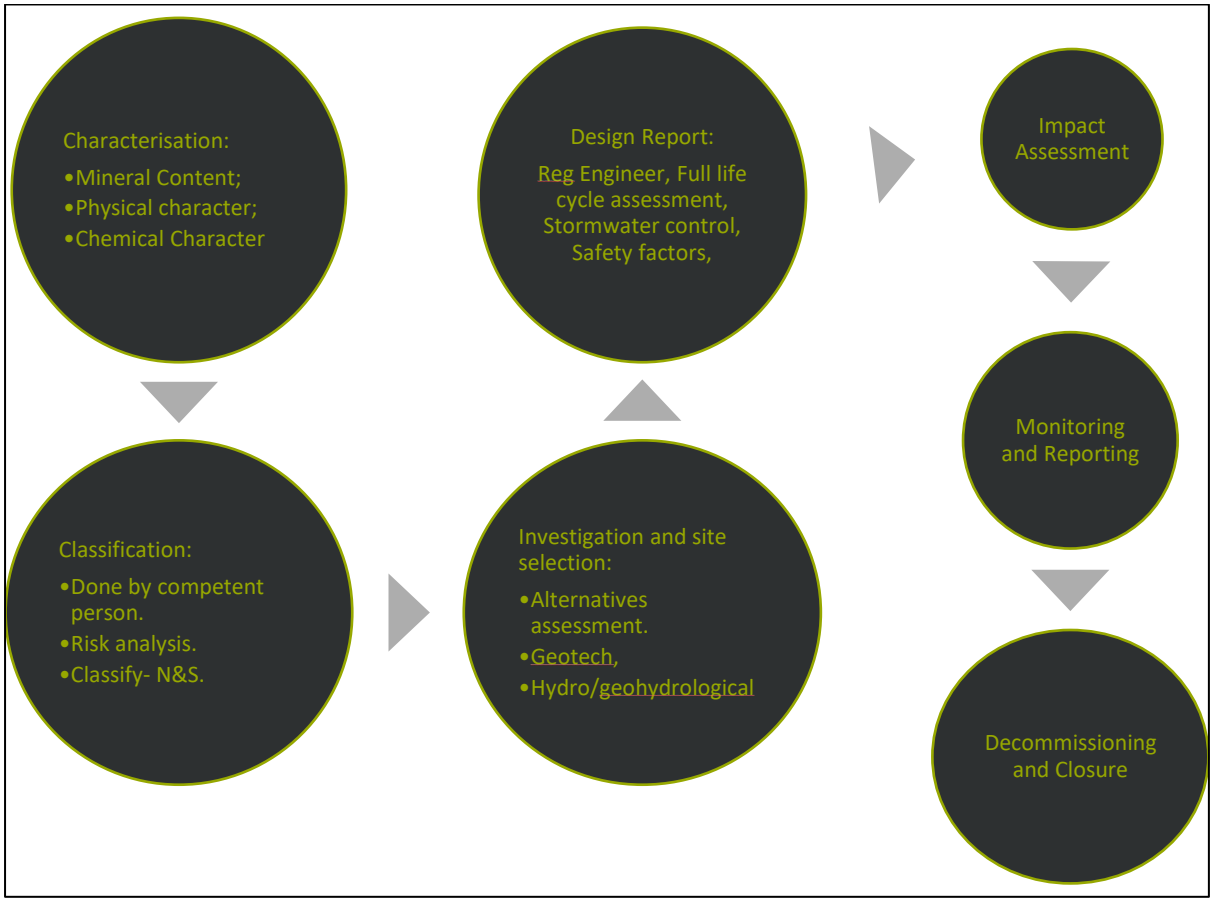



**Figure 13:** Overview of the planning and management of residue stockpiles and residue deposits regulations.

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

These norms and standards prescribe the requirements for the assessment of waste prior to disposal to landfill. The aim of the waste assessment tests is to characterise the material to be deposited or stored in terms of the above-mentioned waste assessment guidelines set by the DEA. Analysis of representative samples will be discussed in the EIA phase where the characterisation of the materials will determine the required mitigation measures to be put forward in the EMPr.

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

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

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

Waste streams generated from mine activities will, where applicable, be classified accordingly to determine their nature (i.e. general or hazardous), and subsequently managed and disposed of in accordance with the relevant legislative requirements. Analysis of representative samples will be discussed in the EIA phase where the characterisation of the materials will determine the required mitigation measures to be put forward in the EMPr.

#### 4.1.4.4 NEMWA NATIONAL NORMS AND STANDARDS FOR DISPOSAL OF WASTE TO LANDFILL, 2013 (GN R. 636)

Once the waste has been assessed and classification is done (waste type identified) the guidelines in this Regulation can be used to determine the minimum requirements for the landfill and containment barrier design. This will distinguish between Class A, Class B, Class C, or Class D landfills (where relevant) and the associated requirements (as presented in **Figure 14**).

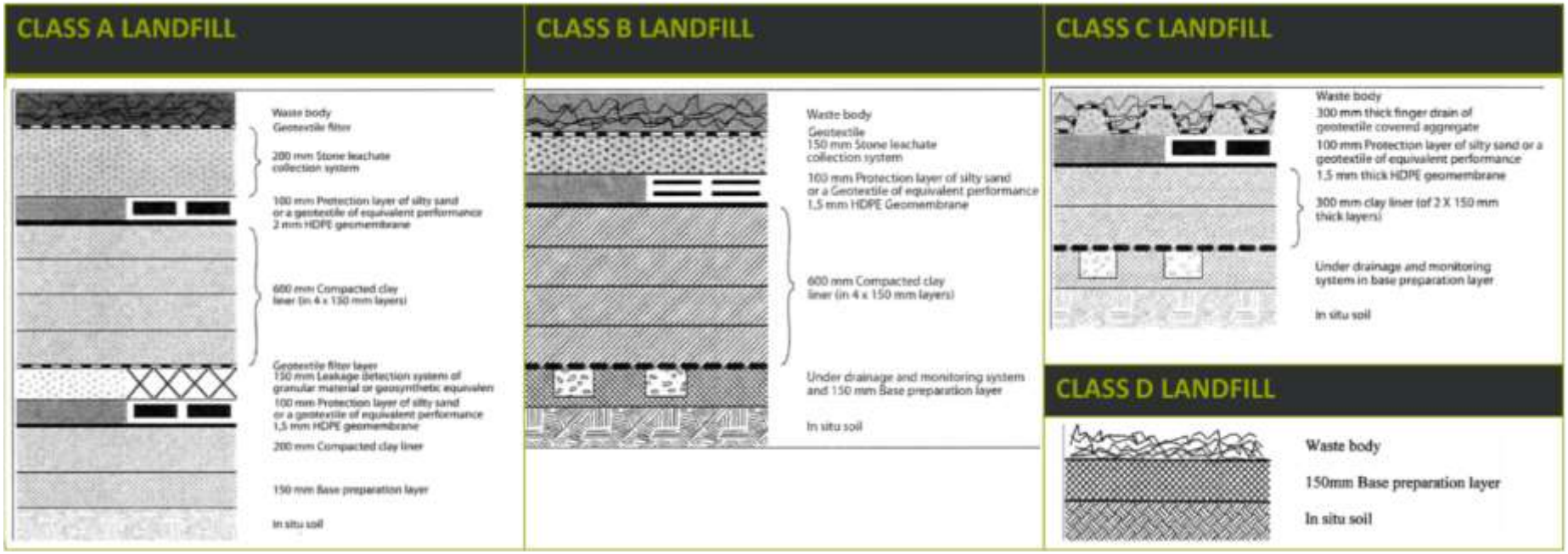



**Figure 14:** Overview of NEMWA Class A to D landfill containment barrier designs.

### 4.1.5 THE NATIONAL ENVIRONMENTAL MANAGEMENT AIR QUALITY ACT

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

To protect the environment by providing reasonable measures for-

i. the protection and enhancement of the quality of air in the republic;

ii. the prevention of air pollution and ecological degradation; and

iii. securing ecologically sustainable development while promoting justifiable economic and social development; and

Generally, to give effect to Section 24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and wellbeing of people.

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

According to the Air Quality Act, air quality management control and enforcement is in the hands of local government with District and Metropolitan Municipalities as the licensing authorities. Provincial government is primarily responsible for ambient monitoring and ensuring municipalities fulfil their legal obligations, with national government primarily as policy maker and co-ordinator. Each sphere of government must appoint an Air Quality Officer responsible for co-ordinating matters pertaining to air quality management. Given that air quality management under the old Act was the sole responsibility of national government, local authorities have in the past only been responsible for smoke and vehicle tailpipe emission control.

The National Pollution Prevention Plans Regulations were published in March 2014 (Government Gazette 37421) and tie in with the National Greenhouse Gas Emission Reporting Regulations which took effect on 3 April 2017. In summary the regulations aim to prescribe the requirements that pollution prevention plans of greenhouse gases, declared as priority air pollutants, need to comply with in terms of the NEMAQA. The regulations specify who needs to comply, and by when, as well as prescribing the content requirements. Mines do have an obligation to report on the GHG emissions under these regulations as well as register with NAEIS.

The National Dust Control Regulations 2013 (NDCR, 2013) are promulgated under the NEMAQA and within these regulations, the standard for the acceptable dust fall rate for residential and non-residential areas is presented in **Table 7**.

**Table 7:** Acceptable dust fall rates (National Dust Control Regulations 2013).

| Restriction Areas | Dust fall rate (D) (mg/m$^2$/day, 30-days average) | ermitted frequency of exceeding dust fall rate |
|---|---|---|
| **Residential area** | D < 600 | Two within a year, not sequential month |
| **Non-residential area** | 600 < D < 1200 | Two within a year, not sequential months |

### 4.1.6 THE NATIONAL HERITAGE RESOURCES ACT

The National Heritage Resources Act (NHRA) (Act 25 of 1999) stipulates that cultural heritage resources may not be disturbed without authorization from the relevant heritage authority. Section 34(1) of the NHRA states that, "no person may alter or demolish any structure or part of a structure which is older than 60 years without a permit issued by the relevant provincial heritage resources authority…". The last few years have seen a significant change towards the inclusion of heritage assessments as a major component of Environmental Impacts Processes required by NEMA and MPRDA. This change requires us to evaluate the Section of these Acts relevant to heritage (Fourie, 2008b):

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

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

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

### 4.1.7 THE NATIONAL FORESTS ACT

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

The presence of protected species on the proposed site is not known at this stage however a biodiversity study will be conducted to inform the EIA phase of the project.

### 4.1.8 NATIONAL ENVIRONMENTAL MANAGEMENT BIODIVERSITY ACT

The National Environmental Management Biodiversity Act (NEMBA) provides for the management and conservation of South Africa's biodiversity within the framework of the NEMA as well as the protection of species and ecosystems that warrant national protection. Within the framework of this act, various regulations are promulgated which provide specific requirements and management measures relating to protecting threatened ecosystems, threatened or protected species as well as the control of alien and invasive species. An assessment of the application area will be undertaken by a biodiversity specialist and the findings of this assessment will be presented in the EIA phase. A summary of these regulations is presented below.

#### 4.1.8.1 NATIONAL LIST OF ECOSYSTEMS THAT ARE THREATENED AND NEED OF PROTECTION (GN 1002 OF 2011)

The NEMBA provides for listing of threatened or protected ecosystems in one of the following categories:

Critically Endangered (CR) ecosystems, being ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation;

Endangered (EN) ecosystems, being ecosystems that have undergone degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems;

Vulnerable (VU) ecosystems, being ecosystems that have a high risk of undergoing significant degradation of ecological structure, function or composition as a result of human intervention, although they are not critically endangered ecosystems or endangered ecosystems; and

Protected ecosystems, being ecosystems that are of high conservation value or of high national or provincial importance, although they are not listed as critically endangered, endangered or vulnerable.

The Biodiversity Specialist will assess whether any of these threatened or protected ecosystems occur within the study area and provide recommendations on how the development should or should not proceed based on the findings of the assessment. The results of this assessment will be presented in the EIA phase of this study.

#### 4.1.8.2 THREATENED OR PROTECTED SPECIES REGULATIONS (GNR 152 OF 2007)

The purpose of these regulations is to -

(a) further regulate the permit system set out in Chapter 7 of the Biodiversity Act insofar as that system applies to restricted activities involving specimens of listed threatened or protected species;

(b) provide for the registration of captive breeding operations, commercial exhibition facilities, game farms, nurseries, scientific institutions, sanctuaries and rehabilitation facilities and wildlife traders;

(c) provide for the regulation of the carrying out of a specific restricted activity, namely hunting;

(d) provide for the prohibition of specific restricted activities involving specific listed threatened or protected species;

(e) provide for the protection of wild populations of listed threatened species; and

(f) provide for the composition and operating procedure of the Scientific Authority.

#### 4.1.8.3 ALIEN AND INVASIVE SPECIES LIST

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

Category 1a Listed Invasive Species: Category 1a Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be combated or eradicated;

Category 1b Listed Invasive Species: Category 1b Listed Invasive Species are those species listed as such by notice in terms of section 70(1)(a) of the Act as species which must be controlled;

Category 2 Listed Invasive Species: Category 2 Listed Invasive Species are those species listed by notice in terms of section 70(1)(a) of the Act as species which require a permit to carry out a restricted activity within an area specified in the Notice or an area specified in the permit, as the case may be; and

Category 3 Listed Invasive Species: Category 3 Listed Invasive Species are species that are listed by notice in terms of section 70(1)(a) of the Act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of Act, as specified in the Notice.

The provisions of this Act will be considered and where relevant incorporated into the proposed mitigation measures and requirements of the EMPr during the EIA phase of this application.

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

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

### 4.1.10 THE CONSERVATION OF AGRICULTURAL RESOURCES ACT

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

### 4.1.11 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT

The Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA) promotes optimal exploitation of minerals and mineral resources. The act provides a framework for a planning system for the country. The Act introduces provisions to cater for development principles; norms and standards; inter-governmental support; Spatial Development Frameworks (SDFs) across national, provincial, regional and municipal areas; Land Use Schemes (LUS); and municipal planning tribunals as well as municipal IDP plans.

### 4.1.12 NOISE STANDARDS

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

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

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

### 4.1.13 ENVIRONMENT CONSERVATION ACT

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

The Noise Control Regulations were revised under GN R. 55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations. The Free State Province did promulgate provincial regulations (PN 24) in 1998 however the Mpumalanga Province has not done so yet and as such, the ECA Noise Control Regulations apply. These noise control regulations will need to be considered in relation to the potential noise that may be generated mainly during the construction and decommissioning phases of the proposed project. The two key aspects of the noise control regulations relate to disturbing noise and noise nuisance.

Section 4 of the regulations prohibits a person from making, producing or causing a disturbing noise, or allowing it to be made produced or caused by any person, machine, device or apparatus or any combination thereof. A disturbing noise is defined in the regulations as ‘a noise level which exceeds the zone sound level or if no zone sound level has been designated, a noise level which exceeds the ambient sound level at the same measuring point by 7 dBA or more.

Section 5 of the noise control regulations prohibits the creation of a noise nuisance. A noise nuisance is defined as ‘any sound which disturbs or impairs or may disturb or impair the convenience or peace of any person’. Noise nuisance is anticipated from the proposed project particularly to those residents that are situated in close proximity to the project site. South African National Standard 10103 also applies to the measurement and consideration of environmental noise and should be considered in conjunction with these regulations.

# 5 NEED AND DESIRABILITY OF THE PROPOSED ACTIVITY

This section will examine the need and desirability of the proposed Elandsfontein project and will examine the importance of coal as a resource as well as the desirability of continuing coal mining operations at the mine.

## 5.1 THE IMPORTANCE OF COAL AS A RESOURCE

Coal as a resource, is important in South Africa, as it remains the main source or fuel for energy generation. Eskom's existing coal-fired power stations are critical in terms of electricity production towards meeting the energy requirements of South Africa as a whole. As a result, coal mining beneficiation and supply is of paramount importance to South Africa for continued electricity generation in order to meet the current energy demands of the country in the short, medium and long term. Currently, coal provides for more than 70 % of the country's primary energy needs. About 53% of the coal that South Africa produces is used for electricity generation, 33% for petrochemical industries, 12% for metallurgical industries, and 2 % for domestic heating and cooking (Webb, 2015).

The National Development Plan (NDP) identifies the need for South Africa to invest in a strong network of economic infrastructure designed to support the country's medium and long-term economic and social objectives. Energy infrastructure is a critical component that underpins economic activity and growth across the country and therefore, it needs to be robust and extensive enough to meet industrial, commercial and household needs. The NDP envisages that, by 2030, South Africa will have an energy sector that provides reliable and efficient energy service at competitive rates, is socially equitable through expanded access to energy at affordable tariffs and environmentally sustainable through reduced pollution.

Coal produced is used locally within the region and is also exported. Eskom is the largest local buyer while China is the major export buyer. Demand for coal is generally very high for both market segments. Selling prices are generally regarded as stable both currently and in the foreseeable future. Elandsfontein Colliery's coal is currently transported by 34tonne coal haulers/side tippers to various power stations and sidings.

The coal sector in South Africa is set to receive a demand boost from the electricity sector in the form of South Africa's Coal Baseload IPP Procurement Programme, under which the Department of Energy is aiming to procure 2,500 megawatts (MW) of new electricity capacity. These projects will require significant coal supplies. After coal consumption for electricity generation, Sasol, which operates coal-to-liquid plants, is the next biggest consumer of coal in South Africa. Sasol's subsidiary, Sasol Mining, supplies the majority of the group's coal needs. Other coal consumers in South Africa include industries such as cement, chemicals and steelmaking, small businesses, and households. The largest consumer of metallurgical coal is steelmaker ArcelorMittal South Africa, which has for years sourced the material locally from Exxaro's Tshikondeni Mine in Limpopo. Exxaro closed the mine in September 2014 and the steel producer is importing coking coal from other countries, including neighbouring Mozambique.

## 5.2 ELANDSFONTEIN OPENCAST AND UNDERGROUND EXTENSION

Elandsfontein Colliery's coal is currently transported by coal haulers/side tippers to various power stations and sidings. The extension of the mining operations at Elandsfontein Colliery, will allow the continued contribution of the mine to favourable economic impacts on both the local and regional economies. The current approved mining area will be depleted by around 2027, which will result in a loss of jobs and economic drivers in the region. Therefore, the mine extension will extend the profitability and life of the mining operation until 2032, and potentially secure the jobs of the current employees for the foreseeable future. If the mining operations were not to be extended, the additional economic activity, skills development and available jobs would not be created and/or maintained, and the coal reserves would remain unutilised. If Elandsfontein Colliery were not to proceed with the proposed extension of mining, mining of these coal reserves will not necessarily be avoided, as another application

in terms of the MPRDA, Act 28 of 2002 can be made by another company. Unless the government declares the area "off limits" to mining, or the demand for coal subsides, mining houses will continue to attempt to mine the coal reserves in the area. In summary, the proposed project will allow the applicant to continue producing a secure, steady supply of coal for use by Eskom.

The needs and desirability analysis component of the "Guideline on need and desirability in terms of the EIA Regulations (Notice 819 of 2014)" includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.). **Table 8** present the needs and desirability analysis undertaken for the Elandsfontein extension project.

**Table 8:** Needs and desirability analysis for the Elandsfontein project

| Ref No. | Question | Answer |
|---|---|---|
| **1** | Securing ecological sustainable development and use of natural resources | |
| **1.1** | How were the ecological integrity considerations taken into account in terms of: Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities. | The following specialist studies are being conducted in support of this application:<br><br>Air Quality Study;<br>Biodiversity, Aquatic Ecology and Wetland Study;<br>Hydrological Study;<br>Blasting Study;<br>Traffic Study;<br>Hydrogeological Study;<br>Heritage and Paleontological Study; and<br>Soils and Land Use Study.<br>The conclusions of these studies are included in this report. |
| **1.2** | How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity? What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | Refer to baseline ecological information in Section 8, and the impact assessment and mitigation measures in Section 9 of this EIA Report. |
| **1.3** | How will this development pollute and / or degrade the biophysical environment? What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | |
| **1.4** | What waste will be generated by this development? What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste? | Refer to waste generation and disposal in Section 3.6.4 |
| **1.5** | How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | A Heritage and paleontological specialist study has been undertaken. |

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| **1.6** | How will this project use and / or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts? | Refer to the impact assessment and mitigation methods in Section 9 of this EIA Report.<br><br>It is noted that due to the nature of this project (mining of coal), a non-renewable resource will be depleted. Coal mining does, however, contribute significantly to the country's economy and power generation needs, and therefore, at the current stage mining of coal is still needed within South Africa. |
| **1.7** | How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimise the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? | Refer to the impact assessment and mitigation methods in Section 9 of this EIA Report. |
| **1.7.1** | Does the proposed project exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialised growth)? | The proposed project will rely on / depend on the extraction of a natural, non-renewable resource (coal) for selling to Eskom. |
| **1.7.2** | Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity, and are there more important priorities for which the resources should be used? | The proposed project will extend the life of the mine in an area where coal reserves have already been identified and are already being mined.<br><br>Refer to Section 6 on alternatives in this EIA Report. |
| **1.7.3** | Do the proposed location, type and scale of development promote a reduced dependency on resources? | The Elandsfontein Mine is already an existing mine and the proposed project will be an extension of the existing mine partially utilising existing infrastructure. Additional / new infrastructure will be required to mine the additional coal and to enhance the quality of the product. |
| **1.8** | How were a risk-averse and cautious approach applied in terms of ecological impacts: | |
| **1.8.1** | What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? | While the expected potentially significant impacts have been identified as part of this EIA Process. |
| **1.8.2** | What is the level of risk associated with the limits of current knowledge? | The level of risk is low – refer to assumptions and limitations included in Section 13 of this report. |

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| **1.8.3** | Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development? | Sufficient information was gathered prior to the onset of this process to indicate that the potential mining of additional coal is feasible. In addition, it is noted that this project extends a current mining operation. |
| **1.9** | How will the ecological impacts resulting from this development impact on people's environmental right in terms following? | |
| **1.9.1** | Negative impacts: e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? | Refer to the impact assessment and mitigation measures in Section 9 in this EIA Report. |
| **1.9.2** | Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts? | |
| **1.10** | Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)? | Refer to Section 8 and the impact assessment and mitigation measures in Section 9 in this EIA Report. |
| **1.11** | Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives / targets / considerations of the area? | Refer to the impact assessment and mitigation measures in Section 9 in this EIA Report. |
| **1.12** | Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations? | Refer to Section 6, details of the alternatives considered, and Section 5 the advantages and disadvantages of the proposed activity. |
| **1.13** | Describe the positive and negative cumulative ecological / biophysical impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and existing and other planned developments in the area? | Refer to Section 9 of this EIA Report. |
| **2** | Promoting justifiable economic and social development | |
| **2.1** | What is the socio-economic context of the area, based on, amongst other considerations, the following: | |

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| **2.1.1** | The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any other strategic plans, frameworks or policies applicable to the area, | The Emalahleni Local Municipality Integrated Development Plan (IDP) for the period of 2019 – 2020 details an unemployment rate of 21.3%. The local economy is relatively diversified with the largest sector, in terms of output as well as proportional contribution being the mining sector. The proposed LoM extension will allow the mine to continue providing coal to industry for an extended period of time. The surrounding communities will also continue to benefit through direct and indirect income; as well as the mine's use of local contractors and suppliers. |
| **2.1.2** | Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.), | The mine will make use of labourers from the local community as far as possible. |
| **2.1.3** | Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and | Refer to the baseline environment in Section 8 of this EIA Report. |
| **2.1.4** | Municipal Economic Development Strategy ("LED Strategy"). | The proposed project will promote and support the sustainability of existing business; and assist in increasing local beneficiation and shared economic growth, through extending the life of the mine. |
| **2.2** | Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? | Refer to the impact assessment and mitigation measures in Section 9 in this EIA Report. |
| **2.2.1** | Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs? | The proposed project will increase the life of mine, which will ensure that the community projects initiated by the mine will have an increased life. This will complement the local socio-economic initiatives identified for the area. |
| **2.3** | How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities? | Refer to the proposed public participation process in Section 7 of the EIA report. |
| **2.4** | Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. |
| **2.5** | In terms of location, describe how the placement of the proposed development will: | |
| **2.5.1** | Result in the creation of residential and employment opportunities in close proximity to or integrated with each other. | Refer to Section 6, details of alternatives considered, in this EIA Report. |
| **2.5.2** | Reduce the need for transport of people and goods. | |

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| **2.5.3** | Result in access to public transport or enable non-motorised and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms of public transport), | |
| **2.5.4** | Compliment other uses in the area, | Refer to item 1.3 of this table (above). The proposed project entails the mining of additional areas to be accessed within an approved mining area. The existing land use and mining of coal will therefore be complimented by the continuation of the project. |
| **2.5.5** | Be in line with the planning for the area. | Refer to item 2.2.1 of this table (above). |
| **2.5.6** | For urban related development, make use of underutilised land available with the urban edge. | Not applicable. The proposed project is not located in an urban area. |
| **2.5.7** | Optimise the use of existing resources and infrastructure, | Refer to Section 3 of this EIA report. |
| **2.5.8** | Opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), | |
| **2.5.9** | Discourage "urban sprawl" and contribute to compaction / densification. | The proposed project will result in the continued employment of workers. Therefore, the influx of additional workers to the area as a direct result of the proposed project is not anticipated. |
| **2.5.10** | Contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs, | Refer to items 2.5.7 – 2.5.9 of this table (above). |
| **2.5.11** | Encourage environmentally sustainable land development practices and processes | The proposed end land use will be developed in order to be environmentally sustainable in the long term. |
| **2.5.12** | Take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), | Refer to item 1.7.3 of this table (above). The proposed project is associated with a portion of a strategic mineral resource (coal reserve). |
| **2.5.13** | The investment in the settlement or area in question will generate the highest socio-economic returns (i.e. an area with high economic potential). | The proposed project will allow the mine to continue contributing to the local, regional and national Gross Domestic Product (GDPs), and also on the local communities through continued employment of employees and local contractors, as well as other influences that the mine has in the community, such as contributions to community upliftment programmes that are undertaken by the mine through their SLP. |

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| **2.5.14** | Impact on the sense of history, sense of place and heritage of the area and the socio-cultural and cultural-historic characteristics and sensitivities of the area, and | Refer to impact assessment in Section 9 of this EIA Report. |
| **2.5.15** | In terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement? | The proposed project will ensure continued employment in the region, as well as projects implemented from the mine's SLP. |
| **2.6** | How was a risk-averse and cautious approach applied in terms of socio-economic impacts: | |
| **2.6.1** | What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? | In terms of the socio-economic impacts, the current knowledge gaps include:<br><br>While the expected potentially significant impacts have been preliminarily identified as part of this Scoping Process, the impacts on socio-economic aspects will be explored in more detail and quantified wherever possible during the EIA Phase.<br><br>The mitigation measures associated with the impacts need to still be determined. |
| **2.6.2** | What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge? | The level of risk is low as the project is not expected to have far reaching negative impacts on socio-economic conditions. In fact, the extended LoM would have a positive impact in terms of employment security for the years to come. |
| **2.6.3** | Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development? | As this project extends a current mining operation, and does not constitute a new mine, a cautious approach has been implemented. |
| **2.7** | How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: | |
| **2.7.1** | Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimise, manage and remedy negative impacts? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. |
| **2.7.2** | Positive impacts. What measures were taken to enhance positive impacts? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. |
| **2.8** | Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socioeconomic impacts will result in ecological impacts (e.g. over utilisation of natural resources, etc.)? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. |
| **2.9** | What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. |

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| **2.10** | What measures were taken to pursue environmental justice so that adverse environmental impacts shall not be distributed in such a manner as to unfairly discriminate against any person, particularly vulnerable and disadvantaged persons (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. The mine will be in line with the regulatory requirements, provide financial provision to ensure that the mitigation measures proposed can be carried out. |
| **2.11** | What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing, and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination? | By conducting a Scoping and Environmental Impact Assessment Process, the applicant ensures that equitable access has been considered. Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report. |
| **2.12** | What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle? | Refer to the impact assessment and mitigation measures in Section 9 of this EIA Report.<br><br>The EIA and EMPr will specify timeframes within which mitigation measures must be implemented. |
| **2.13** | What measures were taken to: | |
| **2.13.1** | Ensure the participation of all interested and affected parties. | Refer to Section 7 of this EIA Report, describing the public participation process to be undertaken for the proposed project. |
| **2.13.2** | Provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation, | Refer to Section 7 of this EIA Report, describing the public participation process to be implemented for the proposed project.<br><br>The advertisement and site notice have been made available in English and Afrikaans to assist in understanding of the project.<br><br>Public meetings will be held in the EIA phase of the project.<br><br>Translators will be available at the public meetings to be held to ensure that all participants can participate in a language they are able to understand (English/Afrikaans). |
| **2.13.3** | Ensure participation by vulnerable and disadvantaged persons, | |
| **2.13.4** | Promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, | |
| **2.13.5** | Ensure openness and transparency, and access to information in terms of the process, | |
| **2.13.6** | Ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, | |

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| **2.13.7** | Ensure that the vital role of women and youth in environmental management and development were recognised and their full participation therein will be promoted? | |
| **2.14** | Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low-, middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)? | Refer to Section 7 of this EIA Report, describing the public participation process to be implemented for the proposed project. |
| **2.15** | What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected? | Workers are educated on a regular basis as to the environmental and safety risks that may occur within their work environment, adequate measures have been taken to ensure that the appropriate personal protective equipment is issued to workers based on the areas that they work and the requirements of their job. |
| **2.16** | Describe how the development will impact on job creation in terms of, amongst other aspects: | |
| **2.16.1** | The number of temporary versus permanent jobs that will be created. | It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period of time. |
| **2.16.2** | Whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area). | |
| **2.16.3** | The distance from where labourers will have to travel. | The current workers travel from the local area to the mine and back and as such, this aspect is an existing aspect with no new impacts. |
| **2.16.4** | The location of jobs opportunities versus the location of impacts. | It is not anticipated that any new jobs will be created; rather, existing jobs will be maintained for a longer period. |
| **2.16.5** | The opportunity costs in terms of job creation. | |
| **2.17** | What measures were taken to ensure: | |
| **2.17.1** | That there were intergovernmental coordination and harmonisation of policies, legislation and actions relating to the environment. | The Scoping and EIA Process requires governmental departments to communicate regarding any application. In addition, all relevant departments will be notified at various phases of the project by the EAP. |
| **2.17.2** | That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures. | |
| **2.18** | What measures were taken to ensure that the environment will be held in public trust for the people, that the beneficial use of environmental resources will serve the public interest, and that the environment will be protected as the people's common heritage? | Refer to Section 7 of this EIA Report, describing the public participation process to be implemented for the proposed project. |

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| **2.19** | Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left? | Refer to the impact assessment and mitigation measures in Section 9 of the EIA Report. |
| **2.20** | What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimising further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment? | Elandsfontein will provide a Bank guarantee to DMRE. The amount will be calculated using the published GN1147 document as required by NEMA Financial Provision Regulations (2015). |
| **2.21** | Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations? | Refer to Section 6, description of the process followed to reach the proposed preferred site, of the EIA Report. |
| **2.22** | Describe the positive and negative cumulative socio-economic impacts bearing in mind the size, scale, scope and nature of the project in relation to its location and other planned developments in the area? | Refer to the impact assessment and mitigation measures in Section 9 of the EIA Report. |

# 6 PROJECT ALTERNATIVES

The identification of alternatives is a key aspect of the success of the EIA process. All reasonable and feasible alternatives must be identified and screened to determine the most suitable alternatives to consider and assess in the EIA phase. There are however some significant constraints that have to be taken into account when identifying alternatives for a project of this scope. Such constraints include social, financial and environmental issues, which will be discussed in the evaluation of the alternatives. Alternatives can typically be identified according to:

- Location/layout/design alternatives;
- Process alternatives;
- Technological alternatives; and
- Activity alternatives (including the No-go option).

For any alternative to be considered feasible such an alternative must meet the need and purpose of the development proposal without presenting significantly high associated impacts. The alternatives are described, and the advantages and disadvantages are presented. It is further indicated which alternatives are considered feasible from a technical as well as environmental perspective.

Alternatives can also be distinguished into discrete or incremental alternatives. Discrete alternatives are overall development options, which are typically identified during the pre-feasibility, feasibility and or scoping phases of the EIA process (DEAT; 2004). Incremental alternatives typically arise during the EIA process and are usually suggested as a means of addressing identified impacts. These alternatives are closely linked to the identification of mitigation measures and are not specifically identified as distinct alternatives. This section provides information on the development footprint alternatives, the properties considered, as well as the type of activity, activity layout, technological and operational aspects of the activity.

## 6.1 DETAILS OF LOCATION ALTERNATIVES

The section below describes the site / location alternatives considered as part of the project. As indicated above, Elandsfontein Colliery is an existing operational mine, and has been subject to previous environmental processes, which considered alternatives in the form of both development and land use alternatives prior to approval.

### 6.1.1 DETAILS OF DEVELOPMENT PROPERTY

Elandsfontein is a mining company holding two mining rights over the proposed extension area and therefore, there is no practical development alternative for the future mining area. The proposed extension of the current mining area has taken into consideration economic viability and practicality as well as the location of the coal resource.

### 6.1.2 CONSIDERATION OF PROPERTY

The proposed amendment of the existing MWP includes areas that are already included in the existing Mining Rights. Therefore, no other alternatives were considered with regards to the consideration of property.

### 6.1.3 LOCATION, LAYOUT OR DESIGN OF THE ACTIVITY

Numerous alternatives were evaluated with regard to the extent of the area to be mined, mostly linked to the presence of surface infrastructure within and adjacent to the target coal resource. The relocation of the existing infrastructure will enable the underlying coal to be accessed, thereby increasing the total coal resources that would be available for extraction over the LoM.

Layout options have been investigated with regards to the placement of the infrastructure at the site including positioning of various aspects of the mine infrastructure including the opencast vs underground mining, stockpiles,roadsand PCDs . This preliminary layout has been investigated further in the EIA phase, and where necessary alternative locations and options assessed. If any infrastructure is planned to be located in areas identified as being of high environmental sensitivity or if any other significant environmental concerns are noted with regards to the proposed layout then the layout is amended based on these findings. The micro-siting information was provided to the specialists to inform the specialist impact assessments.

#### 6.1.3.1 LOCATION ALTERNATIVES

The location alternatives investigated in the EIA phase are described below

**Location Alternative S1a -** *Maximum mining over entire area*: This alternative involves mining over the entire proposed opencast and underground areas. This option can only be considered if no high-sensitivity "No-Go" areas are identified in these areas. In this development alternative, the mining and economically efficient production of coal is emphasised. Less restrictive mitigation measures will be used to protect the environmental features, thus allowing for maximum coal production. This approach has the potential to increase the financial viability of the mine at the expense of any identified environmental features on site.

**Location Alternative S1b -** *Sensitivity-based approach:* This alternative avoids no go areas and considers specialist recommendations regarding buffer distances from important features. In this development alternative environmental resource protection is emphasised and relies on the use and implementation of stringent mitigation measures to minimise identified adverse impacts. This development alternative will use environmental specialist planning and evaluation of mining methodologies (opencast vs. underground), mining footprint alteration, and infrastructure placement and logistic options to avoid consolidated sensitive environmental features and locate the operation in the least (relative) to site, sensitive location.

It is important to note that through the EIA Phase a balance between options S1a and S1b may be identified to try and optimise the mineral extraction but at the same time ensure adequate environmental and social protection.

#### 6.1.3.2 LAYOUT ALTERNATIVES

Two layout alternatives were investigated for assessment in the EIA phase with regards to the SWMP infrastructure are described below

**Layout Alternative L1a –** *Layout with a maximum of 8 PCDs*. Based on the field assessment and the topography of the area the, dirty water catchments were delineated. Layout L1a requires 8 pollution control dams with concrete lined channels which intercepts the dirty storm water run-off and drains it to an associated lined PCD (Figure 15).

**Layout Alternative L1b –** *2 PCD Layout*. A new clean and dirty storm water management system was subsequently developed as part of the WULA and IWWMP for the existing and future infrastructure layout at the Colliery. The mine is currently optimising various contaminated areas by removing contaminated materials to a central location which will be followed by rehabilitation of historically contaminated areas. On further investigation it could be seen that some dirty areas were contaminated with single loads of contaminated/carbonations material and could therefore be decontaminated. This will allow the area to be deemed as a clean area which will reduce total accumulation of dirty water and hence reducing the number of PCD's required. Based on the optimised layout, a total of 2 new formalised (lined) PCD's will be required as depicted in **Figure 16**. This layout was proposed as the preferred layout for assessment by the specialists in the EIA phase due to the fact that only two new PCDs will be required.


**Figure 15:** Layout alternative L1a (8 PCDs)


**Figure 16:** Layout alternative L1b (2 PCDs)

In addition to the layout options discussed above the surface water and aquatic ecology specialists were both asked to considered the river diversion on MR63 and comparatively assessed whether it is preferable to reinstate the river channel in its original position or whether it is better to retain it in the current diverted position.

## 6.2 DETAILS OF PROCESS ALTERNATIVES

The subsections below describe the various process alternatives considered in this EIA report.

### 6.2.1 DISPOSAL OF WASTES

Two main options, with additional sub-options, have been identified for assessment in the EIA phase and are being investigated for disposal of carboniferous waste. These include:

**Process Alternative P1a -** *Disposal to surface waste disposal facility- located on old rehabilitated mine area.*

**Process Alternative P1d -** Disposal of discard and filter cake to pit.

### 6.2.2 WATER SUPPLY FOR DUST SUPPRESSION

Two alternatives for the supply of water were identified, namely:

**Process Alternative P2a -** *Water obtained from dirty water containment facilities*: Water would be obtained from dirty water containment facilities (i.e.: PCD's).

**Process Alternative P2b** - *Water from natural ground or surface water resources*: For this alternative water would be abstracted from boreholes.

### 6.2.3 MINING METHOD

Both opencast and underground mining methods were originally proposed as options for alternative assessment in certain areas within the proposed extension areas. Due to the depth of the coal resource in the area it may have been feasible to mine these areas as opencast and proposed mining areas in the southeast were marked as EITHER Opencast or Underground – however based on feedback from the Blasting Specialist, as well as the reduced environmental impacts associated with underground mining, this area was subsequently changed to be underground only and this alternative was scoped out.

### 6.2.4 DETAILS OF TECHNOLOGY ALTERNATIVES

The subsections below describe the technological alternatives considered in this EIA report.

## 6.3 TRANSPORT OPTIONS

There are several coal product transport options. The feasibility of these options would hinge on the final market for the coal, as well as the proximity of available transport infrastructure. Several alternatives were considered in Scoping – road and conveyor transport were scoped out and only rail transport is considered a suitable alternative as Elandsfontein Colliery's export is already currently transported by rail to the port of Richards Bay from its Oosbank siding.

## 6.4 DETAILS OF ACTIVITY ALTERNATIVES

Opencast and underground mining have been put forward within the proposed extension areas due to the varying depth of the coal resource. The proposed extension areas are currently under agricultural land use (e.g.: grazing and crop lands). Two activity alternatives are considered in this EIA report (activity alternatives A1 and A2).

**Activity Alternative A1 –** *Mining*: The land would be purchased from the current landowners (where necessary) and transformed into mining areas.

