mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Environmental Impact Assessment and Environmental Management Programme Report for the Proposed Hendrina Underground Coal Mine, Mpumalanga

FINAL FOR DMR CONSIDERATION

SUBMITTED FOR ENVIRONMENTAL AUTHORISATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 (ACT NO. 107 OF 2008) (NEMA) AND THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008) (NEM:WA) IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (ACT NO. 28 of 2008) AS AMENDED (MPRDA).

Name of Applicant:	Umcebo Mining (Pty) Ltd
Tel no:	013 653 5481
Fax no:	013 655 2334
Postal Address:	Suite MW 113, Private Bag X 1838, Middelburg 1050
Physical Address:	Umcebo House Voltargo, Witbank 1038
File Reference Number SAMRAD:	MP 30/5/1/2/2/10129 MR

Digby Wells and Associates (South Africa) (Pty) Ltd. Co. Reg. No. 2010/008577/07. Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191. Private Bag X10046, Randburg, 2125, South Africa
Tel: +27 11 789 9495, Fax: +27 11 069 6801, info@digbywells.com, www.digbywells.com

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Report Type:	**Final EIA and EMP Report**
Project Name:	**Proposed Hendrina Underground Coal Mine, Mpumalanga**
Project Code:	**XST3791**

Name	**Responsibility**	**Signature**	**Date**
Claire Dendy	Report Compiler	Dendy	August 2016
Kasantha Moodley	Report Reviewer		September 2016
Barbara Wessels	Report Reviewer	BWessels	October 2016
Michael Hennessy	Legal Review		September 2016
Mellerson Pillay	Report Approver	MPillay	October 2016

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IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act No. 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

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

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

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

OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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

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

EXECUTIVE SUMMARY

Introduction

Umcebo Mining (Pty) Ltd (Umcebo) is proposing the development and operation of a new underground coal mine and associated infrastructure (proposed project) at sites situated approximately 10 to 22 kilometres (km) south east of Hendrina in the Mpumalanga Province of South Africa (project site).

Umcebo currently holds two Prospecting Rights (PRs), namely, MP 1265 PR and MP 1266 PR, on properties located within the Ermelo Coal Field. The total extent of MP 1265 PR (referred to as Mooivley East and Mooivley West) is 3 927 hectares (ha) and comprise the following farms and portions:

- Mooivley 219 IS – Potions 2, 4, 5 and Remaining Extent (RE) of the farm;
- Tweefontein 203 IS – Portions 2, 15, 16, 17 and Portion of Portion 14;
- Uitkyk 220 IS – Portions 2 and 3; and
- Orange Vallei 201 IS – Portions 1 and RE of the farm.

The total extent of MP 1266 PR (referred to as Hendrina South) is 3 153 ha and comprises the following farm and portions:

- Elim 247 IS - RE of the farm;
- Geluksdraai 240 IS – Portions 1 and 2;
- Orpenskraal 238 IS – RE of the farm; and
- Bosmanskrans 217 IS – Portions 3, 6, 7, 8, RE of the farm, RE of Portion 1, RE of Portion 4, RE of Portion 5 and RE of Portion 9.

In terms of the requirements of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), (MPRDA) as amended, a Mining Right Application (MRA) must be submitted to the Department of Mineral Resources (DMR) for the proposed project. In support of the MRA, an Environmental Impact Assessment (EIA) process must be undertaken in accordance with the Environmental Impact Assessment Regulations, 2014 (EIA Regulations, 2014) (promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA). The EIA process will include the following applications:

- An Environmental Authorisation (EA) for listed activities as contained in Government Notice Regulations (GN R) GN R984 and R985);
- Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA);
- Heritage Resources Management (HRM) Process in accordance with section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA); and

- An Integrated Water Use Licence Application (IWULA) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) will also be made for water uses associated with the proposed project.

Digby Wells Environmental (Digby Wells) has been appointed by Umcebo as the independent Environmental Assessment Practitioner (EAP) to conduct an EIA and the associated specialist studies for the proposed Hendrina underground mining operation.

Project Applicant

The particulars for Umcebo are detailed in the table below.

Company name:	Umcebo Mining (Pty) Ltd
Contact person:	Janine Ingram and/ or Elmien Webb
Physical address:	Umcebo House Voltargo, Emalahleni 1038
Telephone:	013 653 5481
Fax:	013 655 2334
Email:	Janine.Ingram@glencore.co.za and / or Elmien.Webb@glencore.co.za

Environmental Consultants

Contact details for the independent EAP are provided in the table below.

Company name:	Digby Wells Environmental
Contact person:	Ms Barbara Wessels
Physical address:	Digby Wells House, Turnberry Office Park, 48 Grosvenor Road, Bryanston, 2191, South Africa.
Telephone:	011 789 9495
Cell phone:	011 069 6801
Email:	barbara.wessels@digbywells.com

Project Overview

The project area comprises three underground reserve blocks namely Mooivley East, Mooivley West and Hendrina South. Each mining area will comprise of a shaft system with two access shafts (man and material) and one ventilation shaft. Mooivley West and Hendrina South will be mined at the same time. Mooivley East mining activities will commence following the mining of Mooivley West and Hendrina South.

The estimated Life of Mine (LoM) will be 36 years[1] for all mining areas with a production rate of 2.4 million tonnes per annum at full capacity, with a total of approximately 78 million tonnes of Run of Mine (ROM) coal. The mine will reach full production within the first four years.

Due to the depth of the resource (i.e. 32 m to 128 m), underground mining will be used to access the ore body. Each mining area will comprise of a shaft system with two shafts accesses (man and material) and one ventilation shaft. The shafts will be constructed to gain access to the underground resource; this will be done through blasting, using packaged explosives or boosters and Ammonium Nitrate Fuel Oil (ANFO). The shafts will be approximately 75 m deep incline shafts. The access shaft will measure about 5 000 m^2. A ventilation shaft will measure about 2 500 m^2.

The proposed mining method for the extraction of coal will be bord and pillar. In mechanised bord and pillar mining, extraction is achieved by developing a series of roadways (bords) in the coal seam connected by splits (cut-throughs) to form pillars, using continuous miners and shuttle cars. These pillars are left behind as part of a primary roof support system. It is expected that there will be dolerite intrusions and a dyke development section will be deployed for the purpose of mining through these and preparing new mining sections.

The quality of coal makes it suitable for use in the domestic thermal market (Eskom). The coal product will be transported to a nearby Eskom power station (e.g. Kusile, Kendal, Kriel, or Grootvlei) via the existing road network.

The project is proposed to commence with construction and development when all required licences and authorisations are granted.

The following is a list of the main infrastructure and structures that will be required for the proposed project and that forms part of this application. A detailed description of these as well as other support infrastructure can be found in Section 5.2.

- Crushing and screening plant;
- Overburden, Product and Topsoil stockpiles;
- Overland Conveyor;
- Three Access Points to the Underground Reserve Blocks; and
- Three Ventilation Shafts (One per Access Point).

[1] The MRA will be made for an initial period of 30 years, the maximum allowed in terms of the provisions of Section 23 of the MPRDA. At the end of this period an application for renewal of the mining right will be made for any remaining reserves.

Policy and Legislative Context

Applications for various environmental approvals are either in progress or will be applied for prior to undertaking the relevant activities for the proposed project. These approvals include:

- Mining Right and an Environmental Management Plan (EMP) in terms of the MPRDA (as amended) to be approved by the Department of Mineral Resources (DMR);
- Environmental authorisation in terms of NEMA and the EIA Regulations, 2014 to be granted by the DMR;
- WML in terms of the National Environmental Management Act, 2008 (Act No. 59 of 2008) approved by the DMR; and
- Water Use Licence in terms of the National Water Act, 1998 (Act No. 36 of 1998) approved by the Department of Water and Sanitation (DWS).

Further compliance with policies, legislation and guidelines relevant to this project is discussed and referenced in Section 6, Part A, of this report.

Need and Desirability of the Project

The entire application (MRA, Scoping, EIA, EMP and specialist reports) should be considered to gain a holistic view of the need and desirability of the proposed project and its related activities.

The national developmental policies communicate the aim to reduce poverty, achieve equity, and increase economic growth. The New Growth Path Framework (Department of Economic Development, 2010) and the National Development Plan 2030 (NDP 2030) (National Planning Commission, 2011) envisage that regions should take advantage of natural resources to achieve the aims of the Plans, but in a sustainable and equitable manner.

Part of the EIA process was to undertake a range of specialist studies which relate to the physical, biological and socio-economic aspects potentially affected by the proposed project. The findings of the studies are summarised in Section 10.1, (Part A) and the reports are appended to this EIA/ EMP. The impact assessment (Section 11, Part A) quantified the expected impacts of each project activity (Table 11-1). Mitigation measures were also identified for each of the expected impacts and are detailed in Section 5, 6 and 7 (Part B).

A sensitivity analysis was further completed to identify the sensitive environmental aspects present on the project site. Refer to Section 8.1 (Part A) for additional information. The original site layout was also amended following the completion of the sensitivity analysis. Refer to Section 8 for a discussion on possible alternatives.

The cumulative effects of the proposed projects are discussed in Section 11.15 (Part A). A number of negative impacts have been identified which will cause significant damage to the natural environment which include the deterioration of soil, air quality, fauna and flora, wetlands, aquatics, heritage and the visual environment. Although it is expected that there will be significant negative impacts as a result of the project it is also expected that the proposed project will contribute to job creation and local economic development.

Given South Africa's abundant coal resources particularly in the Waterberg basin, South Africa is likely to continue to include coal as a significant part of its energy mix (NDP, 2012). This is particularly beneficial in light of South Africa's development priorities of job creation and economic growth as per the (NDP, 2012).

The quality of the proposed project coal makes it suitable for use in the domestic thermal market (Eskom). The envisaged mining activities of the proposed project are expected to have knock-on benefits in terms of local employment, local economic development and increased government revenue and taxes. It is anticipated that the proposed project will be able to provide 78 million tons over the next 36 years.

Purpose of this Report

The overarching objectives of this EIA and EMP report are to:

- Provide an interpretation of the specialist reports;
- Identify and assess potential environmental and social impacts associated with the proposed project; and
- Recommend mitigation and management measures to ensure that should the mining operations be approved the development is undertaken in such a way as to enhance positive impacts and minimise negative impacts.

This report also describes the status quo of the biophysical and socio-economic environments of the project area, based on specialist inputs. Furthermore, an EMP has been developed to mitigate and manage biophysical and socio-economic impacts associated with each project activity.

Various specialist studies were undertaken during the project evaluation to inform the EIA/EMP. These include:

- Soil, Land Use and Land Capabilities Assessment;
- Surface Water Assessment;
- Groundwater Assessment;
- Air Quality Assessment;
- Fauna and Flora Assessment;
- Wetland Assessment;
- Aquatic Ecology Assessment;
- Heritage Assessment;
- Socio-Economic Assessment;
- Visual Assessment;

- Noise Assessment;
- Traffic Assessment;
- Blasting and Vibration Assessment; and
- Rehabilitation and Closure Assessment.

A summary of the baseline environment is presented in Section 10.1 (Part A). Various environmental monitoring plans are included in Section 9 (Part B) of this report and should be implemented to measure compliance, determine if mitigation measures are effective and determine trends over the life of the project.

Baseline Environment

The table below provides a brief summary of the baseline environment as determined during the specialist studies.

Aspect	Baseline Summary
Soil, Land Use and Land Capabilities	The sites being considered are all Greenfields sites in terms of their mining development. They are however all impacted by farming development to some extent and as such rank as brownfield sites in terms of their environmental status when considering soils and land capability. The soils are highly influenced by the parent materials from which they are derived (fine to medium grained sediments for the most part, with areas of quartzite and dolerite intrusive) and by the subtle but variable topography that results in a net positive erosive environment. The altitude of the underlying lithologies (generally flat lying/horizontal) and the negative water balance (evaporation is higher than rainfall) has also had an influence on the weathering processes at work and the pedogenetic mechanisms (soil forming) that contribute to the soil forms mapped. Variation in the wet based hydromorphic soils was also noted, with lower mid-slope transitional form soils that comprise sandy clay to loamy and stratified sub soils and sandy topsoil on the alluvial outwash plains, to highly saturated gley and gleycutanic wetland soil forms that are characterised by topsoil's with better than average organic carbon contents well developed hydromorphic characteristics. It is important to note that the present land use also varies, from areas with little to no cultivation but with some commercial grazing, to areas with intensive commercial cropping and livestock grazing. There is little to no subsistence farming or grazing. These aspects have been taken into account when considering the merits of the proposed mining plan and developments on the surface.

Aspect	Baseline Summary
Surface Water	The project area is located in the Olifants Water Management Area No: 04 in quaternary catchment B12A. The Klein Olifants is the only perennial stream within this quaternary catchment; it traverses the Hendrina South and Mooivley East Mining Right Area. There are other few non-perennial streams within these Mining Right Areas and are tributary to the Klein Olifants. Mooivley West mining right area is drained by an unnamed stream that is also a tributary to the Klein Olifants. Runoff emanating from the mentioned Mining Right Areas flow into the Klein Olifants which eventually joins the Olifants River.
Groundwater	The baseline groundwater quality is generally clean. Ten of the 13 boreholes were sampled and are suitable for human consumption. The sulfate concentrations for the sampled boreholes are currently less than 20.6 mg/ℓ. The recommended sulfate limit is 250 mg/L for aesthetic reasons and 500 mg/L for acute health reasons. Since sulfate is expected to be an element of concern in coal mines as it can result in the creation of acid mine drainage, the values obtained during this study can be used as a baseline for future contamination comparisons. Three of the 13 boreholes fell within the unacceptable category water quality range. These are either due to fluoride or manganese, both of which are suspected to be due to natural dissolution from the host rocks, particular from the pre-Karoo intrusive rocks. Six rock samples were taken to assess the possibility of acid mine drainage. The Sulfide-S analysis shows that while the rocks in the area of BKBH6 (Hendrina South) are unlikely to sustainably generate acid, the rocks in the area of TFBH1 (Mooivley West) have sufficient sulfide to generate acid. The aquifers within the project site are characterised with limited permeability, ranging between 10^{-5} m/d and $7x10^{-2}$ m/d. The low permeability was also evident during the drilling programme as no water strikes with measurable blow yields were detected. The water level took up to two weeks to recover to the static position following the drilling. The only exception is BKBH6 (located in Hendrina South) where a water strike of 2 L/s was recorded at a depth of 10 m, in the weathered sandstone. The borehole was pump tested while the rest of them were slug tested.[2]

[2] A slug test is a particular type of aquifer test where water is quickly added or removed from a groundwater well, and the change in hydraulic head is monitored through time, to determine the near-well aquifer characteristics.

A pumping test is a field experiment in which a well is pumped at a controlled rate and water-level response (drawdown) is measured in one or more surrounding observation wells and optionally in the pumped well (control well) itself; response data from pumping tests are used to estimate the hydraulic properties of aquifers, evaluate well performance and identify aquifer boundaries.

Aspect	Baseline Summary
Air Quality	The ambient air quality in the project area will be influenced by atmospheric pollutants from several local and regional sources, which will include: ▪ Emissions from coal-fired power plants; ▪ Operational opencast and underground coal mines in the Mpumalanga Highveld; and ▪ Residential and agricultural activities in the vicinity. In terms of Air Quality, the main pollutants of concern will be associated with particulate matter i.e. dust generated from mining activities and open sources during mining areas, and vehicular movement on dry and dusty roads.
Fauna and Flora	The site falls primarily within the regional vegetation type: Eastern Highveld Grasslands and partially in the Soweto Highveld Grasslands; both of which are listed as threatened ecosystems by the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004 (NEM: BA). The majority of the study area was dominated by cultivation (3 081 ha) and the dominant natural habitat type was broadly classified as *Eragrostis* dominated Grassland, covering an area of 2 970 ha. In addition, ephemeral pan habitat (31 ha), disturbed grassland (47 ha), alien bushclumps comprised of *Eucalyptus camuldulensis* and *Acacia mearnsii* (57 ha), *Gnidia – Diospyros* Rocky Grassland and *Crinum – Arundinella* Riparian habitat (428 ha) were delineated. A total of 137 plant species were recorded on site of the 273 recorded for the region. Of the twelve plant Species of Special Concern (SSC) recorded for the regional list, five were recorded, including: *Aloe ecklonis* (provincially protected), *Crinum bulbispermum* (Red Data Declining and provincially protected), *Eucomis autumnalis* (Red Data Declining and provincially protected), *Haemanthus humilis* (provincially protected) and a *Satyrium* species (provincially protected). *Aloe ecklonis* and the *Satyrium* species were found in the *Eragrostis* Grassland habitat; *Crinum bulbispermum* and *Eucomis autumnalis* were found in the riparian habitat and *Haemanthus humilis* was found in the rocky grassland. Although no SCC was recorded in the infrastructure areas, they may occur however it is relatively unlikely. A total of 22 mammal species have been recorded on site, five of which are SSC, including Near Threatened: African Clawless Otter (*Aonyx capensis*), and provincially protected: Steenbuck (*Raphicerus campestris*), Serval (*Felis serval*), Aardwolf (*Proteles cristatus*) and Aardvark (*Orycteropus afer*). A total of 83 bird species were recorded. Four frog species were recorded on site, namely: *Amietia angolensis* (Common River Frog), *Bufo gutturalis*

Aspect	Baseline Summary
	(Guttural Toad), *Cacosternum boettgeri* (Common Caco) and *Strongylopus fasciatus* (Striped Stream Frog).
Wetland	The project area is predominantly found within the quaternary catchment B12A, with the Klein Olifants River being the only perennial river, and is characterised by large areas of wetlands, totalling 2 830.2 hectares (ha), which equates to approximately 42 % of the proposed mining right areas. These include three major types of wetlands, being: valley bottom systems, hillslope seeps and pan wetlands, which all function differently and deliver a variety of goods and services. Many of these wetlands are mapped as National Freshwater Ecosystem Priority Areas (NFEPA) and thus are recognised for the role that they play in supporting and provisioning services to the surrounding area and region. These wetlands are also identified as Ecological Support Areas (ESA) according to the Mpumalanga Biodiversity Sector Plan (2013) in the terrestrial and freshwater assessments. Some areas associated with the Klein Olifants River are designated as Critical Biodiversity Areas (CBA). These findings are further highlighted in the Mining and Biodiversity Guideline Report (2013) as these sensitive areas are designated as highest risk to mining and they are of highest biodiversity importance for national biodiversity strategic goals.
Aquatic Ecology	The results of the baseline assessment derived an overall Present Ecological State (PES) class of moderately/largely modified (class C/D). This class was derived due to the existing land use within the catchment area of the Klein Olifants River. The primary cause of the poor ecological status was found to be associated with various agricultural practices including extensive livestock agriculture which has resulted in erosion and subsequent sedimentation of the assessed river reaches.
Heritage	This assessment considered the baseline cultural landscape at local, site specific and development footprint study area level to define the cultural landscape and identify any tangible heritage resources that may be impacted upon by the proposed Project. A total of 542 sites were identified within the local study area, ranging from palaeontological resources through to the historic period. No heritage resources were identified within the development footprint of surface infrastructure, and no direct impacts are envisaged for this component of the Project.

Aspect	Baseline Summary
Socio-Economic	The project site falls within two separate district and two local municipalities, namely the Steve Tshwete Local Municipality (STLM) situated within the Nkangala District Municipality (NDM) and the Msukaligwa Local Municipality (MLM) situated within the Gert Sibande District Municipality (GSDM). Human settlement within the secondary study area is characterised by contrasting patterns. The vast majority of land is sparsely populated with residential uses being limited to stand alone homesteads and worker residences on farms. With regards to race, black Africans constitute the overwhelming majority (92%) of the population, followed by Whites (6%). The majority of the black African population reside in townships within and surrounding Hendrina and Breyten, while the white minority mostly reside in Hendrina town, smallholdings or surrounding farms. Generally, income levels within the study area are extremely low, with 70% of people earning less than R 800 a month.
Visual	The Project is situated in the Ermelo Coalfield Area. This region is characterised by agriculture with coal mines and power stations. The potential visual receptors identified within the practical viewshed of Mooivley West and Hendrina South include 62 farm residences (including farm workers houses), 21 heritage sites (including archaeological sites, burial grounds and graves, and historical buildings) and road users on the N11 national route, the R542 regional road, secondary roads and farm roads within the practical viewshed area. There are no urban areas within the practical viewshed of Mooivley West and Hendrina South. The entire practical viewshed of Mooivley West and Hendrina South is within the Amersfoort-Bethal-Carolina Important Bird Area (IBA). No other protected areas are within this practical viewshed. The potential visual receptors identified within the practical viewshed of Mooivley East include residents of the Hendrina and Kwazamokuhle towns, 62 farm residences (including farm workers houses), seven heritage sites (including burial grounds and graves, and historical buildings) and roads users on the N11 national route, the R38 regional road, secondary roads and farm roads within the practical viewshed area. Approximately 90% of the practical viewshed of Mooivley West and Hendrina South is within the Amersfoort-Bethal-Carolina IBA. No other protected areas are within the practical viewshed.

Aspect	Baseline Summary
Noise	The baseline noise measurements indicate that the noise levels at the surrounding communities are typical of rural districts with little road traffic. The average daytime LAeq levels measured 47 dBA, while the average LA90 levels measured 35 dBA. The average night time LAeq levels measured 41 dBA, while the average LA90 levels measured 28 dBA. It is recommended that the day and night time upper limit level for the surrounding area be set at the same guideline level of the SANS 10103:2008 day and night time maximum allowable rating level for rural districts, which is 45 dBA and 35 dBA respectively. The recommended upper limit levels have been calculated bearing in mind the National Noise Control Regulations definition of disturbing noise as well as to bring it in line with the SANS 10103:2008 guidelines.
Traffic	The individual project sites are currently accessible via Davel Road which branches off the N11 and connects the site to major regional and national routes. The roads likely to be affected considering the possible routes that the traffic generated by the mining activities might travel along. Vehicles were observed along N11, R542 and R38 during the site visit with the presence of a large amount of heavy vehicle traffic passing through the town of Hendrina. The pavement condition of the N11 is in a good condition, as it is a national road maintained by SANRAL, particularly along the section that will be used by traffic generated by the Hendrina Underground Coal Mine when travelling to and from Hendrina and Ermelo. The rest of the roads are also in good condition.

Approach and Methodology for the Public Participation Process

A Public Participation Process (PPP) was initiated during the Scoping phase, which is central to the investigation of environmental and social impacts, as it is important that stakeholders who are affected by the project are given an opportunity to identify concerns and to ensure that local knowledge, needs and values are understood and taken into consideration as part of the impact assessment process. The comments from the stakeholders are included in the Comment and Response Report (CRR) (Appendix 2) and were used to refine the scope of specialist studies.

The draft EIA/EMP report was submitted to the public for their input and comments for a period of 30 days. The commenting period was from the 17 March 2017 and ended on 19 April 2017. The draft EIA/EMP was available for review at the locations listed below and was also available on the Digby Wells website (www.digbywells.com). Electronic copies (CDs) were available from the Digby Wells Public Participation Office.

- Hendrina Public Library; and
- Breyten Public Library.; and

- Digby Wells' website.

A public meeting and landowner meeting were held during this commenting period to present the draft EIA/EMP and obtain comments from the Interested and Affected Parties (I&APs). The draft EIA/EMP has been updated with all the comments received from the I&APs prior to submission to the DMR for consideration. The updated CRR has been attached as Appendix 2. Once the DMR has made a decision on the proposed project this will be communicated to all the registered I&APs.

Project Alternatives

Throughout the assessment of the proposed project, trade-offs were done at different scales to determine the preferred site layout, activities and processes. Aspects that were taken into account include comments received from I&APs, location or site alternatives, routing alternatives and the no-go alternative. The possible negative environmental and social impacts expected from the proposed project are anticipated to be less significant after taking these aspects into consideration.

The nature of the ore deposit will however determine the mining activities and processes and the location of the resource determines the location of the mining operation.

A sensitivity analysis was undertaken during the scoping phase to identify the biophysical and social sensitivities of the project site and to identify those project components that may potentially have an impact on sensitive resources and/or receptors. The fauna and flora, aquatic ecology, water resources, traffic and wetlands aspects were identified as key resources/ receptors. Following the sensitivity analysis it was possible to relocate some of the infrastructure out of wetlands, pans, seep areas and 100 m buffer and/ or 1:100 year floodline of the Klein Olifants River.

Two routing alternatives were investigated, more specifically the location of the conveyor belt and the access road from Mooivley to Davel Road. The preferred options were selected as it is considered to have the lesser impact on the river and wetlands systems.

The no-go option means that the status quo would be maintained. All potential impacts are assessed against the current biophysical and socio-economic baseline; therefore all identified alternatives are inherently assessed against the no-go option.

Impact Assessment Summary

The EIA/EMP report, the associated specialist studies and the PPP have been undertaken and completed in line with the legislative requirements discussed in Section 6 (Part A) of this report. A quantitative impact rating methodology was applied to determine the significance of the expected impacts pre-mitigation and post-mitigation. Table A, Table B and Table C provide a summary of the impacts expected during the various phases of the project. The tables contain impacts with a moderate to major significance rating post mitigation. Section 11 (Part A) of this report lists and assesses all the potential impacts, together with the associated mitigation measures.

Table A: Summary of the Moderate to Major Impacts expected during the Construction Phase

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Soil	Loss of utilisable soil as a resource through sterilisation, compaction, erosion, and salinization/ contamination.	Moderate (negative)	Negligible (negative)
Air Quality	Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter.	Moderate (negative)	Negligible (negative)
Fauna and Flora	Loss of Eragrostis as a result of site clearing – dominated Grassland.	Moderate (negative)	Minor (negative)
Wetlands	Loss of wetland soil and vegetation with degradation to ecological integrity and functioning.	Moderate (negative)	Minor (negative)
	Activities with the wetland channel and the surrounds will impact negatively upon sensitive wetland soils as well as the vegetation.	Moderate (negative)	Minor (negative)
Aquatics	Increased runoff and erosion within the Klein Olifants River due to site clearance within associated wetland habitats and river catchment.	Moderate (negative)	Minor (negative)
	The loss of aquatic habitat as a result of construction activities within a river channel due to construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat.	Moderate (negative)	Moderate (negative)
Heritage	Loss of integrity of rock art sites.	Moderate (negative)	Major (positive)
	Degradation of intrinsic Cultural Significance (CS) of burial grounds and graves.	Major (negative)	Minor (Positive)
Socio-economic	Employment Creation during construction.	Minor (Positive)	Moderate (positive)
	Multiplier effects on the local economy.	Minor (Positive)	Moderate (positive)
	Community development and social upliftment.	Minor (Positive)	Moderate (positive)
	Economic displacement related impacts.	Major (negative)	Moderate (negative)

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
	Disruption of daily movement patterns.	Moderate (negative)	Minor (negative)
	Influx related impacts.	Moderate (negative)	Minor (negative)
	Impacts on community health and safety.	Moderate (negative)	Minor (negative)
	Impact on surrounding land users.	Moderate (negative)	Minor (negative)
Visual	Change of land use from agriculture to mining will have a negative visual impact on the receiving environment.	Major (negative)	Moderate (negative)
	Mooivley West, Hendrina South and Mooivley East - The construction of surface infrastructure will have a negative visual impact on the receiving environment by impacting on the sense of place.	Moderate (negative)	Moderate (negative)

Table B: Summary of the Moderate to Major Impacts expected during the Operational Phase

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Surface Water	Water Contamination leading to deterioration of water quality	Moderate (negative)	Negligible (negative)
Air Quality	Stockpiling will result in dust emissions and reduced air quality.	Moderate (negative)	Negligible (negative)
	Hauling leads to emission and poor air quality.	Moderate (negative)	Negligible (negative)
	Crushing of ore results in fugitive dust emissions.	Moderate (negative)	Negligible (negative)
	Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter.	Moderate (negative)	Negligible (negative)

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Wetlands	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Moderate (negative)	Minor (negative)
	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland (and is a tributary to the Klein Olifants River) will negatively impact water quality as coal fines will very likely be transported from the conveyor into the surrounding environment. Negative impacts from maintenance of the conveyor servitude may also occur. Stockpiling of coal also represents risks to the environment that much be managed.	Moderate (negative)	Minor (negative)
Aquatics	Subsidence of land within the river catchment and subsidence of land underneath river channels (32 m to 128 m).	Moderate (negative)	Minor (negative)
	Contamination of surface water through contaminated runoff and contaminated seepage influx.	Moderate (negative)	Minor (negative)
Socio-economic	Employment Creation During Operation.	Minor (Positive)	Moderate (positive)
	Economic Growth And Diversification.	Minor (Positive)	Moderate (positive)
Visual	Mooivley West, Hendrina South and Mooivley East- Stockpiling of material on the overburden stockpiles, waste rock berms and product stockpiles will have a negative visual impact on the receiving environment.	Moderate (negative)	Moderate (negative)
	Mooivley West and Hendrina South - Dust from the crushing and screening plants will have a negative visual impact on the receiving environment.	Moderate (negative)	Moderate (negative)

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
	Mooivley East - Dust from the crushing and screening plants will have a negative visual impact on the receiving environment.	Moderate (negative)	Moderate (negative)

Table C: Summary of the Moderate to Major Impacts expected during the Decommissioning and Closure phase

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Surface water	Mine decanting resulting in contamination of surface water bodies	Moderate (negative)	Negligible (negative)
Groundwater	Mine decanting and contamination of surface water bodies after mine closure.	Moderate (negative)	Negligible (negative)
Wetland	Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.	Major (negative)	Moderate (negative)
Aquatic	Decant of severely contaminated water into local aquatic ecosystems.	Major (negative)	Minor (negative)
Socio-economic	Dependency on Mine for Sustaining Local Economy.	Moderate (negative)	Minor (negative)

In light of the potential impacts, an EMP has been compiled (see Section 5, 6 and 7 Part B, of this report) to ensure that the potential impacts remain within acceptable levels. Monitoring and management measures have furthermore been prescribed to determine compliance and the effectiveness of the prescribed mitigation and management measures over time.

Conclusions and Recommendations

Following the completion of the various specialist studies appended to this report and the identification and assessment of the expected impacts, it is the opinion of Digby Wells that the proposed project can be authorised. This opinion holds provided that all the recommendations proposed in the specialist studies and the EIA and EMP as well as legislative requirements are implemented and adhered to.