**Activity Alternative A2** – *No-go option*. The 'no-go' or 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

The implication of not amending the existing MWP (within the approved mining right boundary) to include the mining of additional coal resources, as indicated in the MWP, includes a reduction in the existing mining operations overall LoM, as well as compromising the ability of Elandsfontein Colliery to ensure consistent coal supply to Eskom for electricity generation and extended local and regional economic benefits. The area is included in the mining right boundary and if the no-go option is opted for, then most likely the mine will cease to operate soon and the known coal reserves would remain available for future extraction. An opportunity will then be provided for a future mine applicant to apply for rights to access the coal reserves remaining and thereby possibly re-activate mining at a later stage.

The no-go alternative means that the benefits of local and regional employment at the mine would not be realized in the long term. The proposed project would increase the LoM by approximately 7 years. The potential employment and economic benefits will therefore be foregone. The no-go alternative would therefore maintain the current environmental status quo at the site but would reduce the potential LoM by approximately 7 years.

## 6.5 ALTERNATIVE ASSESSMENT

This section describes the pros and cons of various alternatives described above. The findings are presented here in **Table 9**.

**Table 9:** Summary of alternative options assessed in the EIA.

| Alternative Category | Ref | Alternative description | Advantages | Disadvantages / Impacts / Risks | Preliminary Extent, Duration and Significance of potential key impacts for each alternative | Additional Comments | Preferred Alternative |
|---|---|---|---|---|---|---|---|
| Layout alternatives | L1a | 8 PCD Layout alternative | No rehabilitation of previously mined areas required for this alternative. | No rehabilitation of historically contaminated areas will take place. | Water contamination:<br>*Significance: Moderate - High*<br>*Duration: Long-term*<br>*Probability: High*<br>*Reversibility: Limited*<br>*Irreplaceable loss: Yes* | | |
| | L1b | 2 PCD Layout alternative | Fewer PCDs required, reduced impacts associated with PCDs and fewer potential contamination sources.<br><br>Optimising of contaminated areas by removing contaminated materials to a central location. | Rehabilitation of historically contaminated areas is required. | Water contamination:<br>*Significance: Moderate*<br>*Duration: Long-term*<br>*Probability: Moderate*<br>*Reversibility: Limited*<br>*Irreplaceable loss: Yes* | Significantly lower construction, operational and closure phase environmental impacts associated with this option, provided rehabilitation of historically contaminated areas is undertaken. | ✓ |
| Disposal of carboniferous wastes (wash plant waste | P1a | Disposal to surface waste disposal facility- located | Area already disturbed- i.e. brownfields. | Future permanent dump on surface. | Water contamination:<br>*Significance: Moderate - High* | | |

| Alternative Category | Ref | Alternative description | Advantages | Disadvantages / Impacts / Risks | Preliminary Extent, Duration and Significance of potential key impacts for each alternative | Additional Comments | Preferred Alternative |
|---|---|---|---|---|---|---|---|
| rock and possibly filter cake) | | on old rehabilitated mine area. | Carboniferous material easily accessible should there be a future change in technologies and mineral demands. | Differential settling on rehabilitated surface may compromise any foundation liner/barrier (if required).<br><br>AMD seepage if not lined.<br><br>Potential long-term runoff of contaminated water as well as contaminated seepage emanating from the disposal facility.<br><br>Long term – permanent environmental risk/liability associated with future dump integrity (e.g. erosion of cap, illegal mining). | *Duration: Long-term*<br><br>*Probability: High*<br><br>*Reversibility: None*<br><br>*Irreplaceable loss: Yes*<br><br>Acid Mine Drainage:<br><br>*Significance: High*<br><br>*Duration: Long-term*<br><br>*Probability: High*<br><br>*Reversibility: Limited*<br><br>*Irreplaceable loss: Yes* | | |
| | P1d | Disposal of discard and filter cake to pit. | Reduce final void size.<br><br>Limited addition to pit salt load if disposed below pit water level.<br><br>Rehabilitation of the pit to ground level thereby reducing hydrological and soil impacts. | Leaching to water resources (if disposed above groundwater level).<br><br>Potential groundwater contamination and seepage emanating from the pit subsequently resulting in surface and ground water contamination. | Ground water contamination from leaching or seepage:<br><br>*Significance: Moderate - High*<br><br>*Duration: Long-term*<br><br>*Probability: Moderate*<br><br>*Reversibility: None*<br><br>*Irreplaceable loss: Yes* | Most ideal option, no new dump on surface. Already authorized as in current WUL.<br><br>Expected decant volumes for the underground voids are relatively low due to the presence of confining shale and mudstone layers restricting the | ✓ |

| Alternative Category | Ref | Alternative description | Advantages | Disadvantages / Impacts / Risks | Preliminary Extent, Duration and Significance of potential key impacts for each alternative | Additional Comments | Preferred Alternative |
|---|---|---|---|---|---|---|---|
| | | | | Limitations and technical challenges related to options for barrier layers. | | downward filtration of rainwater recharge into the underground mine voids.<br><br>Groundwater modelling shows no significant advantage to disposal at surface disposal facility as opposed to in pit disposal. | |
| Dust suppression water supply | P2a | Water obtained from dirty water containment facilities (i.e.: PCD's). | Assist to reduce water to be treated.<br><br>Reduced use of clean water thus reducing overall water impact.<br><br>This will reduce the risk of surface water discharge. | Lead to further deterioration of water quality within the dirty water containment facilities.<br><br>Potential land contamination from dust suppression taking into consideration the use of water from dirty water containment facilities | Impact on water resources through contamination:<br><br>*Significance: High*<br><br>*Duration: Permanent*<br><br>*Probability: Moderate*<br><br>*Reversibility: Low*<br><br>*Irreplaceable loss: Yes* | A combination of both P2a and P2b alternatives is proposed however dust suppression using dirty water is restricted to the dirty areas and must not be used for spraying topsoil stockpiles. | ✓ |
| | P2b | Water from ground or surface water resources. | No significant advantages identified | Clean ground water resources to be used for water on mine.<br><br>Negative impacts to water resources in the catchment through hydrological alteration | Impact on water resources through hydrological alteration:<br><br>*Significance: Moderate*<br><br>*Duration: Permanent* | A combination of both P2a and P2b alternatives is proposed however dust suppression using dirty water is restricted to the dirty | ✓ |

| Alternative Category | Ref | Alternative description | Advantages | Disadvantages / Impacts / Risks | Preliminary Extent, Duration and Significance of potential key impacts for each alternative | Additional Comments | Preferred Alternative |
|---|---|---|---|---|---|---|---|
| | | | | (reduction in water availability). | *Probability: Moderate*<br>*Reversibility: Low*<br>*Irreplaceable loss: Yes* | areas and must not be used for spraying topsoil stockpiles. | |
| *Land-use Alternatives* | A1 | Land used for mining | Economic advantages: continued employment for mine workers. | Potential for hydrological and chemical modification in local soils, wetlands and aquatic ecosystems. | Mining impacts identified above as well as in Section 9 of this report. | The mine is an existing operational mine, continued mining at the site is considered a feasible land use going forward unless environmental impacts associated with the expansion cannot be mitigated to acceptable levels | ✓ |
| | A2 | No-go alternative | Reduced risk for water contamination and subsequent wetland and aquatic ecological degradation.<br>Reduced risk to the health and safety of the local communities. | Agricultural activities will likely continue to take place if the no-go alternative is followed. This would result in continued impacts to soils, wetlands and aquatic ecology. | Soil impacts associated with farming:<br>Significance: Moderate - High<br>Duration: Long-term – Permanent<br>Probability: Moderate<br>Reversibility: Moderate<br>Irreplaceable loss: Yes<br>Hydrological impacts associated with farming | | |

*Activity Alternatives*

| Alternative Category | Ref | Alternative description | Advantages | Disadvantages / Impacts / Risks | Preliminary Extent, Duration and Significance of potential key impacts for each alternative | Additional Comments | Preferred Alternative |
|---|---|---|---|---|---|---|---|
| | | | | | (alteration of watercourses):<br>Significance: Moderate - High<br>Duration: Long-term – Permanent<br>Probability: Moderate<br>Reversibility: Low<br>Irreplaceable loss: Yes | | |
| Location/layout/design Alternatives<br>Micro siting alternatives | S1a | Maximum mining over entire area | Mining all coal in basin.<br>Most infrastructure on mined out areas or on to-be-mined areas. | Unregulated, buffer insensitive mining can result in permanent impacts to soil, wetland habitats as well as downstream aquatic ecosystems. | Ecological impacts due to surface disturbance, however this alternative will only be considered if the on-site investigations reveal no areas on site of particular concern or sensitivity. | No-go areas were identified, as such this alternative has been discarded. | |
| | S1b | Sensitivity-based approach (avoid / buffer sensitive areas). | The avoidance of wetland and riverine areas and the preservation of a buffer zone can assist in the regulation of potential water quality impacts and reduce ecosystem degradation overall. | Less mining area for the expansion therefore making project less economically viable and profitable. | No significant impacts apart from economic impact on mine. | Wetland areas and associated buffer zones were identified as being of very high sensitivity must be avoided. | ✓ |

# 7 STAKEHOLDER ENGAGEMENT

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

- Compliance with international best practice options;
- Compliance with national legislation;
- Establishment and management of relationships with key stakeholder groups; and
- Involvement and participation in the environmental study and authorisation/approval process.

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

- Introduce the proposed project;
- Explain the authorisations required;
- Explain the environmental studies already completed and yet to be undertaken (where applicable);
- Solicit and record any issues, concerns, suggestions, and objections to the project;
- Provide opportunity for input and gathering of local knowledge;
- Establish and formalise lines of communication between the I&APs and the project team;
- Identify all significant issues for the project; and
- Identify possible mitigation measures or environmental management plans to minimise and/or prevent negative environmental impacts and maximize and/or promote positive environmental impacts associated with the project.

## 7.1 GENERAL APPROACH TO PUBLIC PARTICIPATION

EIMS is assisting GSW with the public participation for the project. The PPP for the proposed project has been undertaken in accordance with the requirements of the MPRDA and NEMA EIA Regulations (2014), and in line with the principles of Integrated Environmental Management (IEM). IEM implies an open and transparent participatory process, whereby stakeholders and other I&APs are afforded an opportunity to comment on the project and have their views considered and included as part of project planning.

An initial I&AP database has been compiled based on known key I&AP's, Windeed searches and stakeholder databases provided by the mine. The I&AP database includes amongst others, landowners, communities, regulatory authorities and other special interest groups.

### 7.1.1 LIST OF ORGANS OF STATE/ AUTHORITIES IDENTIFIED AND NOTIFIED

- The following, but not limited to, Government Authorities were notified of the proposed project:

- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
- Mpumalanga Department of Economic Development and Tourism
- Mpumalanga Department of Health
- Mpumalanga Department of Human Settlement
- Mpumalanga Department of Mineral Resources
- Mpumalanga Department of Public Works, Roads and Transport
- Mpumalanga Department of Social Development
- Mpumalanga Department of Water and Sanitation
- Mpumalanga Lakes District Protection Group
- Mpumalanga Tourism and Parks Agency
- National Department of Agriculture, Forestry and Fisheries
- National Department of Environmental Affairs
- National Department of Mineral Resources
- National Department of Rural Development and Land Reform
- National Department of Human Settlements, Water and Sanitation
- Nkangala District Municipality
- South African National Roads Agency Limited (SANRAL)
- South African Heritage Resources Agency (SAHRA)
- Eskom Holdings SOC Limited
- Transnet SOC Limited
- Emalahleni Local Municipality

### 7.1.2 OTHER KEY STAKEHOLDERS IDENTIFIED AND NOTIFIED

- Birdlife South Africa
- Wildlife & Environmental Society of South Africa (WESSA)
- AFGRI
- Agri SA Mpumalanga
- Federation for a Sustainable Environment
- South African National Biodiversity Institute (SANBI)
- Endangered Wildlife Trust

### 7.1.3 INITIAL NOTIFICATION (NOTICES, ADVERTISEMENTS, AND BACKGROUND INFORMATION DOCUMENT)

The PPP commenced on the 8th of November 2019 with an initial notification and call to register for a period of 30 days, ending on the 8th of December 2019. The initial notification was given in the following manner:

#### 7.1.3.1 REGISTERED LETTERS, FAXES AND EMAILS

Notification letters (English and Afrikaans), faxes, and emails were distributed to all pre-identified key I&APs including government organisations, NGOs, relevant municipalities, ward councillors, landowners and other organisations that might be affected.

The notification letters included the following information to I&APs:

- List of anticipated activities to be authorised;
- Scale and extent of activities to be authorised;
- Information on the intended mining operation to enable I&APs to assess/surmise what impact the activities will have on them or on the use of their land;
- The purpose of the proposed project;
- Details of the affected properties (including details of where a BID and locality map could be obtained);
- Details of the relevant MPRDA and NEMA Regulations;
- Initial registration period timeframes; and
- Contact details of the EAP.

#### 7.1.3.2 BACKGROUND INFORMATION DOCUMENT (BID)

A BID in English was prepared and distributed by post e-mails and made available on the EIMS website (www.eims.co.za). The BID contains the following information:

- Project name;
- Applicant name;
- Project location (including map of study area);
- Description of the EA application process, EIA flow chart, and public participation process;
- Information on future document review opportunities;
- A detailed questionnaire/I&AP registration form; and
- Relevant EIMS contact person for the project.

#### 7.1.3.3 NEWSPAPER ADVERTISEMENTS / GOVERNMENT GAZETTE

Advertisements describing the proposed project and EIA process were placed in newspapers with circulation in the vicinity of the study area. The initial advertisements were placed in the Witbank News (in English and Afrikaans) on the 8 November 2019. The newspaper adverts included the following information:

- Project name;

- Applicant name;
- Project location;
- Nature of the activity; and
- Relevant EIMS contact person for the project.

#### 7.1.3.4 SITE NOTICE PLACEMENT

8 A1 Correx site notices in English and Afrikaans were placed at 8 locations along and within the perimeter of the proposed project area on the 7th of November 2019 during the initial notification. The on-site notices included the following information:

- Project name;
- Applicant name;
- Project location;
- Map of proposed project area;
- Project description;
- Legislative requirements; and
- Relevant EIMS contact person for the project.

#### 7.1.3.5 POSTER PLACEMENT

A3 posters in English and Afrikaans were placed local public gathering places in town near the study area.

The notices and written notification afforded all pre-identified I&APs the opportunity to register for the project as well as to submit their issues/queries/concerns and indicate the contact details of any other potential I&APs that should be contacted. The contact person at EIMS, contact number, email and faxes were stated on the posters. Comments/concerns and queries were encouraged to be submitted in either of the following manners:

- Electronically (fax, email);
- Telephonically; and/or
- Written letters.

### 7.1.4 AVAILABILITY OF SCOPING REPORT NOTIFICATION

Notification regarding the availability of the Scoping Report for public review was given in the following manner to all registered I&APs (which includes key stakeholders and landowners):

- Registered letters with details on where the scoping report can be obtained and/or reviewed, as well as the public review comment period;
- Facsimile notifications with information similar to that in the registered letter described above; and/or
- Email notifications with a letter attachment containing the information described above.

The scoping report was available for public review from the 13th July 2020 to the 14th August 2020 for a period of 30 days. I&APs were also notified of the availability of a high-level presentation presenting the findings of the scoping report that was made available on 7 August 2020.

### 7.1.5 AVAILABILITY OF EIA REPORT NOTIFICATION

Notification regarding the availability of this EIA Report for public review was given in the following manner to all registered I&APs (which includes key stakeholders and landowners):

- Registered letters with details on where the EIA report can be obtained and/or reviewed, as well as the public review comment period;
- Facsimile notifications with information similar to that in the registered letter described above; and/or
- Email notifications with a letter attachment containing the information described above.

This EIA report will be made available for public review from the for a period of 30 days. I&APs will be notified regarding a public meeting to be held during the review period of the EIA report.

### 7.1.6 PUBLIC PARTICIPATION

Comments raised to date have been addressed in a transparent manner and included in the Public Participation Report (Appendix C).

# 8 ENVIRONMENTAL ATTRIBUTES AND BASELINE ENVIRONMENT

This section of the EIA Report provides a description of the environment that may be affected by the proposed project. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, the proposed development have been described. This information has been sourced from existing information available for the area as well as previous specialist reports undertaken for the Elandsfontein Colliery. The DEA screening tool was also used to inform this section.

## 8.1 LOCATION

The project extent and mine area is located on a portion of the remaining extent of portion 8; remaining extent of portion 1; a portion of the remaining extent of portion 6; portion 44; portion 14 and the remaining extent of portion 7 of the Farm Elandsfontein 309 JS, situated approximately 4.0 km south of Kwa-Guqa and about 16.0 km west of Emalahleni, Mpumalanga Province, South Africa.

## 8.2 TOPOGRAPHY

The topography of the greater study area is characterised by moderately undulating plains and pans. The northeastern perimeter is shaped by a topographical high at 1565 mamsl and forms the watershed between quaternary catchments B20G and B11K. The lowest on-site elevation is situated towards the southwest and is recorded at 1476 mamsl. On-site gradients are relatively gentle to moderate with the average slope calculated at 2.30% and –2.20% respectively. A topographical map is included as **Figure 17.**

The resource management of the greater study area falls under the Olifants WMA and quaternary catchment B20G. Although local surface water drainage on site is inferred to be in a general southwestern direction, the regional drainage occurs in a general north to north-western direction. The Grootspruit drainage transects the project area to the southwestern perimeter.

## 8.3 CURRENT LAND-USE

Both mining rights cover an area of approximately 840 ha in total size with disturbed areas (mining) taking up approximately 48% of the space, wetlands taking up approximately 7%, crop fields taking up roughly 4% and degraded grassland areas taking up approximately 41% of the project area. Several pipelines, power lines and associated servitudes also cross the mining right areas including Rand Water steel pipes, a Sasol Pipeline and Eskom Power Lines. Relevant wayleaves and approvals must be obtained before mining in these areas.

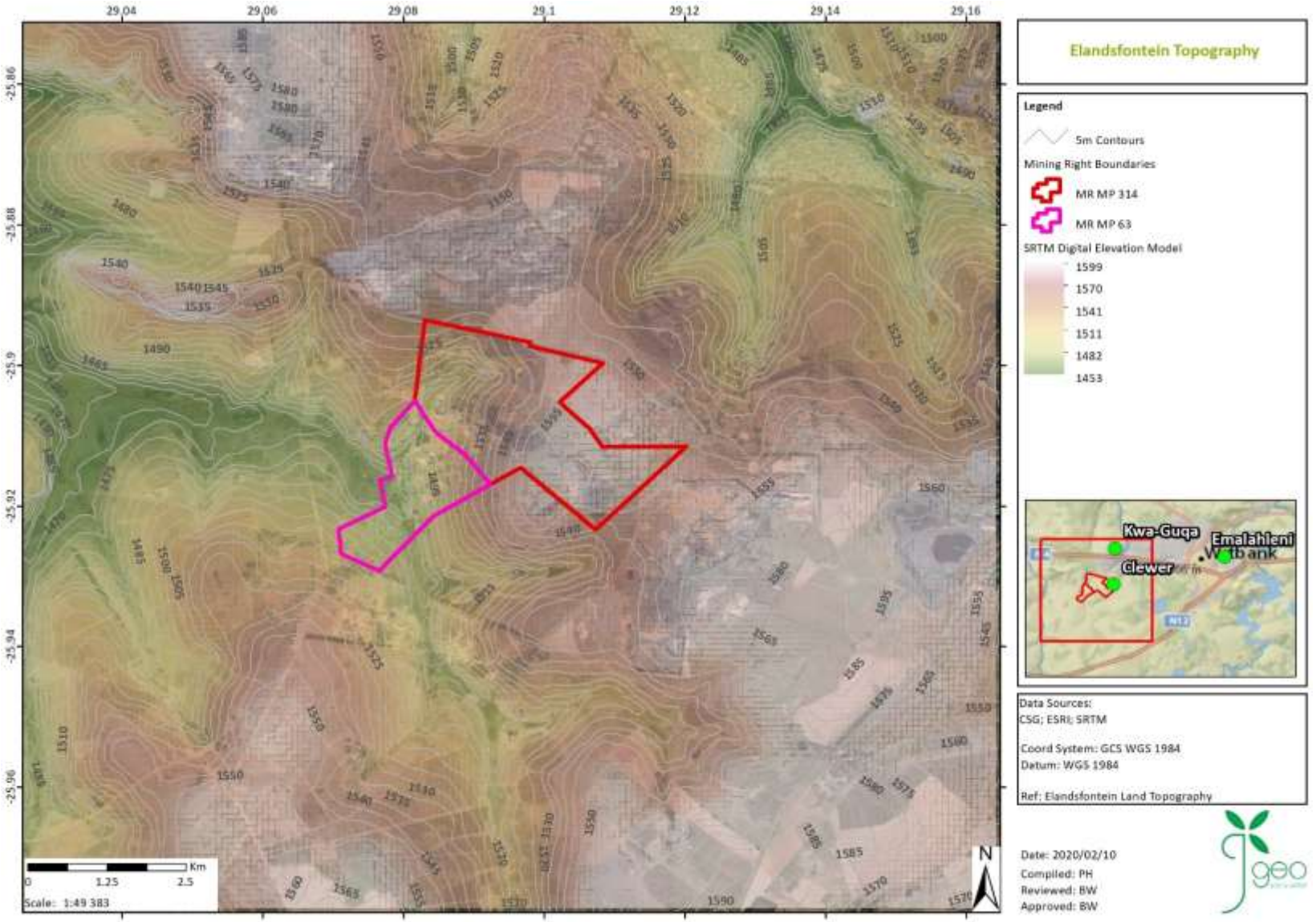



**Figure 17:** Topography / digital elevation model.

## 8.4 GEOLOGY

The study area is underlain by the Ecca Group of the Karoo Supergroup and fall within the Madzaringwe Formation, consisting mainly of arenaceous strata. On a regional scale, two geological lineaments (potentially faults zones) exist in close proximity to the greater study area, striking in a general north-south and southwestnortheast orientation respectively. The site is predominantly underlain by an intergranular and fractured aquifer system comprising mostly fractured and weathered compact sedimentary/ arenaceous rocks. It is worth noting that the subsidence investigation report (Geomech Consulting, 2019) indicated various areas characterised by a "High" risk of subsidence, with various other areas characterised by "Moderate" risks. These areas are indicated in **Figure 19.**

## 8.5 CLIMATE

The study area's weather pattern reflects a typical summer rainfall region, with > 85.0% of precipitation occurring as high-intensity thunderstorms from October to March. Patched rainfall and evaporation data were sourced from the WR2012 database (Rainfall zone B2C) and span a period of some 90 years (1920 – 2009). The calculated mean annual precipitation (MAP) for this rainfall zone is 530.76 mm/a, with the 5th percentile of the data set (roughly equivalent to a 1:20 year drought period) calculated at 342.74 mm/a and the 95th percentile (representing a ~1:20 flood period) 717.84 mm/a. The highest MAP for the 90 years of rainfall data was recorded as of 940.85 mm (1995) while the lowest MAP of 291.38 mm was recorded during 1965. This quaternary catchment is categorised under evaporation zone 4A which have a mean annual evaporation (s-pan) of 1689.0 mm/a, more than double the annual precipitation for the greater study area.

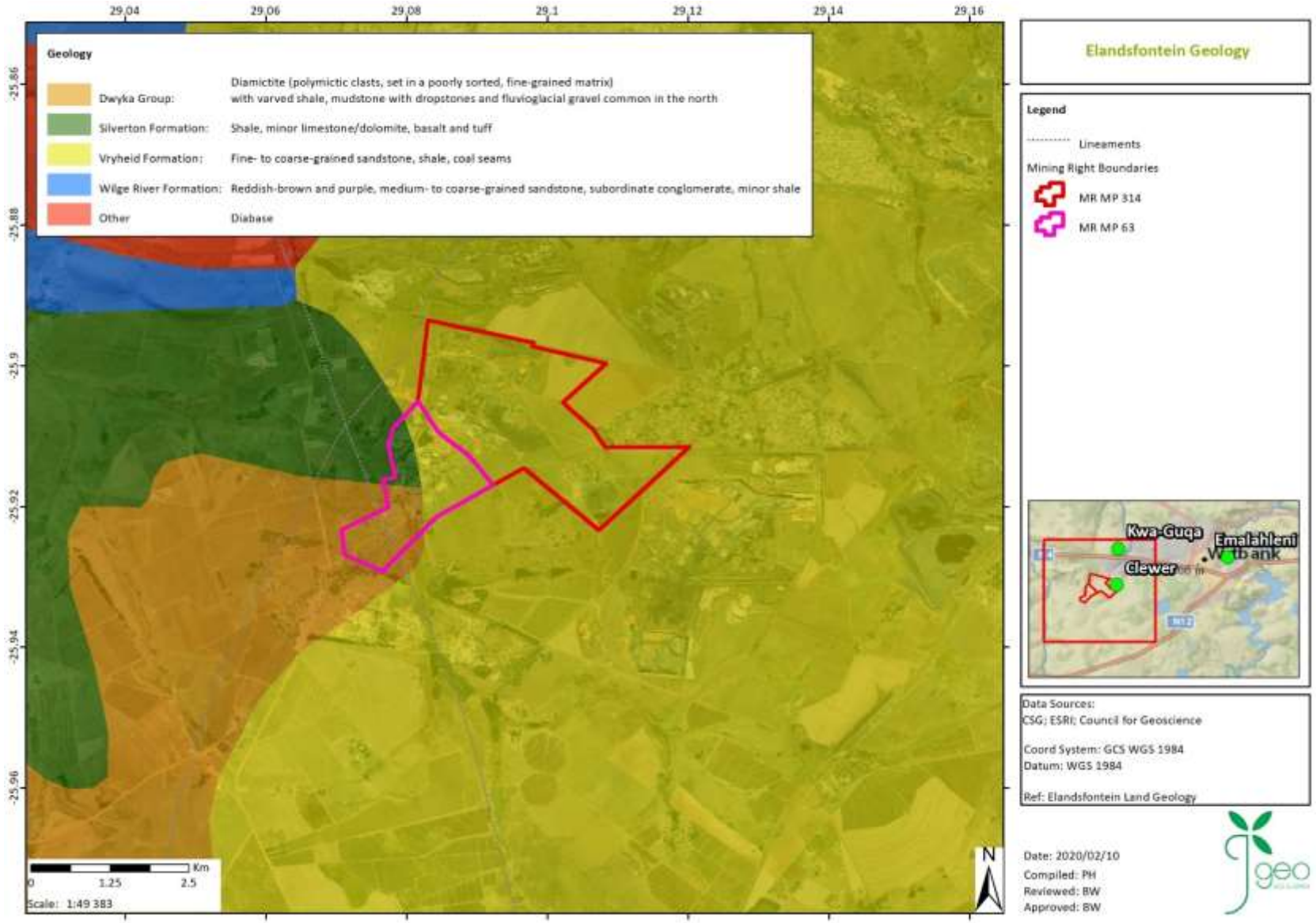



**Figure 18:** Regional geological map.

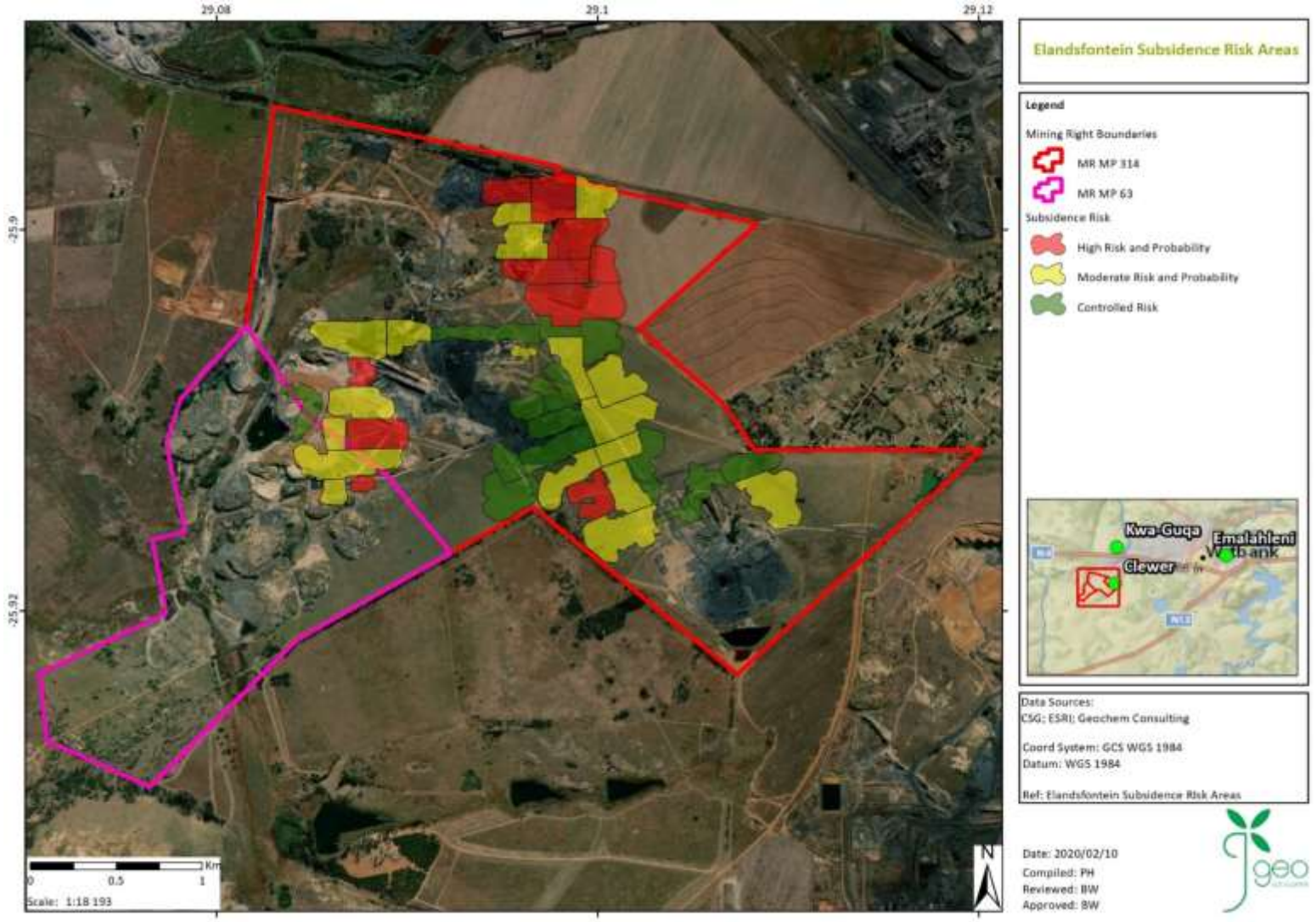



**Figure 19:** Subsidence Risk Areas

## 8.6 SOCIO-ECONOMIC

The following section provides a summary of the social and economic environment that may be influenced by the proposed project. Information in this section was sourced from Stats SA and the Integrated Development Plans (IDP's) for the Emalahleni Local Municipality as well as the Nkangala District Municipality.

According to the National Environmental Management Act (NEMA, 1998) environment refers to the surroundings in which humans exist. When viewing the environment from a socio-economic perspective the question can be asked what exactly the social environment is. Different definitions for social environment exist, but a clear and comprehensive definition that is widely accepted remains elusive. Barnett & Casper (2001) offers the following definition of human social environment:

"*Human social environments encompass the immediate physical surroundings, social relationships, and cultural milieus within which defined groups of people function and interact. Components of the social environment include built infrastructure; industrial and occupational structure; labour markets; social and economic processes; wealth; social, human, and health services; power relations; government; race relations; social inequality; cultural practices; the arts; religious institutions and practices; and beliefs about place and community. The social environment subsumes many aspects of the physical environment, given that contemporary landscapes, water resources, and other natural resources have been at least partially configured by human social processes. Embedded within contemporary social environments are historical social and power relations that have become institutionalized over time. Social environments can be experienced at multiple scales, often simultaneously, including households, kin networks, neighbourhoods, towns and cities, and regions. Social environments are dynamic and change over time as the result of both internal and external forces. There are relationships of dependency among the social environments of different local areas, because these areas are connected through larger regional, national, and international social and economic processes and power relations.*"

The environment influences and constrains behaviour, but behaviour also leads to changes in the environment. The impacts of a project on people can only be truly understood if their environmental context is understood. The baseline description of the social environment will include a description of the area within a provincial, district and local context that will focus on the identity and history of the area as well as a description of the population of the area based on a number of demographic, social and economic variables.

In 2015, Emalahleni's share of population was below the lower-bound poverty line was the lowest (favourable) among the municipal areas. The number of people below the lower bound poverty line was however relatively high at more than 90 000 people in 2015. According to the 2016 Community Survey of StatSA, the so-called poverty headcount (multi-dimensionally) of Emalahleni deteriorated from 8.0% in 2011 to 10.9% in 2016 and second highest in the Province and the so-called poverty intensity also increased from 43.6% to 45.4% in the same period. The unemployment rate of Emalahleni decreased from 27.3% in 2011 to 23.2% in 2015. Emalahleni's unemployment rate was the 5th lowest among all the municipal areas of Mpumalanga. Unemployment rate for females is 29.8% and that of males is 19.2%. Youth unemployment rate according to the Census figure is 36.0%. The municipal economy is dominated by mining and therefore a high dependence on the mining industry. Other industries in the area are making contribution to the local economy; these include trade and community services. Emalahleni ccontribution to the Mpumalanga economy is the highest in the province at more than 20% and is the largest economy in the province.

## 8.7 CULTURAL AND HERITAGE RESOURCES

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. The desktop study revealed that the surroundings of the study area are characterised by a long and significant history. Previous archaeological and heritage studies from this area have revealed a number of heritage sites that include mainly informal graves or burial grounds and historic farmsteads and homesteads or the remains of such structures. During the field work a total of eleven heritage resource were identified (**Figure 20**. The majority of these (eight) were graves and burial grounds (EFN001, EFN002, EFN003, EFN004, EFN007, EFN008, EFN010, EFN011), with the remaining three being structures or remains of structures (EFN005, EFN006, EFN009).

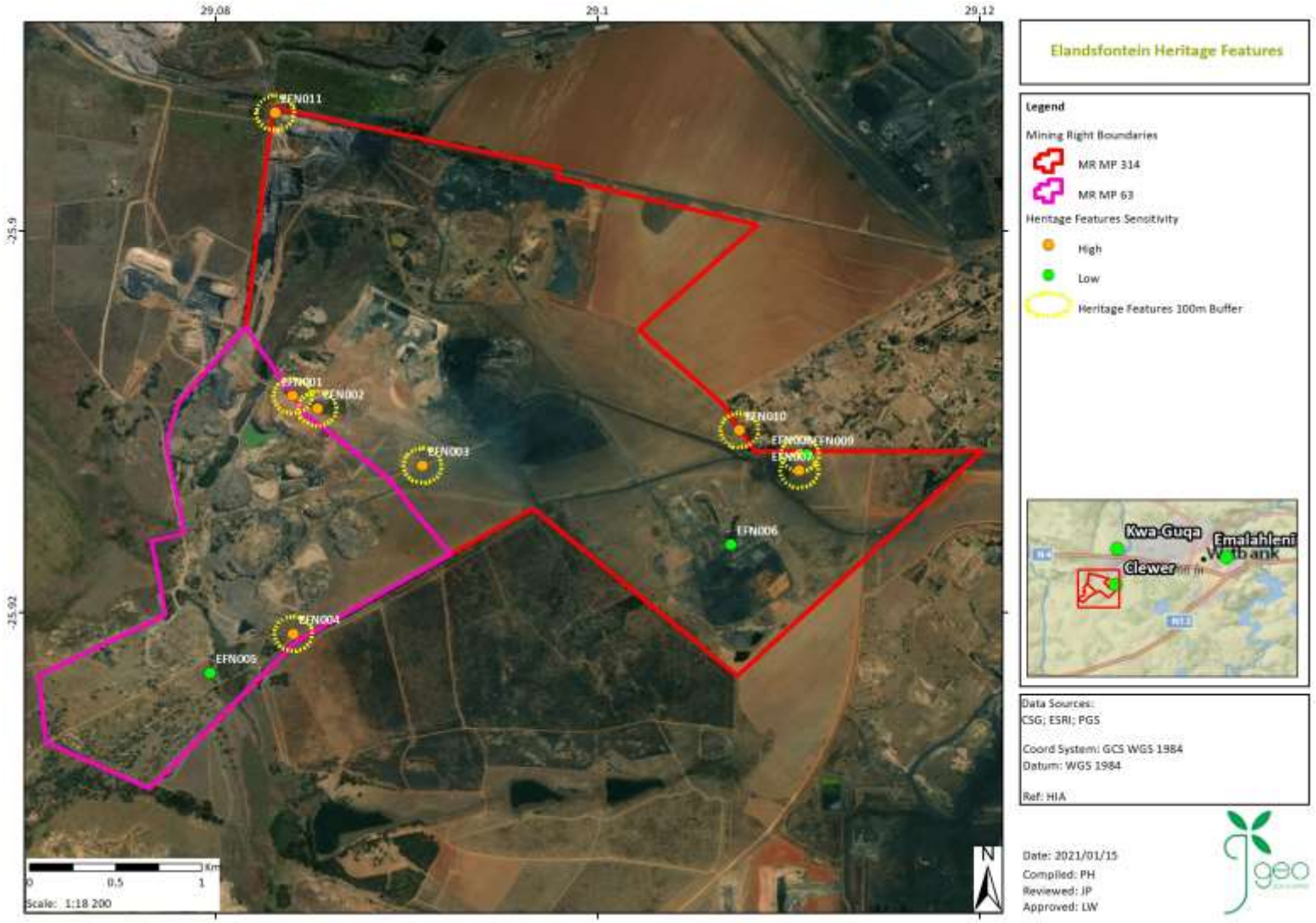



**Figure 20:** Heritage sites

## 8.8 PALAEONTOLOGICAL RESOURCES

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. The geology of the proposed Elandsfontein Colliery, Emalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province is shown on the 1:250 000 2528 Pretoria Geological Map (Council for Geosciences). The proposed development is primarily underlain by the Ecca Group (Vryheid Formation), as well as a small portion in the Dwyka Group. According to the PalaeoMap of the South African Heritage Resources Information System the Palaeontological Sensitivity of the Vryheid Formation is Very High, while the Dwyka Group has a Moderate Palaeontological Sensitivity (Almond and Pether 2008, SAHRIS website). Rock formations of moderate to high Palaeontological Sensitivity are present in the study area and thus a field-based assessment by a palaeontologist is required. Diabase is a Basalt and thus unfossiliferous and not further discussed in this report. (Butler 2019).

According to the SAHRIS palaeo-sensitivity map there is very high possibility of finding fossils in Vryheid Formation (Very High Palaeontological Sensitivity) while there is a moderate chance finding fossils in the Dwyka Group while the basalt has a Zero Palaeontological Sensitivity. A site-specific field survey of the development footprint was conducted on 30 November 2019. No visible evidence of fossiliferous outcrops was found, although Bamford (2018) had uncovered poorly preserved and unidentifiable small pockets of fossils on the Elandsfontein mining development for a previous PIA. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Elandsfontein mining upgrade will be of a medium significance in palaeontological terms.

## 8.9 SOILS AND LAND COVER

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Bb 13 and the Ba 5 land types. A soil map is provided in **Figure 21**. A land cover map is provided in **Figure 22.**

The land capability was determined by using the guidelines described in "The farming handbook" (Smith, 2006). The land capability for the project area is illustrated in **Figure 23** and described in **Table 10.** It is worth noting that the hydromorphic soils have been degraded to a Class V due to wetland indicators within 200 mm from the surface. More detailed information on specific soil forms identified can be found within the soil assessment included in **Appendix D.**

**Table 10**: Land capability for the soils within the project area

| Soil Forms | Land Capability Class | Definition of Class | Conservation Need | Use-Suitability | Percentage Within Project Area | Land Capability Group |
|---|---|---|---|---|---|---|
| **Glencoe** | Class II | Slight limitations, high arable potential and low erosion hazard | Adequate run-off control | Annual cropping with special tillage or ley (25%) | 14.7 | Arable Land |
| **Bainsvlei (Deep)** | | | | | | |
| **Bainsvlei (Shallow)** | | | | | | |
| **Vaalbos** | | | | | | |
| **Carolina** | Class III | Moderate limitations with some erosion hazard | Special conservation practice and tillage methods | Rotation of crops and ley (50%). | 12.8 | |
| **Longlands** | | | | | | |
| **Avalon** | | | | | | |
| **Mispah** | Class IV | Severe limitations, low arable potential and high erosion hazards. | Intensive conservation practice. | Long-term leys (75%). | 11 | |
| **Hydromorphic** | Class V | Watercourse and land with wetness indicators. | Protection and control of water table. | Improved pastures, suitable for wildlife. | 7.5 | Grazing |

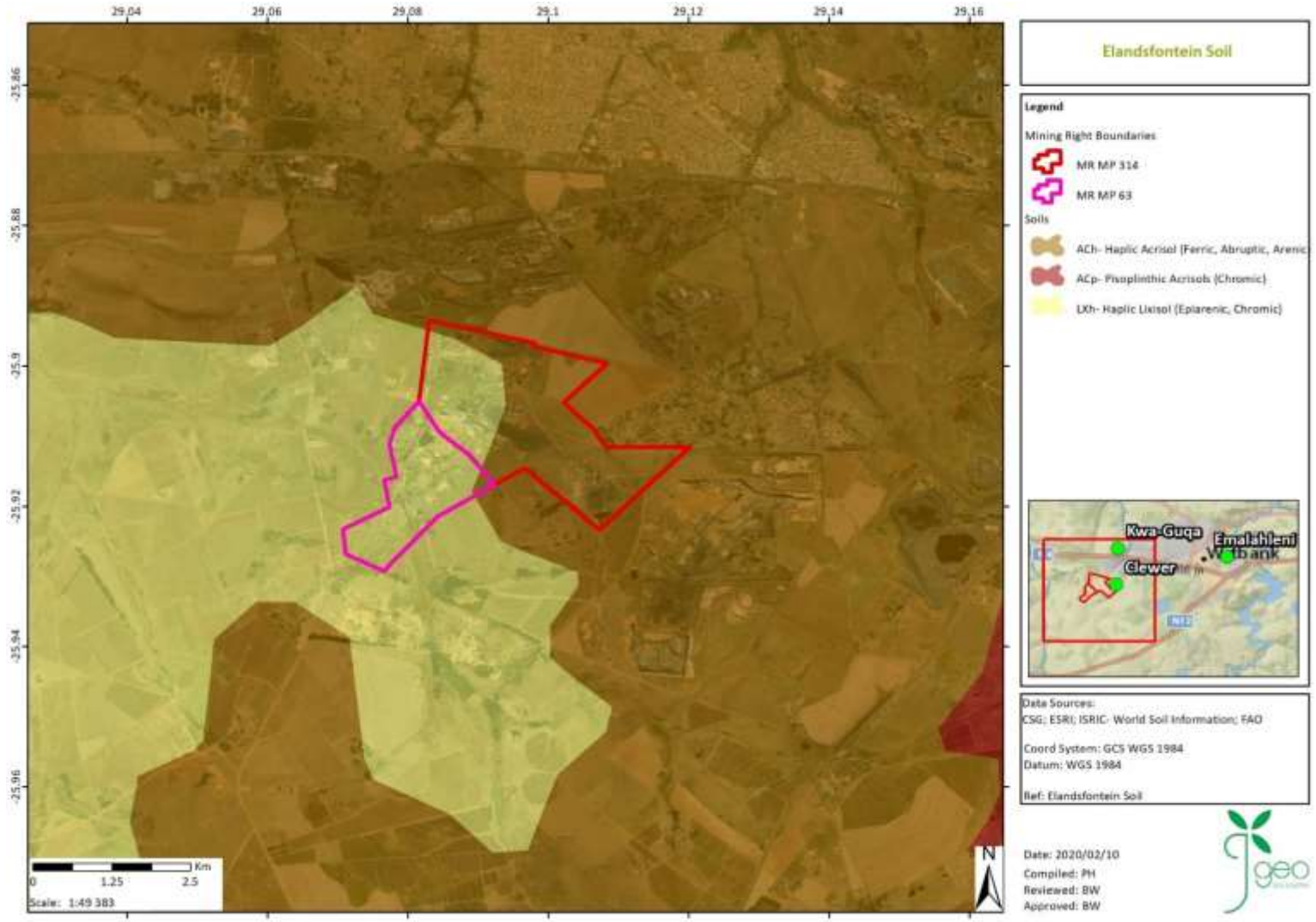



**Figure 21:** Soils map (ENPAT 2000).

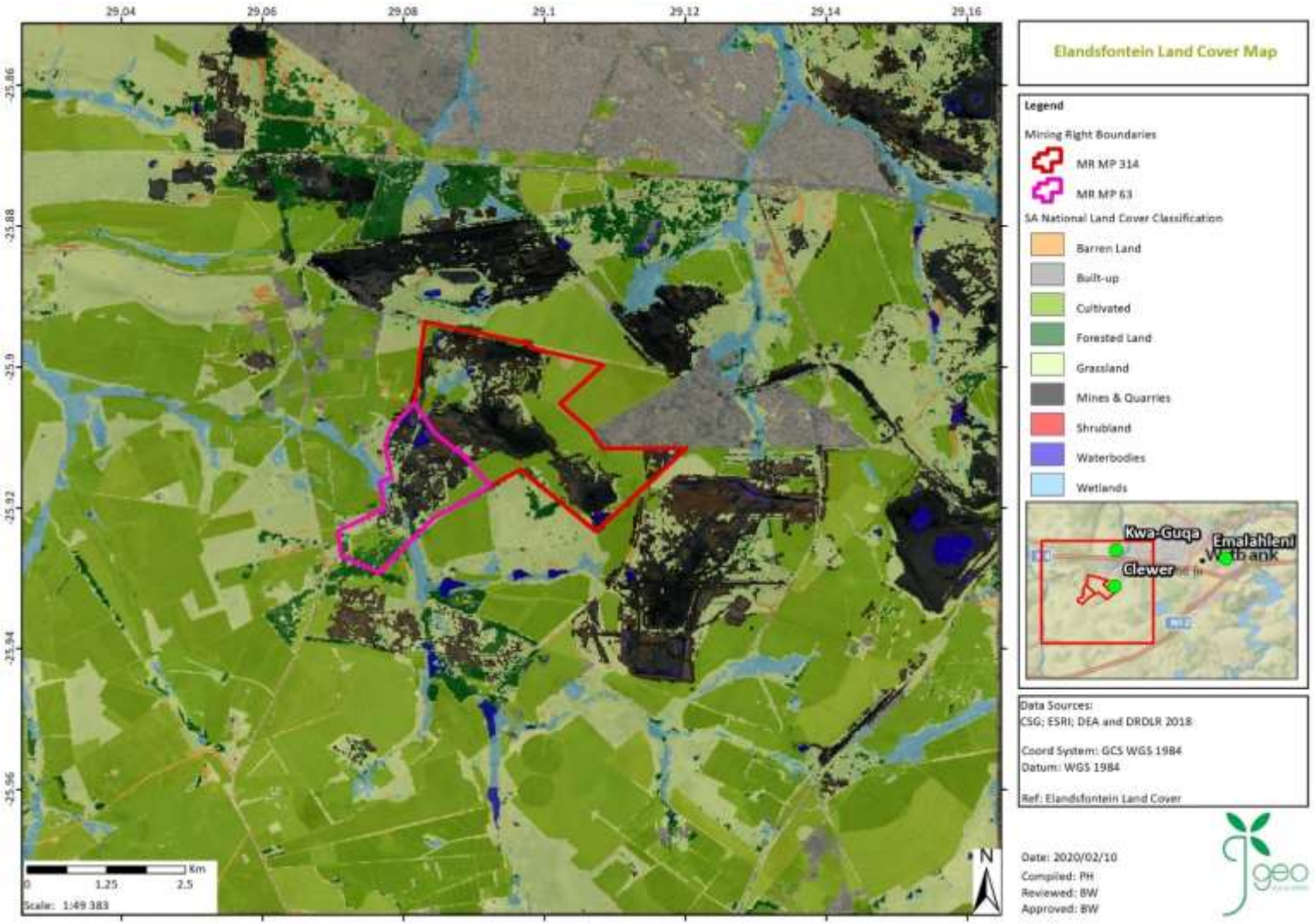



**Figure 22:** Land use / land cover map.

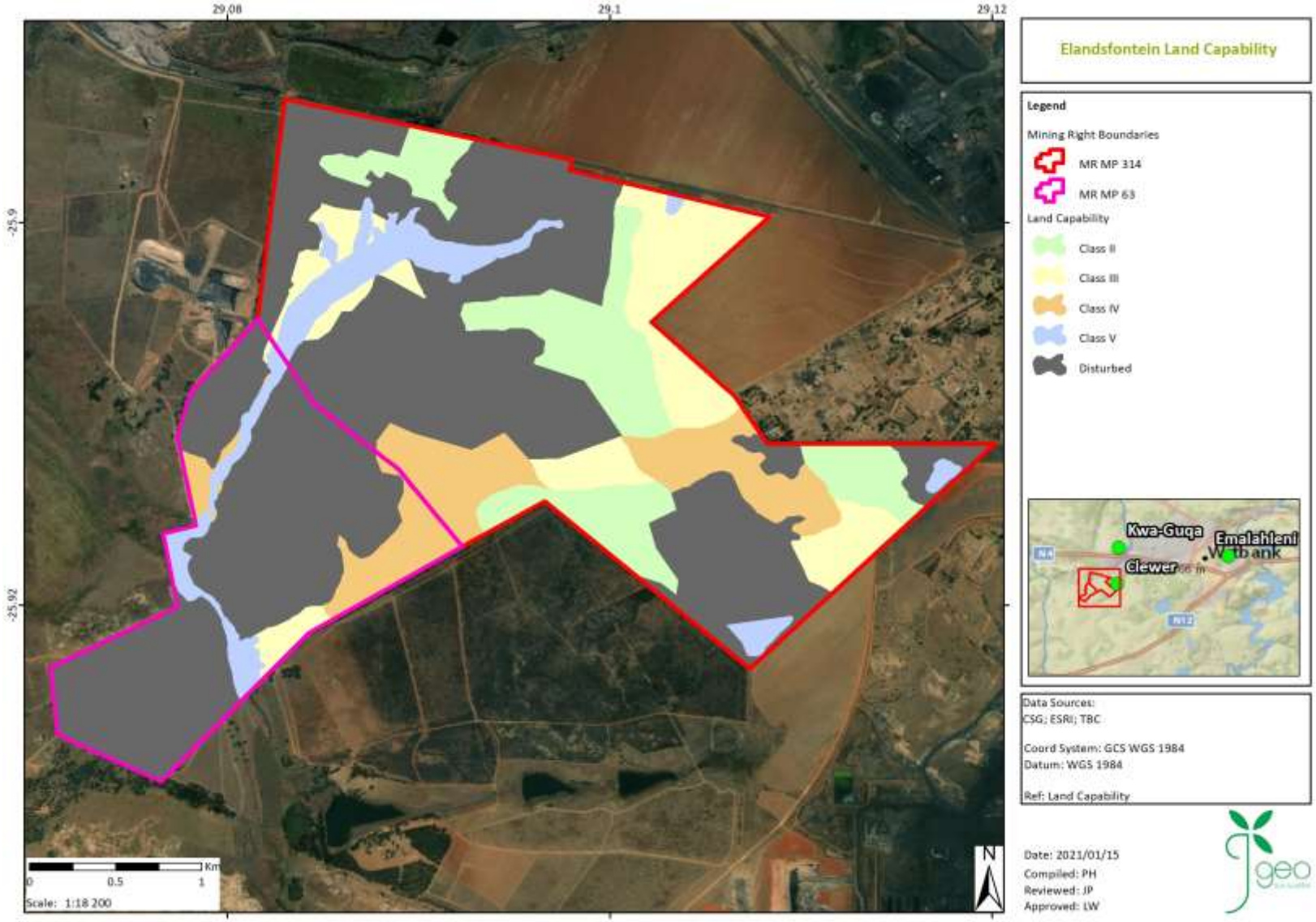



**Figure 23**: Land capability.

## 8.10 FLORA

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. The project area is situated within the grassland biome. This biome is centrally located in southern Africa, and adjoins all except the desert, fynbos and succulent Karoo biomes (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the grassland biome include:

- Seasonal precipitation; and
- The minimum temperatures in winter (Mucina & Rutherford, 2006).

The grassland biome is found chiefly on the high central plateau of South Africa, and the inland areas of KwaZulu-Natal and the Eastern Cape. The topography is mainly flat and rolling but includes the escarpment itself. Altitude varies from near sea level to 2 850 m above sea level. Grasslands are dominated by a single layer of grasses. The amount of cover depends on rainfall and the degree of grazing. The grassland biome experiences summer rainfall and dry winters with frost (and fire), which are unfavourable for tree growth. Thus, trees are typically absent, except in a few localized habitats. Geophytes (bulbs) are often abundant. Frosts, fire and grazing maintain the grass dominance and prevent the establishment of trees. The grassland biome comprises many different vegetation types. The project area is situated within two vegetation types; namely the Eastern Highveld Grassland and Rand Highveld Grassland vegetation type according to Mucina & Rutherford (2006). The vegetation distribution of the site and surrounding areas is shown in Figure 24. The Mpumalanga Biodiversity Sector Plan (MBSP) specifies two different CBA areas, Irreplaceable CBA's and Optimal CBA's. Irreplaceable CBA's include: (1) areas required to meet targets and with irreplaceability biodiversity values of more than 80%; (2) critical linkages or pinch-points in the landscape that must remain natural; or (3) critically Endangered ecosystems (MTPA, 2014). A map showing all Critical Biodiversity Areas (CBAs) is included in **Figure 25.**

**Figure 26** shows the project area superimposed on the MPAES (2013) spatial data. As can be seen in this figure, the project area impacts on an area identified as part of the protected area expansion strategy.

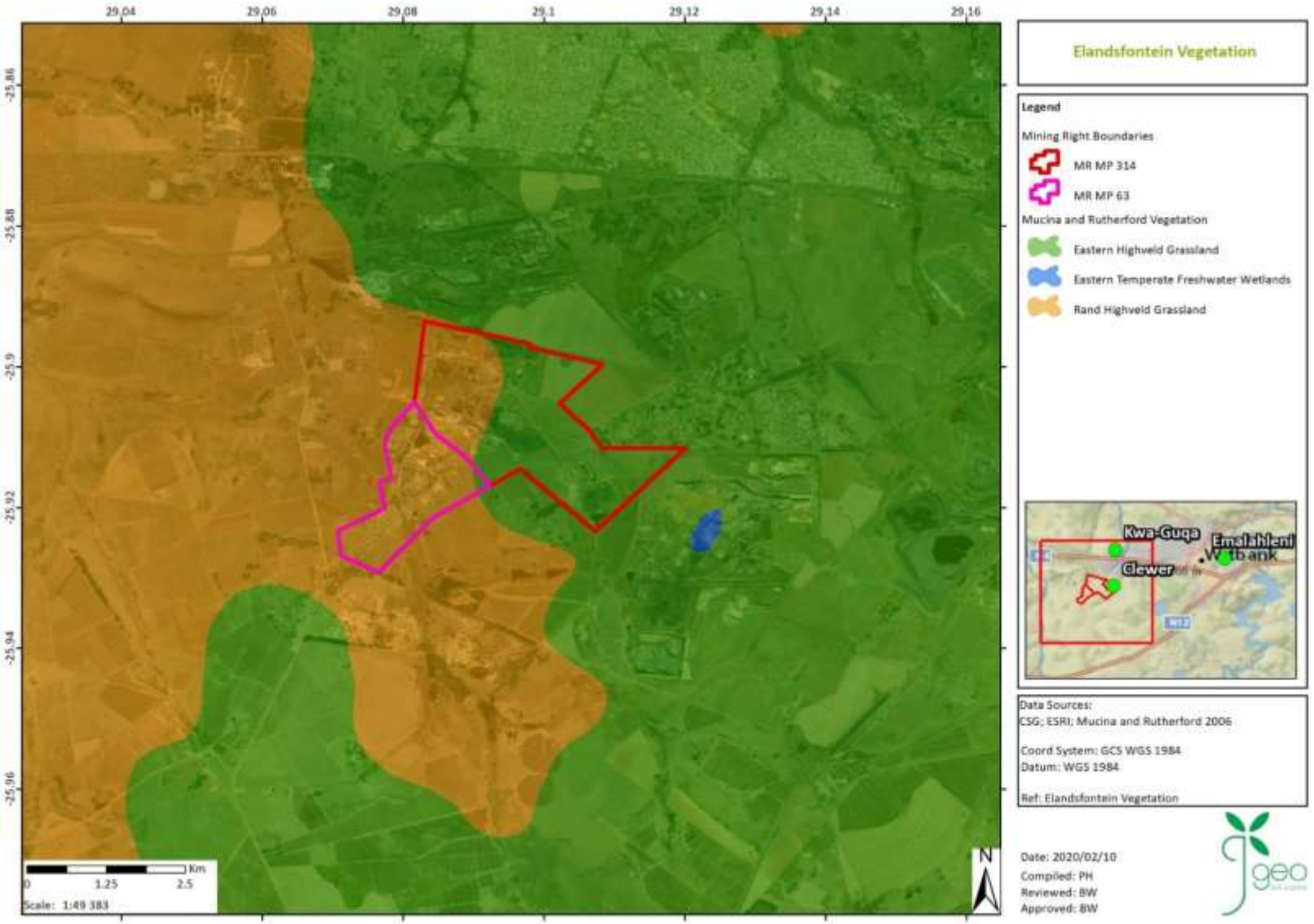



**Figure 24:** Vegetation map.

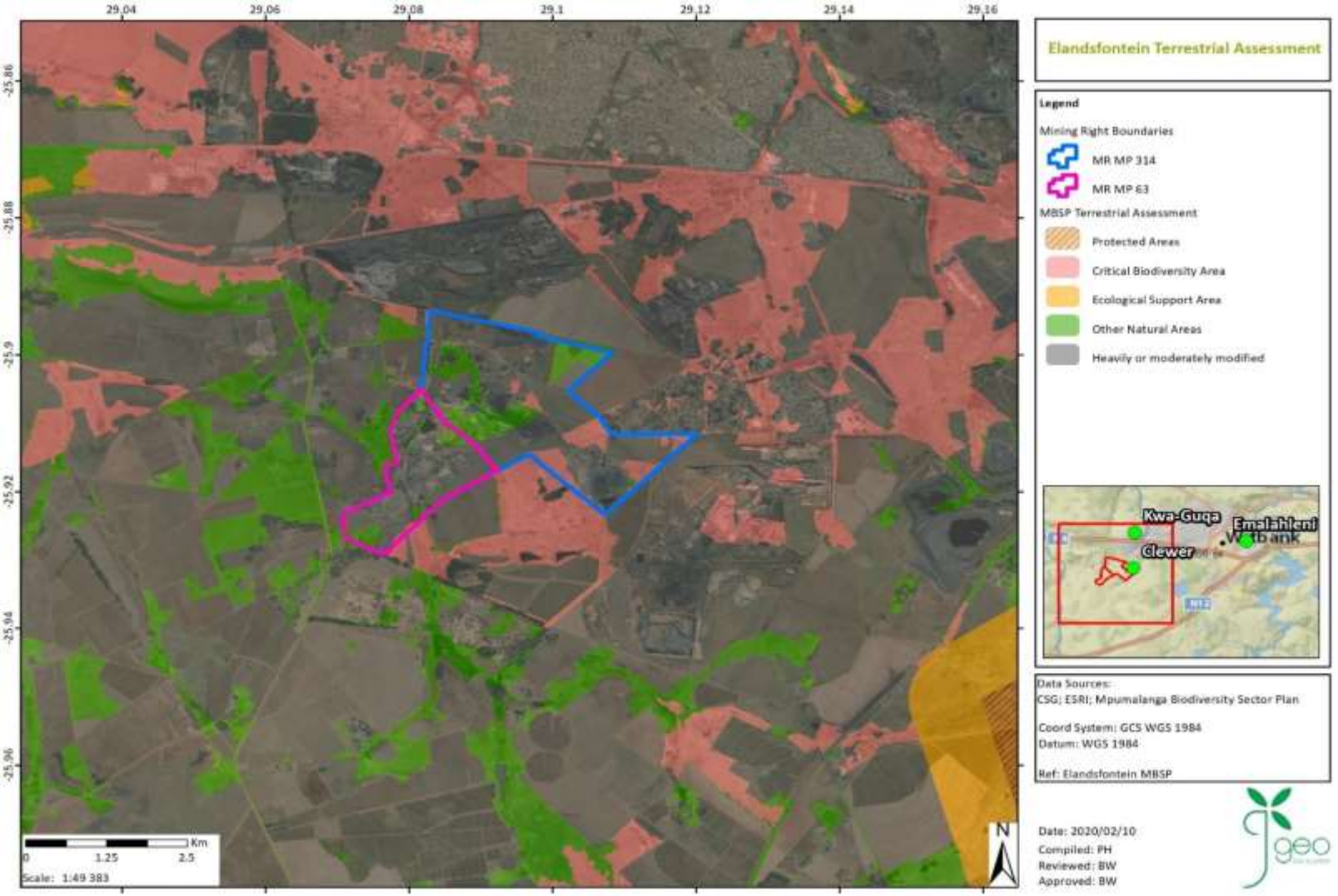



**Figure 25:** Terrestrial Critical Biodiversity Areas (CBA) map

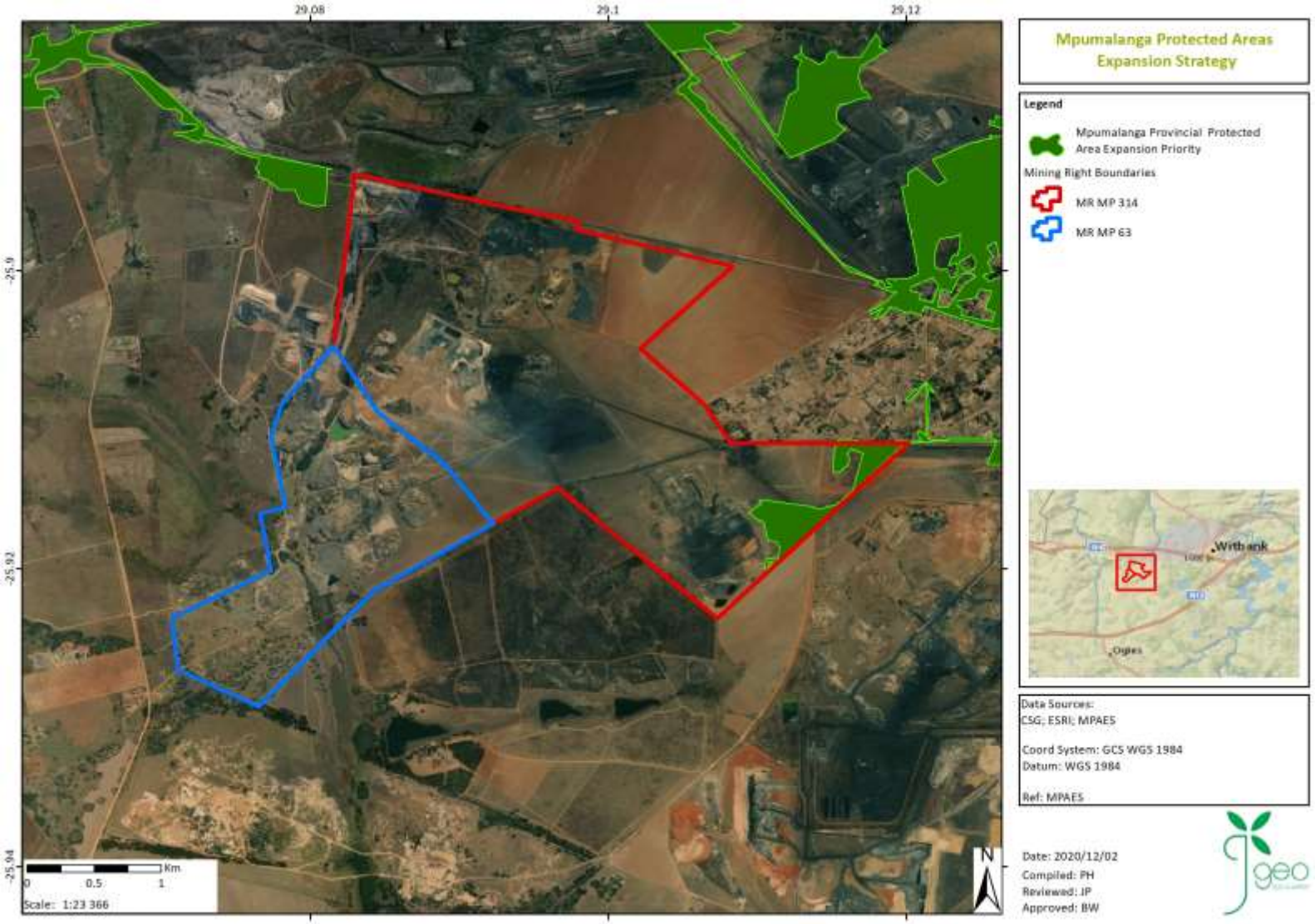



**Figure 26:** Project area in relation the MPAES

## 8.11 FAUNA

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 235 bird species have the potential to occur in the vicinity of the project area. Of the potential bird species, nine (9) species are listed as SCC either on a regional or global scale (**Table 11**).

**Table 11:** List of bird species of regional or global conservation importance that are expected to occur in close vicinity to the project area.

| Species | Common Name | Conservation Status | | Likelihood of Occurrence |
|---|---|---|---|---|
| | | Regional (SANBI, 2016) | IUCN (2017) | |
| ***Anthropoides paradiseus*** | Crane, Blue | NT | VU | Low |
| ***Circus ranivorus*** | Marsh-harrier, African | EN | LC | Moderate |
| ***Geronticus calvus*** | Ibis, Southern Bald | VU | VU | Moderate |
| ***Mirafra cheniana*** | Lark, Melodious | LC | NT | Low |
| ***Oxyura maccoa*** | Duck, Maccoa | NT | NT | Low |
| ***Phoenicopterus minor*** | Flamingo, Lesser | NT | NT | Low |
| ***Phoenicopterus ruber*** | Flamingo, Greater | NT | LC | Low |
| ***Polemaetus bellicosus*** | Eagle, Martial | EN | VU | Low |
| ***Sagittarius serpentarius*** | Secretarybird | VU | VU | Moderate |

The IUCN Red List Spatial Data (IUCN, 2017) lists 87 mammal species that could be expected to occur within the project area. Of these species, 7 are medium to large conservation dependant species, such *Ceratotherium simum* (Southern White Rhinoceros) and *Tragelaphus oryx* (Common Eland) that, in South Africa, are generally restricted to protected areas such as game reserves. These species are not expected to occur in the project area and are removed from the expected SCC list. They are however still included in the expected species list. Of the remaining 80 small to medium sized mammal species, sixteen (16) (20%) are listed as being of conservation concern on a regional or global basis (**Table 12**).

**Table 12:** List of mammal species of conservation concern that may occur in the project area as well as their global and regional conservation statuses.

| Species | Common Name | Conservation Status | | Likelihood of occurrence |
|---|---|---|---|---|
| | | Regional (SANBI, 2016) | IUCN (2017) | |
| ***Aonyx capensis*** | Cape Clawless Otter | NT | NT | Low |
| ***Atelerix frontalis*** | South Africa Hedgehog | NT | LC | Moderate |
| ***Cloeotis percivali*** | Short-eared Trident Bat | EN | LC | Low |
| ***Crocidura maquassiensis*** | Makwassie musk shrew | VU | LC | Low |
| ***Dasymys incomtus*** | Africa Marsh rat | NT | LC | Low |
| ***Eidolon helvum*** | African Straw-colored Fruit Bat | LC | NT | Low |
| ***Felis nigripes*** | Black-footed Cat | VU | VU | Low |
| ***Hydrictis maculicollis*** | Spotted-necked Otter | VU | NT | Low |
| ***Leptailurus serval*** | Serval | NT | LC | High |
| ***Mystromys albicaudatus*** | White-tailed Rat | VU | EN | Low |
| ***Ourebia ourebi*** | Oribi | EN | LC | Low |
| ***Panthera pardus*** | Leopard | VU | VU | Low |
| ***Parahyaena brunnea*** | Brown Hyaena | NT | NT | Low |
| ***Pelea capreolus*** | Grey Rhebok | NT | LC | Low |
| ***Poecilogale albinucha*** | African Striped Weasel | NT | LC | Moderate |

| | | | | |
|---|---|---|---|---|
| ***Redunca fulvorufula*** | Mountain Reedbuck | EN | LC | Low |

Based on the IUCN Red List Spatial Data (IUCN, 2017) and the ReptileMap database provided by the Animal Demography Unit (ADU, 2019) 73 reptile species have the potential to occur in the project area. One of the expected species are SCCs (IUCN, 2017). Based on the IUCN Red List Spatial Data (IUCN, 2017) and the AmphibianMap database provided by the Animal Demography Unit (ADU, 2019) 26 amphibian species have the potential to occur in the project area. One amphibian SCCs should be present in the project area (**Table 13**) according to the above-mentioned sources but in situ confirmation is required.

**Table 13:** List of amphibian species of conservation concern that may occur in the project area as well as their global and regional conservation statuses (IUCN, 2017; SANBI, 2016).

| Species | Common Name | Conservation Status | | Likelihood of Occurrence |
|---|---|---|---|---|
| | | Regional (SANBI, 2016) | IUCN (2017) | |
| **Reptiles** | | | | |
| ***Crocodylus niloticus*** | Nile Crocodile | VU | LC | Low |
| **Amphibians** | | | | |
| ***Pyxicephalus adspersus*** | Giant Bullfrog | NT | LC | Low |

## 8.12 AQUATIC ECOLOGY

The study area considered in this assessment is located within the Southern Temperate Highveld Freshwater Ecoregion (Abel et al., 2008). In comparison to northern African river systems, the aquatic fauna of the considered ecoregion is "lacking in diversity" (Abel et al., 2008). This ecoregion is known to contain approximately 67-101 freshwater fish species of which 1-11 are known to be endemic. The ecoregion is known to have increased flow rates during the spring and summer seasons (October to March) and the indigenous fish species breed during this period.

**Table 4:** Expected fish species in the B20G-1099 Sub Quaternary Reach

| Species | Common Name | IUCN Status (IUCN, 2019) |
|---|---|---|
| ***Enteromius anoplus*** | Chubby Head Barb | LC |
| ***Enteromius paludinosus*** | Straightfin Barb | LC |
| ***Enterormius cf. brevipinnis*** | Steelpoort Barb | NE |
| ***Clarias gariepinus*** | Sharptooth Catfish | LC |
| ***Psuedocrenilabrus philander*** | Southern Mouth-Brooder | LC |
| ***Tilapia sparmanii*** | Banded Tilapia | LC |
| **LC: Least Concern, NE: Not Evaluated** | | |

A total of nine fish species are expected in the study area. The majority of the fish species were listed as Least Concern (IUCN, 2019). However, as noted in the freshwater ecoregion setting, the species *Enteromius cf. brevipinnis* is expected in the project area and is regarded as a Species of Conservation Concern.

## 8.13 SURFACE WATER

The surface water attributes within and surrounding the study area are depicted in **Figure 27**.

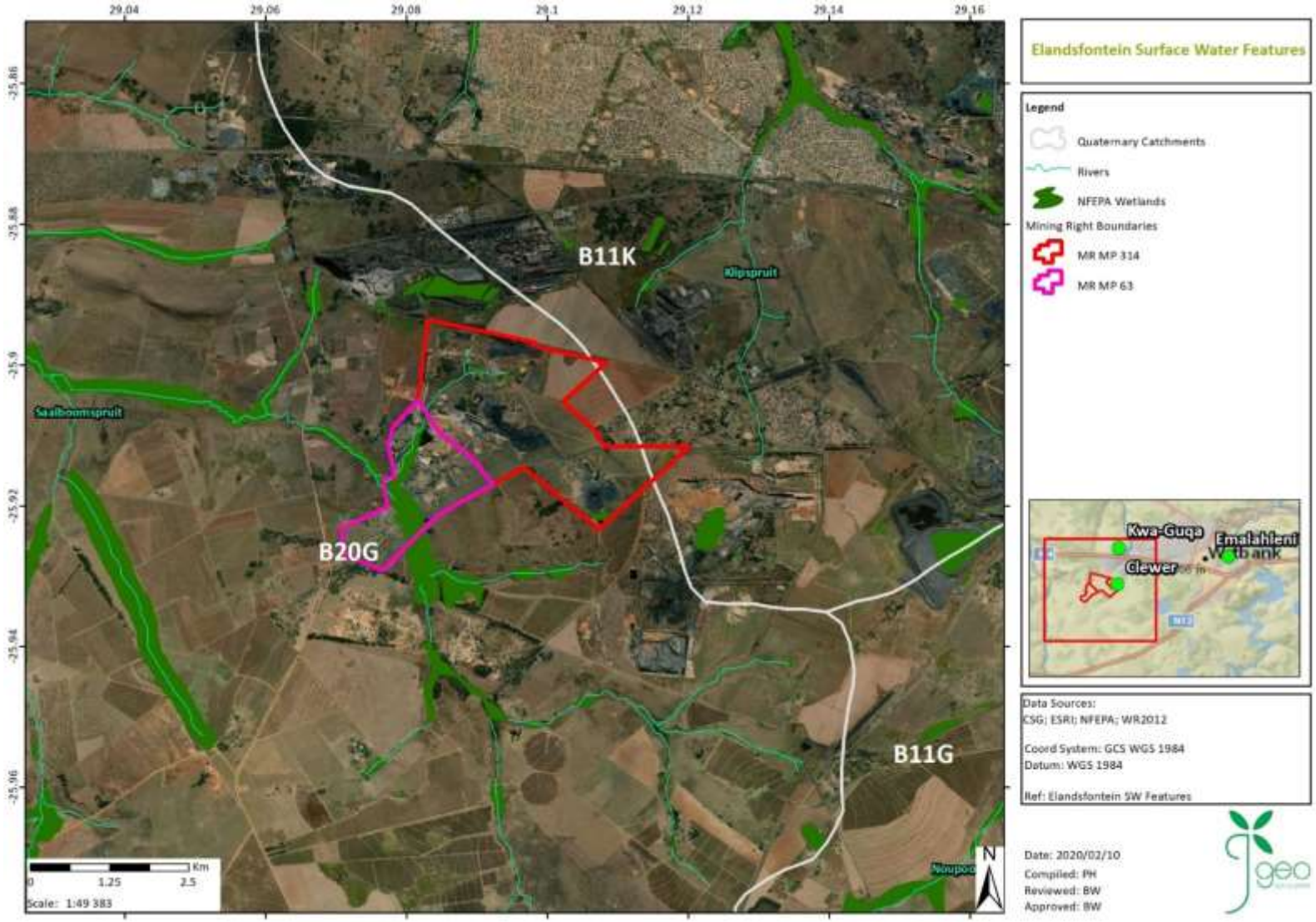



**Figure 27:** Surface water attributes.

### 8.13.1 WATER MANAGEMENT AREA

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. Elandsfontein Colliery is located within the Olifants water management area which falls within three provinces, namely: Gauteng, Mpumalanga and the Limpopo provinces. The Olifants River originates in the Highveld of Mpumalanga and initially flows northwards before curving in an easterly direction through the Kruger National Park and into Mozambique. The Olifants water management area is divided into four major river catchments i.e. the Elands River, Wilge River, Steelpoort River and Olifants River catchments. Elandsfontein Colliery falls within the Wilge River sub-catchment. Elandsfontein Colliery occurs within the B11K and B20G tertiary drainage regions.

Apart from the Elandsfontein mining operations, the Grootspruit catchment is undeveloped and consists mostly of impacted grasslands and dry land agriculture. The topography is relatively flat. Localised areas have steeper slopes, particularly in the vicinity of the streams. The Grootspruit is dammed with multiple farm dams. The water course has an ill-defined channel in the study area and contains significant reedbeds. The flood plains are not well developed.

The Elandsfontein mining operations occur on both sides of the Grootspruit Tributary stream along most of its length. The upper reaches are dammed with pollution control and water supply dams. The natural tributary has a poorly defined water course but is generally heavily reeded. The lower reaches have been modified and the stream is canalised for roughly half its length.

The 50-year and 100-year flood peaks for the Grootspruit are 246 $m^3/s$ and 326 $m^3/s$ respectively, calculated at the point just beyond the mining rights area. The 50-year and 100-year flood peaks for the Grootspruit tributary are 55 m3/s and 75 m3/s respectively, calculated at its confluence with the Grootspruit. The surface water buffer zone is the greater of the 100-year floodline or 100 m from the water course. The buffer zone for the Grootspruit is a combination of these buffers. The buffer zone for the Grootspruit tributary is predominantly the 100 m offset from the water course.

### 8.13.2 MEAN ANNUAL RUNOFF

The Grootspruit has a 81.562 $km^2$ catchment up to just beyond the mining rights area. The tributary of the Grootspruit has a catchment measuring 8.169 $km^2$ up to its confluence with the Grootspruit. The mean annual runoff for the Grootspruit and its tributary are 3.57 $Mm^3/a$ and 0.36 $Mm^3/a$ respectively. Dry weather flows are between May and October.

### 8.13.3 NORMAL DRY FLOW

Due to the small catchment size of the Grootspruit tributary, dry weather flows are likely to be very low and will often be limited to sub-surface flow only. Average dry weather flows appear high, but these are influenced by storm flow from occasional winter rainfall events and unseen subsurface flow.

### 8.13.4 SURFACE WATER QUALITY

Elandsfontein's monthly water monitoring programme currently includes 10 surface water sites of which three are wastewater facilities. Water contaminated with high concentrations of metals, sulphide minerals, dissolved solids, or salts can negatively affect surface and groundwater resources in the area.

The elevated element concentrations in the surface water bodies are potentially associated with high evaporation, low flow conditions and mine water run-off. High SO4 concentration indicates

some form of pollution in this case from coal mining or effluent runoff. Surface water at Elandsfontein has been contaminated and measures to remedy will be put in place.

The latest 2019 surface water monitoring reports were made available. The surface water sites were benchmarked against the Olifants Catchment water quality limits and the wastewater sites were benchmarked against the WUL objectives limits. The surface water sites at Elandsfontein have sulphate dominant type water and are typical of water impacted by the oxidation of pyrite and is commonly associated with mining impacts.