It must be noted however, that the project has the potential to result in significant negative impacts on the natural wetlands and has the potential to alter the functioning of these systems and compromise their ecosystem services provided. However, should the recommendations for higher safety factors be adhered to, as per the recommendations from a comprehensive geotechnical assessment (yet to be completed); the impact can be considerably reduced to a minor impact. The main potential negative impacts are highlighted in Section 11 which also summarises the impact score prior to and after the recommended mitigation measures.

It can be concluded that the project will have a residual negative impact to the wetlands and their catchment areas. Umcebo will need to take this into consideration and manage the residual impact with adequate rehabilitation actions and if need be with an offsetting strategy to ensure no-nett-loss of wetland functionality. The monitoring plans throughout the Life of the Mine (LoM) must also inform Umcebo on the impacts to the wetlands and the remedial actions required.

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ACRONYMS AND ABBREVIATIONS

Acronym	Description
AsgiSA	Accelerated and Shared Growth Initiative for South Africa
Ca	Calcium
CBA	Critical Biodiversity Area
CBD	Central Business District
CEC	Cation Exchange Capacity
CRR	Comment and Response Report
CSR	Corporate Social Responsibility
DMR	Department of Mineral Resources
DoE	Department of Energy
DoL	Department of Labour
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EMFs	Environmental Management Frameworks
EMP	Environmental Management Plan
ERD	Effective Rooting Depths
ESA	Ecological Support Area
GIS	Geographic Information System
Glencore	Glencore Operations South Africa (Pty) Ltd
GSDM	Gert Sibande District Municipality
HDSA	Historically Disadvantaged South Africans
Ha	Hectares
HGV	Heavy Goods Vehicles
HRD	Human Resource Development
HRM	Heritage Resources Management
I&APs	Interested and Affected Parties
IBA	Important Bird Area

Acronym	Description
IDP	Integrated Development Plan
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
K	Potassium
K- Factor	Soil Erodibility Factor
kV	Kilovolt
LED	Local Economic Development
LoM	Life of Mine
L/s	Litres per second
MAE	Mean Annual Evaporation
mamsl	metres above mean sea level
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
mbgl	metres below ground level
MBSP	Mpumalanga Biodiversity Sector Plan
MLM	Msukaligwa Local Municipality
mm	millimetres
Mm^3	million cubic metres
MPRDA	Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)
mS/m	milliSiemen per metre
MRA	Mining Right Application
MRDP	Mpumalanga Rural Development Programme
MNCA	Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998)
MTGS	Mpumalanga Tourism Growth Strategy
MTPA	Mpumalanga Tourism and Parks Agency Act, 2005 (Act No. 5 of 2005)
MW	Megawatts
mya	million years ago
Na	Sodium
NCR	Noise Control Regulations
NDM	Nkangala District Municipality

Acronym	Description
NDP	National Development Plan
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)
NEM:PA	National Environmental Management: Protected Areas Act, 2003 (Act. No. 57 of 2003)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)
NFEPA	National Freshwater Ecosystems Priority Area
NHRA	National Heritage Resources Act, 1999 (Act No. 25 of 1999)
NMT	Non-motorised Transport
NoK	Next of Kin
NPAES	Nationally Protected Areas Expansion Strategy
NQF	National Qualifications Framework
NWA	National Water Act, 1998 (Act No. 36 of 1998)
P	Phosphorus
PCD	Pollution Control Dam
PES	Present Ecological Status
PPP	Public Participation Process
PR	Prospecting Right
PRECIS	National Herbarium Pretoria Computerised Information System
PSSC	Possible Species of Special Concern
RE	Remaining Extent
ROM	Run of Mine
RWQOs	Resource Water Quality Objectives
SEMA	Specific Environmental Management Act
SAWQG	South African Water Quality Guidelines
SMMEs	Small, Medium and Micro-sized Enterprises
SLP	Social and Labour Plan
SPLUMA	Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013)
SSC	Species of Special Concern
STLM	Steve Tshwete Local Municipality
SQR	Sub-Quaternary-Reaches

Acronym	Description
TOPS	Threatened or Protected Species
Umcebo	Umcebo Mining (Pty) Ltd
WMA	Water Management Area
WML	Waste Management Licence
Zn	Zinc

Part A: Scope of Assessment and Environmental Impact Assessment Report

1 Introduction

Umcebo Mining (Pty) Ltd (Umcebois proposing the development and operation of a new underground coal mine and associated infrastructure (proposed project) at sites situated between approximately 10 to 22 kilometres (km) south east of Hendrina in the Mpumalanga Province of South Africa (project site).

Umcebo currently holds two Prospecting Rights (PRs), namely, MP 1265 PR and MP 1266 PR, on properties located within the Ermelo Coal Field. The total extent of MP 1265 PR (referred to as Mooivley East and Mooivley West) is 3 927 hectares (ha) and comprise the following farms and portions:

- Mooivley 219 IS – Potions 2, 4, 5 and Remaining Extent (RE) of the farm;
- Tweefontein 203 IS – Portions 2, 15, 16, 17 and Portion of Portion 14;
- Uitkyk 220 IS – Portions 2 and 3; and
- Orange Vallei 201 IS – Portions 1 and RE of the farm.

The total extent of MP 1266 PR (referred to as Hendrina South) is 2 788 ha and comprises the following farm and portions:

- Elim 247 IS - RE of the farm;
- Geluksdraai 240 IS – Portions 1 and 2;
- Orpenskraal 238 IS – RE of the farm; and
- Bosmanskrans 217 IS – Portions 1, 3, 4, 6, 8, 9 and RE of the farm.

In terms of the requirements of the Minerals and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002), (MPRDA) as amended, a Mining Right Application (MRA) must be submitted to the Department of Mineral Resources (DMR) for the proposed project. In support of the MRA, an Environmental Impact Assessment (EIA) process must be undertaken in accordance with the EIA Regulations, 2014 (promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA). The EIA process will include the following applications:

- An Environmental Authorisation (EA) for listed activities as contained in Government Notice Regulations (GN R) GN R984 and R985);
- Waste Management Licence (WML) in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM: WA);
- Heritage Resources Management (HRM) Process in accordance with section 38(8) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA); and
- An Integrated Water Use Licence Application (IWULA) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) will also be made for water uses associated with the proposed project.

The purpose of the EIA process is to ensure that potential environmental and social impacts associated with construction, operation and closure/ rehabilitation of a project are identified, assessed and appropriately managed. There are two primary phases of an EIA process, namely the scoping phase and the impact assessment phase. Identification of potential impacts occurs during the scoping phase, whilst the assessment and mitigation of those impacts occurs during the impact assessment phase.

An application for a Mining Right in accordance with the MPRDA was lodged with the DMR on 14 April 2016. The mining right was acknowledged by the DMR on 7 June 2016 and the environmental authorisation on 29 April 2016 with reference number MP 30/5/1/2/2/10129 MR. Following a public participation process the scoping report was submitted on 27 May 2016 which was subsequently accepted on 2 November 2016. Following this acceptance of the scoping report we have progressed into the EIA phase.

The EIA Report presents the findings of the EIA phase. The report aimed to characterise the environmental and social context and identify and assess potential environmental and social impacts associated with the proposed project. Through this assessment, mitigation and monitoring measures have been recommended to reduce or eliminate any potential impacts that were identified which have culminated in an Environmental Management Plan (EMP). The Draft EIA Report has been updated to a final version and has been submitted to the DMR for final review and decision making.

2 Item 3: Project applicant

2.1 Item 3(a)(i): Details of the Environmental Assessment Practitioner

Digby Wells and Associates (South Africa) (Pty) Ltd (trading as Digby Wells Environmental – hereafter Digby Wells) has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process and associated IWULA. The details of the EAP are provided in Table 2-1.

Table 2-1: Contact Details of the EAP

Name of Practitioner:	Ms Barbara Wessels
Telephone:	011 789 9495
Fax:	011 069 6801
Email:	barbara.wessels@digbywells.com

2.2 Item 3(a)(ii): Expertise of the Environmental Assessment Practitioner

2.2.1 The Qualifications of the Environmental Assessment Practitioner

Barbara Wessels completed a BSc (Geography and Environmental Management) degree at the University of Johannesburg in 2005. Refer to Appendix 1 for her Curriculum Vitae (CV).

2.2.2 Summary of the EAP's Past Experience

Barbara Wessels completed a BSc (Geography and Environmental Management) degree in 2005 and have been working as an environmental consultant since 2006 with the main focus on the mining industry. She has good knowledge of the relevant environmental legislation and associated processes. During her career she has compiled numerous EIA and EMP reports and managed the associated multi-disciplinary processes.

Other environmental related projects she has been involved with include due diligence, EMP auditing, closure cost assessments, water use licensing, waste management, aquatic assessments and biomonitoring as well as the compilation of rehabilitation plans. She has also worked in various African countries.

3 Item 3(b): Description of the Property

Table 3-1 provides a detailed list of all the affected project farms. Plan 1 in Appendix 3 provides the land tenure map which indicates the farms and portions on which the proposed project is located.

Table 3-1: Details of the Affected Farms Properties

Farm Name:	**MP 1265 PR - Mooivley East and Mooivley West**	
	Farm	**Portion Number**
	Mooivley 219 IS	Portions 2, 4, 5 and the RE of the farm
	Tweefontein 203 IS	Portions 2, 15, 16 and 17 and Portion of Portion 14 of the Farm
	Uitkyk 220 IS	Portion 2 and 3
	Orange Vallei 201 IS	Portion 1 and the RE of the farm
	MP 1266 PR – Hendrina South	
	Farm	**Portion Number**
	Elim 247 IS	RE of the farm
	Geluksdraai 240 IS	Portions 1 and 2
	Bosmanskrans 217 IS	Portions 1, 3, 4, 6, 8, 9 and the RE of the Farm
	Orpenskraal 238 IS	RE of the Farm
Application Area (Ha):	**MP 1265 PR - Hendrina South** **Total Hectares: 3927.4763 3 923 ha**	

Farm	Hectares (Ha)
Mooivley 219 IS (1 004 ha)	Portion 2 – 64 ha
	Portion 4 – 236 ha
	Portion 5 – 247 ha *registered as (Portion 5 (Portion of Portion 1)
	Portion Remaining Extent of the Farm – 458 ha
Tweefontein 203 IS (1 033 ha)	Portion 2 – 373 ha
	Portion 15 – 214 ha *registered as (Portion 15 (Portion of Portion 1)
	Portion 16 – 214 ha *registered as (Portion 16 (Portion of Portion 1)
	Portion 17 – 214 ha *registered as (Portion 17 (Portion of Portion 1)
	A Portion of Portion 14 of the Farm – 17 ha *approximate {128 ha (Portion 14)} Additional portion not in principal prospecting right
Uitkyk 220 IS (1 252 ha)	Portion 2 – 429 ha *registered as (RE 2)
	Portion 3 – 823 ha *registered as (Portion 3 (Portion of Portion 2)
Orange Vallei 201 IS (638 ha)	Portion 1 - 347 ha
	Remaining Extent of the Farm - 292 ha

MP 1266 PR - Hendrina South
Total Hectares: 2787 ha

Farm	Hectares
Elim 247 IS (517 ha)	Remaining Extent of the Farm - 517 ha
Geluksdraai 240 IS	Portion 1 - 85.6532 ha
	Portion 2 - 171.3064 ha
Bosmanskrans 217 IS (2 314 ha)	Portion 1– 428 ha
	Portion 3 – 429 ha
	Portion 4– 319 ha
	Portion 6 – 428 ha *registered as (Portion 6 (Portion of Portion 1)
	Portion 8 - 44 ha *registered as (Portion 8 (Portion of Portion 4)
	Portion 9 – 109 ha
	Remaining Extent of the Farm – 191 ha
Orpenskraal 238 IS - 64.9009 Ha	Remaining Extent of the Farm -64.9009 ha

<table>
<tr><td></td><td><table><tr><td></td><td>*has been subdivided and now known as Portion 2.</td></tr></table></td></tr>
<tr><td>Magisterial District:</td><td>Middelburg, Magisterial/ Administrative District Middelburg</td></tr>
<tr><td>Distance and direction from nearest town:</td><td>
MP 1265 PR - Mooivley East and Mooivley West
<table>
<tr><th>Farm</th><th>Distance and Direction from Nearest Town</th></tr>
<tr><td>Mooivley 219 IS</td><td>12 km South East of Hendrina</td></tr>
<tr><td>Tweefontein 203 IS</td><td>8 km South East of Hendrina</td></tr>
<tr><td>Uitkyk 220 IS</td><td>10 km South of Hendrina</td></tr>
<tr><td>Orange Vallei 201 IS</td><td>8 km South East of Hendrina</td></tr>
</table>
MP 1266 PR - Hendrina South
<table>
<tr><th>Farm</th><th>Distance and Direction from Nearest Town</th></tr>
<tr><td>Elim 247 IS</td><td>19 km South East of Hendrina</td></tr>
<tr><td>Geluksdraai 240 IS</td><td>22 km South East of Hendrina</td></tr>
<tr><td>Bosmanskrans 217 IS</td><td>22 km South East of Hendrina</td></tr>
<tr><td>Orpenskraal 238 IS</td><td>22 km South East of Hendrina</td></tr>
</table>
The Hendrina Farms are situated on Davel Road approximately 10 to 15 km outside the town of Hendrina towards Ermelo.
</td></tr>
<tr><td>21 digit Surveyor General Code for each farm portion:</td><td>
MP 1265 PR - Mooivley East and Mooivley West
<table>
<tr><th>Farm</th><th>Portion</th><th>21 digit Surveyor General Code</th></tr>
<tr><td>Mooivley 219 IS</td><td>RE</td><td>T0IS00000000021900000</td></tr>
<tr><td>Mooivley 219 IS</td><td>2</td><td>T0IS00000000021900002</td></tr>
<tr><td>Mooivley 219 IS</td><td>4</td><td>T0IS00000000021900004</td></tr>
<tr><td>Mooivley 219 IS</td><td>5</td><td>T0IS00000000021900005</td></tr>
<tr><td>Tweefontein 203 IS</td><td>2</td><td>T0IS00000000020300002</td></tr>
<tr><td>Tweefontein 203 IS</td><td>Ptn of Ptn 14</td><td>T0IS00000000020300014</td></tr>
<tr><td>Tweefontein 203 IS</td><td>15</td><td>T0IS00000000020300015</td></tr>
<tr><td>Tweefontein 203 IS</td><td>16</td><td>T0IS00000000020300016</td></tr>
<tr><td>Tweefontein 203 IS</td><td>17</td><td>T0IS00000000020300017</td></tr>
<tr><td>Uitkyk 220 IS</td><td>2</td><td>T0IS00000000022000002</td></tr>
<tr><td>Uitkyk 220 IS</td><td>3</td><td>T0IS00000000022000003</td></tr>
<tr><td>Orange Vallei 201 IS</td><td>RE</td><td>T0IS00000000020100000</td></tr>
<tr><td>Orange Vallei 201 IS</td><td>1</td><td>T0IS00000000020100001</td></tr>
</table>
MP 1266 PR - Hendrina South
<table>
<tr><th>Farm</th><th>Portion</th><th>21 digit Surveyor General Code</th></tr>
<tr><td>Bosmanskrans 217 IS</td><td>RE</td><td>T0IS00000000021700000</td></tr>
<tr><td>Bosmanskrans 217 IS</td><td>1</td><td>T0IS00000000021700001</td></tr>
</table>
</td></tr>
</table>

	Bosmanskrans 217 IS	3	T0IS00000000021700003
	Bosmanskrans 217 IS	4	T0IS00000000021700004
	Bosmanskrans 217 IS	6	T0IS00000000021700006
	Bosmanskrans 217 IS	8	T0IS00000000021700008
	Bosmanskrans 217 IS	9	T0IS00000000021700009
	Geluksdraai 240 IS	1	T0IS00000000024000001
	Geluksdraai 240 IS	2	T0IS00000000024000002
	Elim 247 IS	RE	T0IS00000000024700000
	Orpenskraal 238 IS	RE	T0IS00000000023800000

4 Item 3(c) of Appendix 3: Locality Map

The project site falls within two district and local municipalities, namely the Steve Tshwete Local Municipality (STLM) situated within the Nkangala District Municipality (NDM) and the Msukaligwa Local Municipality (MLM) situated within the Gert Sibande District Municipality (GSDM). A regional plan (Plan 2 in Appendix 3) and local setting plan (Plan 3 in Appendix 3) has been included below.

5 Item 3(d) of Appendix 3: Description of the Scope of the Proposed Overall Activity

5.1 Item 3(d)(i): Listed and Specified Activities

The preliminary infrastructure layout plan is illustrated in Plan 4 in Appendix 3. The proposed project activities as well as the aerial extents of the activities are provided in Table 5-1. The table also provides an indication of those activities listed in terms of the EIA Regulations, 2014 and waste management activities listed in terms of the GN R921 of the NEM: WA. All specialist studies undertaken as part of this EIA phase have assessed the impact of this preliminary infrastructure plan. Following the impact assessment mitigation measures and recommendations were provided. Following these recommendations a final infrastructure layout plan was compiled to include all mitigation measures and relocated infrastructure to avoid sensitive areas.

Table 5-1: Project Activities

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Total Mining Right Area	Hendrina South: 2 788.01 ha Mooivley West: 2 547.46 ha Mooivley East: 1 379.03 ha Total area = 6 714.50 ha	X – Activity 17	GNR 984	
Underground Coal Mining (Bord and Pillar)	Hendrina South : 1 065.47 ha Mooivley West: 1 542.91 ha Mooivley East: 407.39 ha Total area = 3 015.77 ha	X – Activity 17	GNR 984	
Site Clearance (boxcut, roads and infrastructure placement)	Hendrina South : 5.8 ha Mooivley West: 18 ha Mooivley East: 18 ha Total area = 42 ha	X – Activity 27 X – Activity 12	GNR 983 GNR 985	
Development of haul/ access roads	15 291 m – Combined length	X – Activity 24	GNR 983	
Incline Shafts and Ventilation Shafts	Per Mining Area: 2 x incline shafts – 0.5 ha; and 1 x ventilation shaft – 0.25 ha	X - Activity 17 X – Activity 12	GNR 984 GNR 985	
Office Area	43 ha - Combined Area	N/A	Not Listed	
Diesel Generator Set	105 m^2 Combined Area	X- Activity 2	GNR 983	

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Crushing and screening plant	0.4 ha Combined Area	X – Activity 21	GNR 984	
Sewage Treatment Plant	44 m^2 Combined Area	X – Activity 25	GNR 983	
Water Treatment Plant	44 m^2 Combined Area	N/A	Not Listed	
Stockpiling	Topsoil – 9 ha Combined Area Overburden Stockpile – 3 ha Combined Area Product Stockpile – 74 ha each Combined Area	X – Activity 6 X - Activity 17	GNR 984 GNR 984	
Pollution Control Dam (PCD) per mining area	Hendrina South = 0.6 ha Mooivley West = 0.8 ha Mooivley East = 0.8 ha	X – Activity 6	GNR 984	
Water Pipelines	2 300 m – Combined Length	X – Activity 9	GNR 983	
Mine Dewatering	Hendrina South : 1 065.47 ha Mooivley West: 1 542.91 ha Mooivley East: 407.39 ha Total area = 3 015.77 ha	X – Activity 6	GNR 984	
Storage of Fuel, Lubricant and Explosives	732 m^2 – Combined Area	X – Activity 4	GNR 984	
Generation and Temporary Storage of Waste (hazardous and general)	25 m^3 (3 x Skips) per shaft	N/A	Not Listed	X - GN R 921

Name of Activity	Aerial extent of the activity	Listed Activity	Applicable Listing Notice	Waste Management Authorisation
Overland Conveyor	Conveyor = 3 196 m (length)	X – Activity 17 X – Activity 7 X – Activity 8	GNR 984 GNR 984 GNR 985	
Rehabilitation of Project area	Hendrina South : 5.8 ha Mooivley West: 18 ha Mooivley East: 18 ha Total area = 42 ha	N/A	Not Listed	

5.2 Item 3(d)(ii): Description of the Activities to be undertaken

For the purposes of this EIA report the **project site** refers to the mining right area which includes Mooivley East, Mooivley West and Hendrina South, whilst the **project area** refers to the local areas surrounding the project site.

5.2.1 Project Overview

The project area comprises three underground reserve blocks namely Mooivley East, Mooivley West and Hendrina South. Each mining area will comprise of a shaft system with two shafts accesses (man and material) and one ventilation shaft. Mining will commence at Mooivley West and Hendrina South at the same time. Mooivley East mining activities will commence following the mining of Mooivley West.

The estimated Life of Mine (LoM) will be 36 years[3] for all mining areas with a production rate of 2.4 million tonnes per annum at full capacity, with a total of approximately 78 million tonnes of Run of Mine (ROM) coal. The mine will reach full production within the first four years after completion of the construction phase.

The quality of coal makes it suitable for use in the domestic thermal market (Eskom). The coal product will be transported to a nearby Eskom power station (e.g. Kusile, Kendal, Kriel, or Grootvlei); via the existing road network.

The project is proposed to commence with construction and development when all required licences and authorisations are granted.

5.2.2 Mineral Resource

The coal deposit is situated within the Karoo Sequence and varies between 32 to 128 metres (m) below ground level (mbgl). The project area is underlain by Ecca Group, sandstone, shale and coal seams of the Vryheid formation which may be intruded by dolerite sills and dykes. In the northern portion of the Ermelo coal field the coal seams are named from A at the top down to D, at the base (refer to Figure 5-1).

[3] The MRA will be made for an initial period of 30 years, the maximum allowed in terms of the provisions of Section 23 of the MPRDA. At the end of this period an application for renewal of the mining right will be made for any remaining reserves.

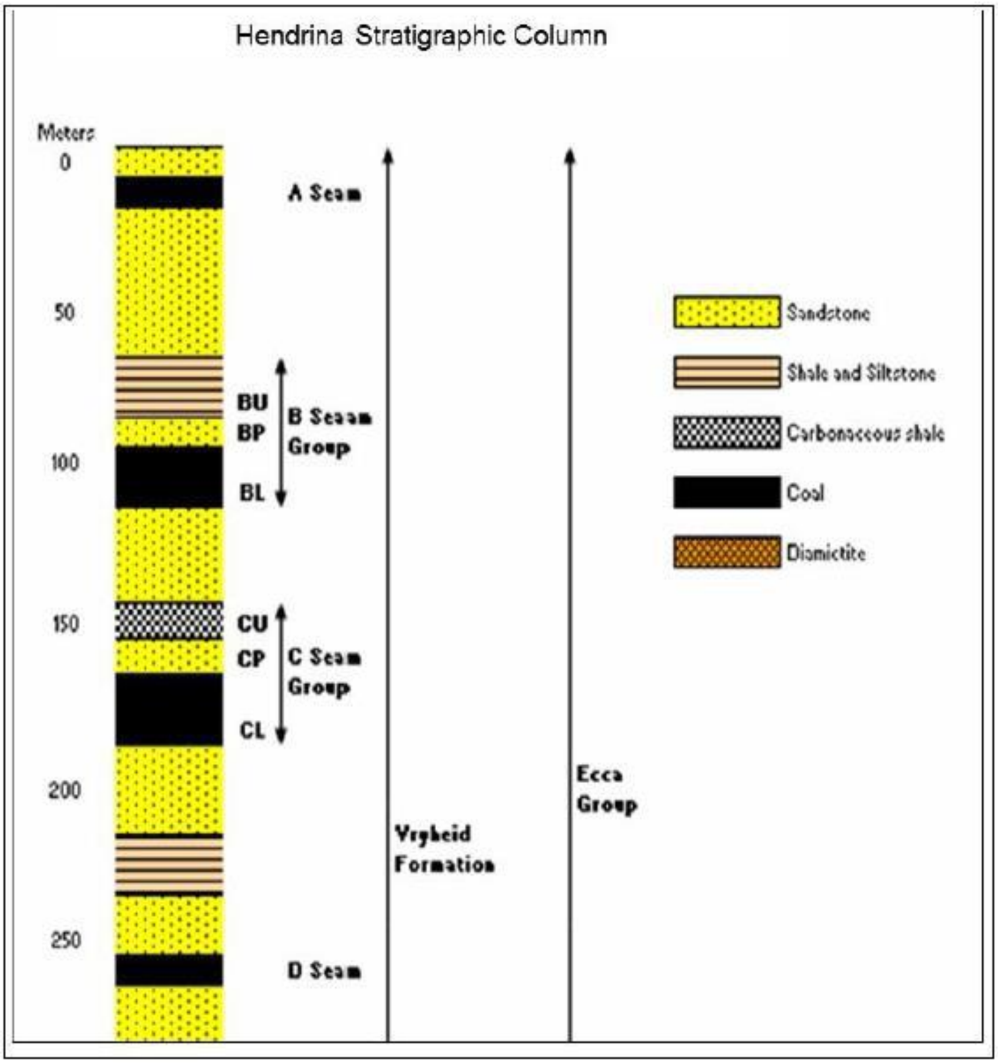

Figure 5-1: Typical Stratigraphic Column for the Project Coal Reserve

The E seam has a maximum thickness of over 3 m in the northern part of the coal field. It is composed predominantly of bright banded coal but it becomes torbanitic and/or shaly towards the north. The C seam is traditionally subdivided into the C Lower and C Upper seams. The C Lower seam is normally less than 0.6 m thick. The upper portion of the C Upper seam is of low grade and may be torbanitic in places. The thickness of the composite seam varies between 0.7 m and 4 m. The B seam may reach a thickness of up to 3 m and comprises mainly dull coal. The A Seam is normally less than 1 metre thick and of low grade.

A geological investigation was undertaken by Shanduka Coal (May, 2012) to evaluate the regional and local geology and coal resource within the project area. The prospecting results revealed a structurally complex coal reserve with high occurrences of dolerite intrusions in the form of sills and dykes. Table 5-2 indicates the measured, indicative and inferred resource for the B and C seams. Based on the findings of the Shanduka Report, only the B seam will be mined for this project.

Table 5-2: Project Resource Statement

Raw Quantities										Resources		
Area	**Seam**	**RD**	**Typical Thickness (m)**	**Typical Raw CV (MJ/Kg)**	**Typical Raw Ash (%)**	**Typical Raw Volatile Metter (%)**	**Typical Raw Fixed Carbon (%)**	**Typical Raw Total Sulfur (%)**	**Typical Raw Inherent Moisture (%)**	**Measured (Mt)**	**Indicated (Mt)**	**Inferred (Mt)**
MP 1265 PR	B seam	1.71	2.24	17.42	40.22	18.41	38.56	1.21	2.82	92.2	22.3	3.6
MP 1265 PR	B seam	1.67	2.18	19.40	35.40	18.70	43.40	1.06	2.50		78.0	
Total										**92.2**	**100.3**	**3.6**

5.2.3 Mining Method

Due to the depth of the resource (i.e. 32 m to 128 m), underground mining will be used to access the ore body. Each mining area will comprise of a shaft system with two shafts accesses (man and material) and one ventilation shaft. The shafts will be constructed to gain access to the underground resource; this will be done through blasting, using packaged explosives or boosters and Ammonium Nitrate Fuel Oil (ANFO). The shafts will be approximately 75 m deep incline shafts. The access shaft will measure about 5 000 m^2. A ventilation shaft will measure about 2 500 m^2.

The proposed mining method for the extraction of coal will be bord and pillar. In mechanised bord and pillar mining, extraction is achieved by developing a series of roadways (bords) in the coal seam connected by splits (cut-throughs) to form pillars, using continuous miners and shuttle cars. These pillars are left behind as part of a primary roof support system. It is expected that there will be dolerite intrusions and a dyke development section will be deployed for the purpose of mining through these and preparing new mining sections.

5.2.4 Mineral Processing

The ROM will be transported, via conveyor, to a crushing and screening plant (2 000 m^2), which will be located within the footprint of the product stockpile. The crushing and screening plant will be located on Mooivley West and on Mooivley East once Mooivley West underground mining has been completed.

The crushing and screening plant feeds ROM material into a tipping bin, the maximum top size is determined by a static grizzly of 1 200 x 1 200 millimetres (mm) slots. Raw coal from the bin will be sized in a double roll primary crusher to 350 mm material. The 350 mm material will be fed into the secondary crusher to produce 120 mm material. The material from the secondary crusher will be fed into a vibrating screen with 50 mm screen apertures. The material larger than 50 mm will be fed into the tertiary crusher to produce -50 mm material. The tertiary crusher product and the screening undersize material will be combined together resulting in a -50 mm stockpile. The process is designed to crush the oversize coal to the desired size. The coal product from the crushing and screening plant will be transferred onto a conveyor belt (approx. 100 m in length) which will feed the coal product on a stockpile area to create cone type stockpiles of 30 m in diameter each.

Coal quantity and quality will be monitored daily for moisture, ash, volatility, fixed carbon, calorific value and sulfur. Figure 5-2 illustrates the process undertaken within the crushing and screening plant.

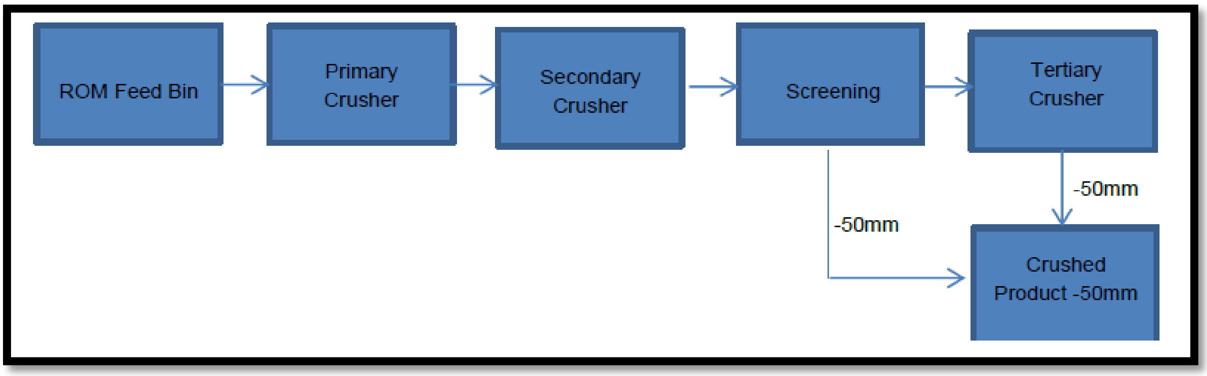

Figure 5-2: Crushing and Screening Plant

5.2.5 Associated Mine Infrastructure

All proposed mine infrastructure has been reflected on Plan 4 in Appendix 3 and includes the following:

- Crushing and screening plant;
- Overburden and Product Stockpiles;
- Access and Service Roads (with weighbridge);
- Overland Conveyor;
- Three Access Points to the Underground Reserve (Two shafts per Access Point);
- Three Ventilation Shafts (One per Access Point);
- Office Complex (change house, workshop, offices);
- Three Pollution Control Dams (PCD) and water pipelines;
- Five Aboveground Storage Tanks for the storage of diesel;
- Three Waste Bins per Shaft Area;
- Site Fencing located around the Conveyer Belt and each Mining Complex;
- Diesel Generator and Sub-station;
- Water Treatment Plant; and
- Package Sewage Treatment Plant.

5.2.5.1 Stockpiles

Any overburden material extracted will be stockpiled and used to rehabilitate the incline shafts once mining is completed. Each overburden stockpile will have a footprint of 1 ha with a volume of 75 000 m^3 and a height of 18 m and will be located on Hendrina South and Mooivley West and later at Mooivley East.

In terms of product stockpiles, there will be two product stockpiles located on Mooivley East and Mooivley West. These stockpiles will have an area of 40 000 m^2 and a height of 10 m. There will be no product stockpile at Hendrina South as the ROM coal will be transported via an overland conveyer belt to the crushing and screening plant at Mooivley West.

During the site clearance and construction phase, topsoil stockpiles are proposed to be established. The topsoil stockpiles will be located at Mooivley East, Mooivley West and Hendrina South. These topsoil stockpiles will be reused during the rehabilitation phase. The total area per topsoil stockpile is estimated to be 30 000 m^2 with a height of 3 m.

5.2.5.2 Site Access and Product Transport

The Mooivley West mining area will be accessed via the Davel Road which branches off in a southern direction from the N11 Highway. An access road will be constructed off the Davel Road to enter Mooivley West. This road is expected to be 6 m wide, which extends toward the office complex and associated parking area. There are also project site service roads of approximately 9 436 m in total length which will have a weighbridge of approximately 342 m to weigh the product before leaving the site.

The Davel Road which is currently a gravel road will be paved. The paving will be constructed using three layers. The lower layer is estimated to be 150 mm thick. The *in situ* Material is required to be of G7 Quality which will be ripped and re-compacted to 93% MOD AASHTO density. The middle layer will be 150 mm thick with G6 quality material and compacted to 95% MOD AASHTO density. The upper layer will be 150 mm thick with G5 quality material and compacted to 95% MOD AASHTO density.

The ROM coal from Hendrina South will be transported to the crushing and screening plant located on Mooivley West via a conveyer belt. The conveyer belt will be closed and have a width of 1 050 mm and a length of 2 531 m. An access road with security fencing on both sides will be situated next to the conveyor. The access road will be 3.5 m wide.

Hendrina South will be accessed from Mooivley West along the service road/ access road located adjacent to the overland conveyer. All access roads will be upgraded to the required standards to prevent road deterioration. The shoulders and intersection of the access roads will be upgraded and widened.

The final coal product will be transported by truck via the Davel Road and N11 to the various Eskom power stations more specifically Kusile, Kendal, Kriel or Grootvlei, depending on the awarded contracts.

Once mining has ceased at Mooivley West, mining will commence at Mooivley East. At this time, a new access road of approximately 258 m will be developed off the N11 to access the Mooivley East area.

5.2.5.3 Water Supply and Management

Possible water sources for use in mining operations include on site dams as well as available site boreholes. However, it is estimated that once the mine reaches full production water will be abstracted from the underground reserves as well as available boreholes. Water will not be abstracted from surface water resources including dams and rivers. Pipes and pumps will be constructed to pump water from the underground reserves directly to the PCDs. Process water will be managed and re-used throughout the operations of the project via a clean and dirty water separation system, which shall include separate drains and sumps.

Water will be required for dust suppression for the mining operation particularly for the continuous miner, roofbolter and overland conveyor. All dirty water will be contained within the site and stored in the PCDs. A silt trap will be installed prior to the discharge of the dirty water into the PCDs to avoid silting up of the dams. It is estimated that approximately 500 m^3/day of water will be required during the construction phase while less than 2 000 m^3/day of water will be required during the operational phase. It must be noted that water will be continuously reused throughout the operation of the project and therefore top ups will only be required when water levels drop as a result of evaporation and dust suppression.

The water balance results are summarised as follows:

- The water requirements for the three sites were calculated based on the maximum water use of 2 000 m^3/day and these resulted in water demand of 20 333 m^3/month;
- The water balance calculations indicate that the water requirements (2 000 m^3/day) at the mine will not be met by the amount of underground water that is currently available will ranges between 0 and 1 000 m^3/day and the runoff which was within the ranges of 0 and 84 m^3/day;
- The deficit will therefore be in the order of magnitude of 1 000 m^3/day in total; and
- More specifically, the deficits were calculated to be in the dry season between 8 000 and 18 000 m^3/month per site and in the wet season between 7 000 and 15 000 m^3/month per site. The mine will have to investigate the source of the make-up water.

Stormwater management and drainage planning are critical for the management of water and waste at mining sites and a Stormwater Management Plan (SWMP) needs to be developed under the guidance of the Department of Water and Sanitation (DWS) Best Practice Guidelines (BPG) (DWS, 2006) focusing on stormwater management (BPG: G1).

Stormwater management will be implemented within the mining areas to ensure, where possible, that clean water is directed away from the mining area. Should stormwater fall within the dirty water areas this water will be transferred to the PCD's to prevent pollution of clean water sources. The combined length of the stormwater drains to be constructed at

Mooivley West is anticipated to be 7 360 m. The length of the stormwater drains to be constructed at Hendrina South is anticipated to be 4 208 m.

A stormwater management plan was compiled for the project area, which covered the clean and dirty water control requirements based on the placement of the proposed infrastructure as per Government Notice (GN) Regulation 704 requirements of the NWA. The summary of findings from the stormwater management plan includes but not limited to:

- The PCDs should have elevated downstream embankment/ walls on flat ground so that water can be contained within and not overflow to the downstream clean water receiving environment and the nearby watercourse;
- At normal operational volume, the PCDs should be able to hold the runoff generated during a 1:50 year storm event and have a 0.8 m free board;
- Silt traps should be in place in the dirty water channels before it enters into the PCDs. This should be placed in a manner that allows desilting clean up when the channels are silted up;
- The volumes of water pumped to and abstracted from the PCDs and water levels should be recorded on a daily basis; and
- The water quality in the PCDs should be monitored monthly to assist in the management/ maintenance of the water and salt balance.

Three proposed PCDs will be required for the mine. The purpose of a PCD is to store process water for re-use in the plant and underground mining area. The PCDs are proposed to be located at Mooivley East, Mooivley West and Hendrina South. Table 5-3 provides a description of the three lined PCDs.

Table 5-3: Detailed Description of the Three Lined PCDs

Pollution Control Dam	Capacity
Mooivley East PCD	24 000 m^3 (90 m X 90 m)
Mooivley West PCD	24 000 m^3 (90 m X 90 m)
Hendrina South PCD	10 000 m^3 (110 m x 30 m)

The PCDs will have a compaction layer of approximately 150 mm made from in situ material (Geosynthetic Clay Liner). The PCDs will be lined to comply with SANS 1526 (1991) and will have a high density polyethylene liner with a thickness of approximately 2000 microns. The liner will have a design life of 36 years. The design, operation and maintenance of the PCDs will be in line with Schedule 6 of GN R 704, and will be able to contain the 1: 50 year 24 hour flood peak volume. This water will be pumped back to operations or underground workings for re-use.

The water allocation per employee is estimated to be at 100 ℓ of water per day during both the construction and operational phase. The water will be sourced from the following water resources:

- Boreholes located on site – additional boreholes may have to be drilled; and
- Water abstracted from dewatering of the underground mining areas.

All portable water will be treated in a Water Treatment Plant, once treated this water will be stored in four 10 000 ℓ Jo Jo tanks for human consumption. The Water Treatment Plant will have a footprint of 22 m^2 and the Jo Jo tanks will occupy a footprint of 39 m^2.

It is envisaged that most of the water will be sourced from the underground reserve to reduce the reliance on borehole water.

5.2.5.4 Waste Management

General and hazardous wastes will be generated as a result of project activities. Table 5-4 provides a preliminary list of potential wastes that may be generated on site.

Table 5-4: Hazardous and General Waste Generated on site

Hazardous Waste	General Waste
▪ Hydrocarbon contaminated waste (e.g. rags, filters, oil drums); ▪ Fluorescent tubes, batteries, printer cartridges and acids; ▪ Aerosols and chemical waste; ▪ Contaminated soil; ▪ Sewage Waste; ▪ Contaminated Protective Personal Equipment (PPE); ▪ Polychlorinated biphenyls (PCBs); ▪ Pesticide-, herbicide-, insecticide- and fertilizer waste; and ▪ Paint and cleaning liquids include leftover paint, paint contaminated containers.	▪ Scrap Metal; ▪ Waste Tires and rubber – generated from vehicles, machinery and the conveyer belt; ▪ Non –contaminated plastic, timber, food waste, canteen waste, cardboard; ▪ Cement; ▪ Waste paper; ▪ Grey water from human consumption; ▪ Non-compactable waste includes ash, wood, used sand, general garden refuse such as trees and branches; and ▪ Cable.

It is anticipated that there will be a minimal amount of waste from the crushing and screening process, which will be discarded into the underground mined out areas.

To manage general and hazardous waste streams a Waste Management System (WMS) will be developed. The system adopts the basic principle of minimising wastes at the source and to recover or reuse wastes. Where this is not possible, waste should be treated, destroyed, or disposed of in an environmentally sound manner.

Waste will be separated in accordance with GNR 634 of November 2013: Waste Classification and Management Regulations, in accordance with NEM: WA. It should however be noted that the operation will also follow the Glencore Waste Management Guideline and Procedure, August 2015.

General wastes will be segregated and placed in colour-coded containers located around the site. Waste will be removed by a registered waste removal company and disposed of at an approved General Waste Landfill Site.

Hazardous waste cannot be re-used or recycled. The hazardous waste will be removed by an independent waste management contractor and disposed of at a hazardous waste facility. All hazardous waste will be stored in hazardous waste receptacles and labelled according to the type of hazardous waste. Material Safety Data Sheets (MSDs) will be developed for each hazardous waste generated on site and contain information on the correct handling and disposal of the waste. The storage areas for all hazardous waste will be demarcated and located on an impermeable surface with roof cover to prevent ingress from rain, generation of leachate and pollution.

Scrap metal and rubber components will be sent to the reclamation yard to be sold or recycled.

5.2.5.4.1 *Package Sewage Treatment Plant*

One Sewage Treatment Plant (STP) is proposed to be constructed on Mooivley West to treat and process the effluent generated as a result of the operation of the mine. The Package STP has a footprint of 22 m^2. The STP will have the capacity to process approximately 150 m^3 of effluent per day, however it is estimated that only 30 m^3 of effluent per day will be generated. It is anticipated that once treated the water will be discharged to the PCD for reuse into the mining process. Sludge will be disposed of by a certified Waste Contractor at a Licensed Disposal Waste Facility. It is estimated that a total of 20 m^3 of sludge per month will need to be removed.

The following classification of waste will be used at the project site, if operational:

- General waste, compactable and non-compactable;
- Waste paper recycling;
- Scrap metal;
- Globes and fluorescent tubes;
- Rubber waste;
- Medical waste;
- Chemical waste; and
- Hazardous waste.

The following waste facilities are anticipated as part of the project:

- PCD;
- Three domestic and hazardous waste temporary storage facilities/skips per shaft; and
- A package STP.

5.2.5.5 Power Supply

Power will be generated through the operation of diesel generators, with a combined power generating capacity of 15 Megawatts (MW) per mining area. The project requires approximately 10 to 15 Megavolt Ampere (MVA) of power. The power generated from each diesel generator set is thus considered to be sufficient for the operation of the proposed mine and associated facilities including the office and workshop buildings. The generators will each occupy a total area of 35 m^2. At this stage, it is not anticipated that power will be required from Eskom.

The power from the generators will be distributed via a 22 Kilovolt (kV) powerline and a stepdown transformer to reduce the voltage. Several substations will also be established for the purpose of stepping down the high voltage for use underground and for surface infrastructure. The substations will be at varying capacities: 11 kV, 66 kV, 550 Volts and 400 Volts and will have flameproof transformers for underground and oil cooled transformers for surface infrastructure. The total length of the powerlines to distribute the electricity is anticipated to be 608 m.

5.2.5.6 Hazardous Materials

During the construction and operation of the project, certain hazardous materials would be transported and stored on site. In particular, diesel would be required for the operation of the diesel generator and mining machinery and vehicles. Diesel will be trucked in by a third party contractor and will be stored in two aboveground storage tanks with a capacity of 82 m^3 or 82 000 ℓ each, thus the combined storage capacity will be approximately 164 m^3 or 164 000 ℓ. These two storage tanks will be placed within bunded walls to contain any leaks, should this occur.

Further to this, oils and other lubricants will also be stored within bunded areas in smaller quantities. Explosives required for developing the incline shafts will be stored in an explosives magazine.

5.2.5.7 Mine Buildings

The workshop and office area will be located at Mooivley West. A total area of 4.39 ha will be disturbed as a result of the construction of the mine buildings at each underground reserve. The infrastructure that will be located within this footprint includes a parking area, mine office, change house, a shift change area, bus drop off area, a security office, a workshop, a store, waste storage area, fuel station and wash bay.

Table 5-5 provides a description of the total area and heights of the various buildings proposed on site.

Table 5-5: Total area and heights of various proposed buildings

Mine Buildings	Total Area	High
Mine office	875 m^2	6 m
Change house	840 m^2	6 m
Shift change area	390 m^2	5 m
Workshop	743 m^2	14 m
Fuel station	366 m^2	N/A
Store	320 m^2	9 m
Security offices	68 m^2	4 m
Parking area	23 093 m^2	N/A

All buildings located on the mine will be mobile.

5.2.5.8 Mine Security and Fencing

Security will be implemented at the mine to ensure no unauthorised access to prevent theft and potential health and safety incidents. Security barbed wire fencing which will be made of galvanised steel will be situated around each mining complex located at Mooivley West, Hendrina South and Mooivley East. Additionally security fencing will be constructed around the access road and overland conveyer between Mooivley West and Hendrina South. The length of the security fencing at Mooivley West is expected to be 5 878 m. The length of the security fencing at Mooivley East is expected to be 4 504 m. The length of the security fencing at Hendrina South is expected to be 2 156 m.

5.2.5.9 Employment Requirements

The project is expected to require approximately 86 employees and personnel during the construction phase, with approximately 371 employees during the operational phase. The construction phase is anticipated to take a period of three years, with the LoM being approximately 36 years.

6 Item 3(e): Policy and Legislative Context

This section (Table 6-1, Table 6-2 and Table 6-3) aims to provide a description of the policy and legislative context within which the project is being proposed. This section has been divided into national, provincial and local legislation and policies, plans, guidelines and development planning frameworks and tools.

Table 6-1: National Legislation Applicable to the Project

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) Section 24 of the Constitution states that everyone has the right to an environment that is not harmful to their health or well-being and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures, that – i. Prevent pollution and ecological degradation; ii. Promote conservation; and iii. Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development	An EIA process has been undertaken to determine the impacts associated with the proposed project. As part of the EIA process, mitigation measures and monitoring plans have been recommended to ensure that any potential impacts are managed to acceptable levels to support the rights as enshrined in the Constitution.	An Application for Environmental Authorisation for the proposed project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 14 April 2016 detailing the proposed activities. A Scoping Report was compiled and submitted to the DMR on 27 May 2016 which detailed the biophysical and social environments which will be affected. An EIA phase has been undertaken where the impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).
Mineral and Petroleum Resource Development Act. 2002 (Act No. 28 of 2002) The MPRDA sets out the requirements relating to the development of the nation's mineral and petroleum resources. It also aims to ensure the promotion of economic and social development through prospecting and mining related activities. The MPRDA requires that mining companies assess the socio-economic impacts of their activities from start to closure and beyond. Companies must develop and implement a comprehensive Social and Labour Plan (SLP) to promote socio-economic development in their host communities and to prevent or lessen negative social impacts. A MRA submitted to the DMR in terms of the MPRDA must be succeeded by various documents including a Scoping Report, EIA Report and an Environmental Management Plan (EMP).	A MRA for the proposed project has been lodged with the DMR on 14 April 2016. The Scoping Report was submitted on 27 May 2016 following the lodgement of this application for the DMR's comment and consideration. This EIA report, which relates specifically to the Umcebo Mining Right has been compiled in accordance with the MPRDA read with the EIA Regulations, 2014.	An Application for Environmental Authorisation for the proposed Project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 14 April 2016 detailing the proposed activities. Along with this application a Mine Works Programme and Social Labour Plan (SLP) was also submitted. A Scoping Report was compiled and submitted to the DMR on 27 May 2016 which detailed the biophysical and social environments which will be affected. An EIA phase has been undertaken where the impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<u>National Environmental Management Act, 1998 (Act No. 107 of 1998)</u> The NEMA, as amended was set in place in accordance with section 24 of the Constitution of the Republic of South Africa. Certain environmental principles under NEMA have to be adhered to, to inform decision making for issues affecting the environment. Section 24 (1)(a) and (b) of NEMA state that: *The potential impact on the environment and socio-economic conditions of activities that require authorisation or permission by law and which may significantly affect the environment, must be considered, investigated and assessed prior to their implementation and reported to the organ of state charged by law with authorizing, permitting, or otherwise allowing the implementation of an activity.* The EIA Regulations, Government Notice Regulation (GN) R.982 were published on 04 December 2014 and promulgated on 08 December 2014. Together with the EIA Regulations, the Minister also published GN R.983 (Listing Notice No. 1), GN R.984 (Listing Notice No. 2) and GN R.985 (Listing Notice No. 3) in terms of sections 24(2) and 24D of the NEMA, as amended. **GN R. 982: Environmental Impact Assessment Regulations, 2014** These three listing notices set out a list of identified activities which may not commence without an Environmental Authorisation from the relevant Competent Authority through one of the following processes: ▪ Regulation GN R. 983 - Listing Notice 1: This listing notice provides a list of various activities which require environmental authorisation and which must follow a basic assessment process. ▪ Regulation GN R. 984 – Listing Notice 2: This listing notice provides a list of various activities which require environmental authorisation and which must follow an EIA process. ▪ Regulation GN R. 985 – Listing Notice 3: This notice provides a list of various environmental activities which have been identified by provincial governmental bodies which if undertaken within the stipulated provincial boundaries will require environmental authorisation. The basic assessment process will need to be followed.	The EIA process has been undertaken in accordance with the principles of Section 2 of NEMA as well as with the EIA 2014 Regulations, promulgated in terms of NEMA. The Listed Notices have been reviewed against the proposed project activities to determine the likely triggers. The listed activities which are potentially triggered under the Listing Notices are provided in Table 5-1. Based on the activities listed, it has been identified that a full EIA process is required for the proposed project. An application and Scoping report for the listed activities has been submitted to the DMR who is the relevant Competent Authority in terms of this application for Environmental Authorisation.	An Application for Environmental Authorisation for the proposed project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 14 April 2016 detailing the proposed activities. A Scoping Report was compiled and submitted to the DMR on 27 May 2016 which detailed the biophysical and social environments which will be affected. The scoping report was subsequently accepted on 2 November 2016. Following this acceptance an EIA phase has been undertaken where the impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) On 29 November 2013, the list of waste management activities published under GN R718 of 3 July 2009 (GN R718) was repealed and replaced with a new list of waste management activities under GN R921 of 29 November 2013. Included in the new list are activities listed under Category A, B and C. These activities include inter alia the following: ▪ Category A describes waste management activities requiring a Basic Assessment process to be carried out in accordance with the EIA Regulations supporting an application for a waste management licence; ▪ Category B describes waste management activities requiring an EIA process to be conducted in accordance with the EIA Regulations supporting a waste management licence application; and ▪ Category C describes waste management activities that do not require a WML but these activities will have to comply with the prescribed requirements and standards as prescribed by the Minister, which includes the Norms and Standards for Storage of Waste, 2013. These activities include the storage of general waste at a facility with a capacity to store in excess of 100 m3 and storage of hazardous waste in excess of 80 m3. The Waste Classification and Management Regulations published under GN R 634 of November 2013 require that all wastes be classified according to SANS10234 and managed according to its classification. The National Norms and Standards for the Assessment of Waste for Landfill Disposal were published under GN R635 on 23 August 2013 and prescribe the requirements for the assessment of waste prior to disposal to landfill in terms of Regulation 8(1)(a) of the Waste Classification and Management Regulations. The National Norms and Standards for the Disposal of Waste to Landfill were published under GN R 636 of 23 August 2013 and determine the requirements for the disposal of waste to landfill as contemplated in Regulation 8(1)(b) and (c) of the Waste Classification and Management Regulations. The Regulations Regarding the Planning and Management of Residue Stockpiles and Residue Deposits from a Prospecting, Mining, Exploration or Production Operation were published in GNR 632 on 24 July 2015 under section 69(1)(i) of the NEM: WA. The purpose of the Regulations is to regulate the planning and management of residue stockpiles and residue deposits from prospecting, mining, exploration or production operations.	The listed activities which are potentially triggered under the NEM: WA is provided in Table 5-1. Based on the activities listed, it has been identified that a full EIA process is required for the proposed project. The triggered waste management activities have been applied for as part of the Environmental Application to the DMR who is the relevant Competent Authority.	An Application for Environmental Authorisation which included a Waste Management License for the proposed Project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 14 April 2016 detailing the proposed activities. A Scoping Report was compiled and submitted to the DMR on 27 May 2016 which detailed the biophysical and social environments which will be affected. The scoping report was subsequently accepted on 2 November 2016. Following this acceptance an EIA phase has been undertaken where the impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also been compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) NEM: BA regulates the management and conservation of the biodiversity of South Africa within the framework provided under NEMA. This Act also regulates the protection of species and ecosystems that require national protection and also takes into account the management of alien and invasive species. This Act works in accordance to the framework set under NEMA. The following regulations which have been promulgated in terms of the NEM:BA are also of relevance: ▪ Alien and Invasive Species Lists, 2014 published (GN R.599 in GG 37886 of 1 August 2014) ; ▪ National Environmental Management: Biodiversity Act, 2004: Threatened and Protected Species Regulations; and ▪ National list of Ecosystems Threatened and in need of Protection under Section 52(1) (a) of the Biodiversity Act (GG 34809, GN R.1002, 9 December 2011).	As part of this proposed project, a flora, fauna, wetlands and aquatic assessment has been undertaken to determine the current status of the environment and to determine any potential ecological sensitivity to be avoided and/or mitigated. There are currently no applications submitted in terms of NEM: BA for the proposed project. This has been confirmed by the flora, fauna, wetlands and aquatic specialist.	The biological assessment details the areas within the Project areas which are of ecological importance. The findings of the biodiversity assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report and in Appendix 8. A list of threatened species that may occur within and may be impacted by the proposed project has been listed in further in Part A: Section 10.1.7.
National Environmental Management: Protected Areas Act, 2003 (Act.57 of 2003) The act aims to provide protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas.	Officially protected areas, either Provincially or Nationally that occur close to a project site could be impacted by the proposed project.	A Fauna and Flora Impact Assessment has been undertaken to determine whether any protected areas are located within the project site see Appendix 8.

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
<u>National Water Act, 1998 (Act No. 36 of 1998)</u> The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. **GN R704 National Water Act, 1998 (Act No. 36 of 1998)** Regulations 4 and 5 of the regulation on use of water for mining and related activities aimed at the protection of water resources, Government Notice Regulation 704 (GN R No. 704) published in June 1999, states the following: ▪ Regulation 4: No residue deposit, reservoir or dam may be located within the 1:100 year flood line, or less than a horizontal distance of 100 m from the nearest watercourse. Furthermore, person(s) may not dispose of any substance that may cause water pollution. ▪ Regulation 5: No person(s) may use substances for the construction of a dam or impoundment if that substance will cause water pollution. ▪ Regulation 6 is concerned with the capacity requirements of clean and dirty water systems, while Regulation 7 details the requirements necessary for the protection of water resources.	An IWULA and Integrated Water and Waste Management Plan (IWWMP) will be compiled and submitted to the Department of Water and Sanitation (DWS) as the decision making authority. The water uses which may be triggered under Section 21 of the NWA in relation to the proposed project are listed below: ▪ S21 (a) - Taking water from a water resource; ▪ S21(b) - Storing water; ▪ S21 (c) – Impeding or diverting the flow of water in a watercourse; ▪ S21 (g) – Disposing of waste in a manner which may detrimentally impact on a water resource; ▪ S21 (i) – Altering the bed, banks, course or characteristics of a watercourse; ▪ S21 (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.	A WULA will be submitted to the DWS for the triggered water uses under Section 21 of the NWA.
<u>National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)</u> According to the NEM: AQA the Department of Environmental Affairs (DEA), the provincial environmental departments and local authorities (district and local municipalities) are separately and jointly responsible for the implementation and enforcement of various aspects of NEM: AQA. A fundamental aspect of the new approach to the air quality regulation, as reflected in the NEM: AQA is the establishment of National Ambient Air Quality Standards (NAAQS) (GN R 1210 of 2009). These standards provide the goals for air quality management plans and also provide the benchmark by which the effectiveness of these management plans is measured.	An Air Quality Assessment has been undertaken to determine the baseline conditions of the air prior to the implementation of the proposed activities.	The proposed project activities have been set out to abide by the NEM: AQA and standards set out in the National Ambient Air Quality Standards. The impacts on air quality associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9). The air quality specialist study can be found in Appendix 7.
<u>National Dust Control Regulation. 2013</u> The Minister of Water and Environmental Affairs, released on the 01 November 2013 the National Dust Control Regulation, in terms of Section 53, read with Section 32 of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). In the published National Dust Control Regulations, terms like target, action and alert thresholds were omitted. Another notable observation was the reduction of the permissible frequency of exceedance from three to two incidences within a year. The standard actually adopted a more stringent approach than previously, and would require dedicated mitigation plans now that it is in force.	An Air Quality Assessment has been undertaken to determine the baseline conditions of the air prior to the implementation of the proposed activities.	The proposed project activities have been set out to abide by the NEM: AQA and standards set out in the National Ambient Air Quality Standards. The impacts on air quality associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
National Heritage Resources Act, 1999 (Act No. 25 of 1999) The National Heritage Resources Act, 1999 (Act No. 25 of 1999) (NHRA) is the overarching legislation that protects and regulates the management of heritage resources in South Africa. The Act requires that Heritage Resources Agency's in this case the South African Heritage Resources Agency (SAHRA). The Provincial Heritage Resources Authority Mpumalanga (PHRA-M) is responsible for the identification, conservation and management of heritage resources throughout the province. The Agency was established in terms of the NHRA.	A Notice of Intent to Develop (NID) was submitted, as part of the Scoping phase, to the Mpumalanga Provincial Heritage Resources Authority (PHRA-M) and the SAHRA. Furthermore, a Heritage Impact Assessment (HIA) has been undertaken and will be submitted as part of the EIA phase to the PHRA-M and the SAHRA.	All heritage/archaeological resources associated with the proposed Project site has been identified and will be avoided. Any chance finds will be communicated to SAHRA and the PHRA-M.
National Noise Control Regulations, R.154 of 1992 (the Noise Regulations) promulgated in terms of Section 25 of the Environmental Conservation Act, 1989 (Act 73 of 1989) The National Noise-Control Regulations (GN R154 in Government Gazette No. 13717 dated 10 January 1992) (NCRs) form part of the Environmental Conservation Act and these Regulations apply to external noise. The NCRs differentiates between Disturbing Noise levels (which is objective and scientifically measurable which are generally compared to existing ambient noise level) and Noise Nuisance (which is a subjective measure and is defined as noise that "disturbs or impairs or may disturb or impair the convenience or peace of any person"). Local Authorities use Controlled Areas to identify areas with high noise levels. Restrictions have been set out for development that occurs in these Controlled Areas. These regulations make provision for guidelines pertaining to noise control and measurements. The regulations make reference to the use of the South African National Standards 10103:2008 (SANS) guidelines for the Measurement and Rating of Environmental Noise with Respect to Land Use, Health, and Annoyance and to Speech Communication. As such, a Noise Impact Assessment in accordance with the NCRs must be undertaken for submission to determine the potential disturbing and nuisance noise levels associated with a particular development.	A Noise Impact Assessment has been undertaken as part of the EIA process to understand the potential impacts of the proposed activities	The proposed project activities will be set out to abide by the National Noise-Control Regulations and standards set out in the SANS 10103:2008. The noise impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9). The noise specialist study has been attached in Appendix 14.
Explosives Act, 1956 (Act No. 26 of 1956) This Act makes provision for, amongst others, storage, transport and the use of explosives. Section 6 of the Act makes provision for storage of explosives in licensed premises and Section 9 makes provision for use of blasting material without a permit. The Explosives Regulations GN R1604 (GG3648 of 8 September 1972 provides safety distances from explosive storage areas.	A Vibration and Blast Impact Assessment has been undertaken as part of the EIA process.	Umcebo will ensure that the external contractors are in possession of the relevant licence regarding storage and handling of explosives on site. However this does not form part of the EIA Process. The blasting impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Spatial Planning and Land Use Management Act, 2013 (Act No 16 of 2013) SPLUMA is a framework act for all spatial planning and land use management legislation in South Africa and came into force on 1 July 2015. Municipalities will as a result of the new legislation be solely responsible for processing and dealing with land use applications and the appeals relating thereto. Municipalities will have 5 years from commencement of the Act to adopt and approve a single land use scheme for all of its municipal area. The land use scheme must include appropriate categories of land use zoning and regulations for the entire municipal area, including areas not previously subject to a land use scheme. Rezoning will be required for land that was previously excluded from town planning schemes and zoned as "undetermined".	This Act will be relevant in terms of the required re-zoning applications related to this proposed project.	Mining companies will have to rezone mine property to comply with any new land use scheme of the Municipality, which would have an implication on rates and taxes after rezoning. However this does not form part of the EIA Process.
National Road Traffic Act, 1996 (Act No. 93 of 1996) The National Road Traffic Act aims to provide for road traffic matters, which shall apply uniformly throughout the Republic and for matters connected therewith.	A Traffic Impact Assessment (TIA) has been undertaken for the proposed project to investigate the potential impacts the project will have on the surrounding road networks.	The findings of the traffic impact assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report and attached as Appendix 15.
National Development Plan Development in South Africa is guided by the NDP, which presents a shared long-term strategic framework within which more detailed development planning can take place to advance the long-term goals adopted in the NDP (National Planning Commission, 2011). The Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and the reduction of inequality. The NDP 2030 sets a target of creating approximately 11 million new jobs and achieving an annual average economic growth rate of 5.4 % by 2030.	This NDP will be applicable in guiding Umcebo to ensure that all adjacent and affected communities attain a decent standard of living through the elimination of poverty and the reduction of inequality	The proposed project will create new job opportunities for the local communities during the Construction and Operational Phases.
South African Mining Charter The Mining Charter focuses on sustainable transformation of the mining industry. The Mining Charter seeks to achieve the following objectives: ▪ Promote equitable access to the nation's mineral resources to all the people of South Africa; ▪ Substantially and meaningfully expand opportunities for HDSAs to enter the mining and minerals industry and to benefit from the exploitation of the nation's mineral resources; ▪ Utilise and expand the existing skills base for the empowerment of HDSAs and to serve the community; ▪ Promote employment and advance the social and economic welfare of communities and major labour sending areas; ▪ Encourage beneficiation of South Africa's mineral commodities; and ▪ Promote sustainable development and growth of the mining industry.	A Social Impact Assessment has been undertaken during the EIA phase. Management and mitigation measures have been developed and aligned to the Mining Charter. These mitigation measures have been included in the EMP.	The social impacts associated with the proposed activities have been determined (Part A: Section 11). The proposed measures in which to mitigate and manage the impacts are also detailed as part of this process in (Part B: Section 5, 6, and 7). A monitoring programme has also be compiled to ensure the proposed project does result in significant environmental damage during LoM (Part B: Section 9).