The following can be concluded from the latest available annual 2020 surface water monitoring reports:

- The northern tributary at monitoring point SW-01 (originating in Elandsfontein), recorded elevated concentrations of EC, TDS, Ca, Na, $SO_4$ and Mn, indicating coal mining pollution. SW-01 is a natural spring which possibly receives decant water from TCM-PCD03, an unlined facility. The decant water originates from groundwater flow from mining areas and industrial facilities located to the north of Elandsfontein.
- From SW-01 to the Farm Dam to TCM-SW05 a gradual deterioration in water quality is observed, indicating the addition of a pollution source/s. The TCM SW02 (upstream) trend analyses remain stable during the reporting period where the trend analyses from TCM SW01 (downstream) fluctuates according to the trend analyses from the upstream tributaries, especially TCM SW05 and the Farm Dam.

The elevated element concentrations in the surface water bodies are potentially associated with high evaporation, low flow conditions and mine water run-off. High $SO_4$ concentrations indicate potential pollution from coal mining or effluent runoff.

### 8.13.5 SURFACE WATER USE

Surface water users in the Wilge River sub-catchment are mainly domestic and agriculture in the form of irrigation and livestock watering. Water uses also take place in the form of impoundments such as farm dams. Surface water within the sub-catchment especially within the mining right area is used primarily for agricultural purposes (irrigation and livestock watering).

## 8.14 WETLANDS

*The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to* ***Appendix D*** *for further details. Various non-perennial and perennial streams have been identified within the proposed project area by means of the "2529" quarter degree square topographical river line data set. Two types of NFEPA wetlands were identified within the MRA, namely channelled valley bottom wetlands as well as seeps. The channelled valley bottom wetlands are classified as natural and the seeps are classified as artificial. The Mpumalanga Highveld Grassland Wetland Layer indicates an additional wetland within the MRA, namely a floodplain wetland with various other wetland types located within the MRA's surroundings. A wetland delineation was completed as seen in*

**Figure *28*.**

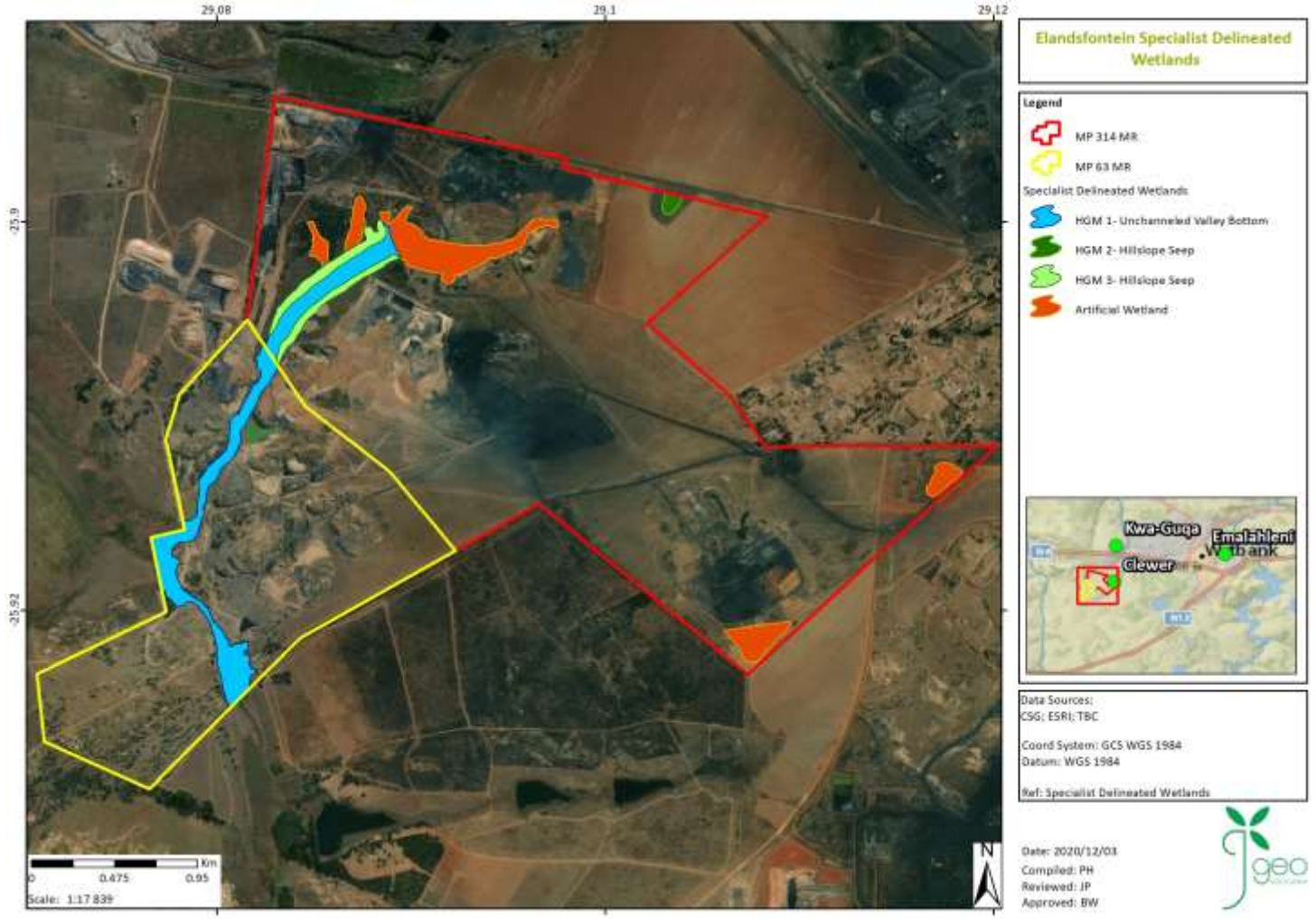



**Figure 28:** Wetland delineation

## 8.15 GROUNDWATER

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. According to the DHSWS Hydrogeological map (DHSWS Hydrogeological map series 2526 Johannesburg) the site is predominantly underlain by an intergranular and fractured aquifer system comprising mostly fractured and weathered compact sedimentary/ arenaceous rocks). The Ecca Group consists mainly of shales and sandstones that are very dense with permeability usually very low due to poorly sorted matrices. Water is stored mainly in decomposed/partly decomposed rock and water bearing fractures are principally restricted to a shallow zone below the static groundwater level. Sustainable borehole yields are limited to < 0.5 l/s, while higher yielding boreholes (> 3.0 l/s) may occur along structural features i.e. fault and fracture zones (Barnard, 2000). Water levels are variable and controlled by topography, ranging from 10.0 mbgl (in low laying areas) to > 40.0 mbgl in higher elevated areas (Olifants ISP DWS, 2004). The maximum aquifer depth fluctuates between 30.0 – 50.0 mbgl.

On a regional scale, two geological lineaments (potentially faults zones) exist in close proximity to the greater study area, striking in a general north-south and southwest-northeast orientation respectively. Faults zones may have an impact on the local hydrogeological regime as it can serve as potential preferred pathways for groundwater flow and contaminant transport.

### 8.15.1 AQUIFER CHARACTERISATION

Two main hydrostratigraphic units can be inferred in the saturated zone:

- A shallow, weathered zone aquifer occurring in the transitional soil and weathered bedrock formations underlain by more consolidated bedrock. Ecca sediments are weathered to depths between 5.0 – 15.0 mbgl (Digby Wells, 2018). Groundwater flow patterns usually follow the topography, discharging as natural springs and/or baseflow at topographic low-laying areas. Usually this aquifer can be classified as a secondary porosity aquifer and is generally unconfined with phreatic water levels. Due to higher effective porosity (n) this aquifer is most susceptible to impacts from contaminant sources.
- An intermediate/deeper fractured aquifer where groundwater flow will be dictated by transmissive fracture zones that occur in the relatively competent host rock. Fractured sandstones and shales sequences are considered as hard-rock aquifers holding water in storage in both pore spaces and fractures. Groundwater yields, although more heterogeneous, can be expected to be higher than the weathered zone aquifer. This aquifer system usually displays semi-confined or confined characteristics with piezometric heads often significantly higher than the water-bearing fracture position.

Analysed data indicate that the regional groundwater elevation correlates moderately to the topographical elevation suggesting a dynamic environment. However, water level data for the shallow aquifer indicate that the majority of levels correlate very well to the topographical elevation. Accordingly, it can be assumed that the regional groundwater flow direction of the shallow aquifer is dictated by topography. Accordingly, the inferred groundwater flow direction of the shallow aquifer will be in a general southwestern direction towards the lower laying drainage system of the Grootspruit transecting the project area from where it will discharge as baseflow. On-site water levels of the underground mine void do not correlate well to topography and is a function of the coal seam floor contours historically mined.

### 8.15.2 HYDROCENSUS AND GROUNDWATER USE

A hydrocensus user survey within the greater study area was conducted during August 2019 where relevant hydrogeological baseline information was gathered. The aim of the hydrocensus survey is to determine the ambient and background groundwater conditions and applications prior to the proposed activities and to identify potential sensitive environmental receptors i.e.

groundwater users in the direct vicinity of the operations. Geosites visited include 21 boreholes as well as two surface water features i.e. drainages. Of the boreholes recorded, the majority are in use (>73.0%) with only two boreholes are not currently utilised.

#### 8.15.2.1 GROUNDWATER QUALITY

The South African National Standards (SANS 241: 2015) have been applied to assess the water quality within the project area. The standards specify a maximum limit based on associated risks for constituents. Water samples were submitted for analysis at a SANAS accredited laboratory for inorganic analysis. Parameters exceeding the stipulated SANS 241:2015 thresholds are highlighted in red (acute health), elemental concentrations above this range are classed as unsuitable for domestic consumption without treatment whereas yellow highlighted cells indicate parameters above aesthetic limits. These standards were selected for use as the current and future water uses in the area are primarily domestic application and/or livestock watering.

The overall ambient groundwater quality of the shallow aquifer is good with the majority of macro and micro determinants below the SANS 241:2015 limits. Isolated sampling localities indicate above limits ammonium (NH4) concentrations which may suggest nearby anthropogenic activities. The local groundwater quality is indicative of an impacted groundwater system and suggest coal mine pollution and acid mine drainage (AMD) conditions present. The latter is characterised by a low pH environment increasing the solubility and concentrations of metals usually aluminium, iron and manganese. Leaching from mined out faces as well as other waste facilities i.e. discard dumps containing carbonaceous material and sulphides will allow for oxidation and hydration resulting in the generation of acidity (H+), sulphates (SO42-) and ferric (Fe3+) and ferrous (Fe2+) iron species and the movement of other conservative contaminants with groundwater in a downgradient direction from the source.

The latest annual 2020 monitoring reports were made available. Groundwater analysis were compared against the Water Use Licence Objectives from DHSWS:

- Sample GW1 is located upstream of the wash plant and coal stockpile, the sample contains elevated concentrations of Na, Cl, SO4 and $NO_3$. But the borehole was not sampled during the June sampling run due to access to the site. t is evident that several groundwater qualities in the Elandsfontein Mining Right area recorded acidic pH levels and elevated concentrations of EC, Ca, Mg, Na, Cl and $SO_4$. Elevated concentrations in coal mining polluter indicators i.e. low pH, high EC, $SO_4$ and metal concentrations, as well as dominant $SO_4$ anions, indicates groundwater contamination in certain areas.
- ECBH-02, ECBH-03, ECBH-04 (west) and ECBH-05 (south) are located directly west and south of the partially rehabilitated pit and discard facility with groundwater impacts recorded more severe in the ECBH-02, ECBH-03 and ECBH-04 monitoring boreholes. Acidic pH levels (<6) were recorded at ECBH-02, ECBH-04 and ECBH-05 with elevated EC concentrations recorded at ECBH-02, ECBH-03, ECBH-04. ECBH-02 and ECBH-03 recorded the most impacted water quality in the area.
- Groundwater to the southwest of Elandsfontein (BH 172 and BH 173) both recorded acidic pH values on average with BH 172 recording elevated EC, Ca, Mg and $SO_4$ concentrations. It is possible that this pollution originates from previous activities located south of the boreholes.

The locations of all groundwater monitoring points are indicated in **Figure 29.**

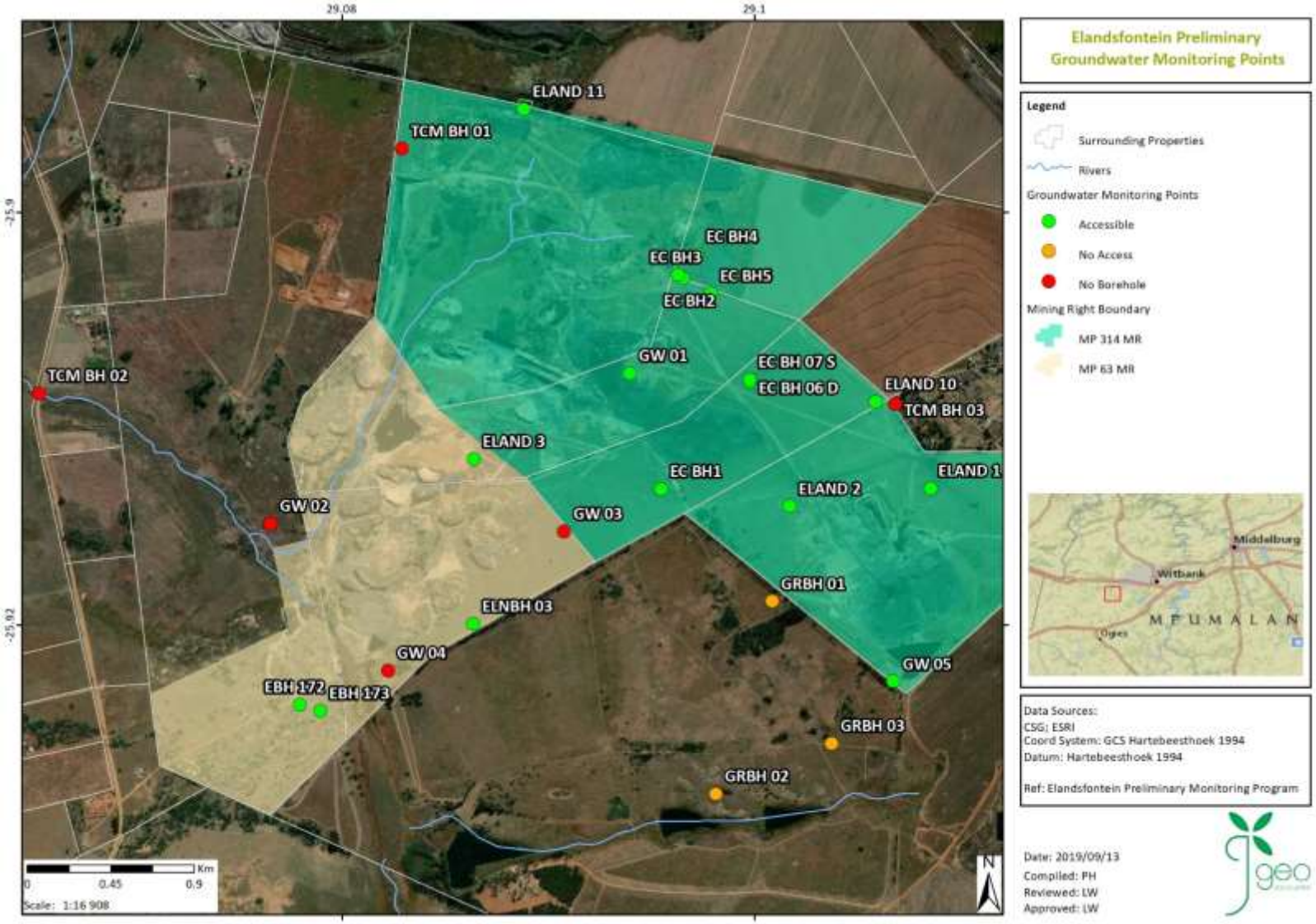



**Figure 29:** Groundwater sampling points

## 8.16 AIR QUALITY

The content of this section has been extracted from a specialist study commissioned for this application. Key findings are presented herein. Please refer to **Appendix D** for further details. Mining operations like drilling, blasting, hauling, and transportation are the major sources of emissions and air pollution. Emissions of particulate matter and nuisance dust will result from mineral plant operations such as crushing, screening and processing for final transportation. Fugitive emissions are also possible from roads and open stockpiles. As part of the commitments made in the approved EMP, dust fallout monitoring has been implemented at the Elandsfontein Colliery.

Nuisance dust can reduce visibility; soil or damage buildings and other materials; and increase costs due to the need for washing, cleaning and repainting. Plants can be affected by dust fallout through reduced light transmission which affects photosynthesis and can result in decreased growth. Fallout dust can also collect in watercourse causing sedimentation and a reduction in the water quality and can also affect aquatic life through the smothering of riverine habitat and fish gill clogging. Coarse dust particles are produced during mining operations which can lead to an increase in fallout dust. The period wind field and diurnal variability in the wind field are shown in **Figure 30**Seasonal variations in the wind field are provided in **Figure 31.** The wind field was predominantly from the north, east and east-southeast, also the directions associated with the strongest winds. The night-time wind rose shows a decrease in the northerly and the north-westerly winds with an increase in the easterly and east-southeasterly winds. The night-time is also characterised by a higher frequency of calm conditions. Summer and autumn show similar wind direction profiles to the period average, while winter shows more frequent winds from the west and spring more from the north.

The main air quality receptors near the mine are Clewer immediately to the east, Kwa-Guqa 3 km to the north-northeast, Ackerville 6 km to the northeast, Phola 6 km to the southwest and Emalahleni 10 km to the east.

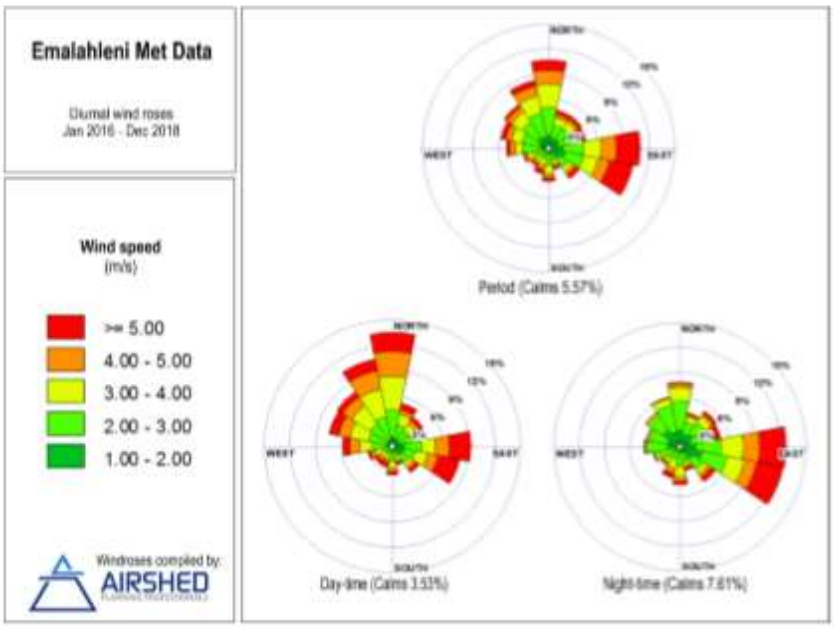



**Figure 30**: Period, day- and night-time wind roses

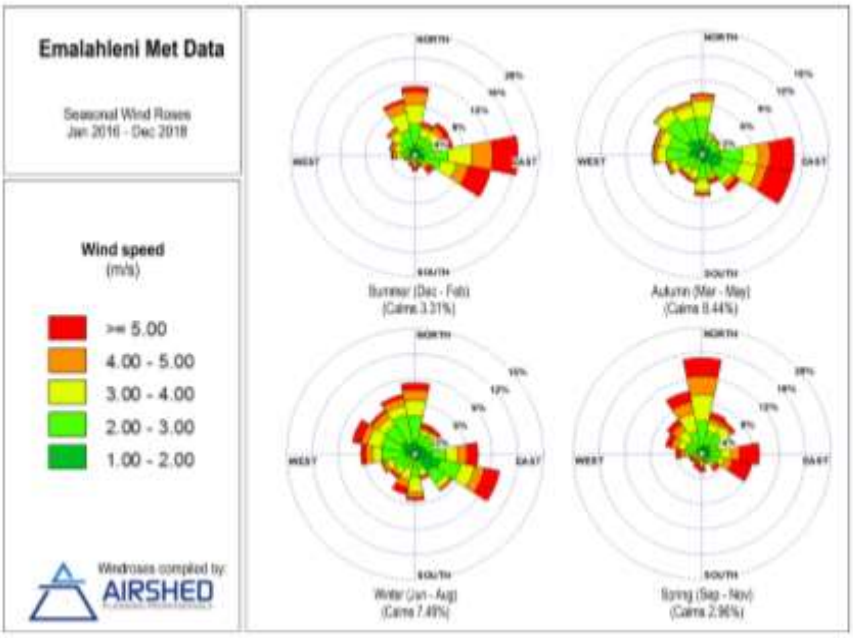



**Figure 31:** Seasonal wind

# 9 ENVIRONMENTAL IMPACT ASSESSMENT

## 9.1 THE IMPACT ASSESSMENT METHODOLOGY

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

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

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

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

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

Each individual aspect in the determination of the consequence is represented by a rating scale as defined in **Table 14.**

**Table 14**: Criteria for determination of impact consequence

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

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

Once the C has been determined the ER is determined in accordance with the standard risk assessment relationship by multiplying the C and the P. Probability is rated/scored as per **Table 15**.

**Table 15:** Probability scoring

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

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

**ER= C x P**

**Table 16:** Determination of environmental risk

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

The outcome of the environmental risk assessment will result in a range of scores, ranging from 1 through to 25. These ER scores are then grouped into respective classes as described **Table 17.**

**Table 17:** Significance classes

| Environmental Risk Score | |
|---|---|
| **Value** | **Description** |
| **< 9** | Low (i.e. where this impact is unlikely to be a significant environmental risk), |
| **≥ 9; < 17** | Medium (i.e. where the impact could have a significant environmental risk), |
| **≥17** | High (i.e. where the impact will have a significant environmental risk). |

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

In accordance with the requirements of Regulation 31 (2)(l) of the EIA Regulations (GNR 543), and further to the assessment criteria presented above it is necessary to assess each potentially significant impact in terms of:

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

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

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

**Table 18:** Criteria for the determination of prioritisation

| Impact Prioritization | | |
|---|---|---|
| **Public response (PR)** | Low (1) | Issue not raised in public response. |
| | Medium (2) | Issue has received a meaningful and justifiable public response. |
| | High (3) | Issue has received an intense meaningful and justifiable public response. |
| **Cumulative Impact (CI)** | Low (1) | Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is unlikely that the impact will result in spatial and temporal cumulative change. |
| | Medium (2) | Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is probable that the impact will result in spatial and temporal cumulative change. |
| | High (3) | Considering the potential incremental, interactive, sequential, and synergistic cumulative impacts, it is highly probable/definite that the impact will result in spatial and temporal cumulative change. |

| | | |
|---|---|---|
| **Irreplaceable loss of resources (LR)** | Low (1) | Where the impact is unlikely to result in irreplaceable loss of resources. |
| | Medium (2) | Where the impact may result in the irreplaceable loss (cannot be replaced or substituted) of resources but the value (services and/or functions) of these resources is limited. |
| | High (3) | Where the impact may result in the irreplaceable loss of resources of high value (services and/or functions). |

The value for the final impact priority is represented as a single consolidated priority, determined as the sum of each individual criteria represented in Table **18.** The impact priority is therefore determined as follows:

**Priority = PR + CI + LR**

The result is a priority score which ranges from 3 to 9 and a consequent PF ranging from 1 to 1.5 (refer to **Table 19**).

**Table 19**: Determination of prioritisation factor

| Priority | Prioritisation Factor |
|---|---|
| **2** | 1 |
| **3** | 1.125 |
| **4** | 1.25 |
| **5** | 1.375 |
| **6** | 1.5 |

In order to determine the final impact significance, the PF is multiplied by the ER of the post mitigation scoring. The ultimate aim of the PF is to be able to increase the post mitigation environmental risk rating by a full ranking class, if all the priority attributes are high (i.e. if an impact comes out with a medium environmental risk after the conventional impact rating, but there is significant cumulative impact potential, significant public response, and significant potential for irreplaceable loss of resources, then the net result would be to upscale the impact to a high significance). The environmental significance rating is presented in **Table 20.**

**Table 20:** Environmental Significance Rating

| Significance Rating | Description |
|---|---|
| **<-17** | High negative (i.e. where the impact must have an influence on the decision process to develop in the area). |
| **≥-17, ≤-9** | Medium negative (i.e. where the impact could influence the decision to develop in the area). |
| **>-9, < 0** | Low negative (i.e. where this impact would not have a direct influence on the decision to develop in the area). |
| **0** | No impact |

| | |
|---|---|
| **>0, <9** | Low positive (i.e. where this impact would not have a direct influence on the decision to develop in the area). |
| **≥9, ≤17** | Medium positive (i.e. where the impact could influence the decision to develop in the area). |
| **>17** | High positive (i.e. where the impact must have an influence on the decision process to develop in the area). |

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

## 9.2 IMPACTS IDENTIFIED

This Section presents the potential impacts that have been identified during the EIA phase assessment. It should be noted that this report will be made available to I&AP's for review and comment and their comments and concerns will be addressed in the final EIA report submitted to the DMRE for adjudication. The results of the public consultation will be used to update the identified potential impacts which will be further refined during the course of the EIA assessment and consultation process.

Potential environmental impacts were identified during the scoping process. These impacts were identified by the EAP, the appointed specialists, as well as the public. **Table 21** provides the list of potential impacts identified.

Without proper mitigation measures and continual environmental management, most of the identified impacts may potentially become cumulative, affecting areas outside of their originally identified zone of impact. The potential cumulative impacts have been identified, evaluated, and mitigation measures suggested which will be updated during the detailed EIA level investigation.

When considering cumulative impacts, it is vitally important to bear in mind the scale at which different impacts occur. There is potential for a cumulative effect at a broad scale, such as regional deterioration of air quality, as well as finer scale effects occurring in the area surrounding the activity. The main impacts which have a cumulative effect on a regional scale are related to the transportation vectors that they act upon. For example, air movement patterns result in localised air quality impacts having a cumulative effect on air quality in the region. Similarly, water acts as a vector for distribution of impacts such as contamination across a much wider area than the localised extent of the impacts source. At a finer scale, there are also impacts that have the potential to result in a cumulative effect, although due to the smaller scale at which these operate, the significance of the cumulative impact is lower in the broader context.

**Table 21:** Identified Environmental Impacts.

| Main Activity / Action / Process | Ancillary Activity | Geo-physical (geology, topography, air, water) | Biological | Socio-economic | Heritage and cultural |
|---|---|---|---|---|---|
| **Site preparation (Planning)** | Vegetation clearance<br>Removal of infrastructure<br>Planned placement of infrastructure<br>Re-establishment of construction contractor area | | | | ○ Disturbance/ destruction of archaeological sites or historic structures |
| **Human resources management (Planning)** | Employment/recruitment<br>I&AP consultations<br>CSI initiatives<br>Skills development programmes<br>Environmental awareness training<br>HIV/AIDS Awareness programmes<br>Integration with Municipalities' strategic long-term planning | | | ○ Employment Opportunities.<br>○ Inability of the community to capture economic benefits & managing expectations. | |
| **Earthworks (Construction)** | Stripping and stockpiling of soils<br>Cleaning, grubbing and bulldozing<br>Removal of building waste and cleared vegetation<br>Digging trenches and foundations<br>Blasting<br>Establishing storm water management measures<br>Establishment of firebreak | ○ Erosion due to storm water runoff<br>○ Impact due to topsoil stripping<br>○ Loss of fertility<br>○ Loss of flow paths<br>○ Emissions and dust<br>○ Water quality impairment due to contamination (influx of pollutants) from construction related activities | ○ Loss/ destruction of natural habitat<br>○ Introduction/ Invasion by Alien Species<br>○ Displacement of faunal species<br>○ Destruction, loss and fragmentation of riverine/wetland habitat due to clearing for opencast infrastructure<br>○ Loss or fragmentation of riverine/wetland buffer zones due to overburden stripping and stockpiling | ○ Visual impact and impact on sense of place<br>○ Interference with Existing Land Uses<br>○ Nuisance and Impact on Sense of Place (i.e. noise, dust, etc.).<br>○ Safety and security (i.e. access to properties, theft, fire hazards, etc.).<br>○ Damage / disruption of services (i.e. water, electricity, sewage, etc.). | ○ Disturbance/ destruction of archaeological sites or historic structures<br>○ Disturbance/ Destruction of Unmarked Graves<br>○ Disturbance/ destruction of fossils |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | ○ Temporary disturbance of wildlife | ○ Impact on existing infrastructure (i.e. roads, fences, etc.)<br>○ Perceptions and Expectations<br>○ Employment Opportunities | | |
| **Civil Works (Construction)** | Establishment of infrastructure and services<br>Mixing of concrete and concrete works<br>Establishment of PCD and storm water/return water dam<br>Establishment of dewatering pipelines<br>Establishment of mobile office and ablution block<br>Sewage and sanitation<br>Establishment of fuel storage area<br>Establishment of chemical storage area<br>Establishment of general waste area<br>Access control and security<br>General site management | ○ Erosion due to storm water runoff<br>○ Impact due to topsoil stripping<br>○ Surface water contamination<br>○ Loss of fertility<br>○ Loss of flow paths<br>○ Emissions and dust<br>○ Water quality impairment due to contamination (influx of pollutants) from underground construction related activities which includes decant of underground water<br>○ Alteration of hydrological characteristics in currently diverted channel for river diversion<br>○ Increase in erosion and sedimentation of downstream riverine/wetland habitat due to reconstruction of new (original) channel | ○ Loss/ destruction of natural habitat<br>○ Introduction/ Invasion by Alien Species<br>○ Displacement of faunal species<br>○ Overburden stripping and stockpiling<br>○ Degradation in riverine/wetland Present Ecological Status through loss of instream habitat and sensitive aquatic biota | ○ Visual impact and impact on sense of place<br>○ Interference with Existing Land Uses<br>○ Nuisance and Impact on Sense of Place (i.e. noise, dust, etc.).<br>○ Safety and security (i.e. access to properties, theft, fire hazards, etc.).<br>○ Damage / disruption of services (i.e. water, electricity, sewage, etc.).<br>○ Impact on existing infrastructure (i.e. roads, fences, etc.)<br>○ Perceptions and Expectations<br>○ Employment Opportunities<br>○ Deterioration of road network condition<br>○ Increase in dust along access road<br>○ Increase in peak hour traffic volumes | ○ Disturbance/ destruction of archaeological sites or historic structures<br>○ Disturbance/ Destruction of Unmarked Graves<br>○ Disturbance/ destruction of fossils |

| | | | | | |
|---|---|---|---|---|---|
| **Open-cast Mining (Operation)** | Drilling<br>Blasting<br>Excavations<br>Removal of overburden by dozing and load haul<br>Establishment of internal haul roads<br>Removal of coal<br>Establishment of RoM stockpiles<br>Establishment of Product Stockpiles<br>Pumping of water to PCD<br>Waste rock dumps for backfilling<br>Soil management<br>Water management<br>Concurrent rehabilitation<br>Water treatment | ○ Subsidence effects on availability of surface water<br>○ Subsidence effects on ground water<br>○ Subsidence - physical alteration of surface-level environment<br>○ Impacts on groundwater quantity<br>○ Depletion in aquifer storage<br>○ Impact on groundwater quality due to leachate<br>○ Impact on groundwater quality due to hydrocarbon contamination<br>○ Surface water contamination<br>○ Impacts from contaminated discharge<br>○ Contamination from burst water pipes<br>○ Pollution from vehicle fleet<br>○ Loss of catchment yield<br>○ Loss of fertility<br>○ Loss of flow paths<br>○ Emissions and dust<br>○ Water quality impairment due to contamination (influx of pollutants) from underground operation related activities which includes decant of underground water, | ○ Displacement of faunal species<br>○ Continued removal and fragmentation of EN vegetation communities<br>○ Flora Direct and Indirect Mortality<br>○ Potential leaks, discharges, pollutant from mining activities leaching into the surrounding environment<br>○ Subsidence - negative impacts on availability of surface water for fauna. Catchment morphology and resultant modification to surface water baseflow and riverine habitat<br>○ Subsidence - detrimental effects to habitat composition (including wetlands) and floral distribution due to changing groundwater dynamics<br>○ Subsidence - physical alteration of surface-level environment leading to negative impacts on habitats | ○ Fly rock, air blast and ground vibration impacts<br>○ Visual impact and impact on sense of place<br>○ Reduction in quantity of water (i.e. water consumption)<br>○ Interference with Existing Land Uses<br>○ Nuisance and Impact on Sense of Place (i.e. noise, dust, etc.).<br>○ Safety and security (i.e. access to properties, theft, fire hazards, etc.).<br>○ Damage / disruption of services (i.e. water, electricity, sewage, etc.).<br>○ Impact on existing infrastructure (i.e. roads, fences, etc.)<br>○ Coal supply<br>○ Employment Opportunities<br>○ Deterioration of road network condition<br>○ Increase in dust along access road<br>○ Increase in peak hour traffic volumes |

| | | | | | |
|---|---|---|---|---|---|
| | | leaching, discharges and potential leaks, as well as transport and storage of carboniferous material<br>○ Increase in erosion and sedimentation of downstream riverine/wetland habitat due to operation of new (original) channel and exposed river bank until vegetation has established<br>○ Loss of wetland functionality<br>○ Impacts due to treated water discharge | and associated fauna<br>○ Degradation in riverine/wetland Present Ecological Status through loss of instream habitat and sensitive aquatic biota<br>○ Destruction, loss and fragmentation of riverine/wetland habitat due to indiscriminate dumping/placement of overburden and topsoil and discard dumps<br>○ Initial decline in riverine/wetland Present Ecological Status through loss of instream habitat and sensitive aquatic biota until system can establish itself through revegetation | | |
| **Infrastructure removal (Decommissioning)** | Dismantling and demolition of infrastructure<br><br>Safety control | ○ Subsidence effects on availability of surface water<br>○ Subsidence - physical alteration of surface-level environment<br>○ Loss of fertility<br>○ Loss of flow paths<br>○ Emissions and dust<br>○ Acid Mine Drainage decant following | ○ Introduction/ Invasion by Alien Species<br>○ Subsidence - detrimental effects to habitat composition (including wetlands) and floral distribution due to changing groundwater dynamics | ○ Safety and security (i.e. access to properties, theft, fire hazards, etc.).<br>○ Impact on existing infrastructure (i.e. roads, fences, etc.)<br>○ Perceptions and Expectations<br>○ Employment Opportunities | ○ Disturbance/ destruction of archaeological sites or historic structures |

| | | | |
|---|---|---|---|
| | | cessation of opencast and underground mining activities and return of groundwater to voids<br>○ Seepage from permanent waste stockpiles<br>○ Degradation in riverine/wetland Present Ecological Status through water quality impairment (AMD) and loss of instream habitat and sensitive aquatic biota | ○ Temporary disturbance of wildlife<br>○ Loss/ destruction of natural habitat<br>○ Subsidence - negative impacts on availability of surface water for fauna. Catchment morphology and resultant modification to surface water baseflow and riverine habitat<br>○ Subsidence - physical alteration of surface-level environment leading to negative impacts on habitats and associated fauna |
| **Rehabilitation (Closure)** | Backfilling of pits and voids<br>Slope stabilisation<br>Erosion control<br>Landscaping<br>Replacing topsoil<br>Removal of alien/invasive vegetation<br>Re-vegetation<br>Restoration of natural drainage patterns<br>Remediation of ground and surface water<br>Rehabilitation of external roads | ○ Water Level Rebound<br>○ Decanting of poor quality water<br>○ Hydrological impacts due to removal of surface infrastructure<br>○ Loss of flow paths<br>○ Emissions and dust<br>○ Subsidence of undermined areas altering base and surface flow and subsequent modification of riverine/wetland habitat | ○ Introduction/ Invasion by Alien Species |

| | | |
|---|---|---|
| **Maintenance (Post closure)** | Initiate maintenance and aftercare program<br>Environmental aspect monitoring<br>Monitoring of rehabilitation | ○ Decant of poor-quality water |

## 9.3 DESCRIPTION AND ASSESSMENT OF IMPACTS

The following potential impacts were identified during the EIA phase assessment. The impact assessment matrix is included in Appendix D and the below subsections describe each impact in more detail.

### 9.3.1 IMPACTS ON HERITAGE AND PALAEONTOLOGICAL RESOURCES

This section presents the preliminary potential impacts identified with regard to heritage resources. While several project phases exist, only impacts associated with the planning, earthworks/construction phase, operation and decommissioning are included here. The reason for this is that no impacts are anticipated on the identified heritage resources during the other phases of the project. The following impacts (as well as their impact rating) on heritage resources were identified:

#### 9.3.1.1 DISTURBANCE/ DESTRUCTION OF HISTORIC BUILDINGS / SITES

Unidentified archaeological sites can seriously hamper construction and development activities and timelines. Destruction/damage or disturbance of such sites requires a permit from the responsible heritage authority. Three historical/recent structure sites are present on the property. These structures have low heritage significance and are given a *Not Conservation Worthy* rating. The impact would be damage to identified historical/recent structures due to earth-moving or vegetation clearance activities.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Historic structures** | Planning | -5.50 | -2.25 | -2.50 |
| | Construction<br>Operations | -7.00 | -2.25 | -2.81 |
| | Decommissioning | -3.00 | -2.25 | -2.00 |

**Proposed Mitigation:**

None required.

#### 9.3.1.2 DISTURBANCE/ DESTRUCTION OF GRAVES

Eight burial grounds are present on the property (EFN001, EFN002, EFN003, EFN004, EFN007, EFN008, EFN010, EFN011). Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating. Three grave/burial ground sites (EFN004, EFN007, EFN011) are situated within or just outside the footprints for the planned UG or OC mining activities. These sites will be negatively affected by mining activities. The impact would be damage to identified graves and burial grounds due to earth-moving or vegetation clearance activities.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Disturbance/ Destruction of Unmarked Graves** | Planning | -16.00 | -9.75 | -12.18 |
| | Construction | -21.25 | -11.25 | -16.87 |
| | Operation | -17.00 | -11.25 | -16.87 |

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| | Decommissioning | -5.50 | -2.00 | -2.00 |

**Proposed Mitigation:**

Mitigation measures would include fencing of the graves and burial grounds and strict avoidance of these sites. Section 17.6(a) of the Mine Health and Safety Act (Act 29 of 1996 and Regulations (2014)) requires the employer to ensure that no mining operations are carried out under or within a horizontal distance of 100m from buildings, roads, railways, reserves, boundaries, any structure whatsoever or any surface which it may be necessary to protect. Reduction of this distance can only be approved by the DMRE.

#### 9.3.1.3 DISTURBANCE/ DESTRUCTION OF FOSSIL MATERIAL

The impact will destroy fossil heritage or permanently seal-in fossils at or below the ground surface. These fossils will no longer be available for research.

Activities that can potentially contribute to the impact would be the site clearance and excavations for the Elandsfontein mine will include widespread digging into the shallow sediment cover as well as into the underlying bedrock. The excavations will also change the topography of the development site. According to the Geology of the project site there is a Very High possibility of finding fossils. Impacts on Palaeontological Heritage are only likely to happen within the construction and operation phases. No impacts are expected to occur during the decommissioning phase.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Disturbance/ destruction of fossils** | Construction<br><br>Operation | -17.05 | -11.25 | -9.00 |

**Proposed Mitigation:**

The EAP and ECO/site manager must be informed that the Vryheid Formation of the Ecca Group has a Very High Palaeontological Sensitivity. There is thus a very high chance that fossils could be present in the Vryheid Fm of the proposed Elandsfontein mining operations upgrade. If fossil remains are discovered during any phase of construction, the Chance Find Protocol must be implemented by the ECO in charge of these developments. These discoveries should be secured, and the ECO/site manager must alert SAHRA so that the proper mitigation (documented and collection) can be undertaken by a palaeontologist.