Table 6-2: Provincial Legislation

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Mpumalanga Tourism and Parks Agency Act, 2005 (Act No. 5 of 2005) (MTPA) The MTPA sets out to promote and sustainably manage tourism and nature conservation and provide for the sustainable use of natural resources within the Province. In pursuing its objectives, the MTPA is required to: ▪ Conserve and manage biodiversity; ▪ Develop and manage protected areas; ▪ Promote, develop and market tourism; ▪ Create growth and transformation within the industry, and thereby economic and employment opportunities for disadvantaged people.	This report will be compiled in accordance with the NEMA and its regulations thereof and relevant Specific Environmental Management Act(s) (SEMAs) where applicable. In addition, the report will, as far as possible, meet the requirements of the MTPA where required.	The biological assessment details the areas within the project areas which are of ecological importance. The findings of the biodiversity assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report. A list of threatened species that may occur within and may be impacted by the proposed project has been listed in further in Part A: Section 10.1.7.
Mpumalanga Road Traffic Act (Act No. 4 of 1998) The Provincial Road Traffic Acts are an extension to the National Act, however focussing more on the provincial level. It looks to consolidate and amend the provisions relating to road traffic within the province and to provide for matters connected therewith.	A Traffic Impact Assessment (TIA) has been undertaken for the proposed project to investigate the potential impacts the project will have on the surrounding road networks.	The findings of the traffic impact assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report.
Mpumalanga Roads Act, 2008 (Act No. 1 of 2008) To provide for the establishment, transformation, restructuring and control of the Mpumalanga Provincial road network.	A TIA has been undertaken for the proposed project to investigate the potential impacts the project will have on the surrounding road networks.	The findings of the traffic impact assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report.
Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998) The MNCA sets out how wild species are to be managed in terms of human use, such as collecting, fishing, hunting, capture, transport and trade. The MNCA deals with rare and endangered species and the powers needed to protect them, as well as the protection of sensitive natural sites from damage and exploitation.	This report will be compiled in accordance with the NEMA and its Regulations. In addition the report will, as far as possible, meet the requirements of the MNCA where applicable.	The biological assessment details the areas within the Project areas which are of ecological importance. The findings of the biodiversity assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report. A list of threatened species that may occur within and may be impacted by the proposed project has been listed in further in Part A: Section 10.1.7.

Table 6-3: Local By-Laws and Guidelines

Applicable legislation and guidelines used to compile the report	Reference where applied	How does this development comply with and respond to the policy and legislative context
Msukaligwa Local Municipality Waste Management By-Law The Council has the responsibility to ensure that all waste generated is: ▪ Collected disposed of or recycled in accordance with these By-laws; and ▪ That such collection disposal or recycling takes account of the waste management hierarchy set out in below. The underlying principle of these By-laws is to establish a waste management hierarchy in the following order of priority: ▪ Avoidance, waste minimisation and waste reduction; ▪ Re-use; ▪ Recycling, reprocessing and treatment; and ▪ Disposal.	The proposed project will ensure that all waste generated by the mining process is dealt with in accordance with this by-law and to ensure that waste is kept to a minimum.	An Application for Environmental Authorisation which included a Waste Management License for the proposed Project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 14 April 2016 detailing the proposed activities. The mitigation measures set out in Part B: Section 5, 6, and 7 will ensure that waste generated at the mine is kept to a minimum.
Steve Tshwete Local Municipality Integrated Waste Management By-Laws The by law states that any person exercising a power in accordance with these by laws must; at all times; seek to promote the waste management hierarchy approach as outlined in the National Environmental Management Waste Act, 2008 (Act No. 59 of 2008) and the National Waste Management Strategy, which is promoting waste avoidance and minimisation, waste reuse, recycling and recovery, waste treatment and disposal. The By Law seeks to promote sustainable development and environmental justice through fair and reasonable measures for the management of waste within the municipality's jurisdiction. The By Laws promotes participation of all municipal residents in the promotion of responsible citizenship by ensuring sound waste management practices within residential and industrial environments.	The proposed project will ensure that all waste generated by the mining process is dealt with in accordance with this by-law and to ensure that waste is kept to a minimum.	An Application for Environmental Authorisation which included a Waste Management License for the proposed Project was submitted to the Mpumalanga Regional office of the DMR in Emalahleni on 14 April 2016 detailing the proposed activities. The mitigation measures set out in Part B: Section 5, 6, and 7 will ensure that waste generated at the mine is kept to a minimum.
National Freshwater Ecosystems Priority Areas The NFEPA project provides a collated, nationally consistent information source of wetland and river ecosystems for incorporating freshwater ecosystem and biodiversity goals into planning and decision-making processes (Nel *et al*. 2011). The spatial layers (FEPA's) include the nationally delineated wetland areas that are classified into hydrogeomorphic (HGM) National Freshwater Ecosystem Priority Areas (NFEPA) project types and ranked in terms of their biodiversity importance. These layers were assessed to evaluate the importance of the wetland areas located within the project area.	This report will be compiled in accordance with the NFEPA and its Regulations.	The only proposed surface infrastructure that is directly placed on NFEPA wetlands is the conveyor that will cross a channelled valley bottom wetland between Mooivley West and Hendrina South Mining Right Areas. The proposed mine plan underlies NFEPA wetlands as well as their buffer and catchment areas. It is nationally recognised that no mining should take place within a 1km buffer area of NFEPA wetlands as best practice and thus the NFEPA wetland pose a significant risk to the project (Nel *et al*., 2011).
Conservation of Agricultural Resources Act 43 of 1983 To provide for control over the utilization of the natural agricultural resources of the Republic to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.	This report will be compiled in accordance with the CARA and its Regulations.	The biological assessment details the areas within the Project areas which are of ecological importance. The findings of the biodiversity assessment in the form of the impacts and the proposed mitigation measures undertaken for the proposed project area detailed in Part A: Section 11 and Part B: Section 5, 6, and 7 of this report. A list of alien plant species that may occur within the proposed project has been listed in further in Part A: Section 10.1.7.

7 Item 3(f): Need and Desirability of the Proposed Activities

The need and desirability of the proposed project has been considered at an economic, social and environmental level which has been discussed below.

7.1 Economic Consideration

According to the Department of Energy (DoE), South Africa's energy resource is dominated by coal. Approximately 77 % of South Africa's primary energy needs are provided by coal resources. The coal mining industry is also responsible for significant levels of direct and indirect employment in South Africa with approximately 87 768 people employed directly in coal mining in 2014.

Given South Africa's abundant coal resources particularly in the Waterberg basin, South Africa is likely to continue to include coal as a significant part of its energy mix. This is particularly beneficial in light of South Africa's development priorities of job creation and economic growth as per the National Development Plan (2012).

According to the South African Coal Road Map (July, 2013), the available data suggests that sufficient coal resources are available to supply all required grades of coal to power stations in the Central Basin Coalfields until the mid-2020s. There is however significant uncertainty associated with the timing, capacity and projected qualities of new mines, as well as the probability of some of these resources going to export. The South African Coal Road Map (July, 2013) has therefore identified the need for new coal mines to be built in either the Central Basin or Waterberg to secure supply to the existing power stations. It is however recognised that there are several alternatives to the current power generation activities, including renewable energy which reduces the demand on non-renewable resources like coal.

The quality of coal to be extracted from the Hendrina Underground Coal Mine makes it suitable for use in the domestic thermal market (Eskom). The proposed project will thus facilitate the planned mining activities and will have knock-on benefits in terms of local employment, local economic development and, increased government revenue and taxes. It is anticipated that the proposed project will be able to provide 78 million tons over the next 36 years.

7.2 Social Consideration

It is anticipated that the proposed project will likely provide a total of 86 jobs during the construction phase and 371 jobs during the operational phase which will ultimately contribute to the surrounding communities through job creation and procurement of goods and services. Umcebo's recruitment policy is based on an employment ratio of 70:30 Historically Disadvantaged South Africans (HDSAs) to non-HDSAs unless business requirements such as maintenance of the company's Mining Charter credentials necessitate differently. Employees recruited from local historically disadvantaged communities should also represent vulnerable groups such as women and people with disabilities.

As part of this proposed project, Umcebo has drafted a Social and Labour Plan (SLP) which outlines the Local Economic Development (LED) programmes set for the surrounding community. The main priority of the LED programmes is to improve the educational facilities within the surrounding communities. As part of its LED planning, Umcebo also intends to implement measures to advance procurement from HDSA suppliers and will continually seek to allocate an amount of annual expenditure in services and consumables to suppliers with this status. The commitment to purchasing will also extend to create long term partnerships with suppliers so as to mentor and support local HDSA-owned businesses. Over a five year period, just over R 1.9 million will be spent on Human Resource Development (HRD), and R 500 000 on LED. A total of almost R 2.6 million has been assigned to the execution of the SLP for the first five years of the proposed project.

Other annual regulatory costs to be incurred by the proposed project include the payment of royalties (roughly 3% of profits), rates and taxes and further R 5.5 million will be spent annually to comply with mining health and safety regulations, and almost R 264 000 on occupational health and safety.

A Skills Development Plan will be developed to address the proposed mine's operational requirements and also cater to employees' future employment aspirations. Underlying the envisaged skills development plan is the overarching objective of enabling current HDSAs to be equipped to apply for increasingly senior level and ultimately management positions at the mine. This will be done through a series of programmes which will help improve the skills of the community.

7.3 Environmental Consideration

It is envisaged that the project will result in a negative impact on the environment as the environment would be transformed from an agricultural and in some areas natural landscape to one of mining. Although mining will be undertaken, this will solely be underground and therefore the surface impact will be limited to the footprint of the associated infrastructure.

During the EIA phase a range of specialist studies which relates to the physical, biological and socio-economic environmental aspects potentially affected by the proposed project was undertaken. The findings of the studies are summarised in Section 10.1, Part A and the reports are appended to this EIA. The impact assessment (Section 11, Part A) quantified the expected impacts of each project activity (Table 11-1). Mitigation measures were also identified for each of the expected impacts and are detailed in Section 5, 6, and 7 (Part B).

The impact assessment showed that no positive environmental impact or benefit to the environment will occur as a result of the commencement of the proposed project.

8 Item 3(g): Motivation for the preferred Development Footprint within the Approved Site including a Full Description of the process followed to reach the Proposed Development Footprint within the Approved Site

8.1 Sensitivity Analysis

An initial site layout plan was compiled during the application phase which outlined the areas for the shafts, overland conveyor, crushing and screening Plant, PCD, offices and workshops see Plan 5 in Appendix 3. The following sensitivities were identified.

- Wetlands: The location of the surface infrastructure, specifically the site shaft office located on Hendrina South and the Shaft with associated infrastructure located on Mooivley East which was proposed to be located within a wetland area and may result in a direct loss or deterioration of the wetland as well as loss of the catchment area, if placed here;
- Fauna and Flora: The primary impact of the proposed development is a loss of flora and fauna habitat in the form of *Eragrostis* dominated Grassland (43 ha) due to infrastructure development;
- Surface water: The Klein Olifants River is the only major perennial river which runs through the project area specifically Hendrina South and Mooivley West. A number of other streams also exist within the three mining areas and all feed into the Klein Olifants River. The location of the Shaft on Hendrina South and the PCD located at Mooivley West is in close proximity to a tributary of the Klein Olifants River and therefore may be located within the 1:100 year floodline or within 100 m of this tributary.

The infrastructure layout plan was then amended during the scoping phase to address these sensitivities in the following manner:

- Wetlands: The infrastructure associated with the Shaft located on Hendrina South has been relocated away from the wetland and 100 m buffer zone to ensure no impact to the wetland occurs. Thereby no direct loss of wetland and subsequent deterioration will be experienced; the Shaft on Mooivley East and its associated infrastructure are still positioned within the wetland buffer;
- Flora: The position of the infrastructure within the project area will result in the loss of *Eragrostis* dominated Grassland. However, the plant area has been reduced to ensure all mining related infrastructure occur in a specified area to minimise the loss of natural vegetation;
- Surface Water: The Shaft on Hendrina South and the PCD on Mooivley West has been relocated away from the tributaries of the Klein Olifants and outside the 100 m buffer zone therefore, minimising the direct impact on the water quality.

Plan 6 in Appendix 3 provides the infrastructure layout map that was compiled during the scoping phase.

Based on this original and scoping phase site layout plan, a site sensitivity analysis was undertaken to identify the biophysical and social sensitivities of the project site and to identify those project components that may potentially have an impact on sensitive resources and/or receptors. The environmental and social aspects considered during the site sensitivity analysis included water resources, air quality, fauna and flora, aquatic ecology, wetlands, heritage, social, visual, traffic, noise and blasting.

Following the completion of the specialist studies a series of sensitivity plans has been generated, which were then combined into a mitigation plan. This mitigation plan includes areas that are considered high impact areas. On completion of this map the infrastructure layout map was re-evaluated in an attempt to avoid these highly sensitive areas. The fauna and flora, aquatic ecology, water resources, traffic and wetland aspects were identified as key resources/ receptors. The analysis resulted in the following sensitivities being identified based on the proposed site layout:

- Traffic: Undermining of a national route specifically the N11;
- Visual: Construction and operation of the infrastructure located at Mooivley East;
- Surface water: The Klein Olifants River is the only major perennial river which runs through the project area specifically Hendrina South and Mooivley West. A number of other streams also exist within the three mining areas and all feed into the Klein Olifants River. The location of the access road located at Mooivley West along the perimeter of the mining right boundary is in close proximity to a tributary of the Klein Olifants River and therefore is located within the 100 m buffer of this tributary; and
- Wetlands: The location of the surface infrastructure, specifically the access roads, PCD, stockpiles, crushing and screening plant, Shaft and ventilation shaft located on Mooivley East, office area and its associated infrastructure, haul and access roads on Mooivley West and all mine related infrastructure on Hendrina South are located within a wetland or seep area and will result in a direct loss or deterioration of the wetland as well as loss of the catchment area, if placed here.

Based on these sensitivities, the initial and scoping phase site layout plan (Plan 5 and 6 in Appendix 3) has been revised as reflected in a final site layout plan (Plan 7 in Appendix 3). The following changes have been made to avoid the identified sensitivities:

- Traffic: The underground layout has moved 100 m away from the N11 at Mooivley East;
- Surface Water: The office area and its associated infrastructure, haul and access roads on Mooivley West have been relocated approximately 150 m to the east to avoid the delineated floodlines and wetlands;

- Wetlands: The topsoil stockpile on Mooivley East, adjacent to the office area, is positioned vertically to reduce the distance of the infrastructure from the pan and seep wetlands. The product stockpile, crushing and screening plant and tip on Mooivley East have been relocated to the south of the weighbridge parking area. The PCD on Mooivley East has now been moved approximately 150 m to the west. The access roads on Mooivley East have been relocated out of seep wetlands; and
- Visual: A long berm will be constructed south of the infrastructure at Mooivley East. It runs from the N11 and reduces the visual impact of the product stockpile, tip, crushing and screening plant, shafts and conveyors to sensitive receptors such as N11 road users.

8.2 Item 3(g)(i): Details of the Development Footprint Alternatives considered

Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives help identify the most appropriate method of developing a project, taking into account location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the no-go alternative. Alternatives also help identify the activity with a reduced environmental and/or social impact. The Scoping Phase aims to identify and screen alternatives to ensure that they are reasonable and feasible. Thereafter, the EIA phase assesses these proposed alternatives to provide the most suitable and final alternative.

Throughout the process various trade-offs were evaluated at different scales to determine the preferred site layout, activities and processes. Aspects that were taken into account include comments received from Interested and Affected Parties (I&APs), location or site alternatives, routing alternatives, activity alternatives, or the no-go alternative. The possible negative environmental and social impacts expected from the proposed project are anticipated to be less significant after taking these aspects into consideration.

The nature of the ore deposit will however determine the mining activities and processes and the location of the resource determines the location of the mining operation. Alternatives could therefore not be considered for these aspects.

The sections below provide an explanation of the alternatives considered for the various aspects.

8.2.1 Site Layout Alternative

The site layout alternatives were identified based on a site sensitivity analysis which was undertaken to identify the biophysical and social sensitivities of the project site and to identify those project components that may potentially have an impact on sensitive resources and/or receptors. The key resources/ receptors are discussed in Section 8.1.

The original site layout considered the footprints of the shafts, overland conveyor, crushing and screening plant, PCD, offices and workshops. A comparison of these layouts and reasoning for shifting the project infrastructure is presented in the Section 8.1.

Feedback from I&APs has been considered when finalising the site layout plan. Based on these sensitivities, the initial site layout plan (Plan 5 in Appendix 3) and Scoping Phase site layout plan (Plan 6 in Appendix 3) has been revised with the following changes reflected in a final site layout plan (Plan 6 in Appendix 3). The following changes have been made to avoid the identified sensitivities:

- Traffic: The underground layout has moved been 100 m away from the N11 at Mooivley East;
- Surface Water: The office area and its associated infrastructure, haul and access roads on Mooivley West have been relocated approximately 150 m to the east to avoid the delineated floodlines of the Klein Olifants River and wetlands;
- Wetlands: The topsoil stockpile on Mooivley East, adjacent to the office area, is positioned vertically to reduce the distance of the infrastructure from the pan and seep wetlands. The product stockpile, crushing and screening plant and tip on Mooivley East have been relocated to the south of the weighbridge parking area. One additional incline shaft on Mooivley East has been proposed and are now adjacent to the product stockpile. The PCD on Mooivley East has now been moved approximately 150 m to the west. The access roads on Mooivley East have been relocated out of seep wetlands; and
- Visual: A long berm will be constructed south of the infrastructure at Mooivley East. It runs from the N11 and reduces the visual impact of the product stockpile, tip, crushing and screening plant, shafts and conveyors to sensitive receptors.

8.2.2 Routing Alternative

8.2.2.1 Conveyer Belt Routing Alternative (between Mooivley West and Hendrina South)

It is proposed that the ROM Coal will be transported from Hendrina South to Mooivley West via conveyer. Alternative routes have been considered to identify where the more favourable location would be to construct the conveyer based on sensitivities and comments received from I&APs. Two routing options have been considered for the construction of the conveyer belt. Route Option 1 (overland conveyor 1) is not considered the favourable option as the conveyer would intersect two tributaries of the Klein Olifants River as well as a number of property boundaries. Route Option 2 (overland conveyor 2) is considered the more favourable option as the conveyer has been repositioned to ensure only one tributary of the Klein Olifants River is intersected. The conveyer runs from Hendrina South, along the property line to Mooivley West where only one farm outside the project area is intersected. Plan 26 provides an illustration of the two conveyer belt routing options.

8.2.2.2 Road Routing Alternative (between Mooivley West and Mooivley East)

It is proposed that a road will be constructed from Mooivley West to Davel Road. Two routing alternatives were investigated. Routing Option 1, the preferred road routing option, requires the development of a new road along the mine boundary, which would follow the farm boundaries. This road will intersect the N11. Route Option 2, the alternative road routing option, will run directly through cultivated lands and will be significantly shorter than Route Option 1. Plan 26 provides an illustration of the two road routing options.

8.2.3 No-Go Option

The no-go or do nothing option means that the status quo would be maintained. All potential impacts are assessed against the current biophysical and socio-economic baseline; therefore all identified alternatives are assessed against the no-go option.

This alternative would mean that the project area would remain as is, covered by vegetation and used as agricultural and grazing land by the farming community. The no mining alternative would mean that the project would not go ahead and as a result any potential impacts associated with the project and its alternatives would not occur. These include positive and negative impacts.

If the project were not to proceed, the expected revenue, economic activity, skills development and job opportunities would not be realised. Furthermore, the coal reserves at the project area would remain unmined.

However the following negative impacts that have been identified will not be experienced. These include:

- Generation of dust including PM_{10} and $PM_{2.5}$ as a result of the construction and operation of the proposed project;
- Loss of sensitive riparian habitats resulting in the loss and/or degradation of aquatic habitat;
- Loss of various wetlands within the surface infrastructure and underground mining footprint. These include three major types of wetlands, being: Channelled Valley Bottom, Valley Bottom and Seeps;
- Potential impact on the water quality of the Klein Olifants River;
- Potential decant of acid mine drainage during post closure at Mooivley West as a result of the sulphide detected in the rocks which may result in significant water quality modification in the Klein Olifants drainage;
- The Shaft located at Mooivley East could potentially decant after closure at 7 m^3/d and could have a negative effect on the river quality;
- Loss of habitat in the form of Eragrostis dominated Grassland (43 ha) due to infrastructure development;
- Mine dewatering will result in the lowering of the water table in the coal seam aquifer;

- Groundwater contamination resulting in the loss of water quality and contamination of boreholes; and
- Noise and visual impact on sensitive receptors around the project area.

9 Item 3(g)(ii): Details of the Public Participation Process followed

The Public Participation Process (PPP) was developed to ensure compliance with environmental regulatory requirements and to provide I&APs with an opportunity to evaluate the proposed project. During this process stakeholders are able to provide inputs and to receive feedback from the environmental specialists and/or proponent.

9.1 Stakeholder Identification

To ensure a proper representation of all stakeholders, the following identification methods were used to develop a stakeholder database:

- Verifying the existing stakeholder database for the project site;
- Desktop and online research;
- Stakeholder networking and discussions to source additional stakeholder details; and
- Conducting Windeed searches in and around the project site to verify land ownership and obtain contact details.

Stakeholders identified who are affected by or interested in the proposed project were grouped into the following broad categories:

- Government: National, Provincial, District, Local authorities;
- Land occupiers and land claimants: Directly affected and adjacent (including Traditional Authorities);
- Communities: Directly affected and adjacent communities;
- Non-Governmental Organisations (NGOs): Environmental organisations, community-based organisations;
- Landowners: Directly affected and adjacent landowners; and
- Business: small medium enterprises, mines and formal business organisations.

9.1.1 Government

The following government departments have been informed and/or consulted:

- South African National Heritage Resources Agency;
- Department of Mineral Resources;
- Department of Environmental Affairs;
- Department of Agriculture, Forestry and Fisheries;

- Regional Office of the Department of Water and Sanitation;
- Mpumalanga Department of Economic Development, Environment and Tourism;
- Mpumalanga Tourism and Parks Agency;
- Mpumalanga Department of Public Works, Roads and Transport;
- Steve Tshwete Local Municipality;
- Nkangala District Municipality;
- Msukaligwa Local Municipality; and
- Gert Sibande District Municipality.

9.1.2 Directly Affected Land Owners

The following directly affected landowners have been identified, as per Table 9-1, and included into the stakeholder database.

Table 9-1: Landowners and Properties Directly Affected

Farm	Portion	Registered Landowner
Orange Vallei 201 IS	RE	Peter Kane-Berman
Orange Vallei 201 IS	1	J.F Davel, Mrs A.J Davel
Tweefontein 203 IS	2	J.F Davel, A.J Davel
Tweefontein 203 IS	Ptn of Ptn 14	Maria Sophia Pretorius
Tweefontein 203 IS	15	M.S Pretorius
Tweefontein 203 IS	16	A.J.B Maree
Tweefontein 203 IS	17	G.R.J Davel
Tweefontein 203 IS	28	Portion endorsed[4]
Tweefontein 203 IS	29	Portion endorsed
Mooivley 219 IS	RE	Vincent Schulze
Mooivley 219 IS	2	Vincent Schulze
Mooivley 219 IS	4	Vincent Schulze
Mooivley 219 IS	5	J.J Oosthuysen
Uitkyk 220 IS	2	Vincent Schulze
Uitkyk 220 IS	3	Peter Kane-Berman
Bosmanskrans 217 IS	RE	A.H Roux, Mrs A.C Roux

[4] Portion endorsed makes reference to farm portions that do not exist according to windeed searches

Farm	Portion	Registered Landowner
Bosmanskrans 217 IS	1	A.H Roux, Mrs A.C Roux
Bosmanskrans 217 IS	3	P.C Oosthuysen
Bosmanskrans 217 IS	4	C. Coetzee, A.W Coetzee
Bosmanskrans 217 IS	6	Riaan Kuiper
Bosmanskrans 217 IS	8	P.C Oosthuysen
Bosmanskrans 217 IS	9	C. Coetzee, A.W Coetzee
Geluksdraai 240 IS	1	P.C Oosthuysen
Geluksdraai 240 IS	2	P.C Oosthuysen
Elim 247 IS	RE	National Government Republic of South Africa
Orpenskraal 238 IS	RE	National Government Republic of South Africa

9.1.3 Adjacent Land Owners

The adjacent land owners are reflected in Table 9-2.

Table 9-2: Adjacent Property Details

Farm	Portion	Registered Landowner
Vaalbank 177 IS	8	Lloyd James John
Groblershoek 191 IS	RE	Riccor Boerdery Pty Ltd
Groblershoop 192 IS	RE	Voorsorg Plase Pty Ltd
Vrischgewaagd 198 IS	3	Stoltz Abraham Johannes
Vrischgewaagd 198 IS	6	Stoltz Abraham Johannes
Grasfontein 199 IS	3	Lloyd John James
Grasfontein 199 IS	8	Dingaansfees Genootskap-Hendrina
Grasfontein 199 IS	25	South African National Roads Agency Ltd
Grasfontein 199 IS	26	South African National Roads Agency Ltd
Grasfontein 199 IS	29	South African National Roads Agency Ltd
Oranje Vallei 201 IS	2	Breedt Jan Augustinus
Tweefontein 203 IS	1	Schickerling John Arthur Vivian
Tweefontein 203 IS	3	Pretorius Maria Sophia
Tweefontein 203 IS	4	Davel Hendrik Albertus Johannes
Tweefontein 203 IS	10	Davel Hendrik Albertus Johannes
Tweefontein 203 IS	11	Davel Hendrik Albertus Johannes

Farm	Portion	Registered Landowner
Tweefontein 203 IS	23	Davel Hendrik Albertus Johannes
Tweefontein 203 IS	27	Portion endorsed
Israel 207 IS	RE	Riccor Boerdery Pty Ltd
Israel 207 IS	3	Riccor Boerdery Pty Ltd
Dwarstrek 216 IS	RE/1	Dirk Steyn Testamentere Trust
Dwarstrek 216 IS	7	Dirk Steyn Testamentere Trust
Bosmanskrans 217 IS	5	Roux Andries Hercules, Roux Alettha Catharina
Bosmanskrans 217 IS	7	Moregloed Trust
Bosmanskrans 217 IS	10	Victoria Bota / Khathutshelo Ramavhoya
Bosmanskrans 217 IS	11	South African National Roads Agency Soc Ltd
Bosmanskrans 217 IS	12	South African National Roads Agency Soc Ltd
Bosmanskrans 217 IS	14	Suid-Afrikaanse Nasionale Padagentskap Ltd
De Wittekrans 218 IS	RE	Anvin Beleggings Trust
De Wittekrans 218 IS	1	De Wittekrans Cc
De Wittekrans 218 IS	3	Anvin Beleggings Trust
De Wittekrans 218 IS	4	Beestepan Boerdery Pty Ltd
De Wittekrans 218 IS	5	Marmic Trust
De Wittekrans 218 IS	6	Maree Andries Jacobus Bester
De Wittekrans 218 IS	10	Plaas De Wittekrans
De Wittekrans 218 IS	15	South African National Roads Agency Soc Ltd
Uitkyk 220 IS	1	Makoliet Landgoed Cc
Uitkyk 220 IS	4	De Clercq Gerhardus Wilhelmus
Uitkyk 220 IS	5	De Clercq Gerhardus Wilhelmus
Knapdaar 221 IS	1	Mninwa Communal Prop Assoc
Knapdaar 221 IS	5	Oosthuysen Jacobus Johannes
Nooitgedacht 237 IS	8	National Government of The Republic of South Africa
Hartbeestfontein 239 IS	RE	Scheepers Familie Trust
Hartbeestfontein 239 IS	6	Mrabheli Communal Prop Assoc
Hartbeestfontein 239 IS	10	Mrabheli Communal Prop Assoc
Hartbeestfontein 239 IS	11	Mrabheli Communal Prop Assoc
Hartbeestfontein 239 IS	12	Amabhokobhoko Vleismark

Farm	Portion	Registered Landowner
Hartbeestfontein 239 IS	13	Amabhokobhoko Vleismark
Hartbeestfontein 239 IS	14	Amabhokobhoko Vleismark
Hartbeestfontein 239 IS	15	Amabhokobhoko Vleismark
Elim 247 IS	1	Department of Rural Development and Land Reform
Hartbeesfontein 259 IS	RE	Coko Trust
Wag-N-Bietjie 553 IS	RE	Tjala Vuna Agribusiness Communal Prop Assoc
Garsfontein 591 IS	RE	Anton Pelser Eiendoms Trust

9.1.4 Communities

The ward councillors for the affected wards were identified and as part of the PPP councillors were engaged in an effort to identify affected communities and the relevant leadership structures i.e., the Mahlangu chieftaincy (Ubukhosi bakaMahlangu). The following communities will be affected by the proposed project:

- Hendrina;
- STLM Ward 1;
- STLM Ward 2;
- STLM Ward 3;
- MLM Ward 10; and
- MLM Ward 13.