### 9.3.2 IMPACTS ON ECOLOGY

The following impacts on the ecological resources within the study area were identified and assessed for the various project phases (planning and design, construction, operation and decommissioning. No impacts on the ecological receiving environment have been identified that will occur during the Decommissioning Phase and the Rehabilitation and Closure Phase. The removal of the vegetation cover on site and other disturbances may increase the erosion potential of the site. Below are the planning, construction and operational phase preliminary impacts on ecological resources identified during the EIA, as well as their impact rating.

#### 9.3.2.1 TEMPORARY DISTURBANCE OF WILDLIFE DUE TO INCREASED HUMAN PRESENCE AND POSSIBLE USE OF MACHINERY AND/OR VEHICLES

As more vehicles will be driving in the area to survey various components of the project, the wildlife will be disturbed. The use of heavy machinery can also lead to the trampling of both vegetation and faunal species.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Temporary disturbance of wildlife** | Construction | -5.00 | -3.00 | -3.37 |

**Proposed Mitigation:**

- Restrict vehicle access outside of demarcated work areas as much as possible and If vehicles are to be used, make use of existing roads.

#### 9.3.2.2 LOSS/ DESTRUCTION OF NATURAL HABITAT

The proposed activities on site will lead to localised damage to the opencast areas as well as areas containing infrastructure. The vegetation communities are classed as EN, though site clearing more of the vegetation communities will be lost. This will also lead to habitat fragmentation and the establishment of alien invasive species as well as soil erosion. Planned seam 2 OC is placed within the wetlands footprint as well as within its buffer zones , resulting in the loss of wetland habitat as well.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Loss/ destruction of natural habitat** | Construction | -10.00 | -3.00 | -3.00 |
| | Decommissioning | -14.00 | -6.00 | -7.50 |

**Proposed Mitigation:**

- The areas to be developed must be specifically demarcated to prevent movement of workers into sensitive surrounding environments;
- Areas of indigenous vegetation, even secondary communities outside of the direct mining footprint, should under no circumstances be fragmented or disturbed further or used as an area for the dumping of waste;
- Appropriate speed humps, enforcing of speed limits with the associated stormwater on access roads managed to avoid erosion and sedimentation. Reducing the dust generated by the listed activities above, especially the earth moving machinery, through wetting the soil surface (with “dirty water”) and putting up signs to enforce speed limit as well as speed bumps built to enforce slow speeds; and
- Where possible, existing access routes and walking paths must be made use of, and the development of new routes limited.

#### 9.3.2.3 INTRODUCTION/ INVASION BY ALIEN SPECIES

The spread of alien invasive species will result in the loss of habitat and water for indigenous fauna and flora. It can also contribute to the spreading of potentially dangerous diseases due to invasive and pest species. Overall the fauna assemblage will be changed.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Introduction/ Invasion by Alien Species** | Construction | -15.00 | -6.75 | -8.43 |
| | Decommissioning | -18.00 | -9.00 | -13.50 |

**Proposed Mitigation:**

- The footprint area of the construction should be kept a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas;
- An extensive alien plant management plan be compiled to remove all alien vegetation from within the project area;
- The use of herbicide needs to be monitored and only be used by a qualified person;
- Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site; and
- A pest control plan must be put in place and implemented; it is imperative that poisons not be used due to the likely presence of SCCs.

#### 9.3.2.4 EROSION DUE TO STORMWATER RUNOFF

Erosion will lead to the loss of vegetation, the removal/ relocation of the topsoil and the destruction of habitat.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Erosion due to storm water runoff** | Construction | -15.00 | -7.50 | -9.37 |

**Proposed Mitigation:**

- The areas to be developed must be specifically demarcated to prevent movement of workers into sensitive surrounding environments;
- Appropriate speed humps and mitre drains must be constructed along the access roads (every three metres of elevation) in order to slow the flow of water run-off from the road surface, if this does not already exist;
- Where possible, existing access routes and walking paths must be made use of, and the development of new routes limited;
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events; and
- A storm water management plan must be compiled and implemented.

#### 9.3.2.5 DISPLACEMENT OF FAUNAL SPECIES

The proposed activities on site will lead to localised damage to the environment and possibly also damage to habitats associated with travelling along access routes. This impact would be temporary, as upon completion of mining activities, the disturbed areas would be rehabilitated which would stimulate the migration of faunal species back to these areas. During operation the faunal community will be influenced in a number of ways, including the loss of their habitat,

disturbances that will either make them move out of the area if possible or have to adapt and possible deaths due to physical harm or indirect harm from pollution.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Displacement of faunal species** | Construction | -14.00 | -6.75 | -8.43 |

**Proposed Mitigation:**

- The areas to be developed must be specifically demarcated to prevent movement of workers into sensitive surrounding environments;
- All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limits, to respect all forms of wildlife;
- No trapping, killing or poisoning of any wildlife is to be allowed on site, including snakes, birds, lizards, frogs, insects or mammals;
- All laydown, storage and temporary infrastructure areas must be within the existing disturbed areas, and not within the adjacent grassland areas;
- During the construction phase, noise must be kept to an absolute minimum during the evenings and at night to minimise all possible disturbances to amphibian species and nocturnal mammals;
- Outside lighting should be designed to minimize impacts on fauna. All outside lighting should be directed away from highly sensitive areas such as the wetland. Fluorescent and mercury vapour lighting should be avoided and sodium vapour (yellow) lights should be used wherever possible;
- No trapping, killing or poisoning of any wildlife is to be allowed;
- The intentional killing of any animals including snakes, insects, lizards, birds or other animals should be strictly prohibited;
- Based on the expected avifaunal species, bird strikes, and electrocutions will be a highly likely, bird flappers must be placed on the transmission line and the towers must be insulated to prevent electrocutions; and
- If any indigenous faunal species are recorded during construction, activities should temporarily cease, and an appropriate specialist should be consulted to identify the correct course of action.

#### 9.3.2.6 CONTINUED REMOVAL AND FRAGMENTATION OF EN VEGETATION COMMUNITIES, CBA: IRREPLACEABLE AND CBA: OPTIMAL HABITATS AND A HIGHEST BIODIVERSITY IMPORTANCE AREA DUE TO THE CREATION OF NEW OPENCAST PITS

The vegetation communities are classed as EN, CBA and “Highest importance area” though site clearing more of the vegetation communities will be lost. This will also lead to habitat fragmentation and the establishment of alien invasive species as well as soil erosion.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Continued removal and fragmentation of EN vegetation communities** | Operation | -15.00 | -5.00 | -6.25 |

**Proposed Mitigation:**

- The areas to be mined must be specifically demarcated to prevent movement of workers into sensitive surrounding environments;
- Areas of indigenous vegetation, even secondary communities outside of the direct mining footprint, should under no circumstances be fragmented or disturbed further or used as an area for the dumping of waste;
- All removed soil and material must not be stockpiled within the watercourse and buffer. stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds;
- Encouraged indigenous vegetation growth within the disturbed area to assist in erosion control; and
- Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.

#### 9.3.2.7 VEGETATION LOSS DUE TO EROSION AND ENCROACHMENT BY ALIEN INVASIVE PLANT SPECIES

The spread of alien invasive species will result in the loss of habitat and water for indigenous fauna and flora. It can also contribute to the spreading of potentially dangerous diseases due to invasive and pest species. Overall the fauna assemblage will be changed. Erosion will also disrupt the vegetation in the surrounding areas and result in habitat loss.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Flora Direct and Indirect Mortality** | Operation | -15.00 | -8.25 | -10.31 |

**Proposed Mitigation:**

- The footprint area of the opencast should be kept a minimum. The footprint area must be clearly demarcated to avoid unnecessary disturbances to adjacent areas;
- An extensive alien plant management plan be compiled to remove all alien vegetation from within the project area; The use of herbicide needs to be monitored and only be used by a qualified person;
- Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site;
- Appropriate speed humps and mitre drains must be constructed along the access roads (every three metres of elevation) in order to slow the flow of water run-off from the road surface, if this does not already exist;

- Where possible, existing access routes and walking paths must be made use of, and the development of new routes limited;
- Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events; and
- A storm water management plan must be compiled and implemented.

#### 9.3.2.8 POTENTIAL LEAKS, DISCHARGES, POLLUTANT FROM MINING ACTIVITIES LEACHING INTO THE SURROUNDING ENVIRONMENT

Acid mine draining leaching into the surrounding area will result in the loss of usable water resources, the loss of fauna and flora species.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Potential leaks, discharges, pollutant from mining activities leaching into the surrounding environment** | Operation | -16.00 | -5.00 | -6.25 |

**Proposed Mitigation:**

- Have action plans on site, and training for contactors and employees in the event of spills, leaks and other impacts to the surrounding environment; and
- The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly.

#### 9.3.2.9 SUBSIDENCE - NEGATIVE IMPACTS ON AVAILABILITY OF SURFACE WATER FOR FAUNA. CATCHMENT MORPHOLOGY AND RESULTANT MODIFICATION TO SURFACE WATER BASEFLOW AND RIVERINE HABITAT

As subsidence will lower the surface area the likelihood that water will drain away faster exist resulting in a loss of surface water for faunal species. With the loss of the water the habitats will also change. Subsidence will likely change the morphology of the catchment, which will include drainage of the catchment. These changes (including drainage) will result in a loss of surface water, which some faunal species may be dependent on. The loss of water will also amount to changes to the habitat structure for the catchment and will have an effect on the overall faunal community structure.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Subsidence effects on availability of surface water** | Operation | -17.00 | -9.00 | -11.25 |
| | Decommissioning | -16.00 | -10.50 | -13.25 |

**Proposed Mitigation:**

- Follow the subsidence reports guidelines (Geomech Consulting (Pty) Ltd Report No. GEOM13-2019-003) on which areas can be undermined without a significant subsidence risk.

#### 9.3.2.10 SUBSIDENCE - DETRIMENTAL EFFECTS TO HABITAT COMPOSITION (INCLUDING WETLANDS) AND FLORAL DISTRIBUTION DUE TO CHANGING GROUNDWATER DYNAMICS

As subsidence will lower the surface area the likelihood that water will drain away faster exist resulting in a loss of surface water for flora species. With the loss of the water the habitats will also change.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Subsidence effects on ground water** | Operation | -15.00 | -9.00 | -12.18 |
| | Decommissioning | -15.00 | -11.25 | -14.06 |

**Proposed Mitigation:**

- Follow the subsidence reports guidelines (Geomech Consulting (Pty) Ltd Report No. GEOM13-2019-003) on which areas can be undermined without a significant subsidence risk.

#### 9.3.2.11 SUBSIDENCE - PHYSICAL ALTERATION OF SURFACE-LEVEL ENVIRONMENT LEADING TO NEGATIVE IMPACTS ON HABITATS (INCLUDING CBAS) AND ASSOCIATED FAUNA

Through the change of the surface level the overall layout of the habitat will be altered and depending on the level of subsidence smaller faunal species such as amphibians might be trapped in the subsidence area restricting their access to necessary resources.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Subsidence - physical alteration of surface-level environment** | Operation | -15.00 | -9.875 | -12.18 |
| | Decommissioning | -15.00 | -10.50 | -13.12 |

**Proposed Mitigation:**

- Follow the subsidence reports guidelines (Geomech Consulting (Pty) Ltd Report No. GEOM13-2019-003) on which areas can be undermined without a significant subsidence risk; and
- Monitor the surface water level on a monthly basis; ensuring that the water level does not decrease.

### 9.3.3 IMPACTS ON AQUATIC ECOLOGY

The following impacts on the ecological resources within the study area were identified and assessed for the various project phases (construction, operation, decommissioning and rehabilitation and closure). No impacts on the aquatic receiving environment have been identified that will occur during the Planning and Design phase. There will be undermining of the watercourses as well as the opencast mining activities within the proximity of the river reach.

#### 9.3.3.1 CONSTRUCTION PHASE IMPACTS ON AQUATIC ECOLOGY

The construction phase activities have the potential to degrade water and habitat quality within the sampled tributary systems, with direct impacts expected within the Elandsfontein tributary. Water quality impacts may include an influx of pollutants through runoff from a modified catchment, resulting in further deterioration of water chemistry.

The proposed opencast layout area overlaps with delineated medium sensitivity areas which serve as buffer zones to the high sensitivity areas identified in the aquatics report. The construction phase activities have the potential to degrade water and habitat quality within the sampled tributary systems. Water quality impacts may include an influx of pollutants through runoff from an exposed un-weathered material, resulting in further deterioration of water chemistry. Further modification of the Elandsfontein tributary is associated with the destruction, loss and fragmentation of riverine/wetland habitat due to clearing for opencast infrastructure which includes clearing and placement of waste (overburden) and topsoil stockpiles where resultant sedimentation of instream areas is anticipated.

Although the PES (baseline) of the river reach assessed was derived to be modified from reference conditions, further deterioration is possible and thus a potential decline in the PES could be observed. Thus, impacts described above will result in reduced biodiversity on a catchment scale

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Destruction, loss and fragmentation of riverine/wetland habitat due to clearing for opencast infrastructure** | Construction | -13.00 | -7.50 | -9.37 |
| **Loss or fragmentation of riverine/wetland buffer zones due to clearing for placement of waste (overburden) and topsoil stockpiles** | | -14.00 | -6.75 | -7.59 |
| **Water quality impairment due to contamination (influx of pollutants) from construction related activities** | | -13.00 | -8.25 | -11.34 |
| **Degradation in riverine/wetland Present Ecological Status through loss of instream habitat and sensitive aquatic biota** | | -10.50 | -7.50 | -8.43 |
| **Construction of underground access portals (shafts) and voids** | | -12.00 | -7.50 | -8.43 |
| **Water quality impairment due to contamination (influx of pollutants) from underground construction related activities which includes decant of underground water** | | -15.00 | -8.25 | -10.31 |
| **Alteration of hydrological characteristics in currently diverted channel for river diversion** | | -12.00 | -6.75 | -8.43 |
| **Increase in erosion and sedimentation of downstream riverine/wetland habitat due to reconstruction of new (original) channel** | | -16.25 | -9.00 | -10.15 |
| **Water quality impairment due to contamination (influx of pollutants) from construction related activities** | | -12.00 | -6.75 | -8.43 |
| **Degradation in riverine/wetland Present Ecological Status through loss** | | -15.00 | -8.25 | -10.31 |

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **of instream habitat and sensitive aquatic biota** | | | | |

**Proposed Mitigation:**

- Underground workings must adhere to a safety factor that will avoid subsidence;
- Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed;
- Make use of passive or active water treatment of mine water decant.
- Monitoring of adjacent watercourses must be undertaken to assess the impact of AMD to these systems; and
- Cut-off trenches must be incorporated into the opencast mining areas' design to decrease contamination of watercourses via AMD.

#### 9.3.3.2 OPERATIONAL PHASE IMPACTS ON AQUATIC ECOLOGY

A section of the proposed underground area undermines the upper reaches of the Elandsfontein tributary. The construction phase activities such as the construction of underground access portals (shafts) and the pumping of underground water into nearby watercourses, have the potential to degrade water quality within the sampled tributary systems, with indirect water quality impacts expected within the Elandsfontein tributary. Water quality impacts may include an influx of pollutants, resulting in further deterioration of water chemistry. There is potential for subsidence following the undermining of the rivers and wetlands. Furthermore, groundwater drawdown would be expected with a resultant loss of water volume in surface rivers and wetlands, with the associated loss of riverine and wetland habitat.

Although the PES (baseline) of the river reach assessed was derived to be modified from reference conditions, further deterioration is possible and thus a potential decline in the PES could be observed. Thus, impacts described above will result in reduced biodiversity on a catchment scale.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Water quality impairment due to contamination (influx of pollutants) from operation of opencast related activities which includes leaching, discharges and potential leaks** | Operation | -17.00 | -13.00 | -16.25 |
| **Degradation in riverine/wetland Present Ecological Status through loss of instream habitat and sensitive aquatic biota** | | -15.00 | -9.75 | -10.96 |
| **Destruction, loss and fragmentation of riverine/wetland habitat due to indiscriminate dumping/placement of overburden and topsoil** | | -9.00 | -6.00 | -6.00 |
| **Destruction, loss and fragmentation of riverine/wetland habitat due to** | | -9.00 | -6.00 | -6.00 |

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| indiscriminate dumping/placement of discard dumps | | | | |
| Water quality impairment due to contamination (influx of pollutants) from underground operation related activities which includes decant of underground water, leaching, discharges and potential leaks, as well as transport and storage of carboniferous material | | -17.00 | -13.00 | -16.25 |
| Increase in erosion and sedimentation of downstream riverine/wetland habitat due to operation of new (original) channel and exposed river bank until vegetation has established | | -12.00 | -6.75 | -7.59 |
| Initial decline in riverine/wetland Present Ecological Status through loss of instream habitat and sensitive aquatic biota until system can establish itself through revegetation | | -12.00 | -6.75 | -7.59 |
| Closure and rehab of currently diverted channel | | 20.00 | 15.00 | 18.00 |

**Proposed Mitigation:**

- Make use of passive or active water treatment of mine water decant.
- Separate clean and dirty water;
- Construct diversion berms and drains around working areas;
- Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths;
- No cleaning of vehicles, machines and equipment in water resources;
- No servicing of machines, vehicles and equipment on site;
- Storage of potential contaminants in bunded areas;
- All contractors must have spill kits available and be trained in the correct use thereof;All released water must be within WUL special limits and discharge must be managed to avoid scouring and erosion of the receiving systems;
- Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses;
- Clean and dirty water must be separated. This water should be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area.

- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- All waste generated on-site must be adequately managed;
- Separation and recycling of different waste materials should be supported;
- Continue with surface water and biomonitoring programmes;
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- All contractors and employees should undergo induction which is to include a component of environmental awareness;
- The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area;
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported;
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems; and
- Alien invasive vegetation management plan to be drafted and implemented.

#### 9.3.3.3 DECOMMISSIONING PHASE IMPACTS ON AQUATIC ECOLOGY

The removal of infrastructure and rehabilitation activities will be a large-scale operation and thus has the potential to contaminate surface water. Particular areas which will require attention includes the RoM stockpiles, screening areas and pollution control facilities. Following the cessation of underground mining activities groundwater returns to the voids created by the mining process, resulting in the contamination of groundwater. Following this influx of groundwater, seepage and decant at specific locations can result in the ingress of contaminated water in downstream river systems, thus severely degrading the local PES. Despite mitigation water quality contamination remains "High" due to the potential regional extent of contamination.

In addition, in line with the precautionary principle, it is anticipated that the undermining of wetlands and river systems within the project area will result in the subsidence of the surface. The resultant potential impacts include serious changes to hydrology resulting in the significant alteration of catchment areas and subsequent habitat levels impacts..

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Removal of surface and underground infrastructure** | Decommissioning | -7.50 | -6.00 | -6.00 |
| **Removal of pollution control facilities** | | -9.00 | -6.75 | -9.28 |
| **Acid Mine Drainage decant following cessation of opencast and** | | -22.50 | -15.00 | -22.50 |

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **underground mining activities and return of groundwater to voids** | | | | |
| **Seepage from permanent waste stockpiles (in the case that surface discard is undertaken)** | | -14.00 | -7.50 | -9.37 |
| **Degradation in riverine/wetland Present Ecological Status through water quality impairment (AMD) and loss of instream habitat and sensitive aquatic biota** | | -15.00 | -9.75 | -12.18 |
| **Subsidence of undermined areas altering base and surface flow and subsequent modification of riverine/wetland habitat** | | -11.25 | -8.25 | -10.31 |

**Proposed Mitigation:**

- The project must make use of existing mining infrastructure and access routes as far as possible;
- Riverine, wetland and drainage line areas associated buffer zones must be avoided and demarcated;
- No mining must occur under rivers, wetland or drainage lines should there be a high risk for subsidence where engineering controls will not suffice to reduce the risk to a suitable rating;
- Appropriate recommendations from the rock engineering study regarding pillar size must be implemented to reduce the overall risk for subsidence, particularly in regions where watercourses are undermined;
- Groundwater models of the mining activities must be completed updated following the completion of the mining activities, this will allow for the identification of areas where mine-water decant may occur
- Should groundwater decant occur, the quality of the water should be determined and the effect upon the surface water determined, and managed accordingly;
- Standard surface water management must be in place, this includes clean and dirty water separation; and
- An alien vegetation removal and management plan must be implemented for the from the onset of the opencast mining phase of the project.

#### 9.3.3.4 REHABILITATION AND CLOSURE PHASE IMPACTS ON AQUATIC ECOLOGY

The water quality impacts aspect for the proposed expansion of mining activities scored a “High” final significance rating due to the potential to exacerbate the acid mine drainage within the project area with regional downstream water quality contamination and associated reduction in aquatic biota diversity and abundances.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Acid Mine Drainage decant following cessation of opencast and underground mining activities and return of groundwater to voids** | Rehab / Closure | -22.50 | -15.00 | -22.50 |
| **Degradation in riverine/wetland Present Ecological Status associated with AMD and loss of sensitive aquatic biota** | | -15.00 | -9.75 | -12.18 |
| **Subsidence of undermined areas altering base and surface flow and subsequent modification of riverine/wetland habitat** | | -11.25 | -8.25 | -10.31 |

**Proposed Mitigation:**

- All surface infrastructure must be removed from the site;
- Compacted areas must be ripped (perpendicularly) to a depth of 300 mm;
- A seed mix must be applied to rehabilitated and bare areas;
- Any gullies or dongas must also be backfilled;
- The area must be shaped to a natural topography;
- Non-invasive trees (or vegetation stands) removed must be replaced; and
- No grazing must be permitted to allow for the recovery of the area.

### 9.3.4 IMPACTS ON GEOHYDROLOGY

The following impacts on the geohydrological resources within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). No impacts on the geohydrological receiving environment have been identified that will occur during the Planning and Design Phase, Construction Phase and the Decommissioning Phase. Below are the preliminary impacts on geohydrological resources for the operational, and rehabilitation and closure phases identified during the EIA, as well as their impact rating according to the methodology described above.

#### 9.3.4.1 IMPACT ON THE GROUNDWATER QUANTITY AND CHANGE IN THE REGIONAL PHREATIC/ PIEZOMETRIC LEVELS DUE TO MINE DEWATERING

There will be an impact on the groundwater quantity and change in the regional phreatic/ piezometric levels due to mine dewatering.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impacts on groundwater quantity** | Operation | -15.00 | -7.50 | -9.38 |

**Proposed Mitigation:**

- Development and implementation of an integrated groundwater monitoring program evaluating hydrochemistry as well as water levels will serve as early warning mechanism to implement mitigation measures such as seepage capturing boreholes down-gradient

of the waste facilities in order to constrain the contamination plume migration as well as manage the groundwater cone of depression.

#### 9.3.4.2 IMPACT ON AQUIFER

Depletion in aquifer storage and formation of a depression zone may potentially lead to a reduction in groundwater contribution to baseflow of local drainages and/or groundwater supported wetlands. It is expected that the groundwater drawdown will range from 4.0 m to ~ 24.0m below the static water level (mbsl) and the groundwater capture zone i.e. zone of influence extent will cover an estimated footprint of 211.0 ha as indicated in Figure 32 and Figure 33.

The numerical groundwater flow model simulations for the proposed opencast operation suggest the average open pit dewatering is approximately 2.57E +02 $m^3/d$ with a maximum pit water ingress of approximately 5.09E +02 $m^3/d$ for the duration of the simulation period. It is noted that the opencast groundwater ingress volumes expected is much lower due to the existing groundwater drawdown caused by current dewatering activities. It is expected that the groundwater drawdown will range from 4.0m to ~ 24.0m below the static water level (mbsl) and the groundwater capture zone i.e. zone of influence extent will cover an estimated footprint of 211.0ha. It should be noted that the simulated impact zone extends slightly beyond the eastern perimeter of the mining right area, however, falls mainly within the mining properties. Baseflow discharges to the model catchment drainages, accounts to approximately 1800.0 $m^3$ /d during pre-mining conditions, whereas baseflow discharge during the operational life of mine period decreases to ~ 1750.0 $m^3$ /d. This accounts for an average loss of ~3.0% with a maximum of >10.0% during the simulation period.


**Figure 32:** Water level drawdown and groundwater capture zone of the shallow, weathered aquifer.


**Figure 33:** Water level drawdown and groundwater capture zone of the deeper, fractured aquifer.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Depletion in aquifer storage** | Operation | -15.00 | -7.50 | -9.38 |

**Proposed Mitigation:**

- Due to mine inflow and dewatering anticipated, depletion of groundwater in storage, hence the formation of a zone of depression, is inevitable. Development and implementation of an integrated groundwater monitoring program assessing regional groundwater levels will serve as early warning mechanism to implement mitigation measures. Should neighbouring water levels and yields be affected, necessary actions such as provision of alternative water supply and/or compensation should be taken to ensure continual water supply.
- Due to the impact and reduction of baseflow reporting to the on-site wetland, it is recommended that a monitoring borehole(s) be drilled in order to evaluate perched water level recovery of the wetland following rehabilitation.

#### 9.3.4.3 IMPACTS ON GROUNDWATER QUALITY

There will be an impact on groundwater quality due to leachate of contaminants from waste facilities. There will also be an impact on groundwater quality due to hydrocarbon contamination caused by mine heavy vehicles and machinery. The calibrated groundwater flow model was used as basis to perform the solute/mass transport scenarios. Sulphate (SO4) is a good indicator for coal mine pollution. The contaminant transport model was calibrated based on hydrochemistry observed at down-gradient observation and monitoring boreholes as well as published literature for coal mine operations. Model domain background values were interpreted from the hydrochemical data analysis as gathered during the hydrocensus user survey.

A 50-year post-closure scenario was simulated to evaluate the pollution plume migration after discontinuing of mining activities. Figure 12-30 depicts the simulated sulphate pollution plume migration within the weathered aquifer after a period of 50-years. The pollution plume extent covers a total area of approximately 875.0ha, reaching a maximum distance of ~600.0 to 700.0m in a general south-western direction towards the lower laying drainage and wetland systems. The simulation indicates that, although the pollution plume extends beyond the mining properties, no neighbouring boreholes will potentially be impacted post-closure while the unknown tributary of the Grootspruit and associated wetland might potentially be impacted on.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impact on groundwater quality due to leachate** | Operation | -16 | -7 | -8,75 |
| **Impact on groundwater quality due to leachate from carbonaceous material used to backfill mine pits.** | | -16 | -9,75 | -12,19 |
| **Impact on groundwater quality due to dust suppression with poor** | | -16 | -9 | -11,25 |

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **quality water obtained from mine dirty water containment facilities.** | | | | |
| **Impact on groundwater quality due to hydrocarbon contamination caused by mine heavy vehicles and machinery.** | | -16 | -8,25 | -10,31 |

**Proposed Mitigation:**

- Development and implementation of an integrated groundwater monitoring program evaluating the regional water quality will serve as early warning mechanism to implement mitigation measures. Effectiveness of alternative barrier systems such as seepage capturing/ scavenger boreholes and/or cut-off trenches down-gradient of waste facilities should be evaluated in order to constrain the migration of contaminants from site. it is recommended that alternative water supply sources or compensation measures should be investigated for nearby users impacted on.
- Monitoring should be conducted by suitably qualified and experienced persons according to an approved water monitoring program. Water samples should be analysed by an accredited laboratory. The monitoring network should be refined and updated based on hydrochemical results obtained to ensure optimisation and adequacy of the proposed localities. It is recommended that additional monitoring boreholes, as indicated in the attached EMPr and groundwater assessment, be established down-gradient of potential decant zones in order to evaluate the mass load contribution of decant water to environmental receptors. Proposed monitoring boreholes should be drilled in pairs to target shallow, weathered as well as deeper, fractured aquifer units. Drilling localities should be determined by means of a geophysical survey in order to target lineaments and weathered zones acting as preferred groundwater flow pathways and contaminant transport mechanisms.
- Mine heavy vehicles and machinery must be serviced and maintained regularly in order to ensure that oil spillages are limited. Spill trays must be provided if refuelling of construction vehicles is done on site. Further to this spill kits must be readily available in case of accidental spillages.
- Groundwater flow modelling assumptions should be verified and confirmed. The calibrated groundwater flow model should be updated on a bi-annual basis as newly gathered monitoring results become available in order to be applied as groundwater management tool for future scenario prediction.
- The geochemical character of the coal product and discard material suggest high acid forming capacity and due to adequate oxidisable sulphides, it has the potential to sustain long-term acid generation. Accordingly, the discard dump footprint and disposal areas as well as plant and stockpile areas should be fully recovered and disposed of at an appropriate barrier system in line with the waste assessment results to minimise the risk of contamination migration to local aquifers.
- The geochemical character of the non-carbonaceous spoils material i.e. sandstone and mudstone/shale are non-acid forming and will not impact on water quality. This material can thus be utilised as backfill substance as part of the rehabilitation.

#### 9.3.4.4 POST-OPERATIONAL WATER LEVEL REBOUND AND FLOODING OF MINE VOIDS

Groundwater levels will naturally rebound post operation and open voids will be flooded.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Water Level Rebound** | Rehabilitation and Closure | +9.00 | +7.00 | +7.889 |

**Proposed Mitigation:**

None required

#### 9.3.4.5 DECANTING OF POOR QUALITY WATER CAUSED BY LEACHATE (AMD)

There will be decanting of poor water quality caused by leachate of sulphide bearing minerals such as pyrite in the presence of oxygen and water to create an acidic environment (i.e. acid rock drainage) – refer to **Figure 34** and **Figure 35**. Various alternative management and mitigation scenarios which include active as well as passive water management strategies were simulated to evaluate the remedial options available. A mine post-closure scenario was simulated wherein hydraulic head recovery within the existing underground voids as well proposed mining areas was evaluated. Simulated average groundwater ingress for the LOM underground operation was combined with the expected groundwater recharge reporting to the underground void and from these volumes it is estimated that under average rainfall conditions, the underground will be flooded in approximately 35 to 40 years after ceasing of mining activities. The proposed depth and geometry of the underground operations allows for the majority of the footprint to be flooded with a low risk of decant occurring.

Expected decant volumes for the underground voids are relatively low due to the presence of confining shale and mudstone layers restricting the downward filtration of rainwater recharge into the underground mine void(s) and ranges between 0.85$m^3$ /d to ~17$m^3$ /d with a combined volume of approximately 50.0$m^3$ /d. The proposed depth and geometry of the underground operations allows for the entire footprint to be flooded without any decant expected, however as indicated in the assessment a potentially higher decant risk area exists i.e. coal floor contour <10.0mbgl which is earmarked accordingly in **Figure 36**.

Generally, the decant point/zone is the lowest topographical point of the existing mining footprint which is in direct connection with surface topography. Expected decant volumes for the backfilled opencast pits varies from ~15.0$m^3$/d to >40.0$m^3$/d depending on the pit effective infiltration volumes. The combined decant volume is approximately ~90.0 $m^3$/d. It should be noted that decant volumes for the opencast operation is expected to be much higher due to the increased effective pit infiltration and rainfall recharge of the backfilled and modified zones. Potential decant zones are depicted in **Figure 37**, it is noted that there are various decant points potentially discharging into the wetland drainage system traversing the site.

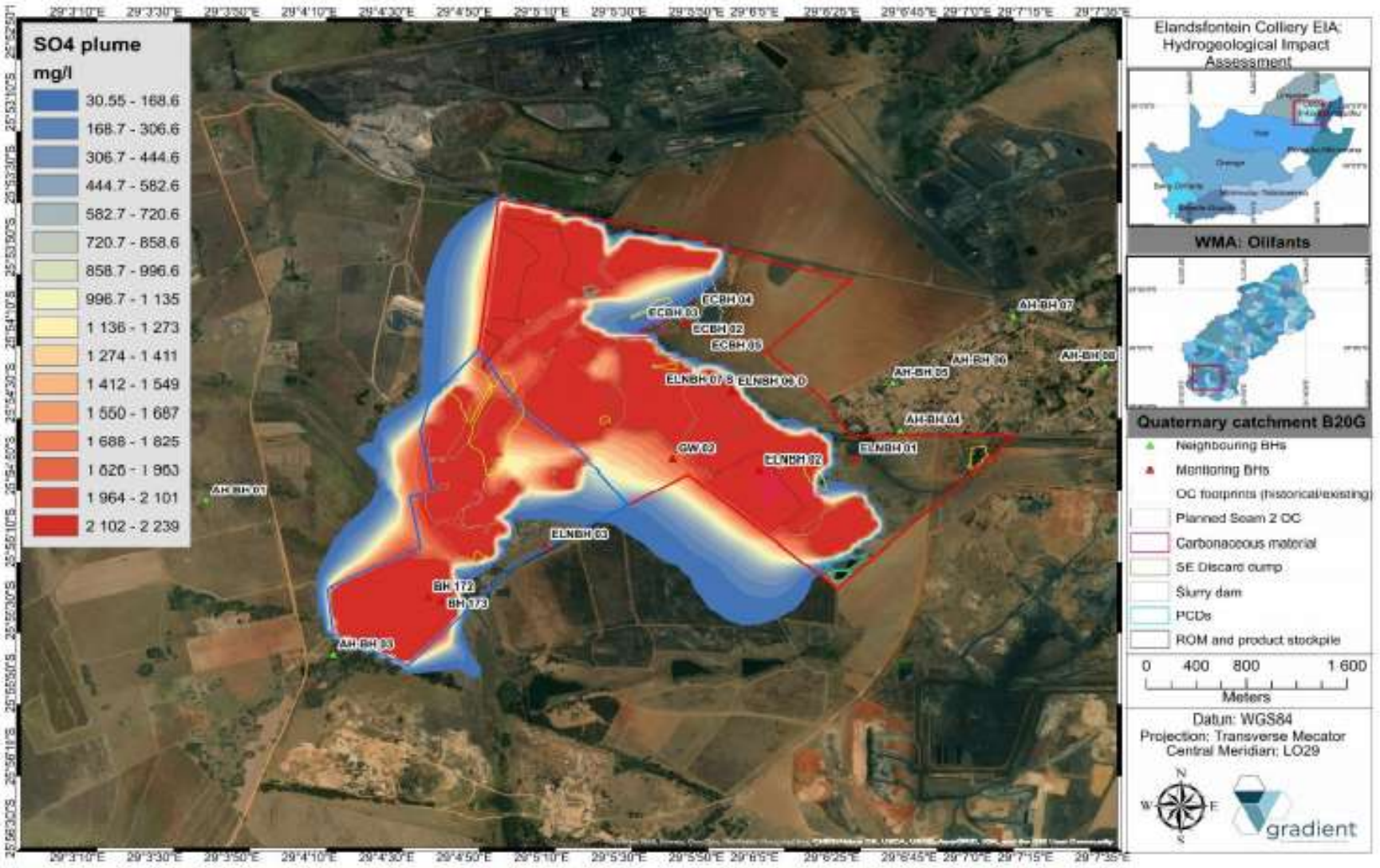



**Figure 34:** Post-closure sulphate pollution plume (50 years)


**Figure 35:** Post-closure sulphate pollution plume (100 years).


**Figure 36:** Potential high-risk decant zone for the underground mine void


**Figure 37:** Potential high-risk decant zone for the backfilled opencast pits

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Decanting of poor-quality water** | Rehabilitation and Closure | -16.00 | -6.00 | -7.50 |

**Proposed Mitigation:**

- Monitoring of surface water and groundwater in accordance with the implemented monitoring network and protocol should be continued throughout the post operational phase;
- Ensure that rehabilitation is properly conducted and in accordance with best practice guidelines as well as the approved mine closure and rehabilitation plan; and
- The geochemical character of the non-carbonaceous spoils material i.e. sandstone and mudstone/shale are non-acid forming and will not impact on water quality. This material can thus be utilised as backfill substance as part of the rehabilitation. The geochemical character of the carbonaceous spoils material i.e. carbonaceous shale suggests a likely capacity for acid formation. However relatively low oxidisable sulphides deem the material insufficient to sustain long term acid generation. Thus, any material of carbonaceous character can also be used as backfill substance, however it is recommended that additional geochemical characterisation be conducted to confirm this.
- The groundwater capture zone should return back to the pre-mining equilibrium after cessation of mine dewatering and replenishment of groundwater in storage, however the lasting effect and subsequent impact on neighbouring borehole water levels and yields should be monitored with alternative water supply sources or compensation measures available for nearby users if impacted on.

#### 9.3.4.6 SEEPAGE OF POOR QUALITY WATER

There will be seepage of poor-quality water from waste facilities. Post closure phase impacts resulting from seepage and leachate from mine waste facilities on downgradient receptors are rated as medium negative without the implementation of remedial measures and low negative with implementation of mitigation measures.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Seepage of poor-quality water** | Rehabilitation and Closure | -16.00 | -5.50 | -6.88 |

**Proposed Mitigation:**

- Monitoring of surface water and groundwater in accordance with the implemented monitoring network and protocol should be continued throughout the post operational phase;
- Ensure that rehabilitation is properly conducted and in accordance with best practise guidelines as well as the approved mine closure and rehabilitation plan; and
- The groundwater capture zone should return back to the pre-mining equilibrium after cessation of mine dewatering and replenishment of groundwater in storage, however the lasting effect and subsequent impact on neighbouring borehole water levels and yields should be monitored with alternative water supply sources or compensation

measures available for nearby users if impacted on.. Ensure that rehabilitation of backfilled opencast and mine waste facility footprints areas is properly conducted and in accordance with best practise guidelines as well as approved mine closure and rehabilitation plans. Rehabilitation should allow for free draining of runoff in order to prevent any surface water ponding.

- The geochemical character of the coal product and discard material suggest high acid forming capacity and due to adequate oxidisable sulphides, it has the potential to sustain long-term acid generation. Accordingly, the discard dump footprint and disposal areas as well as plant and stockpile areas should be fully recovered and disposed of at an appropriate barrier system in line with the waste assessment results to minimise the risk of contamination migration to local aquifers.

### 9.3.5 IMPACTS ON HYDROLOGY

The following impacts on the hydrological resources within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). No impacts on hydrology have been identified that will occur during the Planning and Design Phase.

Below are the impacts on hydrological resources for the construction, operation, decommissioning, and rehabilitation and closure phases identified, as well as their impact rating.

#### 9.3.5.1 IMPACTS ON HYDROLOGY DUE TO TOPSOIL STRIPPING

During the construction phase, topsoil from all facility footprints will be stripped and stockpiled for future use. This may result in the following impacts:

Areas that have been stripped of vegetation and topsoil will be prone to erosion. This could lead to increased suspended solids being deposited into the local streams. It is unlikely that impacts will extend beyond the Grootspruit and the Grootspruit tributary.