9.1.5 Non – Governmental Organisations

The following NGOs were identified and consulted during the process:

- Lawyers for Human Rights;
- Endangered Wildlife Trust;
- Birdlife South Africa;
- South African National Biodiversity Institute;
- Olifants River Forum;
- Working for Wetlands; and
- Inkomati Catchment Management Agency.

9.1.6 Business

The following businesses or business entities were identified and consulted during the process:

- Chamber of Mines;
- Eskom Park;
- Chamber of Commerce;
- Sakhisizwe H.B.C; and
- Transnet.

9.2 Consultation with stakeholders during scoping phase

A summary of the PPP activities undertaken during the Scoping Phase are provided in Table 9-3. Consultation with I&APs during the Scoping Phase was undertaken as follows:

- The Scoping Report was available at Public Libraries and on the Digby Wells website;
- Project announcement materials were emailed and posted to the stakeholder database – an SMS was also sent to stakeholders;
- An advertisement was placed in a local newspaper;
- Site notices were placed at various public places; and
- Key stakeholders were consulted telephonically.

The following stakeholder meetings were conducted during the Scoping phase:

- Landowners Focus Group Meeting: A Landowners Meeting was held on 5 May 2016 with directly affected and adjacent landowners and/or occupiers residing within the project site. As such, concerns relating to the project and applicable to the landowners were discussed in detail and revolved mainly around groundwater management, project details, safety, physical presence of the mine and landownership options should the mine commence. Open discussions were predominantly held in Afrikaans and translation was provided in English as required. The meeting was well attended by landowners and occupiers.
- Public Meeting: The Public Meeting was held on 5 May 2016 for stakeholders to attend from any sector of society. Although various representatives from different stakeholders confirmed attendance e.g. key Local Municipality personnel, the meeting was attended by community members, Community-based Organisations, landowners and a municipal councillor. Diverse attendance at the meeting required that discussions be held in English, with translation provided in Afrikaans when required. Questions raised predominantly revolved around project details, employment and management of environmental impacts.

9.3 Consultation with stakeholders during impact assessment phase

The PPP which has been implemented for the Impact Assessment phase was similar to the process commenced with during the Scoping Phase. The premise of activities was to ensure that the various legislative requirements for PPP are met and that a single, integrated process was followed. This will limit stakeholder fatigue and ensure that stakeholders are presented with a single view of the full project and EIA information. PPP activities during the EIA phase has revolved around I&APs providing comments on specialist study findings, recommendations and mitigation measures proposed. These studies and recommendations were included as part of the EIA/EMP Report.

A summary of the PPP activities undertaken during the EIA phase are provided in Table 9-3. Consultation with I&APs during the EIA Phase was undertaken as follows:

- The EIA Report was available at Public Libraries and on the Digby Wells website; and
- EIA Phase announcement materials were emailed and posted to the stakeholder database and an SMS was also sent to stakeholders.

The following stakeholder meetings were conducted during the EIA phase:

- Landowners Meeting: A Landowners Meeting was held on 29 March 2017 with directly affected and adjacent landowners and/or occupiers residing within the project site. As such, concerns relating to the potential for the mine to contaminate the groundwater, measures to be implemented to prevent this contamination as well as compensation were discussed. The proposed road to be constructed and the mining method to be utilised was raised. The meeting was not well attended as only one landowner attended.
- Public Meeting: The Public Meeting was held on 29 March 2017 for stakeholders to attend from any sector of society. Various representatives from different stakeholders confirmed attendance e.g. key Local Municipality personnel; the meeting was attended by community members, Community-based Organisations, landowners and a municipal councillor. Diverse attendance at the meeting required that discussions be held in English, with translation provided in Zulu when required. Questions raised predominantly revolved around project details, impact to the road network, employment, management of environmental impacts and implementation of the SLP and proposed skill development programmes. The meeting was well attended with over 200 people attending.

9.4 Summary of PPP Activities

The PPP activities have been summarised in Table 9-3 below for the EIA process.

Table 9-3: Summary of PPP Activities during the EIA Process

Activity	Details	Reference in Report

Activity	Details	Reference in Report
Scoping Phase		
Identification of stakeholders	Stakeholder database which includes I&APs from various sectors of society, including directly affected and adjacent landowners in and around the project area. The stakeholder database was updated during both the scoping and EIA phases.	**Appendix 2A:** Stakeholder Database
Distribution of proposed project announcement materials	An announcement letter with comment and registration sheet was emailed and posted to stakeholders on 14 April 2016. *SMSs were also distributed to stakeholders on the database on 14 April 2016.* The Background Information Document was also available on www.digbywells.com.	**Appendix 2B:** BID, letter with registration and comment sheet
Placement of Advertisement	An English advertisement was placed in the Middelburg Observer on 15 April 2016.	**Appendix 2C** Advertisement
Placement of site notices	Site notices were placed at various public places within and around the proposed project area on 19 April 2016. These include, but isn't limited to, the following places: ▪ Hendrina Public Library; and ▪ Breyten Public Library.	**Appendix 2D** Site notice report and site notice map
Placement of Scoping Report	Copies of the Scoping Report were available at the following Libraries: ▪ Hendrina Public Library; and ▪ Breyten Public Library. The Scoping Report was also available on the Digby Wells Website www.digbywells.com (Public Documents) and at the stakeholder meetings. CDs containing the Scoping Report were also made available at the various stakeholder meetings.	**N/A**
Announcement of the Scoping Report	Announcement of availability of the Scoping Report was emailed and posted to the database together with announcement of the Project on 14 April 2016. *SMSs were also sent to the full database on 14 April 2016 indicating availability of the Scoping Report.* *(Public comment period: 20 April to 22 May 2016)*	**Appendix 2B** BID, letter with registration and comment sheet

Activity	Details	Reference in Report
Scoping Stakeholder Meetings	The following stakeholder meetings were held during the 30-day public comment period: ▪ Landowner Focus Group Meeting: 5 May 2016 from 11:00 to 13:00 at the Kosmos Hall, Hendrina; and ▪ Public Meeting: 5 May 2016 from 14:00 to 16:00 at the Kosmos Hall, Hendrina. Comments received at these meetings were captured in the CRR and responded to by the various specialists and project team members.	**Appendix 2E** Public Meeting Photos
Announcement of the updated Scoping Report availability	Announcement of availability of the updated Scoping Report was emailed and posted to the database on 30 May 2016. *SMSs to notify stakeholders that the updated Scoping Report was available for comment were sent to the database.* These reports were made available on www.digbywells.com (Public Documents).	**Appendix 2F**
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders during the Scoping phase were captured in the CRR.	**Appendix 2I**
EIA Phase		
Placement of EIA Report	Copies of the EIA Report were available at the following Libraries: ▪ Hendrina Public Library; and ▪ Breyten Public Library. The EIA Report was also available on the Digby Wells Website www.digbywells.com (Public Documents) and at the stakeholder meetings. CDs containing the EIA Report were also made available at the various stakeholder meetings.	**N/A**
Announcement of the EIA Report	Announcement of availability of the EIA Report was emailed and posted to the database on 17 March 2017. SMSs were also sent to the full database on 17 March 2017 indicating availability of the EIA Report. (**Public comment period: 17 March 2017 to 19 April 2017**)	**Appendix 2G** **EIA Announcement Letter**

Activity	Details	Reference in Report
EIA Stakeholder Meetings	The following stakeholder meetings were held during the 30-day public comment period: ▪ Landowner Focus Group Meeting: 29 March 2017 from 10:00 to 11:30 at the Kosmos Hall, Hendrina; and ▪ Public Meeting: 29 March 2017 from 13:00 to 14:30 at the Kosmos Hall, Hendrina. Comments received at these meetings were captured in the CRR and responded to by the various specialists and project team members.	**Appendix 2H** **Public Meeting Photos**
Obtained comments from stakeholders	Comments, issues of concern and suggestions received from stakeholders during the EIA phase are captured in the CRR.	**Appendix 2I** **Comment and Response Report**

9.5 Item 3(g)(iii): Summary of Issues Raised by I&APs

A summary of the comments received on the Scoping and EIA Report and during the consultation meetings are included in Table 9-4, Table 9-5 and Table 9-6. The tables also provide a response to all comments raised. The detailed CRR is included in Appendix 2I.

Table 9-4: Interested and Affected Parties

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Landowners					
Hermanus Prinsloo	Written Comments	20-Apr-16	Various wetlands will be impacted.	Your comment is noted. As part of the EIA process, a Wetland Impact Assessment has been undertaken. During the Scoping Phase, a baseline investigation was completed to understand the current environment and wetlands on the proposed project site. It is noted that there are several pans and the Klein Olifants River with various tributaries that traverse the proposed project site. The Wetland Assessment has delineated all identified wetlands that are potentially impacted and have provided an in-depth investigation into what the impact is on the wetland environment. The impact assessment showed that during the construction, operation and decommissioning phases major and moderate impacts will occur however these impacts can be mitigated using mitigation measures proposed by the wetland specialist which reduced the impact to a moderate and minor impact. It must be noted that the proposed project is characterised by large areas of wetlands which equates to approximately 42% of the project site, some project infrastructure previously situated within the wetland environment has been relocated out of these wetland areas and associated buffer zones however some infrastructure specifically the infrastructure located on Hendrina South cannot be relocated and may result in a direct loss of the wetland environment (*Refer to Section 11.6 and Appendix 9* of the EIA Report).	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Hermanus Prinsloo	Written Comments	20-Apr-16	As my farm is only a small portion with mining activities on at least two sides, the farm will be swallowed by noise, dust and other nuisances. This will have a negative impact on my property.	As part of the EIA process, a Noise and Air Quality Impact Assessment as well as other specialist studies (i.e. Groundwater, Surface Water and Social to name a few) have been undertaken to determine the potential impacts on surrounding landowners and land occupiers. During the Scoping Phase a baseline investigation was undertaken to understand the current environment. It is expected that the main impacts specifically noise and dust will be associated with the construction and operational phase. It is noted that air quality will be impacted upon by mining activities, however should the proposed mitigation measures be undertaken the impact is considered to be negligible specifically referring to where your farm is located. A monitoring programme has also been compiled which will monitor the dust levels around the mine during the construction, operational and decommissioning phase. The noise levels are considered to be high during the construction phase 45 dBA and 65 dBA however will decreased during operational phase. It is anticipated that the noise levels will be 45 dBa during the operational phase. Should the noise or dust levels exceed recommended standards additional measures will have to be implemented to reduce these levels. (*Refer to Part A Section 10, 11 and Part B 5, 6, 7 and 9 of the EIA Report).*	Addressed - *Refer to Part A Section 10,11 and Part B 5, 6, 7 and 9 of the EIA Report*
Hermanus Prinsloo	Written Comments	20-Apr-16	It will be impossible to farm with activities of this extent all around your property. We produce maize, soya and cattle. Do not mine here.	Your comment is noted.	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Elsabé Engels *Smit & Van Wyk Attorneys*	Written Comments	20-Apr-16	All the clients I represent are farmers; the concern is largely effect on the farming in the long term especially the water supply.	Thank you for the comment. A Surface Water and Groundwater Impact Assessment have been undertaken as part of the EIA process. During the Scoping Phase a baseline investigation was undertaken to understand the current environment and identify potential impacts that may affect the water environment. In particular, a hydrocensus was undertaken for boreholes on and around the proposed project site to determine the existing borehole yields. The water requirements at the mine show that a total of 2 000 m^3/day is required to operate the three mining areas. This water will be obtained from underground water from the underground mine. It is noted that a total of 1 000 m^3/day will still be required by the mine. This water will have to be sourced from other catchments. It must be noted that the water will be continuously reused and recycled and therefore these values are based on a conservative approach. It is recommended that the water balance be updated should mining commence (*Refer to Section 11.2, 11.3, Appendix 5 and Appendix 6* of the EIA Report).	Addressed
Elaine Thirion *Bekker Brink & Brink Inc*	Written Comments	22-Apr-16	Our clients are willing to participate as interested and affected parties.	Thank you for the comment, it is noted. You have been added to the database.	Addressed
Ansie Coetzee	Landowners Focus Group Meeting	05-May-16	What are the potential impacts we can expect from the project?	There are several potential impacts that have been identified during the scoping phase including impacts to water quality and quantity, deterioration of air quality, increase in noise levels, loss of vegetation and disturbance to fauna as well as socio-economic impacts associated with employment and procurement of services. During the EIA phase these impacts were verified by the various specialist studies and assessed. The negative impacts identified included the loss of utilisable soil, generation of gaseous emissions, loss of grassland, deterioration of the wetland and aquatic environment and a visual impact due to the change in land use and generation of dust. Although it is expected that there will be significant negative impacts as a result of the project it is also expected that the proposed project will contribute to job creation and local economic development (*Refer to Section 11 and the various specialist studies* of the EIA Report).	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	Consulted				
Jannie Davel	Landowners Focus Group Meeting	05-May-16	How can the amount of coal that is available be anticipated, since limited drilling was done on the Mooivley Farm? How many holes were drilled as part of the exploration and what is the seam thickness where the coal is located?	During prospecting drilling, all areas were considered however due to the limited drilling undertaken, estimations for the reserve data were collected and used to understand the larger area. A total of 182 boreholes were drilled in the Mooivley Prospecting Rights areas (PR1265) and 36 boreholes inside the Hendrina Prospecting Rights area (PR1266). The coal deposit is situated within the Karoo Sequence and varies between 32 to 128 metres (m) below ground level (mbgl) (*Refer to Section 5.2.2 of the EIA Report*).	Addressed
Gert Davel	Landowners Focus Group Meeting	05-May-16	What is the minimum height of the underground mining machinery (i.e. continuous miner)	The machinery height will be determined by the seam height Typical low-seam equipment continuous miners cut between 1.35 and 2.5m, but some equipment can mine even lower than that. For seams that are thicker, another set of section equipment will be chosen that typically mines between 2.1 and 4.6m.	Addressed
Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	How will the mining be undertaken underground without damaging the Klein Olifants river?	During the EIA phase a groundwater, surface water, wetland and aquatic impact assessment was undertaken to assess the impact underground mining will have on the Klein Olifants River and its associated tributaries. Through the wetland and floodline delineation it was determined that underground mining of the Klein Olifants River; wetlands and associated buffer zones could potentially impact these water systems if subsidence takes place, especially in shallower areas. However it is recommended that a geotechnical investigation be undertaken and all high risk areas for subsidence that coincide with wetlands and their buffers, particularly channelled valley bottom wetlands linked to the Klein Olifants River, should potentially be excluded from the mine plan if design factors cannot address the high risks. The safety factor for underground mining should be determined by the geotechnical specialist for all remaining areas (*Section 11 and 14 of the EIA Report*).	Addressed

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Name of Individual	**Consulted**				
Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	If it rains, the groundwater volume will increase and also impact the flow of the river. With the flow of this water into the underground cavities, the land capability will be negatively impacted.	Only areas that are cleared for infrastructure purposes will result in the loss of land capability. As part of these infrastructure areas, stormwater management structures will be established to control clean and dirty water around the site. Clean water that is not impact by the mine will be directed back to the Klein Olifants and associated tributaries while dirty water will be directed into PCDs which will be reused within the mining operation. All water that enters the underground mine as a result of rainfall will be pumped out into the PCDs (*Section 5.2.5.3 and Appendix 5 of the EIA Report*).	A surface water and groundwater specialist study has been undertaken. The results of this study as well as an impact assessment to determine the impact the proposed project will have on the surface water and groundwater have been summarised in this EIA report and in Appendix 5 and Appendix 6.
J.P Stoltz	Landowners Focus Group Meeting	05-May-16	Specialist studies will be done, but who will be held responsible for impacts like road deterioration, loss of groundwater (boreholes) as well as cracking of infrastructure?	Umcebo will be required to develop and implement a grievance mechanism where I&APs can register complaints and claim damages to boreholes, road deterioration and infrastructure. A procedure will be developed to deal with these claims provided the claim can be proven.	Addressed
Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	Will there be a baseline blasting survey undertaken for the affected households? Will the baseline be available to stakeholders?	A Blasting and Vibration Specialist Study was undertaken as part of the EIA process. It should be noted that there will be limited surface blasting during the development of the shafts during construction and limited underground blasting other than when a geological anomaly is encountered, such as a dyke. During such instances, the DMR will be notified if there are structures located within the blasting radius and the necessary communication with the landowners and land-users will also be done. A blasting impact assessment was compiled and attached as Appendix 16 and is available for public review along with this EIA report. The original report was considered a worst case scenario for the influences evaluated. However the possible impact from drilling and blasting operations had to be reviewed due to a change in development of the decline shafts. The first 5 to 10 blasts are expected still to have some effect from sound, ground vibration, and air blast within the immediate vicinity of the shaft but will start subsiding thereafter. Further assessment was not required (*Refer to Section 11.13. and Appendix 16 of the EIA Report*).	Addressed

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Name of Individual	Consulted				
Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	When will the studies be done for the project?	Specialist studies have been finalised. These specialist studies are available for public review alongside this EIA report for a period of 30 days from the 17 March 2017 to 19 April 2017 The EIA process is anticipated to be concluded during the first quarter in 2017 with a decision from the DMR.	Addressed
Ansie Coetzee	Landowners Focus Group Meeting	05-May-16	The land will be left in ruins and we won't be able to use it for agricultural activities. By that time we will not be able to get hold of the people responsible for the project.	In accordance with Section 41 (1) of the MPRDA has been repealed and in terms of Section 24P in the NEMA as amended, which provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. Therefore it is Umcebo's responsibility to ensure all rehabilitation and closure costs are updated on an annual basis and provided for in terms of the new Financial Provisioning Requirements. This ensures that sufficient funding is retained so that effective rehabilitation is implemented once the LoM is reached. A rehabilitation and closure assessment has been included as part of the EIA process and has been made available for stakeholder comment (*Refer to Section 24 in Part A and Section 8 in Part B and Appendix 17 of the EIA Report*).	Addressed
Ansie Coetzee	Landowners Focus Group Meeting	05-May-16	They promise that they won't do any drilling, but they don't stick to these promises. Can the landowners say no?	Yes the landowners can object to the proposed project. The EIA process currently being undertaken for this project gives stakeholders the opportunity to object and raise comments or issues of concern during the stakeholder engagement process. These comments are captured in a CRR and submitted to the DMR alongside the EIA report for consideration and final decision making. (Refer to Section 9 of the EIA Report).	Addressed - Refer to Section 9 of the EIA Report
Marnus Prinsloo	Landowners Focus Group Meeting	05-May-16	There are multiple mines in the area, all having different approaches and process timelines. We are never certain about what is happening and how to evaluate what the impact will be for these.	During the EIA phase, the cumulative impacts of current and proposed project operations have been assessed by each specialist. A number of mines, industrial activities, agricultural communities and towns have been considered when assessing these impacts. (*Refer to Section 11.15 of this EIA report*). In terms of the timeframes, Digby Wells will ensure stakeholders are kept informed of the process for the duration of the project.	Addressed

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Name of Individual	**Consulted**				
Marnus Prinsloo	Landowners Focus Group Meeting	05-May-16	We have an old house - if blasting takes place it will be impacted.	A Blasting and Vibration Specialist Study was undertaken as part of the EIA process. It should be noted that there will be limited surface blasting during the development of the shafts during construction and limited underground blasting other than when a geological anomaly is encountered, such as a dyke. During such instances, the DMR will be notified if there are structures located within the blasting radius and the necessary communication with the landowners and land-users will also be done. A blasting impact assessment was compiled and attached as Appendix 16 and is available for public review along with this EIA report. The original report was considered a worst case scenario for the influences evaluated. However the possible impact from drilling and blasting operations had to be reviewed due to a change in development of the decline shafts. The first five to 10 blasts are expected still to have some effect from sound, ground vibration, and air blast within the immediate vicinity of the shaft but will start subsiding thereafter. Further assessment was not required (*Refer to Section 11.3. and Appendix 16 of the EIA Report*).	Addressed
Johan Saaiman	Landowners Focus Group Meeting	05-May-16	Unwanted activities will take place as a result of the mine, such as fires, damage to structures (e.g. fencing) and unsafe conditions such as theft. How will this be managed?	The EMP which has been compiled and is now available for comment during the stakeholder comment period contains management and control measures for potential risks, as mentioned. These include barbed wire galvanised steel fencing around the site and access control mechanisms. Emergency procedures have also been developed to address situation such as fires. Umcebo being a subsidiary of Glencore Operations South Africa (Pty) Ltd will also adhere to the company's security and safety procedures and protocols (*Refer to Section 5.2.5.8 in Part A and 4.2 in Part B of the EIA Report*).	Addressed
Gert Davel	Landowners Focus Group Meeting	05-May-16	Further prospecting borehole drilling to be done - how far will it be done from wetlands and rivers?	The buffer zone currently proposed is 100 m away from rivers and/or wetlands.	Addressed

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Christo Coetzee	Landowners Focus Group Meeting	05-May-16	Has the mine been approved yet and what are the steps required?	The project has not yet been approved. The Final Scoping Report was submitted to the DMR on 27 May 2016. The DMR reviewed the report and accept the scoping report on 2 November 2016. Specialist studies were undertaken and the EIA / EMP has been compiled and placed on public review. It is anticipated that the EIA report will be submitted to the DMR on 26 April 2017.	Addressed
Christo Coetzee	Landowners Focus Group Meeting	05-May-16	We do not want mining at all. Our concerns are that plans for our own development and progression are impacted since the mines don’t stick to their commitments. Responsible rehabilitation isn't done and the land will be unusable.	Your objection is noted. The holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. Therefore it is Umcebo's responsibility to ensure all rehabilitation and closure costs are updated on an annual basis and provided for in terms of the new Financial Provisioning Regulations. This ensures that sufficient funding is retained so that effective rehabilitation is implemented once the Life of Mine (LoM) is reached. A rehabilitation and closure assessment has been included as part of the EIA report and has been made available for stakeholder comment (*Refer to Section 24 in Part A and 8 in Part B and Appendix 17 of the EIA Report*).	Addressed

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Christo Coetzee	Landowners Focus Group Meeting	05-May-16	In 2007 prospecting was done by other mines close to existing boreholes I own. Since then the borehole's yield has decreased and it was eventually proven that the decrease was caused by the prospecting activities.	Thank you for the comment. A Surface Water and Groundwater Impact Assessment have been undertaken as part of the EIA process. During the Scoping Phase a baseline investigation was undertaken to understand the current environment and identify potential impacts that may affect the water environment. In particular, a hydrocensus was undertaken for boreholes on and around the proposed project site to determine the existing borehole yields. The results of the yields of these boreholes will be utilised as a baseline to understand if changes in the yields vary as a result of the proposed mining activities. A monitoring project has been developed to ensure regular monitoring of these borehole yields occur, mitigation measures will be required should changes in borehole yields be detected. Additionally a grievance mechanism will be developed to address any possible issues that may arise. (Refer to Section 11.2, 11.3 in Part A, and Section 9 in Part B, Appendix 5 and Appendix 6 of the EIA Report).	Addressed
Christo Coetzee	Landowners Focus Group Meeting	05-May-16	Currently I can easily leave a harvester in the mealie fields without any concern of theft, but with the project it is possible that my machinery, and that of the mine, will be stolen.	Your comment regarding theft is noted. Measures to mitigate risks associated with theft can be identified between Umcebo and the surrounding landowners and land-users.	Addressed
Gert Davel	Landowners Focus Group Meeting	05-May-16	What type of fencing will be used for the mine?	Security fencing will be barbed wire galvanised steel which will be utilised to restrict access to the mining area (refer to Section 5.2.5.8).	Addressed

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Name of Individual	**Consulted**				
Tielman	Landowners Focus Group Meeting	05-May-16	Boreholes from other areas i.e., close to Kendal don't provide groundwater anymore due to mining activity.	Thank you for the comment. A Surface Water and Groundwater Impact Assessment have been undertaken as part of the EIA process. During the Scoping Phase a baseline investigation was undertaken to understand the current environment and identify potential impacts that may affect the water environment. In particular, a hydrocensus was undertaken for boreholes on and around the proposed project site to determine the existing borehole yields. The results of the yields of these boreholes will be utilised as a baseline to understand if changes in the yields vary as a result of the proposed mining activities. A monitoring project has been developed to ensure regular monitoring of these borehole yields occur, mitigation measures will be required should changes in borehole yields be detected (*Refer to Section 11.2, 11.3 in Part A, Section 9 in Part B, Appendix 5 and Appendix 6* of the EIA Report).	Addressed
Tielman	Landowners Focus Group Meeting	05-May-16	The commitments made by the Umcebo - should they be taken over by another mining group, will the commitments also be taken over or will it dissolve?	Yes, legally all the responsibilities will be carried over to the new mine owner, which will be done by means of a Section 11 Cession of Rights under the MPRDA.	Addressed
J.P Stoltz	Landowners Focus Group Meeting	05-May-16	There should be some indication of the direction of mining that will take place. There should be an indication of the placement of rescue chambers.	A mine infrastructure plan (Plan 24 in Appendix 3) has been developed which provides an understanding of the location of all surface infrastructure proposed. Plan 25 in Appendix 3 provides a Life of Mine plan which indicates which areas will be mine over the 36 years.	Addressed

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Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	Because of mining there will be a loss of mealies as a result of deteriorating land capability and availability of water. Agricultural business is very expensive as is and it will be better to just buy out the farmers.	Your comment is noted. Further discussions will need to be held between landowners and Umcebo Mining regarding compensation. Underground mine as the chosen mining method will result in minimal disturbance in relation to open pit mines. A soil, land use and land capability specialist study has been undertaken to assess the impact the mine will have on the land capability. The impacts varied between moderate during construction phase and minor during operational and decommissioning however with the mitigation measures that are provided these impacts were reduced to a negligible impact. Therefore it can be concluded that the impact on the soil, land use and land capability environment is not considered significant as long as the management measures are rigorously adhered to for both the Shaft Complex areas as well as the proposed conveyancing servitude, while more detailed site placement of the conveyer plinths is considered necessary based on the wetland delineation and a more detailed assessment of the wet base soils as part of the pre-construction planning (Refer to Section 10.1.3 , 11.1 and Appendix 4 in the EIA Report).	Addressed
Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	Should mining occur and if borehole water depletes as a result of mining, how will water be provided to us and of what quality?	Thank you for the comment. A Surface Water and Groundwater Impact Assessment have been undertaken as part of the EIA process. During the Scoping Phase a baseline investigation was undertaken to understand the current environment and identify potential impacts that may affect the water environment. In particular, a hydrocensus was undertaken for boreholes on and around the proposed project site to determine the existing borehole yields. The water requirements at the mine show that a total of 2 000 m^3/day is required to operate the three mining areas. This water will be obtained from underground water from the underground mine. It is noted that a total of 1 000 m^3/day will still be required by the mine. This water will have to be sourced from other catchments. It must be noted that the water will be continuously reused and recycled and therefore these values are based on a conservative approach. It is recommended that the water balance be updated should mining	Addressed

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				commence (*Refer to Section 11.2, 11.3, Appendix 5 and Appendix 6* of the EIA Report). Should water need to be provided, a Grievance mechanism will be developed to address these claims and an agreement will be developed between Umcebo and the affected land owners.	
Manie Prinsloo	Landowners Focus Group Meeting	05-May-16	How will water be supplied, will it be piped or borehole?	Thank you for the comment. A Surface Water and Groundwater Impact Assessment have been undertaken as part of the EIA process. During the Scoping Phase a baseline investigation was undertaken to understand the current environment and identify potential impacts that may affect the water environment. In particular, a hydrocensus was undertaken for boreholes on and around the proposed project site to determine the existing borehole yields. The water requirements at the mine show that a total of 2 000 m^3/day is required to operate the three mining areas. This water will be obtained from underground water from the underground mine. It is noted that a total of 1 000 m^3/day will still be required by the mine. This water will have to be sourced from other catchments. It must be noted that the water will be continuously reused and recycled and therefore these values are based on a conservative approach. It is recommended that the water balance be updated should mining commence (*Refer to Section 11.2, 11.3, Appendix 5 and Appendix 6* of the EIA Report).	Addressed
Marnus Prinsloo	Landowners Focus Group Meeting	05-May-16	How will dust impact the environment, and specifically the crops, since it is located right next to the conveyer belt where loading will take place?	An Air Quality Specialist Study has been undertaken as part of the project. In particular, an emissions inventory has been developed to understand the sources of dust (i.e. stockpiles, access roads, crushing and screening plant). The potential impact from dust has been predicted through impact modelling. The predictive model indicates the extent of the dust generation impact. All impacts have been rated to determine the severity. The study showed that the impact associated with the generation of dust resulting in a minor impact during the construction and decommissioning phase however with mitigation measures implemented this impact was reduced to a negligible impact. During the operational phase the dust generated as a result of stockpiling resulted in a moderate impact however with	Addressed