The topsoil stockpile will be prone to erosion prior to it being vegetated. Natural re-vegetation will likely take more than one season to completely cover the topsoil stockpile. The resultant erosion could lead to increased suspended solids being deposited into the Grootspruit and the Grootspruit tributary.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impact due to topsoil stripping** | Construction | -11.25 | -8.75 | -9.84 |

**Proposed Mitigation:**

- Areas that are stripped should be optimised to limit unnecessary stripping;
- Storm water from upslope of the stripped areas should be diverted around these areas to limit the amount of storm water flowing over from these areas;
- The timing of the topsoil stripping should be optimised to limit the time between stripping and construction. Where practical constraints exist and areas need to be left stripped for long periods, contour ploughing, or ripping could reduce run-off and hence reduce erosion;
- Dry season construction is preferable where practical; and
- Hydro seeding of the topsoil stockpile is recommended to speed up vegetation cover. An appropriate seed mix should be designed by a vegetation specialist.

#### 9.3.5.2 SURFACE WATER CONTAMINATION DURING CONSTRUCTION

During the construction phase a significant number of vehicles will be driving around the site. In addition to this, fuels are stored on site and chemicals are used during normal construction activities. This may result in the following impacts:

- If the construction vehicles are poorly maintained hydrocarbon spills could cause pollution if washed off roads by storm water;
- Vehicle wash bays are a common source of hydrocarbon pollutants;
- Leaks from fuel depots could result in surface water pollution;
- Spillage and unsafe storage of chemicals could result in surface water contamination; and
- The affected areas will be the entire construction site. Spillage impacts will be short-term and will cease after the completion of construction. If soils have become contaminated, this will leach out over a prolonged period.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Surface water contamination** | Construction | -6.75 | -4.50 | -5.06 |

**Proposed Mitigation:**

- All construction vehicles should be well maintained and inspected for hydrocarbon leaks weekly;
- Wash bay discharge water should flow through an oil separator;
- Fuel depots and refuelling areas should be bunded;
- Chemicals should be stored in a central secure area; and
- Regular toolbox talks on the responsible handling of chemicals should be undertaken.

#### 9.3.5.3 IMPACTS ON HYDROLOGY DUE TO PIT INFILLING AND DUMP RESHAPING WITHIN THE BUFFER ZONES

During the decommissioning phase, the pits will be backfilled, and the dump side slopes will be reshaped to their final closure slopes. Two pits will be within the 100-year floodlines. One dump will be outside of the floodlines but withing the buffer zone (refer to Hydrology report in **Appendix D** for location of these features).

The closure design specifies that the void infilling is higher than the floodlines to prevent water from inundating the pit area after closure. This is desirable. It limits infiltration of clean water into the void backfill. The effect on the floodlines will be negligible and will be environmentally beneficial compared to allowing water to inundate the backfill.

The dump reshaping will likely be out of the 100-year floodline, or very close to the floodline. If the dump reshaping footprint is out of the 100-year floodline, it will have no effect on the floodline, despite it being in the 100m GN 704 buffer zone. The clean water runoff from the dump will be an environmental benefit.

There is no environmental detriment to reshaping the dump sides so that their footprint is within the 100m GN 704 buffer, but outside the 100-year floodline.

Should the rehabilitated dump footprint encroach within the 100-year floodline slightly (<15 m), it will have no detrimental effects as flow velocities in this zone of the floodplain will be slow. Because of this, the floodline will be negligible altered and the risk of damage to the dump is small. The affected areas will be the Grootspruit Tributary downstream of the discharge point and the Grootspruit. The overall significance will be high positive as it will limit the impacts on floodlines due to infiltration of clean water into the void.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Pit infilling and dump reshaping** | Operation | 18.75 | 18.75 | 21.09 |

**Proposed Mitigation:**

The reshaped footprint should remain outside of the 100-year floodline where possible. However, small concessions (<15 m) are acceptable. Should these concessions be used, the lower 1 m of the dump should be reinforced with rock cladding (60% coverage) with a d50 of 200 mm.

#### 9.3.5.4 IMPACTS ON HYDROLOGY DUE TO TREATED WATER DISCHARGE

During the operational phase, a water treatment plant may discharge up to 3 Ml/days into the tributary of the Grootspruit:

- Wet season baseflows will be significantly increased above their normal flows while the treatment plant is operational. This is considered a positive impact.
- However, the flows are likely to be inconsistent and binary so surface water ecosystems will not be able to depend on this water. The flows will therefore provide similar value as storm water flows provide.
- The water quality is reported to be compliant with the resource water quality objectives, so the water quality will be an improvement on the water quality in the Grootspruit tributary and the Grootspruit.

The affected areas will be the Grootspruit Tributary downstream of the discharge point and the Grootspruit. Impacts will cease after the treatment plant stops operating.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impact due to treated water discharge** | Operation | 12.50 | 12.50 | 14.06 |

**Proposed Mitigation:**

The impacts are positive, so no further mitigation is required.

#### 9.3.5.5 IMPACT DUE TO CONTAMINATED WATER DISHCARGE

Some of the study area should be considered as dirty areas. These areas include the opencast operations, the hards and RoM stockpiles, and any pollution control dams. Storm water and seepage generated from these dirty areas will likely be contaminated and have a detrimental effect on the water quality in the local streams, the Grootspruit and the Grootspruit tributary. These impacts will be most acute during the dry season when stream flows are low.

The colliery must undertake to comply with Government Notice 704 of the South African National Water Act (Act 36 of 1998) in terms of discharge. This act limits discharges of contaminated water from mining related activities to less than once in 50 years on average. Storm water from dirty areas must be routed to a dirty water management system, in accordance with Government Notice 704 of the National Water Act (Act 36 of 1998).

Should a legal discharge occur as a result of extreme rainfall conditions, the Grootspruit and the Grootspruit tributary, and the local streams should have enough capacity to dilute poor quality water. The impacts from extreme rainfall conditions should be low and will last for a short duration.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impacts from contaminated discharge** | Operation | -17.50 | -5.50 | -5.50 |

**Proposed Mitigation:**

- Contaminated shallow seepage and storm water run-off must be collected and routed to a lined pollution control dam. The pollution control dam must be sized in accordance with Government Notice 704 of the South African National Water Act;
- The pollution control dam water levels must be constantly monitored. Steps and procedures must be put in place to manage situations where excess water builds up in the pollution control dam;
- The pollution control dam must be operated empty as far as practicable and cannot fulfil the same role as a water storage dam, unless specifically designed to fulfil both purposes; and
- Water reuse from the pollution control dam must be maximised.

#### 9.3.5.6 IMPACT DUE TO BURST WATER PIPES

Water pipes may transport polluted water between the pollution control dam and other facilities on the proposed colliery. If any of these pipes burst, significant quantities of poor-quality water could be pumped into the environment.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Contamination from burst water pipes** | Operation | -10.00 | -6.00 | -6.75 |

**Proposed Mitigation:**

- It is preferable to run the dirty water pipelines through areas already serviced by dirty water systems where possible; and
- Pipelines should be subjected to frequent patrols. An efficient system of reporting should be available to allow the immediate tripping of pumps should a leak be found.

#### 9.3.5.7 IMPACTS DUE TO WASH BAYS AND WORKSHOPS

During the operational phase storm water generated from the proposed mining areas and pollution control dams must be considered as dirty and must be collected in the dirty water system. This water would have contributed to the flow into the Grootspruit and the Grootspruit

tributary and in the local wetlands. The impounding of this water will result in a small reduction in the yield of the catchment.

If surface subsidence occurs above the underground workings, this will reduce the yield of the Grootspruit and the Grootspruit tributary and the local wetlands. Run-off from this area would have contributed to the flow in these streams. This water will be intercepted and lost from the surface water system to evaporation and infiltration.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Pollution from vehicle fleet** | Operation | -6.75 | -4.50 | -4.50 |

**Proposed Mitigation:**

- All drains that collect the wash water and storm water must be maintained regularly. These should be free of debris and silt;
- All diversion canals, trenches and conduits must be designed to convey run-off from a 50-year design storm; and
- The wash bays and workshops must be equipped with oil separators to remove hydrocarbons from wash down water.

#### 9.3.5.8 LOSS OF CATCHMENT YIELD

During the operational phase storm water generated from the proposed mining areas and pollution control dams must be considered as dirty and must be collected in the dirty water system. This water would have contributed to the flow into the Grootspruit and the Grootspruit tributary and in the local wetlands. The impounding of this water will result in a small reduction in the yield of the catchment.

If surface subsidence occurs above the underground workings, this will reduce the yield of the Grootspruit and the Grootspruit tributary and the local wetlands. Run-off from this area would have contributed to the flow in these streams. This water will be intercepted and lost from the surface water system to evaporation and infiltration.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Loss of catchment yield** | Operation | -17.50 | -15.50 | -20.63 |

**Proposed Mitigation:**

- As is best practice, dirty areas should be minimised. This will have the dual benefit of smaller dirty water management systems and reduction in catchment yield loss; and
- The loss of catchment yield due to underground subsidence can be mitigated by preventing subsidence and surface cracking. The mine must commit to adhering to suitable surface subsidence safety factors.

#### 9.3.5.9 THE REMOVAL OF SURFACE INFRASTRUCTURE AND REHABILITATION

During the decommissioning phase, most impacts will be associated with the removal of surface infrastructure, final pit closure and removal and rehabilitation of the RoM stockpiles and the hards dump. Haul roads will be removed, as will berms and diversion trenches.

During this process, short-term impacts will be moderate, as heavy earthmoving machinery will disturb large areas. Previously vegetated areas may be disturbed which will increase erosion potential. These short-term impacts will give way to long-term benefits.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impacts of removal of surface infrastructure on surface water** | Decommissioning<br>Closure and rehab | -12.50 | -10.00 | -11.25 |

**Proposed Mitigation:**

Apart from due diligence care while performing decommissioning tasks, no mitigation is necessary. Due diligence care includes the following:

- Plant should be well maintained to ensure that hydrocarbon spills are minimised;
- Existing roads should be used where possible; and
- New disturbed areas should be minimised.

#### 9.3.5.10 PIT DECANT

The groundwater study has indicated that decant may occur from the mine workings. After the colliery is closed, contaminated water management becomes passive. Groundwater inflows and recharge through the rehabilitated spoils may create decant from the opencast and underground workings. This decant will be driven by rainfall recharge through the rehabilitated surface and groundwater inflows. The decant water quality is likely to be poor and will contaminate the Grootspruit and the Grootspruit tributary. Decant flows will likely be seasonal and volumes will be dependent on the quality of rehabilitation done and the degree of surface subsidence. Poor rehabilitation will increase the decant volumes. The water quality is likely to remain poor in the long term (>20 years). Eventually as pollutants are leached out of the workings and natural stratification occurs, the seepage water quality will improve.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Pit decant** | Closure and rehabilitation | -20.00 | -10.00 | -11,25 |

**Proposed Mitigation:**

- The rehabilitation work should strive to minimise recharge and maximise run-off;
- A final void could be optimised to evaporate excess pit water if approved by the Department of Water Affairs;
- Where feasible, materials likely to produce the highest amounts of pollution should be replaced in sections of the pit where they will be permanently flooded, thus preventing oxidation of these materials;
- Should passive mitigation measures not be suitable, active alternatives can be considered such as some form of treatment, prior to release;
- The planned mining method and the commitment to adhering to appropriate safety factors must be made by the mine to prevent surface subsidence;

- Methods to stop or reduce decant volumes could include sealing some areas of the mine workings or leaving some areas unmined to act as a barrier to decant; and
- Methods to improve the decant water quality could include flooding of the mining areas, where practical, to reduce oxygen ingress. Routing seepage through lime pits can also improve the water quality if the flows are low enough.

### 9.3.6 IMPACTS ON SOILS

Impacts on the soils within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure).

The major potential impact that would occur as a result of coal mining and related activities would be the loss of potentially productive agricultural land, along with a reduction in land capability. Where storage facilities are established, this impact is virtually permanent, while for other disturbed areas, spoil and topsoil can be replaced and rehabilitated to a certain degree, although a reduction in agricultural potential usually occurs. Successful rehabilitation will depend on how well the mine personnel follow the prescribed guidelines in terms of correct stripping practice (depth and mapping units), optimum stockpiling (height and duration) and proper rehabilitation (physical manipulation and fertilization).

Below are the impacts on soils and geology features during the construction, operation, decommissioning rehabilitation and closure phases, as well as the impact rating.

#### 9.3.6.1 REDUCTION IN AGRICULTURAL POTENTIAL AND LOSS OF FERTILITY

Reduction in natural soil fertility may be caused by removal, storage (stockpiling) and replacement of the soil profile. Aspects such as acidification, loss of nutrients and organic matter could apply. Such an impact will probably become greater, the longer such conditions apply however active rehabilitation would mitigate this situation to a degree. The land potential levels discussed during the sensitivity assessment currently is in a moderate condition. The proposed opencast mining activities will completely degrade and remove soil resources where the proposed mining boundaries impede into the respective features.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Loss of fertility (Process Alternative P3a – dust suppression with dirty water)** | Planning and Design | -1.00 | -1.00 | -1.00 |
| | Construction | -11.00 | -6.00 | -7.50 |
| | Operation | -22.50 | -14.00 | -19.25 |
| | Decommissioning | -4.00 | -4.00 | -5.00 |
| | Closure and Rehabilitation | -1.75 | -1.75 | -1.97 |
| **Loss of fertility (Process Alternative P3b) - dust suppression with surface water** | Planning and Design | -1.00 | -1.00 | -1.13 |
| | Construction | -10.00 | -7.50 | -9.38 |
| | Operation | -13.00 | -9.75 | -13.41 |
| | Decommissioning | -4.00 | -4.00 | -5.00 |

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| | Closure and Rehabilitation | -1.75 | -1.00 | -1.13 |

**Proposed Mitigation:**

- The entire project area should be monitored every month for compaction and erosion. In cases where compaction and/or erosion does occur, action plans should be implemented to apply mitigation and to avoid these areas as much as possible in the near future;
- Soil samples should be taken on site by a soil scientist and sent away for fertility tests within the first month of rehabilitation. The results thereof should be compared to the results obtained prior to construction and after construction to conclude the findings of the change in the top soil's chemical properties. Mitigation measures can be suggested by the relevant soil scientist thereafter to rectify any degradation. Thereafter, similar sampling should be carried out every year within the same season that the previous sampling has been done until closure is obtained;
- Compaction and erosion should be monitored within the first month to gain knowledge of areas impacted upon during the decommissioning phase. Rehabilitation of these sites should take place by means of the rehabilitation guidelines provided. Thereafter, similar monitoring and the accompanied mitigation measures should be applied every six months until closure is obtained;
- A post-mining land capability assessment should form part of a yearly monitoring program to assess the rehabilitated areas against the land capability targets set;
- Only the designated access routes are to be used to reduce any unnecessary compaction;
- Compacted areas are to be ripped to loosen the soil structure;
- The topsoil stockpiles will be vegetated in order to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.
- Prevent any spills from occurring as far as possible;
- If a spill occurs, it is to be cleaned up immediately and reported to the appropriate authorities;
- All vehicles are to be serviced regularly;
- Subsidence monitoring must occur annually with any signs of subsidence reported;
- Underground workings must adhere to a safety factor that will minimise the risk of subsidence;
- Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed;
- Monitoring of adjacent watercourses must be undertaken to assess the impact of AMD to these systems;
- Cut-off trenches must be incorporated into the opencast mining areas' design to decrease contamination of watercourses via AMD;
- Separate clean and dirty water;

- Construct diversion berms and drains around working areas;
- Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths;
- No cleaning of vehicles, machines and equipment in water resources;
- No servicing of machines, vehicles and equipment on site;
- Storage of potential contaminants in bunded areas;
- All contractors must have spill kits available and be trained in the correct use thereof;
- All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems;
- Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses;
- Clean and dirty water must be separated. This water should be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area;
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- All waste generated on-site must be adequately managed; and
- Separation and recycling of different waste materials should be supported.
- Compile a suitable stormwater management plan;
- Construct cut-off berms downslope of working areas;
- Demarcate footprint areas to be cleared to avoid unnecessary clearing;
- Exposed areas must be ripped and vegetated to increase surface roughness;
- Create energy dissipation at discharge areas to prevent scouring;
- Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching;
- Separate clean and dirty water continue with surface water and biomonitoring programmes;
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks, these should be serviced off-site;
- All contractors and employees should undergo induction which is to include a component of environmental awareness;

- The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area;
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported;
- Clean vehicles on-site, and prioritise vehicles gaining access from surround areas;
- Rehabilitation of the area and shaping of the topography must minimise the ingress of water into the mining area;
- Decommission cut-off berms and drains last;
- The area must be shaped to a natural topography post mining;
- Leaking vehicles will have drip trays placed under them where the leak is occurring; and
- If there are leaks the pipelines must be repaired immediately.

### 9.3.7 IMPACTS ON HYDROPEDOLOGY

Various areas within the mining right areas have been determined to have "Moderate" and "High" subsidence risks, which indicates the potential for the loss of interflow. One main hydropedological impact has been identified for the proposed activities, namely "loss of hydropedological flow paths. Below are the preliminary impacts on hydropedology during the planning and design, construction, operation, decommissioning rehabilitation and closure phases, as well as the impact rating. Large portions of the studied area are already impacted upon by current mining activities. These modifications have altered natural flow paths of and complicates hydropedological interpretations in relation to proposed future developments. With this being said, it is worth noting that the recharge soils occupy long sections of the slopes, especially those areas where the proposed pits will be located. Conceptually, the impact of the development on lateral flow paths through the vadose zone will therefore be insignificant. This conceptual understanding was supported by hydrological simulations of one slope which was not yet impacted by development. The simulations indicate that the proposed development will only result in drying of the soils directly below the opencast pits. Approximately 300m downslope of the pit, differences in soil water contents were not observed. Similarly, there was no difference in the outflow and lateral flux to the stream between the natural and developed state.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Loss of flow paths (underground)** | Planning and Design | -2.50 | -2.50 | -3.13 |
| | Construction | -2.50 | -2.50 | -8.25 |
| | Operation | -7.50 | -7.50 | -10.31 |
| | Decommissioning | -6.00 | -6.00 | -8.25 |
| | Closure and Rehabilitation | -4.00 | -4.00 | -5.00 |

**Proposed Mitigation:**

None required.

### 9.3.8 IMPACTS ON WETLANDS

A number of different wetland types and HGM units potentially are located within the project area. None of these wetlands appear to be in a largely natural state, which is likely a result of the local land uses, and predominantly the mining of the area. HGM 1 and 3 have been scored "High" sensitivity ratings given the fact that these systems provide high levels of services and the fact that the proposed "Seam 2" opencast mine will impede into these systems. The buffer zones surrounding the latter two mentioned systems have been scored "Medium" sensitivity. The reason for the medium sensitivity can be ascribed to the lesser extent of functionality provided as opposed to that provided by the wetlands themselves.

The two artificial wetland systems joining HGM 1 and 3 from the north have been scored "Low" sensitivities. These systems are artificial, which decreases their sensitivity significantly. These two systems do however provide some level of functionality, ultimately rendering the systems "Low". As for HGM 2, this system has been identified as being natural, which accounts for a high level of sensitivity. The proposed activities will however not impede into the delineated system, which has resulted in a decreased level of sensitivity ("Low").

The buffer zones surrounding HGM 2 as well as the remainder of the artificial wetland systems have all been determined to be of "Least Concern". It is worth noting that all areas not delineated as part of the features identified by the specialist also are of "Least Concern". Below are the impacts on wetlands during the planning and design, construction, operation, decommissioning rehabilitation and closure phases, as well as the impact rating.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Loss of wetland functionality (Process Alternative P3a – dust suppression with dirty water)** | Planning and Design | -1.00 | -1.00 | -1.00 |
| | Construction | -12.00 | -6.00 | -7.50 |
| | Operation | -22.50 | -22.50 | -33.75 |
| | Decommissioning | -4.00 | -4.00 | -5.00 |
| | Closure and Rehabilitation | -1.75 | -1.75 | -1.97 |
| **Loss of wetland functionality (Process Alternative P3b) - dust suppression with surface water** | Planning and Design | -1.00 | -1.00 | -1.13 |
| | Construction | -12.00 | -7.50 | -9.38 |
| | Operation | -15.00 | -9.75 | -13.41 |
| | Decommissioning | -5.00 | -4.00 | -5.00 |
| | Closure and Rehabilitation | -4.00 | -1.75 | -2.19 |

**Proposed Mitigation:**

No fatal flaws were identified for the project. In the event underground mining is authorised, it is recommended that a subsidence assessment prescribe measures to avoid subsidence of the mined-out areas below the wetlands and buffer zones. In the event opencast mining of Seam 2 is authorised, it is recommended that the extent of the opencast area be amended to adhere to

the buffer zone. If this is not feasible, then a direct loss of wetlands will occur. Due to the expected loss and also degradation of wetlands as a result of the project with either option, it is also recommended that on-site rehabilitation of the area be implemented to allow for some level of wetland compensation, this should be informed by an offset strategy. Additional mitigation measures are listed below:

- Underground workings must adhere to a safety factor that will avoid subsidence;
- Any loss/alteration of flow dynamics must be quantified, and mitigation options to re-introduce water in a safe and environmentally friendly way must be assessed;
- Existing roads must be used as much as possible;
- Proper stripping and stockpiling techniques must be followed (see the Pedology assessment (TBC, 2020) for more detail);
- Concurrent rehabilitation must be carried out rather than full rehabilitation after decommissioning only;
- Monitoring of adjacent watercourses must be undertaken to assess the impact of AMD to these systems; Cut-off trenches must be incorporated into the opencast mining areas' design to decrease contamination of watercourses via AMD;
- Separate clean and dirty water;
- Construct diversion berms and drains around working areas;
- Incorporate green /soft engineering storm water measures. Avoid unnecessary vegetation clearing and avoid preferential surface flow paths;
- No cleaning of vehicles, machines and equipment in water resources;
- Storage of potential contaminants in bunded areas;
- All contractors must have spill kits available and be trained in the correct use thereof;
- All released water must be within DWAF (1996) water quality standards for aquatic ecosystems, and discharge must be managed to avoid scouring and erosion of the receiving systems;
- Contain wastewater in a PCD. Contaminated water must not be discharged into the watercourses;
- Clean and dirty water must be separated. This water should be looked at for treatment and then re-introduced to mitigate losses to the catchment water hydro-dynamics;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area.
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- Separation and recycling of different waste materials should be supported.
- Implement a suitable stormwater management plan;
- Construct cut-off berms downslope of working areas;

- Demarcate footprint areas to be cleared to avoid unnecessary clearing;
- Exposed areas must be ripped and vegetated to increase surface roughness;
- Create energy dissipation at discharge areas to prevent scouring; and
- Temporary and permanent erosion control methods may include silt fences, retention basins, detention ponds, interceptor ditches, seeding and sodding, riprap of exposed areas, erosion mats, and mulching.
- All chemicals and toxicants during construction must be stored in bunded areas;
- All machinery and equipment should be inspected regularly for faults and possible leaks;
- All contractors and employees should undergo induction which is to include a component of environmental awareness. The induction is to include aspects such as the need to avoid littering, the reporting and cleaning of spills and leaks and general good "housekeeping";
- Adequate sanitary facilities and ablutions must be provided for all personnel throughout the project area;
- Have action plans on site, and training for contractors and employees in the event of spills, leaks and other impacts to the aquatic systems;
- All waste generated on-site must be adequately managed. Separation and recycling of different waste materials should be supported.
- All surface infrastructure must be removed from the site at closure. Compacted areas must be ripped (perpendicularly) to a depth of 300mm. An indigenous seed mix must be applied to rehabilitated and bare areas. Any gullies or dongas must also be backfilled and the area must be shaped to a natural topography. Trees (or vegetation stands) removed must be replaced
- No grazing must be permitted to allow for the recovery of the area and a attenuation ponds may be created in channels to retain water in the catchment;
- Comply with the buffer zones as dictated in the WUL, and
- Rehabilitation of the area and shaping of the topography must minimise the ingress of water into the mining area.

### 9.3.9 IMPACTS ON AIR QUALITY

Although there are a number of ambient air pollutants in the vicinity of the proposed Elandsfontein Colliery, the pollutants of concern due to the mining activities will consist primarily of particulate matter. The proposed operations at Elandsfontein Colliery will comprise underground and opencast mining operations, road transportation and materials handling. During the construction phase, two areas will be affected namely:

- The north of the opencast reserve of Block H where a new box-cut will be opened with cuts developed in a southerly direction, and
- Resource Block D and E where a new decline will be developed to access the No.1 Seam. It is understood that the existing infrastructure will be used to access the other underground Resource Blocks and the new opencast areas.

Both the box-cut and decline shaft construction will result in impacts from vehicle tailpipe emissions due to the transport and general construction activities but these impacts are likely to

be localised. Depending on the type and extend of the construction activities, especially for opencast operations in the eastern part of the mine, the PM10 and PM2.5 may reach the western part of Clewer. Fortunately, the prevailing wind is from the east and the north and should result mostly in impacts away from Clewer. Gaseous emissions, especially $NO_2$, CO and $SO_2$ could be a concern at both the box-cut operations and the decline shaft.

Clearing of vegetation and topsoil and levelling of transportation route areas can result in significant levels of particulate matter if not mitigated. There are no AQSR within 1 km from the haul roads, but Clewer is close to the main access route and could be impacted on by additional traffic as part of construction.

Opencast mining activities would have significantly higher air quality impacts than underground operations. This is primarily due to excavation, material handling and vehicle entrainment on roads (haulage of RoM coal, waste and topsoil). The main pollutant of concern is particulate matter, specifically PM10 and PM2.5 due to the potential for health impacts. Dustfall is likely to be high close to the active mining areas. The AQSR most likely to be affected by the opencast operations are the residents of Clever to the east of the mine and to the northeast of the planned open pit. Various controls could be applied to opencast mining, with control efficiencies (CE) ranging from 50% due to water suppression to 99% control by using fabric filters on drills (NPI, 2012).

Underground mining activities would mainly result in gaseous and particulate emissions from the ventilation shaft and the tipping of RoM from the conveyor onto the RoM stockpile. Vehicle entrained dust from road surfaces, windblown dust from trucks and gaseous emissions from truck exhaust (PM, $SO_2$; $NO_x$; CO; $CO_2$) are most likely to impact the AQSR near the haul roads. Controls on the haul roads could range between watering (50% CE) to 100% for sealed or salt-crusted roads (NPI, 2012).

The CHPP is an existing plant but the production would increase from the current 500 000 tpa to 1,365,000 tpa (based on 300 tph, 6500 hrs/yr and 70% efficiency). This would result in increased emissions especially from the crushing and screening circuit.

From an air quality perspective, the only sources of pollution during the closure phase would be vehicles as part of the rehabilitation process and windblown dust from exposed surfaces. The impacts would be significantly lower that during the operational phase and even the construction phase. Below are the preliminary impacts on air quality during the construction, operation, decommissioning rehabilitation and closure phases, as well as the impact rating. No air quality impacts were identified for the planning and design phase.

The establishment of a comprehensive emission inventory formed the basis for the assessment of the air quality impacts from the project's emissions on the receiving environment. To determine the significance of air pollution impacts due to the operational phase of the Project, emissions were quantified for three modelling scenarios:

- Scenario 1 – representative of opencast mining activities (Blocks F and G) and underground mining (Blocks B and C) for Year 2;
- Scenario 2 – representative of opencast mining activities (Block H) and underground mining (Block D) for Year 3; and
- Scenario 3 – representative of underground mining activities (Block A) for Year 5.

Scenario 1 was chosen to represent maximum ROM and product throughput from simultaneous mining of opencast resource blocks (located to the northwest of the CHPP) and underground resource blocks (located to the southwest of the CHPP) respectively. Scenario 2 was chosen to represent maximum waste production (overburden and topsoil) where opencast mining activities are located to the southeast of the CHPP (in near proximity to the closest AQSR) and

underground mining activities are located to the northwest of the CHPP, respectively. Scenario 3 represents impacts due to underground mining activities only, where the underground mining block is located to the southeast of the CHPP (in near proximity to the closest AQSR).

The main contributors to uncontrolled emissions during the operational phase were found to be crushing and wind erosion for PM2.5, unpaved roads and wind erosion for PM10, and unpaved roads and crushing for TSP. With mitigation, although the unpaved roads contribution is much reduced; the main contributing sources to PM2.5, PM10 and TSP emissions remain the same.

Dispersion modelling results are as follows:

- PM10 daily GLCs, with or without mitigation in place, are not likely to exceed the NAAQS at any of the AQSRs. Over an annual average the GLCs are within the standard at all receptors.
- PM2.5 daily GLCs, for both unmitigated and mitigated activities, are not likely to exceed the NAAQS at any of the AQSRs. Over an annual average the GLCs are within the standard at all receptors.
- Maximum daily dustfall rates due to both unmitigated and mitigated scenarios were within the NDCR for residential areas at all AQSRs.

The simulated footprint areas of exceedance for PM10 and PM2.5 impacts were found to be much larger for Scenario 2 than for Scenarios 1 or 3. This increase in magnitude may be explained the higher waste production (overburden and topsoil), and the relative location of opencast mining activities (southeast of the CHPP, in near proximity to the closest AQSR to the east of the mine boundary) and underground mining activities (located to the northwest of the CHPP, in close proximity to the closest AQSR to the north of the mine boundary).

The main sources of impacts due to uncontrolled emissions during the operational phase were found to be unpaved roads, followed by in-pit sources. For controlled operations unpaved roads remains the largest contributor although the crushing source becomes a larger contributor at AQSRs to the north and northeast of the mine boundary.

The main findings from the GHG impact assessment are as follows:

- The total CO2-e emissions for Elandsfontein operations are not likely to be more than 214 417 tpa. The calculated CO2-e emissions from the proposed project operations contribute less than 0.04% to the total of the national inventory's GHG emissions (excluding land-use change and forestry) and 0.05% to the national inventory's "energy" sector GHG emissions.
- GHGs were declared priority pollutants in March 2014 and pollution prevention plans must be developed if the operation contributes more than 100 000 tons CO2eq emissions. The scope 1 GHG contribution due to the proposed mining operations is below 100 000 tons. Based on this, a Pollution Prevention Plan is not required for the proposed project operations.
- The GHG emissions from the proposed operational phase are not likely to result in a noteworthy contribution to climate change on its own.
- The project and the community are likely to be negatively impacted by climate change, the project less than the community due to the short time that operations are likely to occur.

#### 9.3.9.1 GASEOUS AND PARTICULATE EMISSIONS (INCLUDING DUST)

Mining activities have a high potential to cause dust in the immediate and surrounding areas if not adequately managed. The proposed Project operations should not result in significant ground

level concentrations or dustfall levels at the nearby receptors provided the design mitigation measures are applied effectively. From an air quality perspective, the proposed project can be authorised permitted the recommended mitigation measures are applied.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Decline in air quality** | Construction | -7.50 | -6.00 | -7.00 |
| | Operation | -15.00 | -9.75 | -12.50 |
| | Decommissioning | -6.75 | -6.00 | -8.25 |
| | Closure | -4.50 | -4.50 | -5.63 |

**Proposed Mitigation:**

A summary of the recommendations and management measures is given below:

**Construction and closure phases:**

- Air quality impacts during construction would be reduced through basic control measures such as limiting the speed of haul trucks; limit unnecessary travelling of vehicles on untreated roads; and to apply water sprays on regularly travelled, unpaved sections.
- When haul trucks need to use public roads, the vehicles need to be cleaned of all mud and the material transported must be covered to minimise windblown dust.
- The access road to the Project also needs to be kept clean to minimise carry-through of mud on to public roads.

**Operational phases:**

- For the control of vehicle entrained dust it is recommended that water (at an application rate >2 litre/m$^2$/hour), be applied. Literature reports an emissions reduction efficiency of 75%.
- In controlling dust from crushing and screening operations, it is recommended that water sprays be applied to keep the ore wet, to achieve a control efficiency of up to 50%.
- Mitigation of materials transfer points should be done using water sprays at the tip points. This should result in a 50% control efficiency. Regular clean-up at loading points is recommended.
- In minimizing windblown dust from stockpile areas, water sprays should be used to keep surface material moist. A mitigation efficiency of 50 % is anticipated.
- Continuous monitoring of dustfall must be conducted as part of the Project's air quality management plan.

### 9.3.10 VIBRATION AND BLASTING IMPACTS

The potential impacts investigated due to blasting operations are ground vibration, air blast and fly rock. Below are the preliminary blasting impacts during the operational phase, as well as the impact rating. No impacts were identified for the planning and design, construction, decommissioning and closure and rehabilitation phases.

Calculated minimum safe distance is 447 m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on

safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance.

On review of the pit area's location, it is such that Mine Health and Safety act regulation 17.6(a) will be applicable and will need to be considered. The location of both planned seam 1, seam 2 open cast and underground Pit boundary is closer than 100m from private installations and the necessary legal requirements will need to be addressed.

#### 9.3.10.1 BLASTING AND VIBRATION IMPACTS

The potential impacts considered can be described as follows:

- Ground vibration: Levels greater than recommended limits may be damaging to structures. Different structures will also have different permitted levels. Ground vibration may cause damage if levels exceed the structures safe limit. People may also experience ground vibration as perceptible at very low levels and normally react negatively to the experience of ground vibration.
- Air blast: In most cases the effect of air blast is underestimated. High levels of air blast could cause damage and normally windows are first to be damaged. Levels lower than required to induce damage may rattle windows and large roof surfaces. These effects are generally mistaken as ground vibration effect and leads to complaints. Rattling of doors and roofs causes concern and leads to people being upset.
- Fly Rock: Fly rock can be mitigated but possibility never eliminated. However, it can be managed properly with relative ease. Control of fly rock will also control the effects of air blast. Fly rock is a greater concern when an open pit is near houses or structures or installations. Wild fly rock could cause damage to structures and installations but also be lethal to people and animals.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Fly rock, air blast and ground vibration impacts** | Operation | -17.50 | -8.25 | -9.28 |

**Proposed Mitigation:**

- Specific blast design to be done, shorter blast holes, smaller diameter blast hole, using electronic initiation instead of shock tube systems to obtain single hole firing.
- Use of specific stemming to manage fly rock - crushed aggregate of specific size. Redesign with increased stemming lengths.
- Consider underground mining instead of opencast operations in areas closer to Clewer.

### 9.3.11 TRAFFIC IMPACTS

Heavy vehicle construction trips are expected to cause additional wear and tear on the surrounding road network. As most construction will take place on site with existing equipment, the expected effects of this short-term construction on the surrounding road network is minor as the surrounding national and provincial road network has been designed to carry heavy vehicles over long periods. The gravel access road to the site is expected to sustain damage during the construction.

During operation heavy vehicle trips are expected to cause additional wear and tear on the surrounding road network which will mean road maintenance of the surrounding road network will be required earlier than previously expected.

The existing site access creates a dog-legged intersection with Apex road. The site access road should be realigned to create one four-legged intersection. Various intersection capacity upgrades are recommended for the surrounding road network to accommodate the future traffic growth, however these are required irrespective of the mine operations and are the responsibility of the relevant road authority.

#### 9.3.11.1 TRAFFIC AND TRANSPORT IMPACTS

The following impacts were assessed for the construction and operational phases of the project,:

- Site Access road impacts;
- Intersection Capacity Analysis using SIDRA Intersection;
- Deterioration of road network condition (Effect of E80's on surfaced roads); and
- Increase in dust along site access road.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Deterioration of road network condition** | Construction | -9 | -9 | -9,00 |
| **Increase in dust along access road** | | -6,75 | -6 | -6,00 |
| **Increase in peak hour traffic volumes** | Operation | -9 | -9 | -9,00 |
| **Deterioration of road network condition** | | -9,75 | -8,25 | -8,25 |
| **Increase in dust along access road** | | -9 | -7,5 | -7,50 |
| **Increase in peak hour traffic volumes** | | -8,25 | -8,25 | -8,25 |

**Proposed Mitigation:**

- Gravel Access Road should be maintained to support heavy vehicle movement;
- Heavy vehicle trips for planning, construction, decommissioning and rehabilitation and closure phases should be limited to off-peak hours;
- Add warning signage where trucks enter main road;
- Limit heavy vehicle speed to 40km/h along site access road; and
- Water down access road on a regular basis to reduce dust

### 9.3.12 VISUAL IMPACTS

Visual impacts would result from the construction, operation and decommissioning phase of the Elandsfontein project. Specifically, impacts would result from the overburden stockpiles and the mining activities being seen from sensitive viewpoints. People working within the mine would be regarded as having a lower sensitivity as they would be focused on their work activities. Permanent views would be those from the farmsteads and residences within the area as well as from the nearby communities. The application is an extension of an existing operational mine and furthermore there are also several coal mines in the area. The area is therefore already compromised visually and aesthetically.

#### 9.3.12.1 VISUAL IMPACTS

Mining has known visual impacts such as the stockpiles, activities, etc. Elandsfontein Colliery is located in a mining rich area and as such, the general landscape is scattered with mines.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Visual impact and impact on sense of place** | Construction<br>Operation | -11.00 | -5.00 | -5.00 |

**Proposed Mitigation:**

Construction areas must be kept clean and tidy and adequate dust suppression must be undertaken. Stockpiles should be constructed in designated areas to limit the number of stockpiles required at any one time.

### 9.3.13 SOCIO-ECONOMIC IMPACTS

The following impacts on the socio-economic environment within the study area were identified and assessed for the various project phases (planning and design, construction, operation, decommissioning, and rehabilitation and closure). No impacts on socio-economics have been identified that will occur during the Planning and Design Phase and the Rehabilitation and Closure Phase. Below are the construction and operational phase preliminary impacts on socio-economic environment identified during the EIA, as well as their impact rating.

#### 9.3.13.1 REDUCTION IN QUANTITY OF WATER (I.E. WATER CONSUMPTION)

The utilisation of groundwater for any purpose may result in the alteration/ reduction of groundwater levels on site thereby affecting local users. The overall significance is low due to the number of boreholes potentially affected.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Reduction in quantity of water (i.e. water consumption)** | Construction<br>Operation<br>Closure | -13.00 | -6.00 | -6.00 |

**Proposed Mitigation:**

Pre-construction water levels should be recorded for the water sources and should be monitored regularly to ascertain if the water levels are dropping drastically. Should a negative impact be recorded on a water users water availability, this should be compensated proportionally.

#### 9.3.13.2 INTERFERENCE WITH EXISTING LAND USES

Existing land uses would be affected during construction and operation as land affected by the development footprint can no longer be used for other purposes however the significance of this impact is low as the land is currently not used for other activities. Rehabilitation of the land back to arable post-mining land capability will also ensure that the significance of this impact remains low.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Interference with Existing Land Uses** | Construction<br>Operation | -14.00 | -5.50 | -7.33 |

**Proposed Mitigation:**

Where relevant, directly affected landowners must be engaged and agreements must be reached on compensation for any loss of use of the land. There must be a formal procedure in place on how to report incidents to ensure records of all grievances are kept, and responses are given within a certain time. As far as possible interference with existing land uses/livelihoods of those surrounding the mining area should be avoided. If any interference takes place, the landowner should be compensated for their losses following suitable investigations.

#### 9.3.13.3 NUISANCE AND IMPACT ON SENSE OF PLACE (I.E. NOISE, DUST, ETC.)

The proposed mine extension project will impact on the established sense of place of a particular property. Additional vehicles, increased noise and dust, the removal of vegetation, and presence of workers will all contribute to the alteration of the sense of place as well as creating a possible nuisance.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Nuisance and Impact on Sense of Place (i.e. noise, dust, etc.).** | Construction<br>Operation | -12.00 | -5.25 | -5.25 |

**Proposed Mitigation:**

- Adequate dust suppression measures should be utilized to minimize dust production. There must be a formal procedure in place on how to report incidents to ensure records of all grievances are kept, and responses are given within a certain time.
- Sense of place is defined as an individual's personal relationship with their local environment, both social and natural, which the individual experiences in their daily life. It is therefore difficult to mitigate the impact as it is experienced on a personal level.

#### 9.3.13.4 SAFETY AND SECURITY (I.E. ACCESS TO PROPERTIES, THEFT, FIRE HAZARDS, SPONTANEOUS COMBUSTION OF COAL STOCKPILES ETC.)

Future mining activities may result in a risk to the safety and security of landowners, lawful occupiers, and community members in close proximity to the mining areas due to the increase in number of unfamiliar people in the area. Furthermore, any spontaneous combustion of carbonaceous material could cause fires if not adequately controlled.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Safety and security (i.e. access to properties, theft, fire hazards, etc.).** | Construction<br>Operation<br>Decommissioning | -11.00 | -5.25 | -5.25 |

**Proposed Mitigation:**

All mining contractors and employees should wear appropriate identification. Vehicles should be clearly marked for ease of identification. Entry and exit points at the mine should also be controlled. Coal stockpiles should be kept for limited time on site and adequate control of any combustion of coal stockpiles must immediately be initiated.

#### 9.3.13.5 DAMAGE/ DISRUPTION OF SERVICES (I.E. WATER, ELECTRICITY, SEWAGE, ETC.)

Mining operations have the potential to disrupt or damage services such as water supply, electricity supply or sewage collection pipes if not situated away from the services.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Damage / disruption of services (i.e. water, electricity, sewage, etc.).** | Construction<br>Operation | -13.00 | -6.00 | -6.00 |

**Proposed Mitigation:**

Before the project commences, an asset and services baseline of services that may be affected must be compiled. A copy of the baseline records should be given to each landowner/service provider, and a master document kept by the applicant. If any damage occurs it should be reinstated to its pre-project status on conclusion of investigations into the cause. Furthermore, compliance with the Eskom requirements must be adhered to for any activities within close proximity to the Eskom transmission powerlines.

#### 9.3.13.6 IMPACT ON EXISTING INFRASTRUCTURE (I.E. ROADS, FENCES, ETC.)

Activities may impact on existing infrastructure such as increased traffic on the adjacent road network, damage to fences and other local infrastructure.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Impact on existing infrastructure (i.e. roads, fences, etc.)** | Construction<br>Operation<br>Decommissioning | -13.00 | -6.00 | -6.00 |

**Proposed Mitigation:**

An asset and infrastructure baseline of any new public and/or private infrastructure that may be affected by mining activities must be compiled. A copy of the baseline records should be given to the relevant landowner/s or service providers, and a master document kept by the applicant. If any damage occurs it should be reinstated to its pre-project status on conclusion of investigations into the cause.

#### 9.3.13.7 PERCEPTIONS AND EXPECTATIONS

The proposed mine extension is likely to create great interest, particularly with regards to the potential for employment, perceived safety and security risks, and the exact nature of the proposed project. It must be born in mind that the mine is already in operation and the proposed extension of the life of mine will largely only result in ongoing employment, etc. The scale of the mining operation is not anticipated to be ramped up to such a degree that the current impacts would be greatly exacerbated.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Perceptions and Expectations** | Construction<br>Operation<br>Decommissioning | -12.00 | -6.00 | -6.00 |

**Proposed Mitigation:**

Perceptions and expectations must be managed through ongoing, open and transparent communication with affected stakeholders, communities, landowners and occupiers.

#### 9.3.13.8 EMPLOYMENT OPPORTUNITIES

Minor employment opportunities for some unskilled, skilled labour as well as providing services during construction (e.g. accommodation, transportation, etc.) may arise from this project. It is important to note that the project is an extension of the existing mining operations to extend the life of mine and therefore new job opportunities may be limited.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Employment Opportunities** | Construction<br>Operation<br>Decommissioning | 2.25 | 6.00 | 6.00 |

**Proposed Mitigation:**

Recruitment for any additional labour or services should be focused in the local area and preference given to the local communities if possible.

#### 9.3.13.9 COAL SUPPLY FOR ENERGY SECURITY

The continued supply of coal to Eskom will aid in energy security for the country.

| Impact | Project Phase | Pre-Mitigation Score | Post-Mitigation Score | Final Significance |
|---|---|---|---|---|
| **Coal supply** | Operation | 15.00 | 15.00 | 15.00 |

**Proposed Mitigation:**

No mitigation required.

# 10 CLOSURE COSTING AND OBJECTIVES

The goals and objectives for closure are determined based on the baseline environment and the land uses that will be established post mining. The vision, and consequent objective and targets for rehabilitation, decommissioning, and closure, aim to reflect the local environmental and socio-economic context of the project, and to represent both the corporate requirements and the stakeholder expectations as well as the legislative framework and regulations.

It is important to note that mining on this site pre-dates the current environmental closure and rehabilitation regulatory requirements. As such proactive planning for a defined closure vision was not factored into the early mining and progressive rehabilitation efforts. Therefore the closure vision presented herein aims to define a realistic and practically achievable closure vision within the restrictions presented by the current state of the mining operation.

The land is currently not used for any other productive use. The surrounding area has a varied land-use character, including:

- Heavy industrial: Highveld Industrial Park, Transalloys Smelter directly adjacent to the North and north east respectively.
- Mining: There is an abandoned opencast coal mining operation located along the north western boundary of the site.
- Cultivated land: Maize plantations directly to the north-north east.
- Grazing land: Open grasslands around the site are used for livestock grazing.
- Residential: The village of Clewer is located directly to the east of the mine.
- Conservation: There is a game farm and lodge located to the south of the mine area.

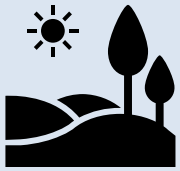
The final closure vision must consider the current and predicted future rehabilitation opportunities and constraints. These include consideration of the following:

- Availability of adequate topsoil to achieve a sustainable and stable vegetative growth medium;
- The ability to achieve a free draining final landform;
- The suitability of the water resources to support a final post closure land use; and
- The potential for integration of the final land use with the surrounding uses.

In support of achieving this post closure vision there are certain key rehabilitation, decommissioning, and closure objectives. 'Well-conceptualised rehabilitation objectives will allow assessment of the risks associated with achieving these objectives and guide the setting of suitable rehabilitation actions to be taken to mitigate these risks at every stage of the mine's life. Rehabilitation objectives describe 'what' needs to be achieved to reach the mine's rehabilitation goal. These objectives should be aligned to site-specific characteristics that are within the mine's control. Rehabilitation objectives should be as specific, measurable, achievable, and realistic as possible. They should also define a time period against which they can be measured' (LaRSSA, 2019). Driven by the closure vision and with due consideration of the project context and historical mining restrictions, the closure objectives are presented in **Table 22**.

A detailed Rehabilitation and Closure Plan is included as part of the EMPr in **Appendix E.**

**Table 22:** Closure Objectives, Targets and Criteria for final rehabilitation, decommissioning, and closure.

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| **Landform**  | To create a planned rehabilitated landscape that meets predefined land capabilities commitments, and which has:<br>• Suitable slope profiles for the planned land use/s and that limit the potential for erosion; and<br>• Adequate soil cover thickness.<br>• No remnant residue deposits post closure apart from defined northern discard facility. | Mine closure landform design.<br>Topsoil stripping and placement register (where applicable)- topsoil source, volume stripped/ placed, depth, type, stockpile location, placement location (incl direct placement).<br>Rehabilitated landscape slope (%).<br>Erodibility factor of rehabilitated soils and visual erosion indicators.<br>Topsoil cover thickness of rehabilitated landscape (mm).<br>Land Capability class[1]. | Maximise concave slopes on rehabilitated land as far as practically possible.<br>Rehabilitated wetlands (Class I):<br>• Soil depth must exceed 250 mm; and<br>• Specific wetland soil used, as stockpiled from pre-mining delineated wetland areas.<br>Rehabilitated Arable land: (Class II):<br>• Soil depth > 600 mm<br>• Soil material must not be saline or sodic.<br>• Slope (%) will be such that when multiplied by the soil erodibility factor K, the product will not exceed 2,0.<br>• Slopes must be flatter than 1:14, and free draining.<br>Rehabilitated Grazing land (Class III):<br>• has soil or soil-like material, permeable to the roots of native plants, that is more than 0.25 m thick and contains less than 50 % by volume of rocks or pedocrete fragments larger than 100 mm diameter. | Alignment with post closure land capability plan |

[1] The land capability classification used by LaRSSA.

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | | | • supports or is capable of supporting a stand of native or introduced grass species or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.<br>• Soil depth ≥ 250 mm.<br>• Slopes between 1:7 and 1:14.<br>Rehabilitated Wilderness (Class IV):<br>• Land that has little or no agricultural capability by virtue of being too arid, too saline, too steep or too stony to support plants of economic value.<br>• Its uses lie in the fields of recreation and wildlife conservation. It does, however, also include watercourses, submerged land, built-up land and excavations.<br>• Soil depth between 150 – 250 mm where soil cover is applicable. | |
| | To recreate a sustainable landform that is aligned with the long-term water management requirements, and that:<br>• Limits ingress of water through backfilled open cast spoils that could | Mine closure landform design. | No unplanned ponding of water over the rehabilitated landscape. Ensure a suitable soil structure that does not have a high density or excessive blocky structure on rehabilitated pit. | No unplanned ponding.<br>Limited erosion gullies or features. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | require ongoing water management in the long-term;<br>• Ensures adequate water availability for post-mining land use/s; and<br>• Design the final void sizes to ensure optimal evapotranspiration in relation to the post- closure water balance. | | | |
| | To, as far as reasonably possible, re-create a free-draining profile across the back-filled pits, having the correct gradient for the planned land capability to support the intended land use. | Mine closure landform design.<br>Rehabilitated landscape slope (%).<br>Visual observations (erosion/ ponding) | Concave slopes.<br>Slopes aligned with determine post closure land capability targets and free draining.<br>≥ Pre-mining drainage density.<br>Limited erosion features (i.e. concentrated flows and unnecessary loss of topsoils).<br>No unplanned ponding of water. | Rehabilitated areas are free draining to controlled containment and discharge points.<br>Limited erosion gullies or features.<br>No unplanned ponding. |
| | To ensure a safe (for humans and animals) landscape in relation to any final voids or pit lakes. | Rehabilitated void slope. | Void walls slope less than 1:3 to static water level.<br>Stable slope.<br>No discharge of up catchment surface water flows into void.<br>No injury or loss of animal or human life. | Safe for humans and animals.<br>No evidence of slope instability or erosion.<br>Separation of clean and dirty water. |
| | To ensure that sufficient soil (growth medium) is kept in stockpiles to backfill any areas of settlement (melon holes) so as to keep rehabilitated areas free-draining and to conserve land capability. | Material Balance (maintained).<br>Topsoil and softs contingency sources. | Maintain adequate contingency stockpiles (topsoil and softs) or alternative sources. | Rehabilitated areas are free draining to controlled containment and discharge points.<br>No erosion gullies or features.<br>No unplanned ponding.<br>Alignment with post closure land capability plan |
| | To provide long-term stabilisation of the geo-technical conditions of the disturbed mining areas. | Mine closure landform design.<br>Slopes | Mine closure landform design to take into account: bulking factors; long-term material settlement factors.<br>Alignment with landform design. | No unrehabilitated melon holes.<br>No unplanned ponding.<br>No erosion gullies or features. |

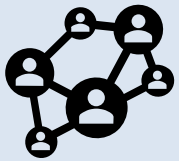
| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | | | Stable, vegetated landform slopes. | |
| | To limit the need for, or intensity of, long-term care-and-maintenance of recreated landforms. | Mine closure landform design. | Mine closure landform design to take into account: bulking factors; long-term material settlement factors.<br>Alignment with landform design. | Alignment with landform design. |
| **Soils and land capability**  | Objective for soil stockpiling (where applicable):<br>• To minimise the quantity of soil stockpiled.<br>• To limit the time stripped soils are stockpiled.<br>• To limit the number of times stripped soils are re-handled.<br>• To stockpile soils by end-tipping (and increase stockpile height using shovel, if necessary), to minimise compaction.<br>• To fertilise and revegetate stockpiled soils to maintain soil fertility and reduce soil loss via erosion. | Mine closure landform design.<br>Up to date steady state roll over mining and progressive rehabilitation.<br>Soil stripping and handling plan- updated and monitored.<br>Topsoil stripping and placement register- topsoil source, soil moisture, volume stripped/ placed, depth, type, stockpile location, placement location (incl direct placement).<br>Stockpile height.<br>Stockpile vegetative cover and presence of invasive species.<br>Topsoil material balance. | Minimise the topsoil stockpile to the volume from box cut, operational surface preparation (e.g. roads, infrastructure, etc), and ramp up to steady state progressive rehabilitation.<br>Limit handling of topsoils to a maximum of 2 events (i.e. stripping/stockpiling and placement).<br>No unnecessary damage/ disruption to stockpiles.<br>Ensure correlation between stockpiled soil and soil available for rehabilitation.<br>Stockpile soils separately as defined in the soil stripping and handling plan.<br>No domination of invasive species.<br>Compliance with soil stripping and handling plan. | Alignment with post closure land capability plan<br>Topsoils across rehabilitated pit area (excluding final void and maintenance roads where applicable).<br>≥85% correlation between available soil and stripped soil.<br>Audited compliance with soil stripping and handling plan. |
| | Objectives for soil replacement:<br>• To minimise the loss of replaced soils.<br>• To replace different soils types in their correct catenal position on the recreated land surface.<br>• To minimise compaction during soil replacement.<br>• To replace soils of the right type, to the correct depth, | Mine closure landform design.<br>SSSAP-updated and monitored.<br>Topsoil material balance.<br>Topsoil stripping and placement register- topsoil source, soil moisture, volume stripped/ placed, depth, type, stockpile location, placement location (incl direct placement).<br>Level of rehabilitated soil compaction.<br>Degree of differential settlement.<br>Post rehabilitation soil survey. | Ensure correlation between stripped, stockpiled and replaced soil.<br>Strip/stockpile and replace topsoils and subsoils separately as far as possible.<br>Avoid unnecessary mixing of topsoils and subsoils.<br>Handling of soils to be undertaken when soils are dry (i.e. >3-5% below plasticity limit).<br>Compliance with mine closure landform design. | Alignment with post closure land capability plan<br>Topsoils across rehabilitated pit areas. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | to achieve planned land capability targets.<br>• To ensure sufficient soil is kept in stockpiles (or the identification of contingency sources) for longer term care-and-maintenance activities on rehabilitated land.<br>• To ensure a planned and coordinated approach to topsoil replacement and rehabilitation of previously mined areas. | | Key soil-spoil interface (e.g. scarify compacted spoil surface prior to soil placement).<br>Use suitable equipment for topsoil placement and levelling (e.g. dump truck and dozers).<br>Single topsoil placement and levelling-i.e. ensure accurate topsoil balance and planning.<br>Retain 1-5% of total soil stripped for future repair work or identify a future contingency topsoil source. | |
| | Objectives for soil amelioration:<br>• To optimise soil conditions conducive to improved soil structure.<br>• To optimise soil conditions that enhance germination, facilitate root development and vegetation growth.<br>• To improve water and nutrient use efficiency of vegetation. | Nature of the rehabilitated topsoils, including physical properties, chemical properties, and biological properties.<br>Soil structure. | Alignment of soil condition with that required to meet the defined land capability commitments. | Alignment with post closure land capability plan<br>Topsoils across rehabilitated pit areas.<br>Soil Physical parameters:<br>- Rock content: as low as possible (< 50 % by volume of rocks or pedocrete fragments larger than 100 mm diameter).<br>Soil chemical parameters:<br>- Comply with pH (KCl): between 6 and 7.5.<br>- Salinity (as EC): <400mS/m and exchangeable sodium percentage less than 15.<br>- Fertility: P (Bray 1); and K: Target for P – 10mg/kg to 17 mg/kg; Target for K 40 mg/kg to 250 mg/kg.<br>- Organic Carbon: > 0.75% through depths of 250 mm. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | | | | - Major Cations: Ca= between 200-3000mg/kg- recommended ~800mg/kg; Mg= between 50-300mg/kg- recommended 150 mg/kg; Na= between 50-200mg/kg- recommended <100 mg/kg). |
| | To replace a soil cover of appropriate soils, permeable and with effective depth aligned with the Land Capability target. | See indicators listed for soil stripping, stockpiling, replacement, and amelioration. | See targets listed for soil stripping, stockpiling, replacement, and amelioration. | Alignment with post closure land capability plan<br>Topsoils across rehabilitated pit area. |
| | Ensure mixed land use capabilities aligned with the planned end use and the surrounding area. | Vegetation coverage and composition. | Objective post mining land capability includes:<br>- Class I for all wetland areas;<br>- Class II for all planned mining areas that have a Class II pre-mining capability;<br>- Class III for all previously mined and rehabilitated areas; and<br>- Class IV or no functional capability for areas designated for alternative land-uses. | Alignment with post closure land capability plan |
| **Water resources**  | To provide long-term stabilisation of the geochemical conditions of the disturbed mining areas. | - Water quality monitoring locations parameters (as defined in the water monitoring programme. | - Limit contribution of contaminated mine water (plume) to local surface water resources. | - Updated numerical groundwater model and water liability assessment.<br>- Updated mine water management plan (for residual and latent impacts).<br>- Updated and secured financial provision for residual and latent impacts. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | | | | - Comply with National Water Act or WUL requirements.<br>- Compliance with GN704. |
| | To strive for minimal residual impact on natural water resources. Formalisation of river channels (natural and artificial). | - Water quality monitoring locations and parameters (as defined in the water monitoring programme. | - Limit contribution of contaminated mine water (plume) to local surface water resources.<br>- Limit hydraulic connectivity between underground workings and shallow groundwater and surface water. Seal off man made preferential flow paths.<br>- No uncontrolled and untreated release of contaminated mine decant water. | - Updated numerical groundwater model and water liability assessment.<br>- Updated mine water management plan (for residual and latent impacts).<br>- Compliance with GN704.<br>- Updated and secured financial provision for residual and latent impacts.<br>- Comply with WUL requirements. |
| **Biodiversity**  | Objectives for revegetation:<br>• To reduce soil loss to a minimum.<br>• To optimise the efficient use of water within the rehabilitated landscape.<br>• To enable long-term functionality of the predefined land-use.<br>• To form the building-blocks for a resilient ecological system (with predefined natural coverage areas), so that successional processes lead to the predefined vegetation complex. | Mine closure plan and landform design.<br>Vegetation structure and species composition. | Maximise concave slopes on rehabilitated land as far as practically possible. | Natural areas vegetation structure and species composition to align with local reference site:<br>- ≥80% of the reference site species richness.<br>- <10% of assessment plots failing to meet species richness target.<br>Alien invasive plants not dominating and presence to align with, and improve on, surrounding local reference sites. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | To maintain a productive and sustainable vegetation cover within defined natural coverage areas (as per the plan that align with the surrounding references sites.<br>Grazing land use over the rehabilitated areas (excl wetland areas) supports or is capable of supporting a stand of native or introduced grass species or other forage plants utilisable by domesticated livestock or game animals on a commercial basis.<br>Arable land to support economic attainment of yields of adapted agronomic or horticultural crops that are at least equal to the current national average for those crops | Vegetation structure and species composition.<br>Arable land yields. | Sustainable natural areas.<br>Economically sustainable and viable arable land. | Natural areas vegetation structure and species composition to align with local reference site.<br>Presence of alien invasive plants to align with and improve on surrounding local reference sites. |
| | To remediate the impacts to wetlands associated with the mining operation, to the target REC state and prevent further loss of ecological integrity in future through adaptive management and monitoring. | Wetland Present Ecological Status (PES).<br>Implement wetland and watercourse rehabilitation plan. | Improve the integrity of HGM 1 to at least a PES of D (Currently Class F).<br>Maintain, and if possible, improve, the PES Classes for HGM unit 3. | HGM 1 and 3 = Class D PES. |
| **Infrastructure**<br>  | Objectives for surface infrastructure:<br>• To decommission, decontaminate (if necessary), dismantle and remove for safe disposal all identified surface infrastructure that has no beneficial post-mining re-use potential.<br>• Following removal of unwanted infrastructure, to | Mine closure plan and landform design.<br>Site surveys.<br>Status of rehabilitated land.<br>Land contamination assessments- if applicable.<br>Conclusion of, and compliance with, post closure land-use agreements.<br>Conclusion of, and compliance with, post closure management and maintenance plan. | Remove all unnecessary infrastructure and ensure formal handover and transfer of any remnant infrastructure.<br>Compliance with defined land capability targets. | Alignment with post closure land capability plan.<br>Signed agreements for ongoing land use and management.<br>No remnant infrastructure or waste materials remaining on surface, unless transferred in writing in the signed agreements. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| | rehabilitate cleared footprint areas.<br>• To stabilise and re-purpose remaining surface infrastructure that has a beneficial post-mining re-use potential-if any.<br>• To identify public-private partnerships and/or new owners for the ongoing, long-term management and ownership of remaining surface infrastructure.<br>• To put in place formal agreements for the 'new owners' for the management and maintenance of remaining infrastructure. | | | |
| **Social and economic**  | To protect public health. | Public health and safety risk assessment. | Compliance with mine health and safety legislation. | Site is safe for human and animals. |
| | Return majority of disturbed land to useable land-uses. | Mine closure plan and landform design. | Compliance with defined land capability targets. | Alignment with post closure land capability plan |
| | To facilitate a transition from mining to viable grazing land use through effective agreements (lease/ co-operation/ sale) that promote to reinstatement of the land as a contributor to local grazing land. | Conclusion of, and compliance with, post closure land-use agreements.<br>Conclusion of, and compliance with, post closure management and maintenance plan. | Compliance with defined land capability targets. | Alignment with post closure land capability plan<br>Post closure land-use agreements (covering land use, rehabilitated land management and ongoing maintenance, including where relevant management of residual impacts).<br>No unattended public complaints.<br>Where possible written confirmation from the affected landowner/ complainant must be solicited confirming that outstanding issues have been addressed and closed out. |

| Aspect | Objective | Indicators | Target | Closure Relinquishment Criteria |
|---|---|---|---|---|
| **Climate**  | Ensure closure objectives and actions are climate change resilient. Ensure assessment and consideration of long-term climate change predictions in the ongoing closure planning and implementation. | Climate change predictive models. Revised and updated closure risk assessment and planning. | Obtain latest climate change predictions and ensure consideration in closure planning, risk assessments and financial provision reporting updates. Regular groundwater model updates to include climate change scenarios. | Apply latest climate change prediction to assessment of residual and latent impacts- provision of reasonable and adequate contingency funding. |

# 11 SENSITIVITY MAPPING

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural and social assets in a region. The sensitivity mapping technique integrates numerous datasets (base maps and shapefiles) into a single consolidated layer making use of Geographic Information System (GIS) software. Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural and social sensitivity weightings – which is determined by specialists' input within each respective field based on aerial or ground-surveys. Therefore, the sensitivity mapping exercise assists in the identification of low, medium and highly sensitive areas within the MR areas, towards selecting the preferred location, design and layout, and process or technology alternatives for the proposed activities and infrastructure.

This sensitivity mapping approach allows for the proposed activities to be undertaken whilst protecting identified sensitive environmental areas / features. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of Environmental Assessment processes. A buffer zone 106 m in size has been calculated for all the wetlands on-site due to the high level of threats associated with opencast mining. No buffer zones are required for the underground mining activities due to the fact that very little to no surface impacts are associated with underground mining activities as well as the fact that the opencast mining's calculated buffer zone will conserve the wetland for any mining activity. A buffer zone 106 m in size has been calculated for all the wetlands on-site due to the high level of threats associated with opencast mining except in certain areas where approval has been obtained from DHSWS for a 42m buffer. No buffer zones are required for the underground mining activities due to the fact that very little to no surface impacts are associated with underground mining activities as well as the fact that the opencast mining's calculated buffer zone will conserve the wetland for any mining activity.

**Table 23** below provides a breakdown of the sensitivity rating and weightings applied to determine the sensitivity score of each aspect, and **Figure 38** below presents how the sensitivity mapping technique integrates numerous datasets into a single consolidated sensitivity layer, and **Figure 39** presents the combined sensitivity map.

The combined sensitivity map includes individual sensitivities according to heritage, biodiversity, blasting and vibration, wetlands, surface water and soil land type features in and around the project area. The sensitivities related to other identified impacts were excluded as their effects cannot be directly or accurately measured to ascertain sensitivity. A buffer zone 106 m in size has been calculated for all the wetlands on-site due to the high level of threats associated with opencast mining except in certain areas where approval has been obtained from DHSWS for a 42m buffer. No buffer zones are required for the underground mining activities due to the fact that very little to no surface impacts are associated with underground mining activities as well as the fact that the opencast mining's calculated buffer zone will conserve the wetland for any mining activity.

**Table 23:** Sensitivity rating and weighting

| Sensitivity Rating | Description | Weighting |
|---|---|---|
| Least concern | The inherent feature status and sensitivity is already degraded or contain no inherent sensitivities. The proposed development will not affect the current status and/or may result in a positive impact. These features would be the preferred alternative for mining or infrastructure placement. | -1 |

| | | |
|---|---|---|
| Low/Poor | The proposed development will not have a significant effect on the inherent feature status and sensitivity. | 0 |
| High | The proposed development will moderately negatively influence the current status of the feature. | 1 |
| Very high | The proposed development will have a significantly negative influence on the current status of the feature. | 2 |

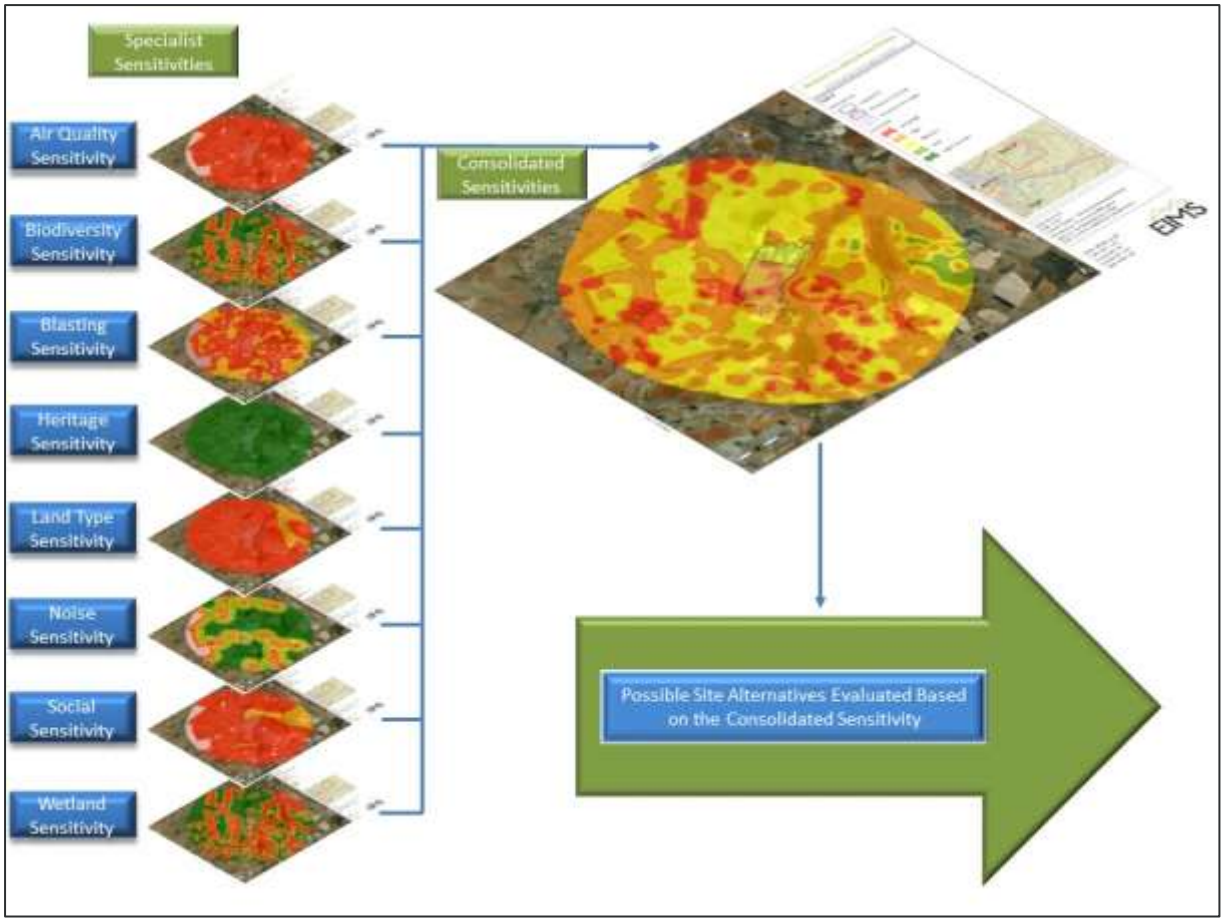



**Figure 38:** Sensitivity mapping approach

A final sensitivity map which shows the proposed mining areas avoiding all sensitivities / no-go areas is presented in **Figure 40.** Proposed opencast mining areas must be adjusted to align with this figure.

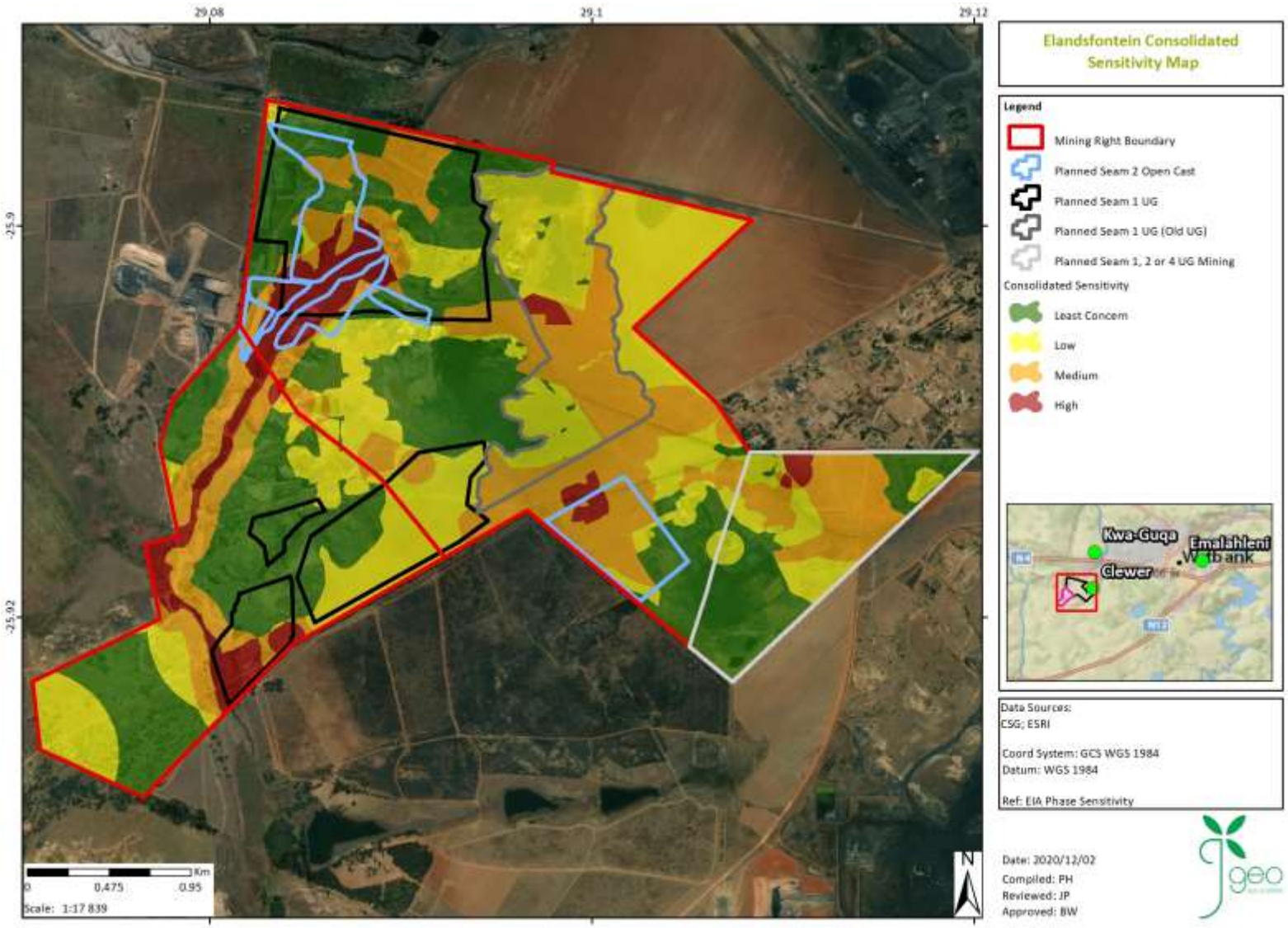



**Figure 39:** Sensitivity map

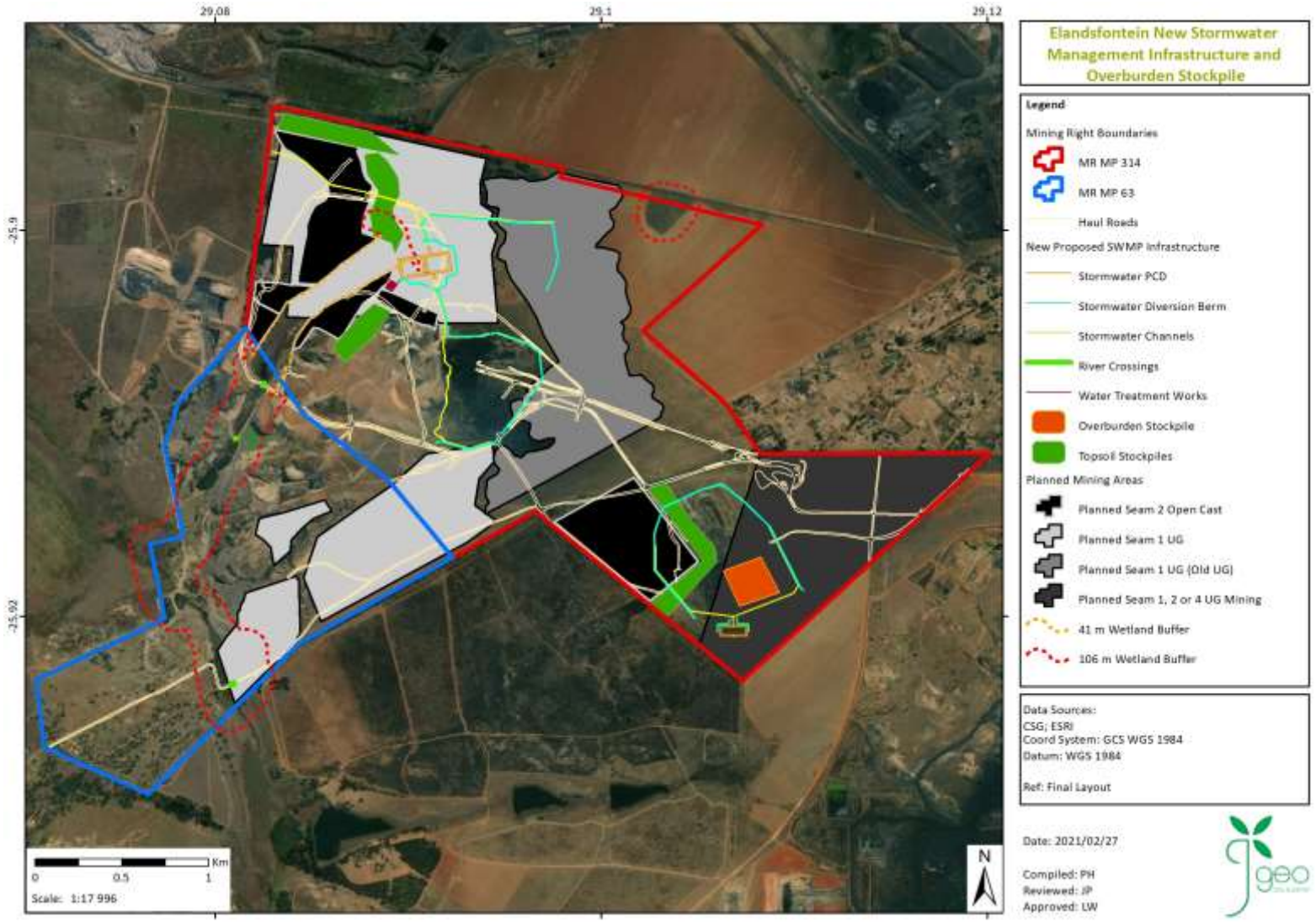



**Figure 40:** Final Layout Map

# 12 CONCLUSIONS AND RECOMMENDATIONS

The Scoping Phase of the EIA process identified potential issues and impacts associated with the proposed project and defined the extent of the studies required within the EIA Phase. The EIA Phase addressed those identified potential environmental impacts and benefits (direct, indirect and cumulative impacts) associated with all phases of the project including design, construction and operation, and recommends appropriate mitigation measures for potentially significant environmental impacts. The EIA report provides sufficient information regarding the potential impacts and the acceptability of these impacts in order for the Competent Authority to make an informed decision regarding the proposed project. The release of a draft EIA Report provided stakeholders with an opportunity to verify that the issues they have raised through the EIA process had been captured and adequately considered.

The EIA Phase aimed to achieve the following:

- Provide an overall assessment of the social and biophysical environments affected by the proposed project.
- Assess potentially significant impacts (direct, indirect and cumulative, where required) associated with the proposed coal mine extension project and associated infrastructure.
- Identify and recommend appropriate mitigation measures for potentially significant environmental impacts; and
- Undertake a fully inclusive public involvement process to ensure that I&APs are afforded the opportunity to participate, and that their issues and concerns are recorded.

Further details regarding the determination of financial provision and the estimated cost for long term water treatment is included in the Final Rehabilitation Decommissioning and Closure Plan.

## 12.1 CONCLUSIONS FROM SPECIALIST STUDIES

The conclusions and recommendations of this EIA are the result of the assessment of identified impacts by specialists, and the parallel process of public participation. The public consultation process has been extensive, and every effort has been made to include representatives of all stakeholders in the study area. The main conclusions from each of the specialist studies are presented below.

### 12.1.1 TERRESTRIAL ECOLOGY

The final significance rating for the opencast has been scored a “Medium negative” prior to mitigation, implementation of mitigations, resulted in a “Low negative”. The significance rating for underground operations was only rated a “High” negative” due to the consideration of possible subsidence during the operational phase, and after the decommissioning and rehabilitation phases, however due to the nature of subsidence it remains a stochastic event. The final significance rating for the surface infrastructure, stockpiles and their respective associated activities. has been scored a “Medium negative” prior to mitigation, implementation of mitigations, resulted in a “Low negative”.

It is recommended that the proposed opencast mining areas (Seam 2) be amended to adhere to the delineated high and medium sensitivity areas and that the underground mining areas (Seam 1) be moved to stay outside of the delineated wetlands to ensure avoidance.

No fatal flaws were identified for the project. It is the opinion of the specialist that the Elandsfontein project, may be favourably considered. All recommendations and mitigation measures prescribed herein must be considered by the issuing authority.