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				mitigation measures the impact was reduced to a negligible impact (*Refer to Section 11.4 and Appendix 7 of the EIA Report*).	
James Lloyd	Landowners Focus Group Meeting	05-May-16	What distance from the mine will boreholes be impacted on by mine dewatering?	A groundwater model has been developed to understand the cone of depression (i.e. at what distance and depth boreholes will be affected by mine dewatering. Plan 20 and 21 in Appendix 3 provides an illustration of which boreholes may be impacted upon by the proposed project. (Refer to Appendix 6 of the EIA Report). It is predicted that the cone of depression will remain within the mining right boundary and does not extend past this area.	Addressed
James Lloyd	Landowners Focus Group Meeting	05-May-16	I am leasing the farm from the Government, what will the compensation be?	This will only happen if the property needs to be purchased. Normal activities can still proceed on the surface, whilst underground mining occurs. Further discussions will need to be held between landowners and Umcebo Mining regarding compensation.	Addressed
James Lloyd	Landowners Focus Group Meeting	05-May-16	What is the purpose of the EIA?	The purpose of an EIA is to identify and assess the potential impacts of the project and to determine the mitigation measures required to avoid or reduce the significance of the impacts assessed. The EIA process also allows stakeholders to become involved and submit comments or request specific information. An independent Environmental Assessment Practitioner must be appointed as per the EIA Regulations to undertake the EIA and associated specialist studies.	Addressed
Alpheus Pretorius	Landowners Focus Group Meeting	05-May-16	Will the soil analysis be correctly done? Umcebo might need to spend more money if the soil potential is lost.	Underground mine as the chosen mining method will result in minimal disturbance in relation to open pit mines. A soil, land use and land capability specialist study has been undertaken to assess the impact the mine will have on the land capability. The impacts varied between moderate during construction phase and minor during operational and decommissioning however with the mitigation measures that are provided these impacts were reduced to a negligible impact. Therefore it can be concluded that the impact on the soil, land use and land capability environment is not considered significant as long as the management measures are rigorously adhered to for both the Shaft	Addressed

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				Complex areas as well as the proposed conveyancing servitude, while more detailed site placement of the conveyer plinths is considered necessary based on the wetland delineation and a more detailed assessment of the wet base soils as part of the pre-construction planning (*Refer to* Appendix 4 in *the EIA Report*).	
Jannie Davel	Landowners Focus Group Meeting	05-May-16	Should the petrol price increase, will you use a powerline instead of a generator on site?	Umcebo will investigate if sufficient power will be generated through the use of generators. It is unlikely that powerlines will be installed to obtain power for the project (*Refer to Section 5.2.5.5 of the EIA Report*). Should power be required, the necessary applications will be lodged to obtain approvals.	Addressed
Gert Davel	Landowners Focus Group Meeting	05-May-16	Where will the waste be stored?	It is expected that minimal general and hazardous waste will be generated as part of the project. A designated waste storage area with waste skips will be developed and managed as per the Waste Regulations. Waste will be removed and transported to a registered waste disposal site by a registered waste handler (*Refer to section 5.2.5.4 in the EIA Report*).	Addressed

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Vincent Shulze	Landowners Focus Group Meeting	05-May-16	A major concern is that, should mining happen, the water will be affected and we are very reliant on borehole water for our livelihood. On average, what is the impact on borehole water (quality and quantity) from such a project?	A groundwater model has been developed to understand the cone of depression (i.e. at what distance and depth boreholes will be affected by mine dewatering). Plan 20 and 21 in Appendix 3 provides an illustration of which boreholes may be impacted upon by the proposed project. The boreholes that may be impacted upon are located within the mining right area (Refer to Appendix 6 of the EIA Report). The study concluded that the water table will drop as a result of dewatering of the underground mining area. However the boreholes located in the upper aquifer will not be impacted by the underground mine. Mining is likely to alter the natural geochemistry by exposing the sulfides for oxygenation. This could result in sulfate contamination as observed in the coal mines in the region, where the concentration could reach up to 2500 mg/L. Mitigation measures have been proposed which ensure that the groundwater will not be contaminated by the mine. Additionally should boreholes become dry as a result of mine dewatering, compensation from the mine will need to be investigated where the mine will have to provide water to the farmers. A monitoring programme has also been proposed where the boreholes will continue to be tested to ensure the mine does not impact the groundwater.	Addressed
Jannie Davel	Landowners Focus Group Meeting	05-May-16	Will mining occur underneath the N11 highway on the western side?	During the Scoping Phase it was proposed that the N11 will be undermined however the infrastructure layout and mining area has been moved 100 m away from the N11 at Mooivley East to avoid undermining of this national route.	Addressed

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Jannie Davel	Landowners Focus Group Meeting	05-May-16	I disagree with the current location of the shaft on my farm since it is located on a pan and needs to be moved.	Various specialist studies have been undertaken to identify areas of sensitivity based on these sensitivities infrastructure have been repositioned in an effort to avoid these no go areas. Where infrastructure could not be repositioned mitigation measures have been proposed to reduce the potential impact. More specifically the shaft proposed to be located on your farm has been shifted out of the wetland and its associated buffer however the ventilation shaft is still located within the wetland buffer. The shaft has not been relocated off your property (Refer to Section 8 Part A and Section 5, 6 and 7 Part B of the EIA Report).	Addressed
Gert Davel	Landowners Focus Group Meeting	05-May-16	As part of the application undermining will occur at the N11 and river. If the application is rejected, will the resource be left?	An application was submitted on 14 April 2016, and subsequently accepted by the DMR. It is now required that a scoping and EIA phase be undertaken to assess the impacts of the project and provide the DMR with sufficient information to make a decision. A WULA and IWWMP will also be submitted to the DWS for final decision. This decision can either be positive or negative from the DMR and DWS. Should a rejection of the project be received from the DMR or DWS, no mining activities will be allowed to take place by Umcebo.	Addressed
Gert Davel	Landowners Focus Group Meeting	05-May-16	Will the various seams on different levels be mined or only at one level?	There are four (A, B, C and D) coal seams, but only B seam will be mined. (*Refer to Section 5.2.2 of the EIA Report).*	Addressed
Marnus Prinsloo	Landowners Focus Group Meeting	05-May-16	The conveyer belt is running though mealie fields and a wetland. Will there be proper access management and what is the servitude for the conveyor belt?	During the EIA phase the impact the conveyer belt would have on the environment was assessed by various specialist studies specifically air quality, wetlands, aquatics and visual. These studies identified areas of high sensitivity and no go areas. The relocation of the conveyer belt reduces the impact through the avoidance of a steam and wetland. The final infrastructure layout is provided in Plan 24 in Appendix 3). The conveyer belt will be accessed via a service road and security fencing will be placed alongside to prevent unauthorised access.	Addressed

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Name of Individual	**Consulted**				
Marnus Prinsloo	Landowners Focus Group Meeting	05-May-16	How will the mine affect the grazing fields for cattle and sheep?	Underground mine as the chosen mining method will result in minimal disturbance in relation to open pit mines. A soil, land use and land capability specialist study has been undertaken to assess the impact the mine will have on the land capability. The impacts varied between moderate during construction phase and minor during operational and decommissioning however with the mitigation measures that are provided these impacts were reduced to a negligible impact. Therefore it can be concluded that the impact on the soil, land use and land capability environment is not considered significant as long as the management measures are rigorously adhered to for both the Shaft Complex areas as well as the proposed conveyancing servitude, while more detailed site placement of the conveyer plinths is considered necessary based on the wetland delineation and a more detailed assessment of the wet base soils as part of the pre-construction planning (*Refer to Appendix 4 in the EIA Report*).	Assessed
Gert Davel	Landowners Focus Group Meeting	05-May-16	Will the Klein Olifants River be dammed?	The Klein Olifants River will not be dammed.	Addressed
Tielman	Landowners Focus Group Meeting	05-May-16	Will the underground pillars put in place during the mining operations be affected? Will it be able to support the surface?	Yes, the pillars will be engineered and established to uphold the surface. This will be done according to the stipulated legislated requirements for safety.	Addressed
Kobus van Wyk (Landowner representative) *Smit & Van Wyk Attorneys*	Public Meeting	05-May-16	Will the air quality modelling be undertaken to determine the impacts on all the areas proposed for mining? What are the timeframes for these studies to be completed?	An Air Quality Specialist Study has been undertaken as part of the project. In particular, an emissions inventory has been developed to understand the sources of dust (i.e. stockpiles, access roads, crushing and screening plant). The potential impact from dust has been predicted through impact modelling. The predictive model indicates the extent of the dust generation impact. All impacts have been rated to determine the severity. The study showed that the impact associated with the generation of dust resulting in a minor impact during the construction and decommissioning phase however with mitigation measures implemented this impact was reduced to a negligible impact. During the operational phase the dust generated as a result of stockpiling resulted in a moderate impact however with mitigation measures the impact was reduced to a negligible impact (*Refer to Section 11.4 and Appendix 7*	An air quality specialist study has been undertaken. The results of this study as well as an impact assessment to determine the impact the proposed project will have on air quality have been summarised in this EIA report and in Appendix 7.

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				of the EIA Report).	
Mr Vincent Schulze	Landowner Meeting	29-Mar-17	Concern with regards to the impact that mining could have on his boreholes and availability of groundwater. There are no dams on the property and he is therefore dependent on groundwater for some household use and livestock	The study concluded that the water table will drop as a result of dewatering of the underground mining area. However the boreholes located in the upper aquifer will not be impacted by the underground mine. Mining is likely to alter the natural geochemistry by exposing the sulfides for oxygenation. This could result in sulfate contamination as observed in the coal mines in the region, where the concentration could reach up to 2500 mg/L. Mitigation measures have been proposed which ensure that the groundwater will not be contaminated by the mine. Additionally should boreholes become dry as a result of the mine dewatering, compensation from the mine will need to be investigated where the mine will have to provide water to the farmers. A monitoring programme has also been proposed where the boreholes will continue to be tested to ensure the mine does not impact the groundwater.	Addressed
Mr Vincent Schulze	Landowner Meeting	29-Mar-17	He stated that the borehole water is not always used for drinking. It has a strong smell; and is blackish (when it is left to stand then residue collects at the bottom)	Should any quality or quantity issues be picked up that is as a result of the mining activity then these issues will have to be raised and possible compensation will have to be negotiated with the mine (i.e. mine supply water or compensation)	Addressed
Mr Vincent Schulze	Landowner Meeting	29-Mar-17	Question regarding the Davel road that will be diverted on his property - I would prefer for the road to be for private use -The mine representative have met with me before regarding this -I want to be involved in the process going forward	Your comment is noted. The road diversion although mentioned in the EIA report does not form part of the EIA application. It will be dealt with separately and involve the Roads department. The mine will be made aware of the issue raised.	Addressed
Mr Vincent Schulze	Landowner Meeting	29-Mar-17	During the prospecting that was undertaken it was communicated that open cast mining was being considered next to the Klein Olifants River. If this is the case what will the impact be on groundwater?	The Hendrina mine will be an underground mine only. The resource is currently located between 32 to 128 metres (m) below ground level. Therefore it is not feasible to conduct open cast mining.	Addressed
Lawful occupier/s of the land – No Comments Received					
Landowners or lawful occupiers on adjacent properties					

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Ockert Steyn	Public Meeting	05-May-16	Even if I do ask a question, Digby Wells will not provide an answer but only indicate "noted" in the Comment and Response Report.	Responses to comments are provided in this Comment and Responses Report which provides a response based on the information that is currently available. Further studies have been completed to provide more detailed responses and have been included in this report.	Addressed
K R Eales	Public Meeting	05-May-16	How many coal seams are located underground?	There are two upper and two lower coal seams (*Refer to Section 5.2.2 of the EIA Report*).	Addressed
K R Eales	Public Meeting	05-May-16	Which coal seams will be targeted for mining?	Coal seam B will be targeted for underground mining. (*Refer to Section 5.2.2 of the EIA Report*).	Addressed
K R Eales	Public Meeting	05-May-16	What is the quality of coal to be mined?	The quality of coal makes it suitable for use in the domestic thermal market (Eskom). (*Refer to Section 5.2.1 of the EIA Report*).	Addressed
K R Eales	Public Meeting	05-May-16	Was project advertised in the local newspaper because I saw a poster at a local Police Station?	Yes, the project was announced in the Middelburg Observer in addition to erecting site notices in the project area (*Refer to Appendix C3 of the EIA Report*).	Addressed
Municipal councillor					
Cllr Doctor Khanyile Ward 2 Kwaza	Public Meeting	05-May-16	Where is the project site and when will the project go ahead?	The project is situated on the Davel road approximately 10 – 22 km south east of Hendrina and next to the N11 highway (in the direction of Ermelo). The project may only proceed if the needed regulatory licenses are granted by the relevant competent authorities, which can take between two - five years. (*Refer to Section 3 of the EIA report*).	Addressed
Cllr Doctor Khanyile Ward 2 Kwaza	Public Meeting	05-May-16	What will the benefits be to communities?	A Social and Labour Plan (SLP) has been developed as part of the Mining Right Application. Potential benefits to communities include direct and indirect employment, skills development, local enterprise development through procurement and possible infrastructure development. A Social Specialist Study has been undertaken to assess the benefits of the project which specifically relates to job creation and economic development in the local markets. (*Refer to Section 11.9 of the EIA Report*).	
Cllr Doctor Khanyile Ward 2 Kwaza	Public Meeting	05-May-16	How will coal be transported?	Coal will be transported from Hendrina South to Mooivley West via conveyer belt. The coal will then be crushed and screened. The final Coal product will be transported via haul trucks on the existing road network.	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Cllr Doctor Khanyile Ward 2 Kwaza	Public Meeting	05-May-16	When did exploration occur?	Prospecting was undertaken in 2009.	Addressed
Municipality					
Cheppy Masina Hendrina Kwazamokuhle Community	Written	8-Jun-16	I'm Cheppy Masina from Hendrina Kwazamokuhle. I am the Chairperson of Kwazamokuhle Community Forum, which deals mainly with recruitment of local people for employment and business opportunities including skilling of local people. I'm glad to know of your proposal for Mining in Hendrina. We wish to work and establish relationship with you on behalf of the community and ensure all issues related to public participation are properly attended to. Cheppy Masina Kwazamokuhle Community Forum Chairperson 0799530208	Your comment is noted. You have been registered on the I&AP database and will receive notifications with regards to the progress of the project.	Addressed
Organisations of state (Responsible for Infrastructure that may be affected Roads Department, Eskom, Telkom, DWA etc. - No Comments Received					

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Nokukhanya Khumalo (South African Heritage Resources Agency)	Written Comments	21-Apr-17	SAHRA Archaeology, Palaeontology and Meteorites (APM) Unit agrees with the recommendations contained in the Heritage impact Assessment report and has no objections to the proposed development on the following conditions: A CMP must be commissioned by the mine to be written by a heritage specialist and submitted to SAHRA for approval. The CMP must detail potential direct and indirect impacts to all the heritage resources identified within a distance of a 100 m from the proposed surface infrastructure development and within the 500 m blast zone radius. ▪ The CMP must ensure that a status quo report is in place for all the rock art sites. ▪ The CMP must allow for the annual monitoring of all heritage resources within the mine right area by the relevant heritage specialist. ▪ It must contain the responsible persons to initiate monitoring of all the heritage resources and submit the subsequent reports to SAHRA. ▪ The CMP should contain the procedure to allow for family members to gain access to their respective grave sites. All burial grounds within the mine right area must be fenced with an access gate to allow for family visitation. A palaeontologist must train the ECO and the mine geologist to identify the local fossilised flora. The Fossil Finds Procedure must be included in the EMPr for implementation. The following additional conditions apply to the development: If the newly discovered heritage resources prove to be of archaeological or palaeontological significance a Phase 2 rescue operation might be necessary, and a permit will be needed before mitigation. You may contact SAHRA APM Unit for further details: (Nokukhanya Khumalo/Phillip Hine 021 202 8652), - and if any unmarked human burials are uncovered then please contact the SAHRA BGG Unit (Mimi Seetelo 012 320 8490). If any damage or disturbances to the heritage resources identified in the HIA are foreseen and the recommendations within this Final Comment cannot be adhered to then a motivation letter should be submitted to SAHRA as an additional documents in a new permit application for mitigating the sites. Should you have any further queries, please contact the designated official using the case number quoted above in the case header.	Your comments are noted and have been attached to the EIA report for DMR consideration (Appendix 18)	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Mr J.J Eksteen (Mpumalanga Tourism and Parks Agency)	Written Comments	20-Apr-17	With reference to your correspondence reference Umcebo Mining MP30/5/1/2/2/10129 MR, of march 2017 herewith our comments: Attached is figure 1, a MBSP map indicating the terrestrial biodiversity status of the mining area. Please ensure that all the above ground infrastructure of the underground coal mine are placed outside the CBA (Critical Biodiversity Areas). The CBA terrestrial biodiversity area must be conserved to meet the biodiversity conservation targets. Furthermore figure 2, a MBSP freshwater biodiversity map indicates the ESA (Ecological Support Area) Wetlands. These wetlands must be conserved in order to provide clean water to the source of the Klein Olifants River MTPA is also concerned about the following negative effects of underground mining, on the water resources and associated biodiversity above ground: 1. Subsidence, how will this be mitigated if it occurs under the wetlands? 2. Dewatering of the aboveground wetlands and grasslands, how ill dewatering be monitored and how will the negative effects thereof be mitigated during the mining phases? 3. How will the AMD decant after the decommissioning phases be dealt with and if there are no decant predicted how will the dirty underground water be treated so that nearby boreholes can still be used?	A Response letter will be compiled by Digby Wells to address the issues raised and submitted to the Mpumalanga Tourism and Parks Agency directly.	Addressed
Communities - No Comments Received					
Traditional Leaders - No Comments Received					
Department of Land Affairs					

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
William Nyoni *Department of Rural Development and Land Reform*	Written Comments	18-Apr-17	There are emerging farmers who have been leasing the affected properties. These lessees are primarily using the properties for maize production, cash crop production, natural grazing and grazing pastures for their livestock.	Thank you for the comment, it is noted and has been considered as part of the Social Impact Assessment that has been compiled during the EIA phase. The emerging farmers referred to will not be directly impact by mining infrastructure. As the mine is an underground mine it will not have a direct impact to the farming activities located within the mining right area. It is not anticipated that dust or noise will have a significant impact to the farmers. Additionally if the boreholes are located in the shallow aquifer it is not anticipated that the yield of the boreholes will be affected. However if a boreholes becomes dry, a grievance mechanism has been put in place which will compensate the farmers if it was caused by mining activities.	Addressed
William Nyoni *Department of Rural Development and Land Reform*	Written Comments	18-Apr-17	Please also note that there are occupiers who are occupying these properties. Thus the Department would appreciate it if a session with the lessees and the occupiers can be arranged wherein the proposed mining operations would be clearly explained to them for their understanding going forward as these people will be directly affected by the proposed mining operation.	Thank you for the comment. As part of the Stakeholder Engagement Process, stakeholders are invited to attend meetings where the project is presented and stakeholders are provided with an opportunity to raise concerns regarding the project. During the Scoping Phase a public meeting was held on 5 May 2016 where all stakeholders including landowners and occupiers were invited to attend. A few directly affected occupiers did attend this public meeting. An additional public meeting was held during the Environmental Impact Assessment (EIA) Phase. (Refer to Section 9 of the EIA Report for feedback on the stakeholder engagement process during the Scoping Phase and EIA phase).	Addressed
William Nyoni *Department of Rural Development and Land Reform*	Written Comments	18-Apr-17	Should you wish to gain access to the above mentioned properties, please inform the Department well in advance so same can be conveyed to the lessees well in advance to avoid any inconvenience and unnecessary conflicts?	Thank you for the understanding, Digby Wells will ensure that advanced notice is provided to ensure that there is no inconvenience caused.	Addressed
Department of Environmental Affairs - No Comments Received					
Other Competent Authorities Affected - No Comments Received					

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	Consulted				
Mpumalanga Tourism and Parks Authority	Written Comment	15-Apr-16	Please register MTPA as a IAP and forward the hardcopies of the application to Komilla Narasoo for registration. Kind Regards Frans Krige LUA Scientist MTPA Send to: Komilla Narasoo MTPA N4 Halls Gateway Mataffin Nelspruit 1200 Attention :Komilla Narasoo Block G Room G28	Your comment is noted. MTPA was registered as an I&AP and has been included on the database. Additionally a CD was submitted to the department for comment on the EIA report on 16 March 2017.	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Mr M Montsha *Department of Mineral Resources*	Written Comments	02-Nov 2017	It should be noted that the Department requires the following to be undertaken and form part of the final EIR and EMPr to be submitted. A) A map at an appropriate scale which superimposes the proposed activity and its associated infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers; B) Details of financial provisions for the rehabilitation, closure and ongoing post decommissioning management of negative environmental impacts; C) Feasible and reasonable alternatives based on the different types / categories of alternatives must be identified and assessed, so that the Department can be able to make an informed decision; D) Public Participation Process must be transparent an all comments received during the process must be incorporated into the comments and response report of the final Environmental Impact Report; E) Proof of correspondence with the various stakeholders must be included in the EIAR. Should you be unable to obtain comments, proof of the attempts that were made to obtain comments should be submitted to the Department; F) All comments from interested and affected parties must be adequately addressed in the final Environmental Impact Report; G) For linear activities such as roads and pipelines, a description of the co-ordinates of the corridor in which the proposed activities are to be undertaken. The impacts of these linear activities must be thoroughly assessed; H) Any other matters required in terms of Appendix 3 (3) and Appendix 4 (1) of the EIA Regulation 2014. The applicant is hereby reminded to comply with the requirements of regulation 3 of the EIA regulations, 2014 with regards to the time and period allowed for complying with the requirements of the regulations.	The issues that have been raised by the DMR have been addressed in the following Sections as discussed below: A) A sensitivity map has been compiled and included in Appendix 3 Plan 7; B) The financial provision and closure report has been discussed in Section 24, 8 and Appendix 17. The mitigation measures for the decommissioning phase has been included in Section 11; C) Feasible and reasonable alternative have been investigated and discussed in Section 8; D) A public participation process has been completed in a transparent manner. It has been documented in detail in Section 9 and Appendix 2; E) All comments have been captured in the CRR (Appendix 2) and Section 9; F) All comments have been adequately addressed in the CRR (Appendix 2) and Section 9; G) The roads proposed to be constructed will be located within the mining right area. All linear activities have been assessed and discussed in Section 11; H) The EIA and EMPR have been compiled in accordance with the DMR format and Appendix 3 (3) and Appendix 4 (1) of the EIA Regulation 2014	Addressed

Interested and Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Consultation Status (Consensus dispute, not finalised, etc.)
Name of Individual	**Consulted**				
Mr M Montsha *Department of Mineral Resources*	Written Comments	02-Nov 2017	Please ensure that the EIAR includes the A3 size locality maps of the area and illustrates the exact location of the proposed development. The maps must be of acceptable quality and as a minimum, having the following attributes: ■ Maps are related to one another; ■ Co-ordinates; ■ Legible legends; ■ Indicate alternative; ■ Scale; and ■ Vegetation types of the study area. Your attention is drawn to Section 24F of the NEMA which stipulates "that no activity may commence prior to an environmental authorisation being granted by the component authority.	The final locality map has been included in Appendix 3 Plan 24	Addressed

Table 9-5: Other Affected Parties

Other Affected Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
No Comments Received					

Table 9-6: Interested Parties

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
Albert	Public Meeting	29-Mar-17	How is the mine going to impact the water quality? How is the impact on water quality investigated? Why does the presentation not provide the results on water quality?	The presentation could not present all information included in the EIA Report. The results have been shown in the EIA report which has been placed on public review to give I&APs the opportunity to comment on the report. It can be confirmed that a surface and groundwater specialist study has been undertaken to investigate the impact the mine will have on water quality. During the investigation, samples were taken to understand the baseline environment. These results will be utilised as a baseline to understand whether the water quality is being impacted by the mine. This will be undertaken through monitoring of the surface and groundwater during the construction, operational and decommissioning phases. The results of the samples taken to assess water quality is also presented in the surface and groundwater specialist studies (Refer to Appendix 5 and 6) It was noted that the mine will impact the surface and groundwater quality however through effective mitigation measures this impact has been reduced to a negligible impact.	Refer to Appendix 5 and 6
Albert	Public Meeting	29-Mar-17	Roads will be affected and the private sector will want to run away from this responsibility. The standard of the road will decrease	Your comment is noted. It can be agreed that an increase in coal trucks utilising the road network will result in deterioration of the road network. The upgrade of this road does however fall upon the roads agency. The mine will ensure communication with the road agency is established to ensure maintenance and upgrades of the road occurs. It must be noted that the Mine cannot upgrade or make changes to the roads without consulting the road agency.	N/A
Albert	Public Meeting	29-Mar-17	How will the mine ensure that the roads are upgraded or maintained by the government when the road is damaged. The mine must play a role	Your comment is noted. It can be agreed that an increase in coal trucks utilising the road network will result in deterioration of the road network. The upgrade of this road does however fall upon the roads agency. The mine will ensure communication with the road agency is established to ensure maintenance and upgrades of the road occurs. It must be noted that the Mine cannot upgrade or make changes to the roads without consulting the road agency.	N/A

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
Sam	Public Meeting	29-Mar-17	I am happy that a Social Impact Assessment was undertaken. The study showed that there will be an increased growth within the local economy. Therefore this will have a positive impact on our businesses. So thumbs up. I understand that the N11 will be upgraded however what about the Central District Business (CBD) roads? Mitigation measures will need to be included to ensure the road is not damaged by the mine this includes the roads being utilised to go through Bethel and Middelburg.	Your comment is noted. A traffic impact assessment has been completed as part of the EIA phase. The study ensured that mitigation measures for the road network has been proposed and will be implemented. It can be confirmed that where the road joins the N11 will be upgraded. All upgrades must comply with the relevant legislation.	Refer to Appendix 15
J.M Mahlangu	Public Meeting	29-Mar-17	Concern is around the safety after closure as we have seen in previous communities where accidents have happen and we want to know what will the mine do in a situation like this	As part of the EIA process a rehabilitation and closure plan has been compiled which has been attached as Appendix 17. The report provides a rehabilitation plan which must be implemented once the mine closes to prevent potential health and safety incidents occurring. The study indicates that the shafts will be backfilled with material from the mine. The shaft will then be sealed with a concrete slab and vegetated to a natural state. The incidents mentioned are related to old abandoned shafts that have not been closed properly.	Refer to Appendix 17
J.M Mahlangu	Public Meeting	29-Mar-17	The concern is around blasting and the affect it has on housing	A Blasting and Vibration Specialist Study was undertaken as part of the EIA process. It should be noted that there will be limited surface blasting during the development of the shafts and limited underground blasting.	Refer to Appendix 16
J.M Mahlangu	Public Meeting	29-Mar-17	How will the community benefit from the mine?	The social and labour plan (SLP) has been compiled. The report includes specific conditions relating to job creation, community projects and training programs which will need to be implemented. This SLP is submitted to the DMR alongside the mining right which must be implemented should the mining right be accepted.	N/A
J.M Mahlangu	Public Meeting	29-Mar-17	This meeting should be done first with me. There has been no verbal communication with me. A prior meeting needs to be done.	Your comment is noted.	N/A

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
J.M Mahlangu	Public Meeting	29-Mar-17	I agree, understand and expect that local labour will be given first preference. Additionally I understand that training and skill development will be provided through the various initiatives proposed by the mine. I also understand that certain skills are required by the mine which may not be available within the local community. I should have been the first one to be consulted, now it looks like I am selling these people and I am not going to support that	Your comment is noted. As we are in the EIA phase, this is the last meeting Digby Wells will have with the community. Therefore it has been communicated to the mining house that should further engagement with the community be required, the community leaders will be the first to be contacted.	N/A
Barry	Public Meeting	29-Mar-17	Will the community benefit? Yes or No	Yes, it can be communicated that the local community will benefit, directly and indirectly from the construction and operation of the mine. During the construction and operational phases, a variety of skills will be required including skilled, semi-skilled and unskilled. Local employment will be given first priority however should specific skills be required that cannot be obtained from the community, these skills will be sourced elsewhere. It must also be noted that not only will the community benefit directly by the mine (labour), indirect benefits will also be created such as increased capital within the community, economic growth and diversification.	Refer to Appendix 12
Barry	Public Meeting	29-Mar-17	There are rumours that Eskom is going to close, what will be the benefit for the community? Do not refer us to the government as they are not here	This public meeting is specifically for the proposed Hendrina underground mine. Therefore Digby Wells cannot comment on the closure of Eskom power stations.	N/A
Barry	Public Meeting	29-Mar-17	When will this project start?	The EIA report is currently out for public review for a period of 30 days. It is proposed that the final EIA report is submitted to the DMR on 26 April 2017. The DMR then has 107 days to consider the application and make a decision. Should the authorisation be obtained, capital must still be sourced before the mine considers moving into the construction phase of the project.	N/A
Renee Mathibela	Public Meeting	29-Mar-17	There are rumours that Eskom is planning to shut down some of its power stations. The community needs to know about this.	This public meeting is specifically for the proposed Hendrina underground mine. Therefore Digby Wells cannot comment on the closure of Eskom power stations	N/A

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	**Consulted**				
Vusi	Public Meeting	29-Mar-17	I would like to follow up on the question raised earlier. The communality is aware that Eskom is closing various power stations in the area. If you are unaware of this information then your information is outdated.	Eskom requires coal and power stations to operate. The power stations that are closing down are considered to be old and no longer able to be maintained. Coal is continuously in demand and therefore new power stations will be constructed to keep up with south Africa power demand.	N/A
Vusi	Public Meeting	29-Mar-17	So what will happen with exporting the coal? There are no details on supply chain and procurement.	The quality of coal makes it suitable for use in the domestic thermal market (Eskom) therefore no coal will be exported. The supply chain and procurement for labour will only be completed should the mining right be granted	N/A
Vusi	Public Meeting	29-Mar-17	We often find that the system is not in our favour and we are not able to benefit	The SLP has been compiled to provide an understanding of what the mine is required to do to give back to the community. The report includes specific conditions relating to job creation, community projects and training programs which will need to be implemented. This SLP is submitted to the DMR alongside the mining right which must be implemented should the mining right be accepted.	Refer to Appendix 12
Vusi	Public Meeting	29-Mar-17	The social responsibility on shares is not clear and associations on how the share responsibility in terms of BBBEE and Social	The SLP has been compiled which is provides an understanding of what the mine is required to do to give back to the community. This SLP is submitted to the DMR alongside the mining right which must be implemented should the mining right be accepted. Should authorisation be received further investigation into this issue will be undertaken during later community liaison.	Refer to Appendix 12

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
July Mnguni	Public Meeting	29-Mar-17	The mining right is needed. These people here are all unemployed. People in Hendrina often do not get the jobs as they do not have experience. How will the mine make sure people are trained to obtain the jobs created by the mine?	Your comment is noted. As part of this proposed project, Umcebo has drafted a Social and Labour Plan (SLP) which outlines the Local Economic Development (LED) programmes set for the surrounding community. The main priority of the LED programmes is to improve the educational facilities within the surrounding communities. As part of its LED planning, Umcebo also intends to implement measures to advance procurement from HDSA suppliers and will continually seek to allocate an amount of annual expenditure in services and consumables to suppliers with this status. The commitment to purchasing will also extend to create long term partnerships with suppliers so as to mentor and support local HDSA-owned businesses. Over a five year period, just over R 1.9 million will be spent on Human Resource Development (HRD), and R 500 000 on LED. A total of almost R 2.6 million has been assigned to the execution of the SLP for the first five years of the proposed project.	Refer to Appendix 12
July Mnguni	Public Meeting	29-Mar-17	The people on the farms should get first preference to job opportunities by the mine. Why did you not call them to come here?	Your comment is noted. The EIA process was undertaken in according with the EIA Regulations 2014. The public participation process was followed which included notifying I&APS through adverts, background information documents as well as site notices. A public meeting was held during both the Scoping and EIA phase to provide information to the community. Additional it can be confirmed that the local community will be given first priority to job opportunities. We rely on the community to assist us in obtaining further details of people that you feel will need to be notified.	N/A
July Mnguni	Public Meeting	29-Mar-17	In Zulu to the public: Let us do it ourselves people because these people are going to gives us problems. The councillors who are meant to be here are not here and we do not want them to be here.	Your comment is noted.	N/A
Musawenkosi Masina	Public Meeting	29-Mar-17	How will the mine contribute to climate change have mitigation measures been included to prevent the mines contribution to climate change?	The mine may impact climate change through the generation of greenhouse gases from generators and haul trucks at the mine. It will be proposed that catalytic converters are utilised on trucks and generators to reduce the generation of these gases.	Refer to Appendix 7

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
Musawenkosi Masina	Public Meeting	29-Mar-17	The mine will result in pollution of the environment. Therefore, will a clinic or hospital be established to provide support to the community should they become sick from the mine.	It is not anticipated that they mine will contribute negatively to the health of the community as the coal will not be processes to release unwanted emissions. As stated in the SLP In terms of LED: The mine will consult with the Steve Tshwete Local Municipality regarding priority projects within the IDP.	
Musawenkosi Masina	Public Meeting	29-Mar-17	Will there be blasting and have mitigation measure been included to prevent damage to the buildings and prevent impact to the people living in the community.	A Blasting and Vibration Specialist Study was undertaken as part of the EIA process. It should be noted that there will be limited surface blasting during the development of the shafts during construction and limited underground blasting other than when a geological anomaly is encountered, such as a dyke. During such instances, the DMR will be notified if there are structures located within the blasting radius and the necessary communication with the landowners and land-users will also be done. A blasting impact assessment was compiled and attached as Appendix 16 and is available for public review along with this EIA report. The original report was considered a worst case scenario for the influences evaluated. However the possible impact from drilling and blasting operations had to be reviewed due to a change in development of the decline shafts. The first 5 to 10 blasts are expected still to have some effect from sound, ground vibration, and air blast within the immediate vicinity of the shaft but will start subsiding thereafter. Further assessment was not required (Refer to Section 11.13. and Appendix 16 of the EIA Report).	Refer to Section 11.13. and Appendix 16 of the EIA Report

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
Musawenkosi Masina	Public Meeting	29-Mar-17	Skills development- does the mine have these skills for the people?	Your comment is noted. To obtain a mining right a SLP needs to be undertaken and submitted to the DMR for consideration. This SLP stipulates the labour to be used and programmes to be started to help empower the local communities. These programmes include training and skills development. The SLP currently stipulates that local labour should be given first preference. During the construction and operational phases, a variety of skills will be required including skilled, semi-skilled and unskilled. Local employment will be given first priority however should specific skills be required that cannot be obtained from the community, these skills will be sourced elsewhere. It must also be noted that not only will the community benefit directly from the mine (labour); indirect benefits will also be obtained such as increased capital within the community, economic growth and diversification.	Refer to Appendix 12
Musawenkosi Masina	Public Meeting	29-Mar-17	What is the estimated figure on the number of people who will benefit	It is anticipated that the proposed project will likely provide a total of 86 jobs during the construction phase and 371 jobs during the operational phase which will ultimately contribute to the surrounding communities through job creation and procurement of goods and services. Umcebo's recruitment policy is based on an employment ratio of 70:30 Historically Disadvantaged South Africans (HDSAs) to non-HDSAs unless business requirements such as maintenance of the company's Mining Charter credentials necessitate differently. Employees recruited from local historically disadvantaged communities should also represent vulnerable groups such as women and people with disabilities.	Refer to Appendix 12
Musawenkosi Masina	Public Meeting	29-Mar-17	How will the mine benefit the community directly.	It can be communicated that the local community will benefit, directly from the construction and operation of the mine. During the construction and operational phases, a variety of skills will be required including skilled, semi-skilled and unskilled. Local employment will be given first priority. Additionally services and goods will need to be sourced by the mine which will encourage economic development within the local economy through the growth of businesses.	Refer to Appendix 12

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
Musawenkosi Masina	Public Meeting	29-Mar-17	Will there be education development programmes for matriculates such as bursaries?	In accordance with the SLP, LED programmes will need to be set up for the community. The main priority of the LED programmes is to improve the educational facilities within the surrounding communities. Additional training and skill development programmes will also be set up to advance the community and provide them with the skills required to obtain the various jobs offered at the mine. It will be suggested to the mine that a bursary program should be set up to assist school pupils and matriculates obtain the required education.	Refer to Appendix 12
Musawenkosi Masina	Public Meeting	29-Mar-17	If there is a future meeting please bring speakers	Your comment is noted	N/A
Musawenkosi Masina	Public Meeting	29-Mar-17	What is the duration of the mine?	The project is proposed to commence once the environmental authorisation; IWUL and WML have been granted. The estimated LoM will be in excess of 30 years but the environmental authorisation will be required for an initial period of 36 years.	N/A
July Mnguni	Public Meeting	29-Mar-17	To the councillor: (In Zulu) I do not want to disrespect you. I did not see you were at the meeting	Your comment is noted	N/A
Sipho	Public Meeting	29-Mar-17	What mines do is present us with so many opportunities in the SLP and then do not implement them and the community then suffers. It is proposed that after you get the right you must come back to the community to discuss how the SLP will be implemented including training and skill development programmes	Your comment is noted and a recommendation to this extent has been included in the EIA report.	N/A
Zandile	Public Meeting	29-Mar-17	We need to get assurity for when opportunity comes up that the person hired is from this community. How are you going to employ us? How is the community services going to be recognised	Should the mine obtain the environmental authorisation, notices will be sent detailing the jobs and services required by the mine. The local communities will be required to register on the registry as well as on a vendor list. If further engagement is required, the community should communicate with the mine directly.	N/A

Interested Parties		Date of comments received	Issues raised	EAPs response to issues as mandated by the applicant	Section and paragraph reference in this report where the issues and/or responses were incorporated
Name of Individual	Consulted				
July Mnguni	Public Meeting	29-Mar-17	When are we going to register? You must tell us everything	The EIA report is currently out for public review for a period of 30 days. It is proposed that the final EIA report is submitted to the DMR on 26 April 2017. In terms of the EIA phase the DMR has 107 days to make a decision on the Authorisation (positive or negative). Should the Authorisation be obtained, capital must be secured before the mine begins construction Once these funds are secured a recruitment process will be initiated which will aim to focus on local labour employment.	N/A
Gilbert	Public Meeting	29-Mar-17	There have been a number of questions asked. Go and have your DMR license as you are currently not giving us something tangible.	Your comment is noted.	N/A

10 Item 3(g)(iv): The Environmental Attributes Associated with the Development Footprint Alternatives

A number of specialist studies were undertaken during the EIA phase for the proposed project. The information provided in this section has been obtained from these reports. For the purposes of this EIA report the **project site** refers to the mining right area which includes Mooivley East, Mooivley West and Hendrina South, whilst the **project area** refers to the local areas surrounding the project site.

10.1 Type of Environment Affected by the Proposed Activity

10.1.1 Climate

The project area falls within the central Mpumalanga Province climatic zone, characterised by strong unimodal summer rainfall (October to March), warm summers and cold dry winters with frost. Precipitation falls mainly in November, December and January and occurs in the form of showers and thunderstorms, which are often extreme and sometimes accompanied by hail.

10.1.1.1 Wind

The spatial and annual variability in the wind field for the project area is clearly evident in Figure 10-1. The predominant wind direction is from the northeast and east northeast accounting for 12% and 11% respectively. Secondary contributions are observed from northwest and west northwest respectively. Wind speed greater that ≥ 5.4 m/s occurred for about 11% of the time.

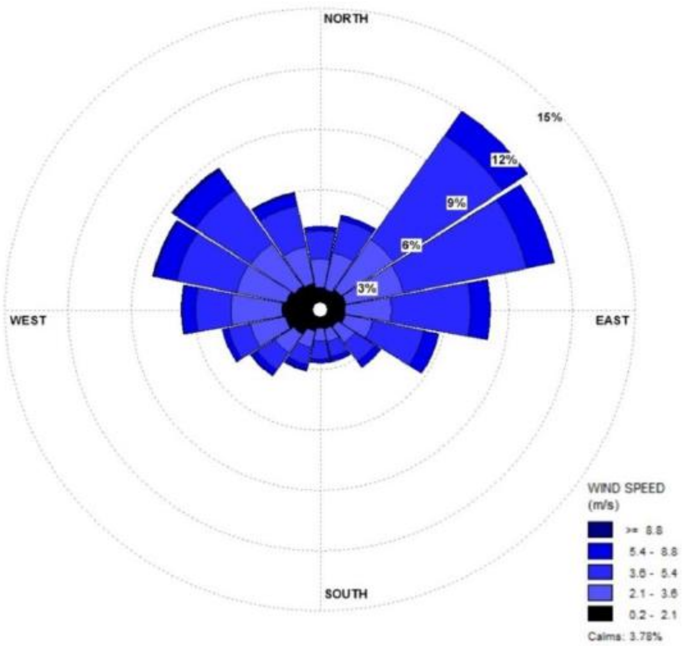

Figure 10-1: Surface Wind Rose

Over the three year period, calm conditions (wind speeds < 0.5 m/s) occurred for 3.78% of the time. Average wind speed was 3.3 m/s. The diurnal patterns during the night, morning and evening hours were somehow similar, with the dominant winds coming from the northeast, except in the afternoon when westerly winds dominated (Figure 10-2). Strong winds greater than 5.4 m/s reaching ~14% in the morning and afternoon respectively were observed.

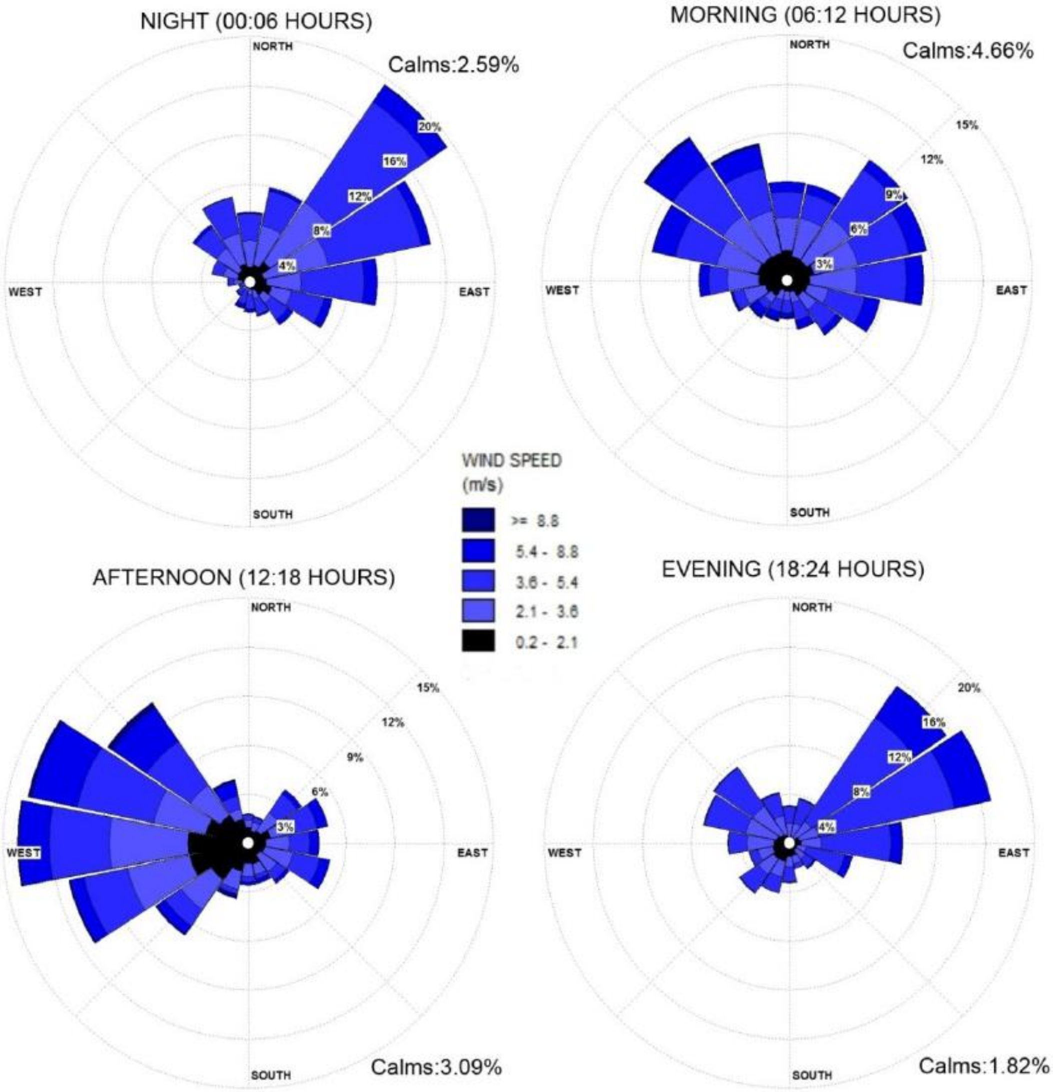

Figure 10-2: Diurnal Variation of Winds Night-Time: 00:00 – 06:00 (top right), Morning 06:00 – 12:00 (top left), Afternoon 12:00 – 18:00 (bottom left) and Evening 18:00 – 24:00 (bottom right)

The seasonal (Figure 10-3) patterns show spring to have been dominated by winds from the northwest (11%), west northwest (8%) and north northwest (9%) respectively. Wind speed ≥ 5.4 m/s was observed 18% of the time. Summer was dominated by winds from the northeast (19%), east northeast (16%) and east (10%), with winds ≥ 5.4 m/s occurring for 7% of the time. In autumn, winds from the east northeast (10%) and northeast (9%) were dominant, with winds ≥ 5.4 m/s occurring for 6% of the time. Winter was dominated by wind blowing from the northwest (10%), with secondary contributions from the west northwest (9%) and west (8%) respectively. Wind speed ≥ 5.4 m/s occurred for 12% of the time.

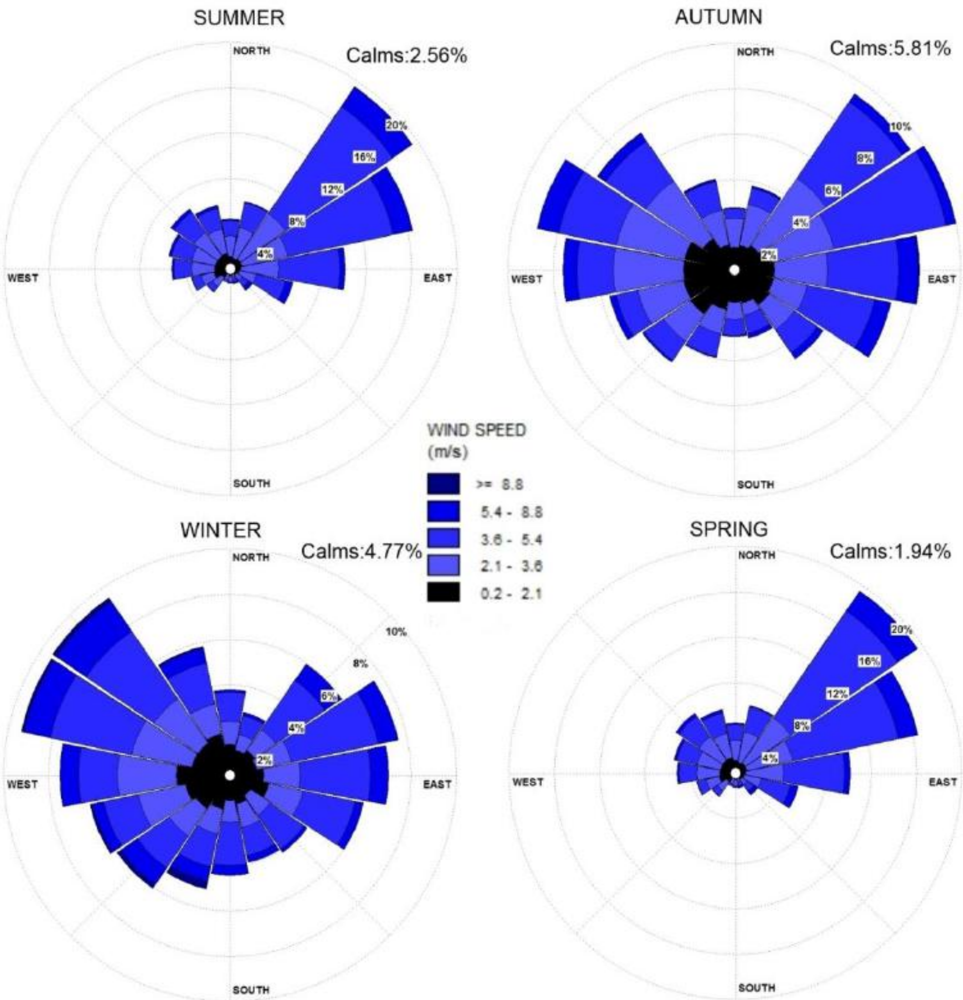

Figure 10-3: Seasonal Variation of Winds in summer (Dec – Feb); autumn (March – May); winter (Jun – Aug) and spring (Sep – Nov)

10.1.1.2 Rainfall

The total monthly and average rainfalls are shown in Figure 10-4 for the three-year period 2013 - 2015. The highest total monthly precipitation (196 mm) was observed in December. The lowest rate of 1 mm was observed in June. The annual total and average rainfall of 994 mm (max) and 60 mm are reported. The area has a mean annual precipitation of around 700 mm.

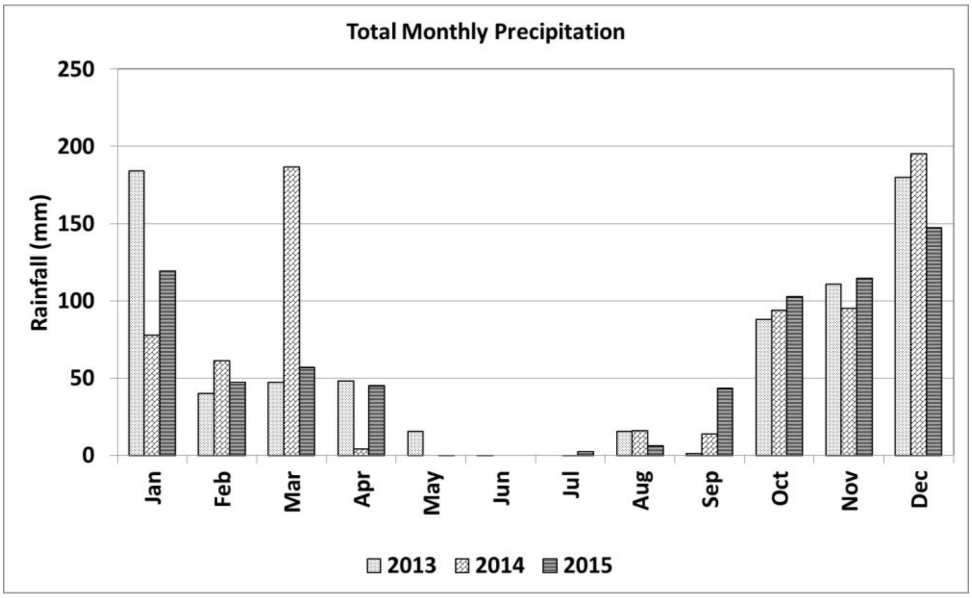

Figure 10-4: Total Monthly Precipitation

10.1.1.3 Temperature

The maximum temperatures range from 17°C in July to 29°C in December and January, with monthly average ranging from ~8°C in July to 19°C in December, January and February (Figure 10-5). Annual average temperature for the project site is given as 15°C.

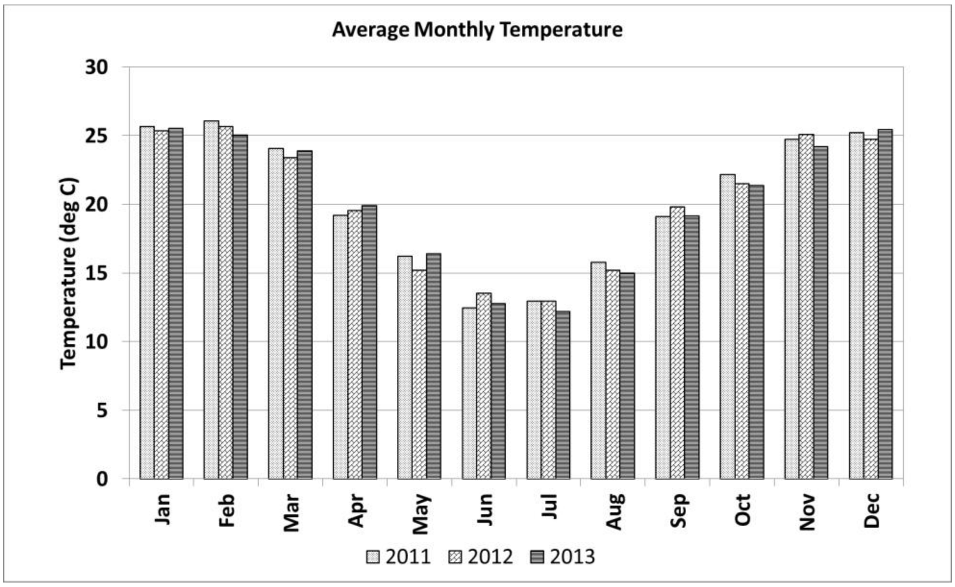

Figure 10-5: Average Monthly Temperature

10.1.1.4 Relative Humidity

The data in Figure 10-6 are representative of the relative humidity for the Project area. The annual maximum and average relative humidity is given as 100% and 71%, respectively. The monthly maximum reaches 100% at times during the year. The monthly average on the other hand is around 70% for the whole year, with the highest of 75% observed in the months of June.

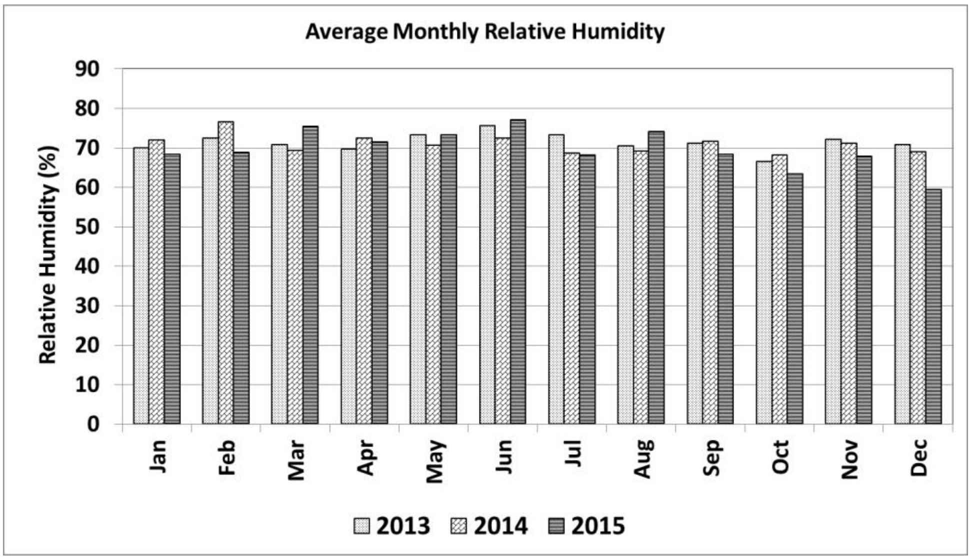

Figure 10-6: Average Monthly Relative Humidity

10.1.1.5 Evaporation Rates

Monthly evaporation data was obtained from the WR2005 manual (WR2005, 2009). The project area lies within quaternary catchments B12A, which has a MAE of 1 262 mm. The evaporation obtained is based on Symons Pan evaporation measurements and needs to be converted to lake evaporation. This is due to the Symons Pan being located below the ground surface and painted black which results in the temperature in the water being higher than that of a natural open water body. The Symons Pan figure is then multiplied by a lake evaporation factor to obtain the adopted lake evaporation which presents the monthly evaporation rates of a natural open water body. Table 10-1 is a summary of the evaporation from the WR2005 for the B12A quaternary.

Table 10-1: Summary of Evaporation Data

Months	Symons Pan Evaporation (mm)	Lake Evaporation Factor	Lake Evaporation (mm)
January	165.1	11.0	138.7
February	137.6	9.2	121.1
March	135.8	9.1	119.5
April	104.5	7.0	91.9
May	88.0	5.9	76.5
June	71.4	4.8	60.7
July	78.2	5.2	64.9

Months	Symons Pan Evaporation (mm)	Lake Evaporation Factor	Lake Evaporation (mm)
August	103.6	6.9	83.9
September	134.2	8.9	108.7
October	161.8	10.8	131.1
November	152.7	10.2	125.2
December	168.1	11.2	139.5
Total	**1 501**	**N/A**	**1 262**

The evaporation rates presented in Table 10-1 show that the highest evaporation of 139.5 mm, 138.7 mm and 131.1 mm was recorded in December, January and October respectively. The monthly minimum evaporation ranges between 60.7 mm in June and 64.9 mm in July.

10.1.2 Geology

A geological assessment was undertaken by Shanduka Coal (May, 2012) to evaluate the regional and local geology and coal resource within the project area. The prospecting results revealed a structurally complex coal reserve with high occurrences of dolerite intrusions in the form of sills and dykes. Although no dolerite was encountered by the boreholes drilled during this study, Shanduka Coal (2012) reported that intrusive dykes and sills, predominately doleritic in composition, are common and devolatilisation[5] of the coal adjacent to the intrusives can be significant.

The E seam has a maximum thickness of over 3 m in the northern part of the Ermelo coal field. The C seam is traditionally subdivided into the C Lower and C Upper seams. The C Lower seam is normally less than 0.6 m thick. The upper portion of the C Upper Seam is of low grade and may be torbanitic in places. The thickness of the composite seam varies between 0.7 and 4 m. The B seam may reach a thickness of up to 3 m and comprises mainly dull coal. The A seam is normally less than 1 metre thick and of low grade.

The average seam thicknesses of the seams at the project site are summarised in Table 10-2. Considering the coal quality and coal seam thickness, only the B seam will be mined at the project site. The local coal deposit varies in depth between 32 m to 128 mbgl.

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[5] Coal devolatilization is a process in which coal is transformed at elevated temperatures to produce gases, tar* and char (Solomon *et al*, 1988).

Table 10-2: Average Coal Seam Thicknesses

Seam	Average thickness (m)
A	0.65
B	2.27
C	1.91
D	0.24

The aeromagnetic map of the project site is given in Plan 8 in Appendix 3. A number of southwest-northeast trending dykes are traceable. The linear anomalies cross on the eastern tip of Hendrina South and on the western portion of Mooivley East and West. The Mooivley East and West areas are characterised by what appear to be disconnected sills having significant difference in magnetic anomaly. Considering the magnetic anomaly, a continuous horizontal sill is expected to exist in the area of Hendrina South.

10.1.3 Soil

A Soil Assessment (Appendix 3) was undertaken in support of the EIA to determine soil characteristics and the impact associated with the proposed project.

The project site is in close proximity to a number of existing mining ventures, and forms part of the greater coal mining regions of the eastern and central Highveld coal fields of South Africa. The pedological study was performed in March and May 2016 and based on a variable grid bases with the understanding that the differences in soil forms, site sensitivity, the impact of surface infrastructure and the possibility of subsidence due to underground mining collapse will affect the surface features to differing degrees.

10.1.3.1 Soil Forms Identified

The dominant soil forms encountered during the site investigation include those of the orthic phase Hutton, Clovelly, Griffin, Shortlands and shallow Mispah and Glenrosa, with sub dominant forms that include the Shortlands, Valsrivier and Glencoe forms. In addition, and of importance to the area in question, is the significantly large proportion of the area that comprises wet based soils and materials that classify as “wetlands” in terms of the wetland delineation guidelines, DWAF guidelines (2005). These hydromorphic form soils are extremely prevalent and are primarily associated with the Klein Olifants River catchment and its tributaries. Figure 10-7 provides a map of all dominant soils within the project site. The dominant groups include the deep sandy loams (generally >700 mm) with no signs of wetness, moderately deep sandy loams and silty clay loams, shallow soils and very shallow materials, and a number of groups of hydromorphic soil forms that vary in depth and underlying plinthite character. A more detailed explanation of the characteristics of these soil types can be found in Appendix 3.

10.1.3.2 Soil Chemical Characteristics

The results presented in Table 10-3 of the analysis returned moderate to light textured soils with a pH of between 4.2 and 7.5, a base status ranging from 2.2 CEC values (total of cations (Ca, Mg, K and Na) (me %) to 10.6 me %, and nutrient levels reflecting generally acceptable concentrations of calcium and magnesium, but deficiencies in the levels of potassium, phosphorous and zinc, with predictably low organic carbon matter. The structured and basic derived soils returned values that are indicative of the higher reserves of calcium and magnesium. They are inherently low in potassium reserves, and returned lower levels of zinc and phosphorous for economically acceptable agricultural growth.