### 12.1.2 AQUATIC ECOLOGY AND WETLANDS

It is the specialist’s recommendation that the project does not present any fatal flaws. In the event that underground mining is authorised, it is recommended that a subsidence assessment prescribe

measures to avoid subsidence of the mined-out areas below the wetlands and buffer zones. In the event that opencast mining of Seam 2 is authorised, it is recommended that the extent of the opencast area be amended to adhere to the buffer zone. Due to the expected loss and degradation of rivers and wetlands as a result of the project with either option, it is further recommended that on-site rehabilitation of the area be implemented to allow for some level of wetland compensation, this should be informed by an offset strategy. If all recommendations made are met, it is the specialist's opinion that no fatal flaws exist and that the proposed activities should proceed as have been planned.

A buffer zone of 106 m in size has been calculated for all the wetlands on-site due to the high level of threats associated with opencast mining. In certain areas approval has been obtained from DHSWS for reduction of the wetland buffer to 42m. No buffer zones are required for the underground mining activities due to the fact that very little to no surface impacts are associated with underground mining activities as well as the fact that the opencast mining's calculated buffer zone will conserve the wetland for any mining activity.

### 12.1.3 HYDROLOGY

The Elandsfontein mining operations occur on both sides of Grootspruit tributary along most of its length. The upper reaches are dammed with pollution control and water supply dams. The natural tributary has a poorly defined water course but is generally heavily reeded. The lower reaches have been modified and the stream is canalised for roughly half its length. The proposed opencast and underground operation will create significant impacts if unmitigated. Mitigation will reduce these impacts significantly. Post closure mine workings decant has the potential to create high long-term impacts on the Grootspruit and its tributary. If this decant water is treated and released, the impacts are likely to become positive.

### 12.1.4 GEOHYDROLOGY

The local groundwater quality is indicative of an impacted groundwater system and suggest coal mine pollution and acid mine drainage (AMD) conditions present. The latter is characterised by a low pH environment increasing the solubility and concentrations of metals i.e. usually aluminum, iron and manganese.

The overall water quality of the upstream surface water samples is poor due to elevated levels of sulphate as well as heavy metals (Fe, Al and Mn) i.e. coal mine pollution indicators. The downstream water quality is unacceptable due to highly elevated levels of sulphate as well as heavy metals (Fe, Al and Mn) causing high salt loads. There is a definite deterioration of water quality evident in a downstream direction and suggest contaminated water ingress from potentially mine decant and interflow zones or seepage from mine discard dumps.

Model simulations for the proposed underground development suggest the average underground void dewatering is approximately 1.44E +03 $m^3$ /d with a maximum underground water ingress of approximately 2.03E +03 $m^3$/d for the duration of the simulation period. It is expected that the groundwater drawdown will range from 4.0m to ~ 30.0m below the static water level (mbsl) and the groundwater capture zone i.e. zone of influence extent will cover an estimated footprint of 643.8ha. It should be noted that the simulated impact zone extends slightly beyond the eastern and south-eastern perimeters of the mining right area, however, falls mainly within the mining properties. It is not expected that the underground operations will have a significant effect on the baseflow discharge to local drainages.

A mine post-closure scenario was simulated wherein hydraulic head recovery within the proposed opencast areas was evaluated. It is calculated that the backfilled opencast pit flooding and associated decant periods ranges between~5.0years to >20years depending on the geometry of the backfilled pit. Expected decant volumes for the backfilled opencast pits varies from 15.0$m^3$ /d to > 40.0$m^3$/d depending on the pit effective infiltration volumes. The combined

decant volume is approximately 90.0m$^3$ /d. It should be noted that there are various decant points potentially discharging into the wetland drainage system traversing the site.

A mine post-closure scenario was simulated wherein hydraulic head recovery within the existing underground voids as well proposed mining areas was evaluated. Simulated average groundwater ingress for the LOM underground operation was combined with the expected groundwater recharge reporting to the underground void and from these volumes it is estimated that under average rainfall conditions, the underground will be flooded in approximately 35 to 40 years after ceasing of mining activities. The proposed depth and geometry of the underground operations allows for the majority of the footprint to be flooded with a low risk of decant occurring.

Expected decant volumes for the underground voids are relatively low due to the presence of confining shale and mudstone layers restricting the downward filtration of rainwater recharge into the underground mine void(s) and ranges between 0.85m$^3$ /d to ~17m$^3$/d with a combined volume of approximately 50.0m$^3$/d.

A 50-year post-closure scenario was simulated and covers a total area of approximately 875.0ha, reaching a maximum distance of ~600.0 to 700.0m in a general south-western direction towards the lower laying drainage and wetland systems. The simulation indicates that, although the pollution plume extends beyond the mining properties, no neighbouring boreholes will potentially be impacted post-closure while the unknown tributary of the Grootspruit and associated wetland might potentially be impacted on.

A 100-year post-closure scenario was simulated and covers a total area of approximately 1030.0ha, reaching a maximum distance of 1100.0 to 1300.0m in a general south-western direction. The simulation indicates that, although the pollution plume extends beyond the mining properties, no neighbouring boreholes will potentially be impacted post-closure while the unknown tributary of the Grootspruit and associated wetland might potentially be impacted on. It is evident that sulphate concentrations for all monitoring boreholes stabilises to a maximum sulphate contribution load of between 1600.0 to 1800.0mg/l, which is above the SANS threshold.

Various alternative management and mitigation scenarios were simulated to evaluate the remedial options available. The preferred mitigation scenario entails establishment of scavenger boreholes down-gradient of waste facilities and backfilled opencasts in combination with rehabilitation of the southeastern discard dump. The combination of the mitigation effect of the negative groundwater gradient created as well as the reduction in waste footprints due to removal and rehabilitation of the existing southeastern discard damp, reduces the pollution plume footprint by >45.0% to ~607.0ha.

The preferred mitigation scenario entails implementation of down-gradient seepage capturing boreholes in combination with rehabilitation of the discard dump.

During the operational phase the environmental significance rating of groundwater quantity impacts on downgradient receptors are rated as medium negative without implementation of remedial measure and low negative with implementation of proposed mitigation measures.

Groundwater quality impacts from the discard dump, coal stockpile areas, PCD's and related waste facilities are rated as medium negative without implementation of remedial measures and medium/low negative with implementation of mitigation measures. Post closure phase impacts resulting from seepage and leachate from mine waste facilities on down-gradient receptors are rated as medium negative without the implementation of remedial measures and low negative with implementation of mitigation measures.

Groundwater modelling shows no significant advantage to disposal at surface disposal facility as opposed to in pit disposal ,therefore in pit disposal is recommended as the preferred option to deal with discard.

### 12.1.5 SOIL

The planning, construction, operational, decommissioning and rehabilitation/closure phases have all been assessed during the impact assessment. For these phases, opencast and underground mining was considered respectively. The results from the impact assessment suggest that no final significance ratings higher than "Low" are expected during the planning, construction, decommissioning and rehabilitation/closure phases. As for the operational phase, the opencast mining activities and underground mining activities have been scored "High" and "Medium" final significance ratings respectively. It is the specialist's opinion that all proposed activities may proceed as have been planned given the adherence to all recommendations and prescribed mitigation measures.

### 12.1.6 HERITAGE AND FOSSILS

The HIA identified various heritage resources within the study area of which the burial grounds and graves and the palaeontology could be rated as having a High to Very High heritage significance and would require mitigation measures before the project can commence. Three sites comprising historical/recent structures were identified which could be rated as having a Low heritage significance and would not require mitigation measures.

Eight burial grounds are present on the property (EFN001, EFN002, EFN003, EFN004, EFN007, EFN008, EFN010, EFN011). All of these sites are located inside the two proposed mining rights areas, and three (EFN004, EFN007, EFN011) are situated within or just outside the footprints for the planned UG or OC mining activities. Burial grounds and graves have high heritage significance and are given a Grade IIIA significance rating.

The pre-mitigation Environmental Risk impact significance is rated as negative High, but with the implementation of the required mitigation measures the post-mitigation ER impact can be reduced to Medium. The overall Environmental significance will be Medium negative.

If any of the eight burial grounds will be impacted directly by the planned mining activities, they. must be relocated after completion of a detailed grave relocation process, that includes a thorough stakeholder engagement component, adhering to the requirements of s36 of the NHRA and its regulations as well as the National Health Act ad its regulation. Any graves or burial grounds that will not be impacted must be avoided and retained in situ with a buffer zone of 100m.

An overall medium palaeontological sensitivity is allocated to the development footprint. The scarcity of fossil heritage at the proposed development footprint indicates that the impact of the Elandsfontein mining upgrade will be of a medium significance in palaeontological terms. It is therefore considered that the proposed development is deemed appropriate and feasible and will not lead to detrimental impacts on the palaeontological resources of the area. Thus, the construction of the development may be authorised in its whole extent, as the development footprint is not considered sensitive in terms of palaeontological resources.

The combined considered opinion of the heritage specialists is that the potential impacts on identified heritage resources could be mitigated sufficiently to allow the project to continue.

### 12.1.7 AIR QUALITY

The conclusion from the impact assessment is that cumulative impacts due to the planned mining operations would have a "Medium negative" significance on the surrounding environment and human health during the operational phase, even after mitigation is applied, due to the

increased mining and production rates and the close proximity of AQSR (Clewer) to the planned mining operations.

The proposed Project operations should not result in significant ground level concentrations or dustfall levels at the nearby receptors provided the design mitigation measures are applied effectively. From an air quality perspective, the proposed project can be authorised permitted the recommended mitigation measures are applied.

### 12.1.8 TRAFFIC

The traffic and transport implications of the combining of separate mining rights into a single mining right are minimal and easily mitigated. It is recommended that the applicant's request be approved from a traffic and transportation perspective.

### 12.1.9 SUBSIDENCE

If the recommended guidelines are applied and mining is not conducted in areas in which sinkhole formation could be expected (based on the rock engineering investigations which would have to be conducted in more detail for each shallow mining area) none of the future underground mining areas should / would be considered high risk .

### 12.1.10 BLASTING

The evaluation of effects yielded by blasting operations was evaluated over an area as wide as 3500m from the mining area considered. The range of structures observed is typical roads (tar and gravel), low cost houses, corrugated iron structures, brick and mortar houses, boreholes and heritage sites.

The location of structures around the Pit areas is such that the charge evaluated showed possible influences due to ground vibration. The closest structures observed are the Road, Power Lines/Pylons, Railway Line, Heritage Sites, Houses, Sewer Works, Boreholes, Industrial Structures and Buildings/Structures. Ground vibrations predicted for all pit areas ranged between low and very high. The expected levels of ground vibration for some of these structures are high and will require specific mitigations in the way of adjusting charge mass per delay to reduce the levels of ground vibration. Ground vibration at structures and installations other than the identified problematic structures is well below any specific concern for inducing damage.

Air blast predicted showed the same concerns for opencast blasting. High levels may contribute to effects such as rattling of roofs or door or windows with limited points that are expected to be damaging and others could lead to complaints. The current accepted limit on air blast is 134 dBL. Damages are only expected to occur at levels greater than 134dB. It is maintained that if stemming control is not exercised this effect could be greater with greater range of complaints or damage. The pits are located such that "free blasting" – meaning no controls on blast preparation – will not be possible.

On charges considered it is expected that air blast will be greater than 134 dB at a distance of 110m and closer to pit boundary. The structures inside the Pit areas is expected to be relocated and will then not be of concern as it is currently inside the pit area. Infrastructure at the pit areas such as roads, heritage sites, power lines/pylons and Hydrocencus boreholes are present but air blast does not have any influence on these installations.

Fly rock remains and concern for blasting operations. Based on the drilling and blasting parameters values for a possible fly rock range with a safety factor of 2 was calculated to be 447 m. The absolute minimum unsafe zone is then the 447 m. This calculation is a guideline and any distance cleared should not be less. The occurrence of fly rock can however never be 100% excluded. Best practices should be implemented at all times. The occurrence of fly rock can be

mitigated but the possibility of the occurrence thereof can never be eliminated. There are boreholes that are in proximity of the blasting areas and could be problematic.

Specific actions will be required for the pit areas such as Mine Health and Safety Act requirements when blasting is done within 500m from structures and mining with 100m for structures. The Road, Railway Line, Power Lines/Pylons, Houses, Boreholes, Heritage Sites and buildings/structures falls within the 500m range from the various pit areas.

The pit areas are located such that specific concerns were identified and addressed in the report. The greatest concern is area south of Clever. Opencast operations will be significantly restricted, and it may lead to areas not minable. This is mainly due to the location of this area closer than 100 m to the Clever township and the restrictions with regards to ground vibration, air blast and fly rock. .

Calculated minimum safe distance is 447m. The final blast designs that may be used will determine the final decision on safe distance to evacuate people and animals. This distance may be greater pending the final code of practice of the mine and responsible blaster's decision on safe distance. The blaster has a legal obligation concerning the safe distance and he needs to determine this distance. There is no reason to believe that this operation cannot continue if attention is given to the recommendations made.

## 12.2 NOMINATION OF PREFERRED ALTERNATIVES

This section describes the preferred nominated alternatives as described and discussed in Section 6.

### 12.2.1 LAYOUT ALTERNATIVES

Significantly lower construction, operational and closure phase environmental impacts are associated with the two PCD layout option (**Layout Alternative L1b**), provided rehabilitation of all historically contaminated areas is undertaken. This is therefore nominated as the preferred layout alternative as per the final layout map (**Figure 40**) and rehabilitation of all previously contaminated areas is recommended. Prior to the construction of the diversion channel, the original channel appears to have been poorly-defined and would likely have been a valley bottom wetland without a channel. The diversion channel collects and concentrates the flow of the Grootspruit tributary. This robs the wetland of surface water. For this reason, the original valley bottom wetland morphology should be reinstated. Concentrating the flow in a small channel reduces the availability of water for plant growth and therefore less water will be lost from the Grootspruit tributary. The channel therefore slightly increases the yield of the Grootspruit tributary. However, this is unnatural and should not be used as an argument for keeping the diversion channel.

### 12.2.2 PROCESS ALTERNATIVES

Disposal of carboniferous wastes (wash plant waste rock and possibly filter cake) to pit (**Process alternative P1a**) is recommended. This is considered the most ideal option as no new dump is required on surface and it is already authorized in the current WUL. There is a northern discard and slurry area approved for the excess material generated from the mining process (northern void). Expected decant volumes for the underground voids are relatively low due to the presence of confining shale and mudstone layers restricting the downward filtration of rainwater recharge into the underground mine void(s) and ranges between 0.85$m^3$ /d to ~17$m^3$ /d with a combined volume of approximately 50.0$m^3$/d. Most ideal option, no new dump on surface. Already authorized as in current WUL.

Expected decant volumes for the underground voids are relatively low due to the presence of confining shale and mudstone layers restricting the downward filtration of rainwater recharge

into the underground mine voids. Groundwater modelling shows no significant advantage to disposal at surface disposal facility as opposed to in pit disposal.

Regarding water supply for Dust suppression, **a combination of both alternative**s is considered suitable. A combination of both Alterntiave P2a (water obtained from dirty water facilities) and Alternative P2b (water from ground or surface water resources) is proposed however dust suppression using dirty water is restricted to the dirty areas and must not be used for spraying topsoil stockpiles.

### 12.2.3 LAND-USE ALTERNATIVES

Land used for mining (**Land use alternative A1**) is preferred. The mine is an existing operational mine, continued mining at the site is considered a feasible land use going forward unless environmental impacts associated with the expansion cannot be mitigated to acceptable levels. As all impacts can be mitigated to acceptable levels this alternative is preferred.

### 12.2.4 MICRO SITING ALTERNATIVES

A sensitivity-based approach is preferred (**Alternative S1b)** in order to avoid / buffer highly sensitive areas identified in the wetland and aquatic biodiversity reports, specifically the 106 wetlands buffer no-go area for opencast mining.

## 12.3 ENVIRONMENTAL IMPACT STATEMENT

The findings of the specialist studies conclude that there are no environmental fatal flaws that should prevent the proposed project from proceeding, provided that the recommended mitigation and management measures are implemented. Based on the nature and extent of the proposed project, the local level of disturbance predicted as a result of the construction and operation of the mine, the findings of the EIA studies, and the understanding of the significance level of potential environmental impacts, it is the opinion of the EIA project team that the significance levels of the majority of identified negative impacts can generally be reduced by implementing the recommended mitigation measures.

Despite the negative impacts caused by the mine, it must be considered that there are positive impacts as well, mostly based on the economic contributions, skills development and SLP initiatives. Based on the nature and extent of the proposed and the predicted impacts as a result of the construction, operation and closure of the facility, the findings of the EIA, and the understanding of the mostly low - moderate post-mitigation significance level of potential environmental impacts, it is the opinion of the EIA project team that the environmental impacts associated with the application for the proposed project can be mitigated to an acceptable level and the project should be authorized.

## 12.4 RECOMMENDATIONS FOR INCLUSION IN ENVIRONMENTAL AUTHORIZATION

The following key recommendations are made:

- Ensure rehabilitation of all previously contaminated areas takes place prior to construction and mining commencing at any of the new areas.
- It is recommended that the proposed opencast mining areas (Seam 2) be avoid the delineated high and medium sensitivity areas.
- The preferred groundwater remediation mitigation scenario entails establishment of scavenger boreholes down-gradient of waste facilities and backfilled opencasts in combination with rehabilitation of the southeastern discard dump. Monitoring of surface water and groundwater in accordance with the implemented protocol should be continued throughout the post operational phase. Surface water quality monitoring must be conducted on the both the

Grootspruit and its tributary as per the recommended monitoring locations indicated in the Hydrology report.

- Aquatic monitoring must be done, this includes ground water and surface water to ensure that that acid mine drainage is detected and managed.
- A management plan must be compiled for acid mine drainage.
- Dust suppression using dirty water is restricted to the dirty areas and must not be used for spraying topsoil stockpiles.
- Ensure that rehabilitation of backfilled opencast and mine waste facility footprints areas is properly conducted and in accordance with best practise guidelines as well as approved mine closure and rehabilitation plans. Rehabilitation should allow for free draining of runoff in order to prevent any surface water ponding.
- Keep the surface & sub-surface water as well as storm water away that may run off from the dumps from the low laying areas, such as wetlands as well as the surrounding areas, from leaving the project area in an uncontrolled manner.
- A monitoring programme for recording blasting operations is recommended. The following elements should be part of such a monitoring program: Ground vibration and air blast results; blast information summary; meteorological information at time of the blast; video recording of the blast and fly rock observations.
- Blast designs should be reviewed and done prior to blasting operations planned. This is specifically areas that are close to areas such as Clever. The final mining decision with the different restrictions will have influence on allowable charging and design will need to consider this. Distance between blast and POI's must be confirmed and the specific drill pattern and blasthole depth must be considered. Recommended stemming length for blasting should range between 20 and 30 times the blast hole diameter. In cases for better fly control this should range 30 and 34 times the blast holes diameter.
- On-site rehabilitation of the area be implemented to allow for some level of wetland compensation, this should be informed by an offset strategy
- Follow rehabilitation measures outlined in the Final Closure and Rehabilitation Plan included in the attached EMPr.
- If any of the eight burial grounds will be impacted directly by the planned mining activities, they must be relocated after completion of a detailed grave relocation process.
- If fossil remains are discovered during any phase of construction, either on the surface or exposed by excavations, the Chance Find Protocol must be implemented by the ECO (site manager).
- A spill management plan must be put in place to ensure that should there be any chemical spill out or over that it does not run into the surrounding areas.
- The wetlands buffer must comply with the approved WUL.
- A fire management plan needs to be and implemented to restrict the impact fire might have on the rehabilitated areas.

# 13 ASSUMPTIONS, LIMITATIONS AND UNCERTAINTIES

Certain assumptions, limitations, and uncertainties are associated with the EIA Phase. This report is based on information that is currently available and, as a result, the following limitations and assumptions are applicable:

- The EIA Report is based on project information provided by the client; and
- The description of the baseline environment has been obtained from specialist studies.

Furthermore, certain assumptions, limitations, and uncertainties are associated with the EIA phase specialist studies and these are detailed for each aspect below.

## 13.1 HERITAGE

Not detracting in any way from the comprehensiveness of the fieldwork undertaken, it is necessary to realise that the heritage resources located during the fieldwork do not necessarily represent all the possible heritage resources present within the area. Various factors account for this, including the subterranean nature of some archaeological sites and the existing highly disturbed nature of the study area. As such, should any heritage features and/or objects not included in the present inventory be located or observed, a heritage specialist must immediately be contacted.

Note: it was not possible to access a couple of areas within the larger study area, due to existing opencast mining activities as well as the presence of discard dumps and earth berms that prevented access to certain areas.

Such observed or located heritage features and/or objects may not be disturbed or removed in any way until such time that the heritage specialist has been able to make an assessment as to the significance of the site (or material) in question. This applies to graves and cemeteries as well. If any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply as set out below.

## 13.2 BIODIVERSITY

The following limitations should be noted for the study:

- As per the scope of work, the fieldwork component of the assessment comprised of one assessment only, which was conducted during the wet season (5th of March 2020 and 18th of March 2020);
- This project has not assessed any temporal trends for the respective seasons; and
- Despite these limitations, a comprehensive desktop assessment was conducted, in conjunction with the detailed results from the surveys, and as such there is a high confidence in the information provided; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

## 13.3 HYDROGEOLOGY (GROUNDWATER)

Data limitations were addressed by following a conservative approach and assumptions include the following:

- The scale of the investigation was set at 1:50 000 resolutions in terms of topographic and spatial data, a lower resolution of 1:250 000 scale for geological data and a 1: 500 000 scale resolution for hydrogeological information.

- The Digital Elevation Model (DEM) data was interpolated with a USGS grid spacing of 25 m intervals.
- Rainfall data and other climatic data was sourced from the WR2012 database.
- Water management and catchment-based information was sourced from the GRDM and Aquiworx databases.
- The concept of representative elementary volumes (REV) have been applied i.e. a scale has been assumed so that heterogeneity within a system becomes negligible and thus can then be treated as a-homogeneous system. The accuracy and scale of the assessment will result in deviations at point e.g. individual boreholes.
- No site characterisation boreholes were drilled as part of this investigation and aquifer parameters as well as hydrostratigraphic units were assumed based on historical investigation and similar studies conducted.
- The investigation relied on data collected as a snapshot of field surveys and existing monitoring data.
- Further trends should be verified by continued monitoring as set out in the monitoring program.
- The numerical groundwater flow model was developed based on existing geological and hydrogeological information.
- The numerical groundwater flow model was developed considering site specific information. It should be stated that influences from neighbouring mining developments were not taken into consideration as part of this investigation.
- Stratigraphical units, as delineated from surface geology within the model domain, are assumed to occur throughout the entire thickness of the model and were incorporated as such.
- The geological structures (fault zones and dyke contact zones) were modelled as permeable linear zones.
- The model basement or lower perimeter of the model domain was delineated based on the competent
- Karoo basement or Dwyka tillite/diamictite is generally impermeable.
- Model calibration was achieved by assigning a ratio of 1:1 for Hydraulic Conductivity (K) in x and y directions, with a ratio of 1:10 in the z direction i.e. anisotropic aquifer.
- Perennial rivers within the model domain have been treated as gaining type streams. As such groundwater is lost from the system via baseflow to local drainages.
- Groundwater divides have been assumed to align with surface water divides and it is assumed that groundwater cannot flow across this type of boundaries.
- Prior to development, the system is in equilibrium and therefore in steady state.

## 13.4 HYDROLOGY (SURFACE WATER)

The floodline delineation assumes that the survey provided is a true reflection of the surface topography. This survey was compiled by a third party and provided for floodline delineation. The post mitigation impact assessment scores assume that mitigation measures will be implemented as recommended in this document. Should these mitigation measure not be implemented, the post mitigation scores may no longer be valid. The impact assessment assumes that the mine is in full compliance with GN 704 of the South African national Water Act, act 36 of 1998.

## 13.5 AQUATIC ECOLOGY

The following aspects were considered as limitations:

- The Subsidence Risk Assessment completed for the project area did not cover the upper reaches of the Elandsfontein tributary marked for underground mining;
- The depths of the proposed mining operation were not defined at the time of writing this report. Considering this, the potential and risk for subsidence is unknown. Thus, based on the precautionary principle, it is assumed that mining will be shallow and there is a risk for subsidence to occur;
- The proposed activities listed in this study are based on the assessment of several existing underground coal mine activities. A number of assumptions have been made through the compilation of the activity list; and
- No proposed river diversion shapefiles were available at the time of the study, therefore the impact assessment was based on the areas presented within this report.

## 13.6 WETLANDS

The following aspects were considered as limitations:

- The wetlands within the MRA were the focus for the study, these systems were groundtruthed and further assessed. Wetland areas beyond the MRA but within the 500 m regulated area were only considered at a desktop level;
- Shapefiles of the subsidence risk areas have not been provided;
- The areas within (and especially surrounding drainage lines) the MRA have significantly been modified. This modification could lead to inaccuracies pertaining to delineations and identification of wetland indicators. The majority of wetland areas were covered in tailing material/silt which renders the dominant soil form in such an instance a Witbank soil form. The latter mentioned according to (DWAF, 2005) is classified as a terrestrial soil as opposed to hydromorphic soils;
- Some the delineated wetlands are characterised by artificial water inputs, which provides difficulties in identifying hydromorphic soils; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

## 13.7 HYDROPEDOLOGY

The following aspects were considered as limitations:

- The hydropedological assessment undertaken in 2019 (TBC, 2019) was used to supplement this particular report. Therefore, no additional modelling has been done to incorporate the latest mine layout. It is however the specialist's opinion that the effects of the latest layouts for all four transects assessed will be similar to the effects of the layout assessed in 2019 due to the similarities in extent as well as the negligible effect that the proposed mining had on the vadose zone in the previous assessment.
- Only the slopes affected by the proposed mining areas have been assessed;
- No surface impacts (i.e. haul roads, infrastructure, shafts, evaporation ponds etc) have been included into this report;
- Access could not be gained at observation 8 and 9;

- It has been assumed that the mining areas provided to the consultant are correct;
- The GPS used for ground truthing is accurate to within five meters. Therefore, the wetland and the observation site's delineation plotted digitally may be offset by at up to five meters to either side;
- Geohydrological modelling was not part of the hydropedological assessments; and
- The planned seam 1, 2 or 4 (underground or opencast) area has not been assessed due to the fact that this portion was not part of the initial hydropedological assessment which was used to supplement this particular assessment. It is recommended that a full hydropedological assessment be undertaken for this portion in the event that the opencast alternative be chosen, and that a geohydrological assessment be undertaken in the event that this portion be mined via underground activities.

## 13.8 SOIL

The following aspects were considered as limitations:

- The MRA consists of approximately 50% disturbed areas, ultimately limiting soil classification;
- Shapefiles of the subsidence risk areas have not been provided;
- A soil stripping guideline is not part of this assessment;
- The property across the river to the west has not been assessed given the irrelevance of this property to the proposed development as well as the fact that this area has been disturbed by historic mining activities; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side.

## 13.9 AIR QUALITY

The main assumptions, exclusions and limitations are summarized below:

- Meteorological data: no onsite meteorological data was available and measured data from the Department of Environment, Forestry and Fisheries (DEFF) station in Emalahleni was obtained for the period January 2016 – December 2018. The data is regarded representative with the station located approximately 9 km to the east-northeast of the mining offices.
- Information: All project/process related information referred to in this study was obtained from the Independent Competent Person's (CPR) Report, dated 30 October 2019 (CPR, 2019); the Mining Works Programme (MWP), dated January 2020 (MWP, 2020); and the Air Quality Impact Assessment report by Digby Wells Environmental, dated August 2017 (DWE, 2017). It was assumed that this information is correct.
- Impacts: The impact of the operational phase was determined quantitatively through emissions calculation and dispersion simulation. Due to their temporary nature, the assessment of impacts from the construction and closure phases is mainly of a qualitative nature. A general estimation of emissions due to the construction phase was provided. No impacts are expected post-closure provided the rehabilitation of final landforms is successful.
- The impact assessment was limited to airborne particulates (including TSP, PM10 and PM2.5). These pollutants are either regulated under NAAQS or considered a key pollutant released by this operation.
- The quantification of sources of emission was restricted to the proposed Project. Although other existing sources of emission within the area were identified, such sources were not quantified as

part of the emissions inventory and simulations. Their impact would be considered by ambient air quality monitoring in the region.

- In the absence of detailed construction and decommissioning plans, fugitive dust emissions for these phases were discussed qualitatively.
- There will always be some error in any geophysical model; however, modelling is recognised as a credible method for evaluating impacts, but it is desirable to structure the model in such a way to minimise the total error. A model represents the most likely outcome of an ensemble of experimental results. The total uncertainty can be thought of as the sum of three components: the uncertainty due to errors in the model physics; the uncertainty due to data errors; and the uncertainty due to stochastic processes (turbulence) in the atmosphere.
- The stochastic uncertainty includes all errors or uncertainties in data such as source variability, observed concentrations, and meteorological data. Even if the field instrument accuracy is excellent, there can still be large uncertainties due to unrepresentative placement of the instrument (or taking of a sample for analysis). Model evaluation studies suggest that the data input error term is often a major contributor to total uncertainty. Even in the best tracer studies, the source emissions are known only with an accuracy of $\pm 5\%$, which translates directly into a minimum error of that magnitude in the model predictions. It is also well known that wind direction errors are the major cause of poor agreement, especially for relatively short-term predictions (minutes to hourly) and long downwind distances. All of the above factors contribute to the inaccuracies not even associated with the mathematical models themselves.
- A disadvantage of the model is that spatial varying wind fields, due to topography or other factors cannot be included. Although the model has been shown to be an improvement on the ISC model, especially short-term predictions, the range of uncertainty of the model predictions is -50% to 200%. The accuracy improves with fairly strong wind speeds and during neutral atmospheric conditions.

## 13.10 BLASTING AND VIBRATION

In view of the data evaluated it is the opinion of the author that the project can be executed successfully with consideration of the recommendations. There are areas that would be better mined underground than opencast due to the significant restrictions it will have on opencast blasting operations. Areas will not be feasible to mine if opencast operation will be selected. Proper management and control on the aspects of ground vibration, air blast and fly rock is possible and can be done. Specific problem areas were identified, and recommendations made. It is possible that the full resource may be mined with careful consideration of the recommendations.

## 13.11 TRAFFIC

SMEC South Africa (Pty) Ltd has attempted to source information on the cost implications for developers for the repair of roads damaged by E80's. Although some information on developer contributions was found, this did not apply to Environmental Impact Assessments and only to a change in land-use rights. The legal financial implications of wear and tear of the road network are unclear. If any additional information on this is made available, this report will be updated accordingly, however no additional information has been received from SANRAL when requested.

Details on assumptions have been included in detail where relevant in the report. As this study was conducted during the covid-19 pandemic, historic data was used as a basis for analysis. Future changes to trip patterns and the development rate of the surrounding area are likely to result in changes to typical traffic volumes in the area. Historic counts grown at 3% per annum provide a conservative estimate of the demand on the surrounding road network and required road authority upgrades are likely to be less extensive than estimated in this report. Conservative assumptions were made in terms of

construction labour requirements, no. of labourers accessing the site at the same time and in the distribution of trips to the surrounding road network.

# 14 UNDERTAKINGS

## 14.1 UNDERTAKING REGARDING CORRECTNESS OF INFORMATION

I __**John von Mayer**__ herewith undertake that the information provided in the foregoing report is correct, and that the comments and inputs from stakeholders and Interested and Affected Parties has been correctly recorded in the report.

Signature of the EAP

Date: _7 June 2021____

## 14.2 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I ___**John von Mayer**___ herewith undertake that the information provided in the foregoing report is correct, and that the level of agreement with Interested and Affected Parties and stakeholders has been correctly recorded and reported herein.

Signature of the EAP

Date: __7 June2021___

# 15 REFERENCES

Aller, L., Bennet, T., Lehr, J.H., Petty, R.J. and Hacket, G. 1987. DRASTIC: A standardized system for evaluating groundwater pollution using hydrological settings. Prepared by the National Water Well Association for the US EPA Office of Research and Development, Ada, USA.

Barbour MT, Gerritsen J. White JS. 1996. Development of a stream condition index (SCI) for Florida. Prepared for Florida Department of Environmental Protection: Tallahassee, Florida.

Barnard, H. C., 2000. An explanation of the 1:500 000 general Hydrogeological Map. Johannesburg 2526.

Bean, J.A., 2003. A critical review of recharge estimation methods used in southern Africa. PhD thesis, (unpubl). University of the Free State, South Africa.

Bredenkamp, D., Botha, L.J., Van Tonder, G.J. and Janse van Rensburg, H., 1995. Manual on qualitative estimation of groundwater recharge and aquifer storativity, based on practical hydro-logical methods. Water Research Commission, TT 73/95. ISBN 1 86845 1763.

Council of Geoscience geological map sheet 2528: Pretoria (1:250 000).

Council of Geoscience topographical map sheet 2529CC (1:50 000).

Dallas HF. 2007. River Health Programme: South African Scoring System (SASS) Data Interpretation Guidelines. Report produced for the Department of Water Affairs and Forestry (Resource Quality Services) and the Institute of Natural Resources.

Department of Water Affairs and Forestry (DWAF) 2005. Final draft: A practical field procedure for identification and delineation of wetlands and Riparian areas.

Department of Water Affairs and Forestry Directorate: National Water Resource Planning. 2004. Internal Strategic Perspective: Olifants Water Management Area.

Department of Water and Sanitation (DWS), Government of the Republic of South Africa. 2016. Government Gazette, 22 April 2016. Classes and Resource Quality Objectives of Water Resources for Catchments of the Olifants River.

Department of Water and Sanitation (DWS). 1996. South African Water Quality Guidelines. Volume 7: Aquatic Ecosystems.

Department of Water and Sanitation (DWS). 1999. Resource Directed Measures for Protection of Water Resources. Volume 2: Integrated Manual (Version 1). Department of Water Affairs and Forestry, Pretoria

Department of Water and Sanitation (DWS). 2005. River Ecoclassification: Manual for Ecostatus Determination. First Draft for Training Purposes. Department of Water Affairs and Forestry.

Department of Water and Sanitation (DWS). 2019. A Desktop Assessment of the Present Ecological State, Ecological Importance and Ecological Sensitivity per Sub Quaternary Reaches for Secondary Catchments in South Africa. Draft. Compiled by RQS-RDM.

Freeze, R. Allan, and John A. Cherry. 1979. Groundwater. Prentice Hall Inc., New Jersey. Gebrekristos, R., 2018.

Geomech Consulting. 2019. Existing Underground Workings Subsidence Investigation Report.

Groundwater Report Amendment to the Environmental Management Programme for the Elandsfontein Colliery. Digby Wells Report ref.no.: ANK3784. Google Earth, 2017. 6.0.12032 Beta.

GSW. 2019. Background Information Document.

International Institute for Land Reclamation and Improvement/ILRI (2000). ISBN 90 70754 207. SANS 241: 2015. South African National Standards: Physical, aesthetic, operational and chemical determinants for drinking water.

Johnson, MR. Anhauser, CR., Thomas, RJ., 2006. The geology of South Africa. Council for Geoscience. ISBN 1919908-77-3. Lynch, S.D., Reynders, A.G. and Schulze, R.E., 1994: A DRASTIC approach to groundwater vulnerability mapping in South Africa. SA Jour. Sci., Vol. 93, pp 56 - 60.

Kotze DC, Marneweck GC, Batchelor AL, Lindley DC, Collins NB. 2008. A Technique for rapidly assessing ecosystem services supplied by wetlands. Mondi Wetland Project.

Kraft, P., Vaché, K.B., Frede, H.-G. Breuer, L. 2011. A hydrological programming language extension for integrated catchment models, Environmental Modelling & Software, doi: 10.1016/j.envsoft.2010.12.009

Kruseman, G.P, de Ridder, N.A., 1994. Analysis and Evaluation of Pumping Test Data.

Land Type Survey Staff. (1972 - 2006). Land Types of South Africa: Digital Map (1:250 000 Scale) and Soil Inventory Databases. Pretoria: ARC-Institute for Soil, Climate, and Water.

Macfarlane, D.M., Dickens, J. & Von Hase, F. (2009). Development of a methodology to determine the appropriate buffer zone width and type for developments associated with wetlands, watercourses and estuaries.

Macfarlane, D.M., Kotze, D.C., Ellery, W.N., Walters, D., Koopman, V., Goodman, P. Goge, C. (2008). WET-Health, A technique for rapidly assessing wetland health.

Morris, D. 2008. Archaeological and Heritage Impact Assessment on Remainder of Carter Block 458, near Lime Acres, Northern Cape. McGregor Museum.

Mucina, L. and Rutherford, M.C. (Eds.) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelizia 19. South African National Biodiversity Institute, Pretoria South African.

Mybhurg, A.C. 1956. Die Stamme van die Distrik Carolina. Departement van Naturelle Sake, Pretoria.

Nel JL, Murray KM, Maherry AM, Petersen CP, Roux DJ, Driver A, Hill L, Van Deventer H, Funke N, Swartz ER, Smith-Adao LB, Mbona N, Downsborough L and Nienaber S. 2011. Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

Ollis DJ, Snaddon CD, Job NM, and Mbona N. 2013. Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African Biodiversity Institute, Pretoria.

Parsons, R, 1995. A South African Aquifer System Management Classification, Water Research Commission, WRC Report No KV 77/95. van Tonder and Xu, 2000.

Program to estimate groundwater recharge and the Groundwater Reserve.

Rountree, M. and Kotze, DC. 2013. Manual for the Rapid Ecological Reserve Determination of Inland Wetlands (Version 2.0). Joint Department of Water Affairs/Water Research Commission Study. Report No XXXXXXXXX. Water Research Commission, Pretoria.

Schaap MG, Leij FJ, Van Genuchten MTh, 2001. Rosetta, a computer program for estimating soil hydraulic parameters with hierarchical pedotransfer functions. Hydrology 251: 163-176. http://dx.doi.org/10.1016/S0022-1694(01)00466-8.

Schulze, R. 1989. ACRU: Background, Concepts and Theory. Report 35, Agricultural Catchments Research Unit, Department of Agricultural Engineering, University of Natal, Pietermaritzburg, South Africa.

Skinner, W. 1911. The Mining Manual. The Capitalist. London.

Soil Classification Working Group. (1991). Soil Classification A Taxonomic system for South Africa. Pretoria: The Department of Agricultural Development.

South African National Biodiversity Institute (SANBI). 2009. Further Development of a Proposed National Wetland Classification System for South Africa. Primary Project Report. Prepared by the Freshwater Consulting Group (FCG) for the South African National Biodiversity Institute (SANBI).

VAN DER WALT, J. 2013. Archaeological Scoping Report for The Proposed Establishment Of The Transalloys Coal-Fired Power Plant Near Witbank, Mpumalanga Province.

Van Tol, J., Le Roux, P. & Lorentz, S. 2017. The science of hydropedology- Linking soil morphology with hydrological processes. Water Wheel 16(3).

Van Tol, J.J. & Le Roux, P.A.L., 2019. Hydropedological grouping of South African soil forms. South African Journal of Plant and Soil.

Vegter, JR., DWS and WRC, 1995. Groundwater Resources of the Republic of South Africa.

Younger, P.L., R.S., 2007. Groundwater in the environment: An introduction. Blackwell Publishing.

# APPENDICES

Appendix A: Environmental Assessment Practitioner (EAP) Curriculum Vitae

Appendix B: Maps

Appendix C: Public Participation

Appendix D: Specialist Reports

Appendix E: EMPr (including Final Rehabilitation, Decommissioning and Closure Plan)

Appendix F: Impact Assessment Matrix