Table 10-3: Analytical Soils Results (Soil Report, 2016)

Obs Pt	Soil Fm	pH (Water)	Res (ohms)	Ca (mg/kg)	Mg (mg/kg)	K (mg/kg)	Na (mg/kg)	P (Bray1)	Al (mg/kg)	Ca (Mg)	Ca (mg/k)	Zn (mg/kg)	C (%)	Org Mat (%)	Sand (%)	Silt (%)	Clay (%)
H1	Hu	7.52	1146	2774	218	4	10	7	0.8	12.72	748	1.2	0.32	NA	68	13	19
H2	We	5.55	2100	3089	1327	220	21	0.3	10	2.33	20.07	4.29	2.52	4.33	52	14	24
H3	Av	5.93	840	3632	1473	217	171	0.5	9	2.47	23.53	3.52	1.01	1.73	60	6	34
H4	Cv	4.96	500	537	149	225	8	10.7	51	3.60	3.05	2.92	1.01	1.73	82	4	14
H5	Cv/Gf	5.02	1400	1626	470	322	132	0.6	11	3.46	6.51	1.25	1.19	2.04	60	16	24
H6	Bd	5.33	990	734	373	107	61	0.3	15	1.97	10.35	1.25	0.86	1.49	68	12	20
H7	Rg	4.2	940	353	85	253	4	43.7	17	4.15	1.73	5.52	1.44	2.48	77	3	20
H7a	Lo	4.7	622	122	34	12	3	7	6	3.59	13	0.9	0.04	NA	74	24	2
H7b	Lo	6.85	842	1946	728	12	20	7	1.2	2.67	222.83	1.10	0.33	NA	55	6	39

The dominant soils mapped in this area are neutral to acid (4.20 to 7.60), generally within the accepted range for good nutrient mobility albeit that lime is often a requirement for some of the commercial crops grown. However, some of the soils derived from intrusive material will tend to be more alkaline than indicated by these results due to the potential buffering capacity of the moderately high levels of calcium carbonate.

In addition to the acidity/ alkalinity of a soil, the salinity and/or sodicity are of importance in a soils potential to sustain growth. Highly saline soils will result in the reduction of plant growth caused by the diversion of plant energy from normal physiological processes, to those involved in the acquisition of water under highly stressed conditions. Salinity levels of <60 milliSiemen per metre (mS/m) will have no effect on plant growth. From 60 – 120 mS/m salt sensitive plants are affected, and above 120 mS/m growth of all plants is severely affected. Generally, the soils mapped in this area tend toward being non-saline in character, but could become susceptible to an increase in salinity if their water regime is not well managed, particularly on the more clay rich materials (Rensburg and Arcadia).

The soil fertility mapped in this area returned moderate to high levels of some of the nutrients required for good plant growth, although Zinc (Zn), Phosphorus (P) and Potassium (K) are generally lower than the optimum level required, and the soil depths are inhibiting due to the extreme soil structure. Significantly large areas of soil with an acceptable level of plant nutrition where mapped on soils that are not generally considered to be of an arable rating. These results can possibly be ascribed to either a natural anomaly in nutrient levels within the soil profile sampled, or to residual levels of fertiliser within the soil due to farming activities in the area. There are no indications of any toxic elements that are likely to limit natural plant growth in the soils mapped within the project area. Fairly standard fertiliser treatments will be needed for optimum agricultural production of crops on areas that have previously been planted, with good water management being of paramount importance on both dry-land as well as irrigated lands.

The potential for a soil to retain and supply nutrients can be assessed by measuring the Cation Exchange Capacity (CEC) of the soils. The low organic carbon content is balanced to some extent by the relatively high clay content which naturally provides exchange sites that serve as nutrient stores. These conditions will result in a moderate retention and supply of nutrients for plant growth. Low CEC values are an indication of soils lacking organic matter and clay minerals. Typically a soil rich in humus will have a CEC of 300 me/100g (>30 me/%), while a soil low in organic matter and clay may have a CEC of 1-5 me/100g (<5 me/%). Generally, the CEC values for the soils mapped in the area are moderate to low, due to the moderate clay contents but poor organic matter content.

10.1.3.3 Soil Physical Characteristics

The majority of the soils mapped exhibit apedal to weak structure, moderate clay contents and mesotrophic to dystrophic characteristics. Due to the texture and structure inherent in these soils, compaction within the "A" horizon is likely to occur if heavy machinery is used during the wet summer months over unprotected ground, while the sensitivity of the soils to erosion is a factor to be considered during the rehabilitation process.

10.1.3.4 Soil Erosion and Compaction

The erosion potential of a soil is expressed by an erodibility factor ("K - factor"), which is determined from soil texture, permeability, organic matter content and soil structure.

The average "Erosion Indices" for the dominant soil forms on the project site can be classified as having a moderate erodibility index. This is largely ascribed to the generally low organic carbon content and the sensitivity of the soils to solution weathering. These factors are offset by the generally gentle to flat topography and the moderate clay contents. The vulnerability of the "B" horizon to erosion once/if the topsoil is removed must not be under estimated.

The wet and structured soils are susceptible to compaction due to the swelling clays that are common in the majority of the materials classified. These soils will need to be managed extremely well, both during the stripping operation, as well as during the stockpiling/ storage and rehabilitation stages.

The concerns around erosion and compaction are directly related to the fact that the protective vegetation cover and topsoil will be disturbed during any mining or construction operation. Once disturbed, the actions of wind and water are increased. Loss of soil (topsoil and subsoil) is extremely costly to any operation, and is generally only evident at closure or when rehabilitation operations are compromised.

Well planned management actions during the construction and operational phases will assist in a more effective and sustainable approach, and will have an impact on the ability to "close" an operation successfully once completed.

10.1.3.5 Dry land Production Potential

The dry land production potential of the shallow soils and the more structured forms is poor. The deeper and apedal soils are easier to cultivate and have a better propensity to both drainage as well as the holding of moisture within the soil that is available to the plant. These soils are more productive dry land materials that are also easier to manage.

10.1.3.6 Irrigation Potential

The irrigation potential for the soils is "moderate to good" in terms of the soil structure and drainage capability. With good water management, and adequate drainage, the deeper (>700 mm) soils could be economically cultivated to as irrigated crops. The spatial distribution and occurrence of these soils is limited and it is unlikely that sufficiently large enough areas of soil are available to make the use of irrigation viable on anything other than highly intensive market and tunnel gardening. Irrigation is practiced to some extent in the area of the project site. Again, the spatial distribution of the soils with adequate soil rooting depths will limit the size of the areas that can be cultivated, thus limiting the potential for economic irrigation farming. In addition, for any irrigation to be undertaken in the area on a large (sustainable) scale, it would require the installation of a number of surface water impoundments as storage during the dry months. A more detailed study would be needed if irrigated farming is to be considered as an "End Use" for the rehabilitated areas.

10.1.3.7 Soil Utilisation Potential

In general, the soils that will be disturbed and that will require rehabilitation, are moderately deep to shallow (Effective Rooting Depths (ERD) = 400 mm to 800 mm), moderately well drained, with a susceptibility to erosion and compaction and in a significant proportion of the project site show signs of wetness at depth (shallow or perched water table).

The wet based and structured soils will be difficult to work, both from a trafficability, workability, storage and rehabilitation point of view. Compaction must be considered carefully as the working of the wet based and structured soils when wet (rainy season), will be detrimental and compaction will occur. The structure of the soil will affect their workability, and provision will need to be made for the timing of the stripping and rehabilitation works to be undertaken if the structural integrity of these soils are to be maintained.

The potential for the use of the hydromorphic soils for economic crop production and/or market gardening is at best poor, and should not be considered for anything other than as wilderness/conservation lands (preferred option), while the potential for economic farming of the structured soils is considered at best to be "low intensity grazing land". The less structured and non-hydromorphic soils that cover a substantial portion of the site are considered arable class soils, and as such can be considered for use in low intensity livestock grazing and or arable crop production.

10.1.3.8 Pre-Construction Land Capability

The land capability of the project site was classified into four classes (wetland, arable land, grazing land and wilderness/conservation) according to the *Chamber of Mines Guidelines, 1991*. The "land capability classification" was used to classify the land units identified during the pedological survey. In conjunction with the soils classified, the climate, ground roughness and topography (Geomorphology) were assessed and used in the determination of the Land Capability Rating. Table 10-4 provides a description of the land capability found within the project site.

Table 10-4: Land Capability Classification

Land Capability Classification	Description
Arable	Significantly large portions of the project site have been cultivated and are being economically farmed to annual crops under dry land and irrigation. The percentage area of soil that classify as "arable" land is however somewhat smaller, with some of the farming being undertaken on soils that are either less than 700 mm in depth, rocky and inhibited in rooting depth, are associated with the transition zone wetlands or in some cases cultivation is being undertaken in the wetland zone. The area of actual cultivated land use is therefore not the same as the "arable" land capability delineated on the map.
Grazing	A significant portion of the project site rates as grazing land potential, and is used as such. These areas are generally confined to the shallower (500 mm to 700 mm) and transitional hydromorphic soil Forms that are moderately well drained. These soils are generally darker in colour, and are not always free draining to a depth of 750 mm, but are capable of sustaining palatable plant species on a sustainable basis, especially since only the subsoil's (at a depth of 500 mm) are periodically saturated. In addition, there should be no rocks or pedocrete fragments in the upper horizons of this soil group. If present it will limit the land capability to wilderness/conservation land.
Wilderness/Conservation	The areas that classify as either conservation or wilderness land are found associated with the more structured, and shallower rocky soils (Glenrosa and Mispah) that are associated with non-hydromorphic soils. These are for the most part evident as outcrop or shallow sub-outcrop on the lower mid-slopes, or occasionally on the crest slopes. This land capability unit is not prevalent in the area of concern.
Wetland	The wetland areas are defined in terms of the wetland delineation guidelines, DWAF guidelines (2005), which use both soil, topography as well as vegetation criteria to define the domain limits. These zones are dominated by hydromorphic soils that are often structured, and have plant life that is associated with aquatic processes. The soils are generally dark grey to black in the topsoil horizons, high in transported clays, and show pronounced mottling on gleyed backgrounds (pale grey colours) in the subsoils. These soils occur within the zone of groundwater influence. This land capability unit is very prevalent in the project area and makes up a significant proportion of the area that could potentially be impacted by the proposed development.

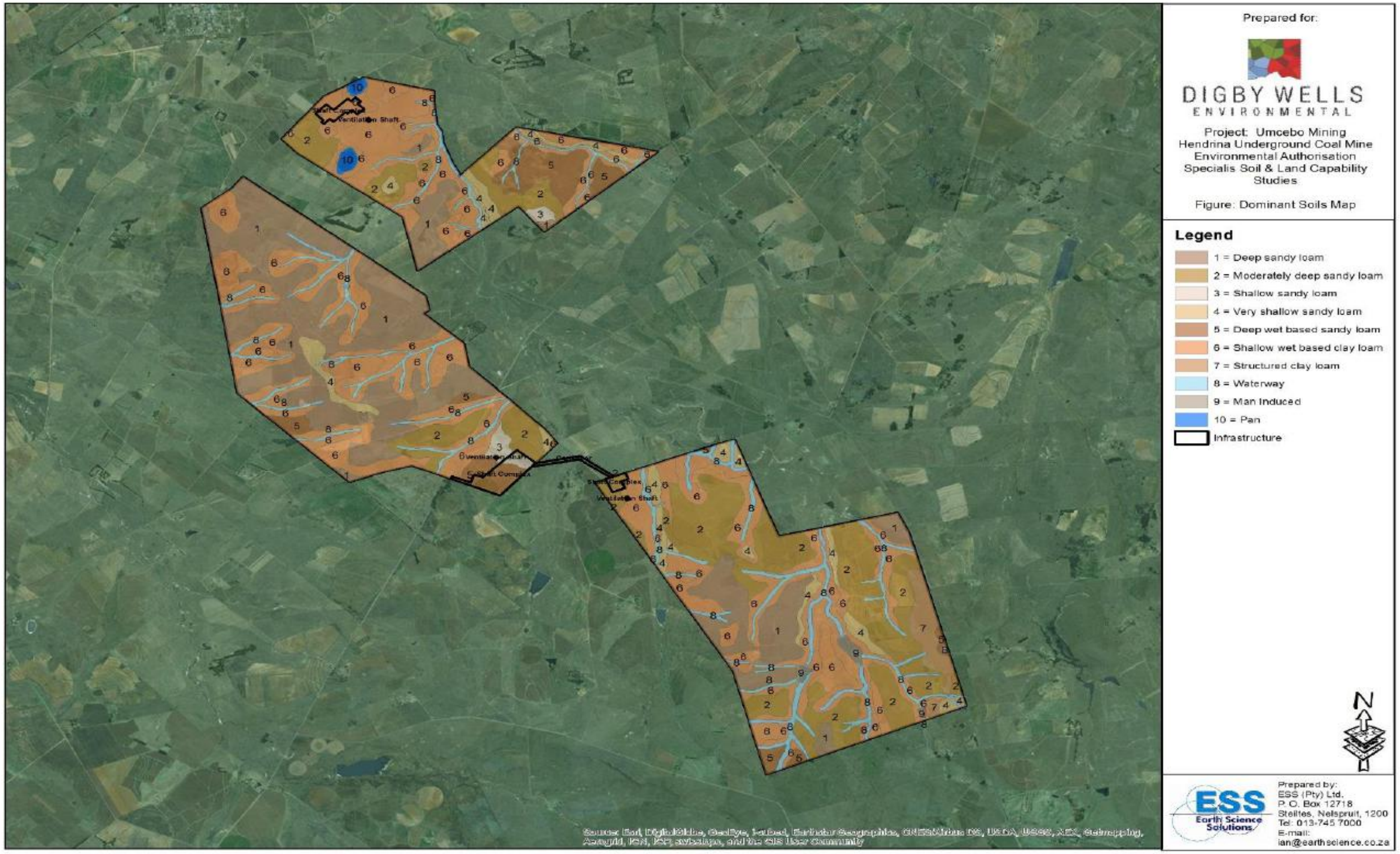


Figure 10-7: Dominant Soil Map

Figure 10-8: Land Capability Plan

10.1.4 Surface Water

A Surface Water Assessment (Appendix 5) was undertaken in support of the EIA to determine the surface water characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

10.1.4.1 Regional Hydrology

The project area is predominantly located in the Olifants Water Management Area (WMA 04), in quaternary catchment B12A. The surface water attributes of the affected catchments namely Mean Annual Precipitation (MAP), Mean Annual Runoff (MAR), and Mean Annual Evaporation (MAE) were obtained from the Water Resources of South Africa 2005 Study (WR2005) and are summarised in Table 10-5.

Table 10-5: Summary of the surface water attributes of the B12A quaternary catchment

Catchment	Area (km^2)	MAP (mm)	MAR $m^3 * 10^6$	MAE (mm)
B12A	405	672	12.69	1501

The B12A quaternary catchment has a net area of 405 km^2 and has a MAR of 12.69 million cubic metres (Mm^3). Runoff emanating from this quaternary catchment drains in a northerly direction via the Klein Olifants River which then feeds into the Olifants River.

10.1.4.2 Mean Annual Runoff

Based on GN R704[6] requirements, all runoff emanating from dirty water areas such as mine infrastructure, operational areas and ROM stockpiles need to be contained within these areas, so as not to mix with the downstream clean water.

The proposed project will be an underground mine. However, there will be surface infrastructure including a crushing and screening plant, PCD and offices. The identified infrastructure areas amount to approximately 1.5 km^2. The percentage loss in MAR for the B12A quaternary catchment and the sub catchments at each of the three sites due to the project are depicted in Table 10-6 and are relatively small, all below 5%.

[6] Regulations on Use of Water for Mining and Related Activities aimed at the Protection of Water Resources; GN R704 in Government Gazette 20119 of 4 June 1999

Table 10-6: Loss in MAR due to Proposed Infrastructure

Catchment	Total Area (km^2)	Catchment MAR (m^3* 10^6)	Infrastructure Area (km^2)	Percentage decrease in MAR (%)	Loss in MAR (m^3* 10^6)
B12A	405	12.69	0.42	0.10	0.013

10.1.4.3 Land and Water Uses

The predominant land and surface water use in the study area is agricultural (livestock watering and crop irrigation); according to the Water Authorisation and Registration Management System (WARMS) database.

Based on the site survey, cultivated land exists within all the mining right areas, while other parts consist of grassland and farm houses.

10.1.4.4 Water Quality

A site visit was conducted on 16 and 17 March 2016 to collect water samples from the Klein Olifants River and other streams around the project area. The Klein Olifants was mostly dry with sections having stagnant water. Five water samples were collected.

March is considered wet season in South Africa hence the water quality results for March represent the baseline water quality during the wet season. During the dry season, only two samples were collected at the same locations as the other monitoring points were dry; this sampling round was completed in June 2016.

Samples were submitted to Aquatico Laboratory (Pty) Ltd, a SANAS accredited laboratory, in Pretoria for analyses of physical and chemical water quality parameters. Table 10-7 presents the coordinates for the surface water sampling points. Details pertaining to the location of these samples are discussed in the Surface Water Report, 2016 (Appendix 5). The results of the surface water quality analysis are presented in Table 10-8.

The predominant water use around the project area is agriculture (irrigation) and for that reason the results were also benchmarked against the South African Water Quality Guidelines for Agricultural Use: Irrigation (DWAF, 1996). The Resource Water Quality Objectives (RWQOs) are defined by the DWS, based on the NWA as “clear goals relating to the quality of the relevant water resources” (DWAF, 2006a). In South Africa, the South African Water Quality Guidelines (SAWQG) has been developed as discrete values that depict the change from one category of fitness for use to another (DWAF, 1996).

The Klein Olifants water quality has also been benchmarked with the RWQO for the Upper and Middle Olifants catchments. To understand the baseline water quality of the project area, analysis of the variation in the water quality during the wet and dry season was undertaken.

The water quality guidelines describe the “fitness for use” of a water resource, while the Water Quality Objectives define “what management action is required” for a water resource. The fitness for use of water defines how suitable the quality of water is for its intended use.

Table 10-7: Surface Water Monitoring Points

Point Name	Latitude*	Longitude*
SW01	26°13'58.88"S	29°46'35.67"E
SW02	26°14'40.47"S	29°46'56.78"E
SW03	26°13'6.39"S	29°46'7.33"E
SW05	26°17'30.89"S	29°50'14.73"E
SW06	26°8'49.83"S	29°45'8.31"E

Table 10-8: Water Quality Results benchmarked against the Olifants RWQO and SWQG: Irrigation use guidelines

Sample ID		pH	EC (mS/m)	TDS (mg/l)	Cl (mg/l)	SO_4 (mg/l)	NO_3 (mg/l)	NH_4 (mg/l)	PO_4	F (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	Fe (mg/l)
Olifants RWQO		**6.5 - 8.4**	**111**	**N/A**	**5**	**500**	**4**	**0.1**	**0.125**	**3**	**N/A**	**N/A**	**N/A**	**N/A**
SWQG: Agriculture Use: Irrigation (Target water quality)		**<6.5 - >8.4**	**N/A**	**40**	**140**	**N/A**	**N/A**	**N/A**	**N/A**	**2**	**N/A**	**N/A**	**70**	**5**
Wet Season														
SW01	18/03/2016	7.4	19.0	116.0	7.7	20.6	0.40	0.27	0.00	0.4	14.0	8.0	13.7	-0.004
SW02	18/03/2016	8.2	36.1	213.0	23.7	19.0	0.32	0.15	0.00	0.6	24.2	14.9	35.0	-0.004
SW03	18/03/2016	8.2	38.3	229.0	21.2	16.5	-0.13	0.18	0.00	0.6	18.3	12.8	52.7	-0.004
SW05	18/03/2016	8.1	31.1	194.0	18.4	22.5	-0.13	0.19	0.00	0.5	21.9	16.8	21.5	-0.004
SW06	18/03/2016	7.8	46.1	280.0	15.3	24.1	-0.13	0.73	0.00	0.5	30.6	17.0	56.4	-0.004
Dry Season														
SW05	17/06/2016	8.6	57.9	316.0	23.0	2.1	-0.13	0.3	0.0	0.5	43.6	18.4	62.9	-0.004
SW06	17/06/2016	9.0	94.5	520.0	59.0	74.3	-0.13	0.3	0.0	0.6	47.2	58.2	77.2	-0.004

10.1.4.5 Water Quality Results

In Table 10-8, the Olifants River water quality results can be summarised as follows:

- pH at SW05 and SW06 exceeded (>8.4) the Olifants RWQO and the target water quality for agricultural use: irrigation, but only during the dry season;
- All samples have elevated TDS levels that exceed the SWQG limits (40 mg/l) for Agriculture/ Irrigational use. The Olifants RWQO does not specify guideline limits for TDS;
- Chloride (Cl) concentrations exceeded the Olifants RWQO (5 mg/l) during wet and dry seasons. However, the concentrations were still within the SWQG: Irrigational limit of 140 mg/l;
- Ammonia (NH_4) concentrations exceeded the Olifants RWQO limit (0.1 mg/l) in both wet and dry seasons; and
- Sodium (Na) at SW06 exceeded the SWQG: Irrigational limit of (70 mg/l) during the dry season.

The Klein Olifants River was not flowing during both the wet and dry season surveys. During the dry season or low flows, the lower volume of water reduces the dilution effect on several parameters and high parameters concentrations are likely to be observed.

The water quality presented does not provide a precise river water quality as there was no flow during the site assessment. Samples were taken on stagnant pools of water along the river and this only provides an indicative baseline water quality which will still need to be updated during high flows.

10.1.4.6 Water Balance

A site-wide water balance model has been prepared to understand flows within the project sites operational water circuit, during average dry season and average wet season scenarios. This section details the water balance which is done in accordance with the Best Practice Guideline G2 – Water and Salt Balances (DWS, 2010).

The water balance results are summarised as follows:

- The water requirements for the three sites were calculated based on the maximum water use of 2 000 m^3/day and these resulted in water demand of 20 333 m^3/ month;
- The water balance calculations indicate that the water requirements (2000 m^3/day) at the mine will not be met by the amount of underground water that is currently available will ranges between 0 and 1 000 m^3/day and the runoff which was within the ranges of 0 and 84 m^3/day;
- The deficit will therefore be in the order of magnitude of 1 000 m^3/ day in total; and

- More specifically, the deficits were calculated to be in the dry season between 8 000 and 18 000 m^3/month per site and in the wet season between 7 000 and 15 000 m^3/month per site. The mine will have to investigate the source for additional water supply such as importing water from other catchments.

The results of the water balance as per recent DWS template are illustrated in Table 10-9.

Table 10-9: Water Balance Summary

Facility Name	Water In			Water Out		Quantity m^3/a)	Balance
	Water Circuit/stream	Quantity (m^3/mon)	Quantity (m^3/a)	Water Circuit/stream	Quantity (m^3/month)		Quantity (m^3/month)
Potable Water Treatment Plant				Underground Potable Water Demand	576	6 916	
	Boreholes / Underground Supply	1 130	13 560	Surface Potable Water Demand	554	6 644	
		1 130	**13 560**		**1 130**	**13 560**	**0**
Pollution Control Dam Mooivley West	Rainfall	454	5 442	Dust Suppression	300	3 598	
	Runoff Product Stockpile	1 229	14 751	Evaporation	852	10 220	
	Underground dewatering	6 779	81 347	Underground and other Uses	20 034	240 402	
	Runoff Topsoil Stockpile	168	2 016	Storage	0	0	
	Runoff Overburden Stockpile	336	4 031				
	Runoff Office Area	25	294				
		8 990	**107 881**		**21 185**	**254 220**	**-12 195**
Pollution Control Dam Hendrina South	Rainfall	185	2 217	Dust Suppression	134	1 613	
	Underground dewatering	11 958	143 500	Evaporation	347	4 164	
	Runoff Topsoil Stockpile	168	2 016	Storage	0	0	

Facility Name	Water In			Water Out		Quantity m^3/a)	Balance
	Water Circuit/stream	**Quantity (m^3/mon)**	**Quantity (m^3/a)**	**Water Circuit/stream**	**Quantity (m^3/month)**		**Quantity (m^3/month)**
	Runoff Overburden Stockpile	336	4 031	Underground and other Uses	20 199	242 387	
		12 647	**151 765**		**20 680**	**248 164**	**-8 033**
Pollution Control Dam Mooivley East	Rainfall	454	5 442	Dust Suppression	108	1 298	
	Runoff Product Stockpile	1 253	15 036	Evaporation	852	10 220	
	Runoff Topsoil Stockpile	168	2 016	Storage	0	0	
	Runoff Overburden Stockpile	336	4 031	Other Uses	3 536	42 429	
	Runoff Office Area	25	294				
	Underground dewatering	2 261	27 127				
		4 496	**53 946**		**4 496**	**53 946**	**-16 689**
Total Water Balance		**14 616**	**175 388**		**43 500**	**522 000**	**-28 884**

10.1.4.7 Floodline Determination

To understand the risk of flooding to the proposed mine infrastructure, and in accordance with GN 704 regulations, where it is stated that infrastructure should not be placed within the 1:100 year floodline, or a horizontal distance of 100 m from a watercourse (whichever is greater), it is necessary to determine the 1:100 year floodlines. Streams and drainage lines within close proximity to surface infrastructure areas were modelled.

The 1:100 year floodlines are illustrated on Plan 17 in Appendix 3. A floodline determination for surface infrastructure at Mooivley East was not undertaken, as the closest stream was approximately 900 m away, with an elevation difference in excess of 10 m. The following surface infrastructure falls within the floodlines and/ or the 100 m buffer of watercourses:

- Fence around Mooivley East infrastructure;
- Conveyor, access road and fence connecting Hendrina South and Mooivley West sites; and
- Fence, haul road and access road at Mooivley West.

The following is recommended:

- The conveyor and access road connecting Hendrina South and Mooivley West, should be elevated above the floodline at a height of approximately 1 662 mamsl (height subject to more detailed and accurate elevation survey data). A culvert/ bridge for the road crossing should be constructed and sized appropriately. The fence should be designed and constructed to withstand a 1:100 year flood;
- The proposed berm running along the haul road at Mooivley West, must be constructed above the floodline at a height of approximately 1 696 mamsl (height subject to more detailed and accurate elevation survey data), to ensure that flooding of infrastructure does not occur; and
- A water authorisation in terms of Section 40 of the NWA for all watercourse crossings should be applied for in the water use license application.

Lastly, as mentioned previously, the 5 m contours which were used to model the floodlines, do not accurately capture the channel dimensions and adjacent floodplains, resulting in less accurate flood elevations. It is recommended that a detailed elevation survey is undertaken and that the floodlines are remodelled using this data, to obtain accurate flood elevations.

10.1.5 Groundwater

A Groundwater Assessment (Appendix 6) was undertaken in support of the EIA to determine groundwater users and characteristics of the groundwater in the area (depth, flow etc.).

10.1.5.1 Groundwater usage

A total of 190 boreholes were recorded during the hydrocensus and from the national groundwater archive. The groundwater use within the project area is set out below:

- 31 (16%) are used for drinking only;
- 6 (3%) are used for drinking and livestock watering;
- 2 (1%) are used for drinking, livestock and irrigation;
- 31 (16%) is used for irrigation;
- 47 (25%) are used for livestock watering only;
- 17 (9%) are not used for any purpose; and
- The remaining 56 (29%) could not be confirmed.

10.1.5.2 Baseline groundwater quality

The groundwater quality results have been compared to the South African National Standards (SANS) 241:2015 Standards for Drinking Water (Table 10-10) and have been grouped into two classes namely Acceptable and Unacceptable in accordance with the above stated standards.

Ten of the 13 boreholes sampled are suitable for human consumption. None of the tested parameters exceeded the recommended limits. These boreholes are listed in Table 10-10. The sulfate concentrations for the sampled boreholes are currently less than 20.6 mg/L. The recommended sulfate limit is 250 mg/L for aesthetic reasons and 500 mg/L for acute health reasons. Since sulfate is expected to be an element of concern in coal mines, the values obtained during this study can be used as a baseline for future contamination comparisons.

Three boreholes (MVBH3, BKBH6 and UKBH8) fell within the unacceptable category based on water quality. These boreholes are listed in Table 10-10 and the parameters that exceed the recommended standard are highlighted in red.

- Borehole BKBH6 indicates a number of parameters with elevated concentrations, particularly chloride (1,694 mg/L) and sodium (2,146 mg/L). These elements are indicative of high residence groundwater; thus old water. As confirmed from aquifer testing, however, the borehole is characterised by a permeability of 0.07 m/d and transmissivity of 9.4 m^2/d and is unlikely to be associated with water of high residence time. The recorded high concentrations could possibly be a result of human or laboratory error. Since this result is from a once-off sampling event, it is not possible to fully explain the observed anomaly. Further monitoring is recommended to better define the water quality associated with borehole BKBH6;
- Borehole UKBH8 has fluoride concentration of 2.14 mg/L. This is probably due to the natural dissolution of the host rocks, particularly the pre-Karoo intrusive rocks; and

- Borehole MVBH3 is in the unacceptable category due to an elevated manganese concentration of 0.23 mg/L. The source for these is suspected to be due to the natural dissolution of the host rocks.

10.1.5.2.1 *Diagnostic plots*

Stiff diagrams (Figure 10-9) were used to characterise the groundwater by analysing the concentration of the major cations (Ca, Mg, $Na^{+}K$) and anions (SO_4, Cl and HCO_3). In Stiff diagrams, cations are plotted in meq/L on the left side of the zero axis and anions are plotted on the right side. This diagram is useful in making a rapid visual comparison between water of different sources.

The diagram shows that all the samples are enriched in alkalinity and depleted in sulfates. This suggests that no mine-related contamination has taken place, as mine water is typically distinguished by enriched sulfate and depleted alkalinity.

The Na and K content of borehole BKBH6 is around 120 meq/L and is significantly higher than the rest of the boreholes, where it is less than 8 meq/L. The borehole is different from the others not only due to its high Total Dissolved Solids (TDS), but due to its reduced Mg. This further confirms that the borehole quality is unique from the rest and needs to be investigated further through continuous monitoring.

The water chemistry is also displayed using a Piper diagram as shown in Figure 10-10. A Piper diagram is used to classify the water type by plotting the ratios of the major cations (Ca, Mg, Na and K) and anions (Cl, SO_4 and HCO_3+CO_3) as two points in tri-linear fields. These two points are then extended into the main diamond-shaped field of the Piper diagram to plot as one point.

The Piper diagram also confirms the results observed in the Stiff diagrams. The dominant anion is HCO_3, while the dominant cations range from Ca to $Na^{+}K$ and are suspected to be results of ion exchanges between water of higher residence time and those that are recently recharged. No mine-related impacts are evident in the samples.

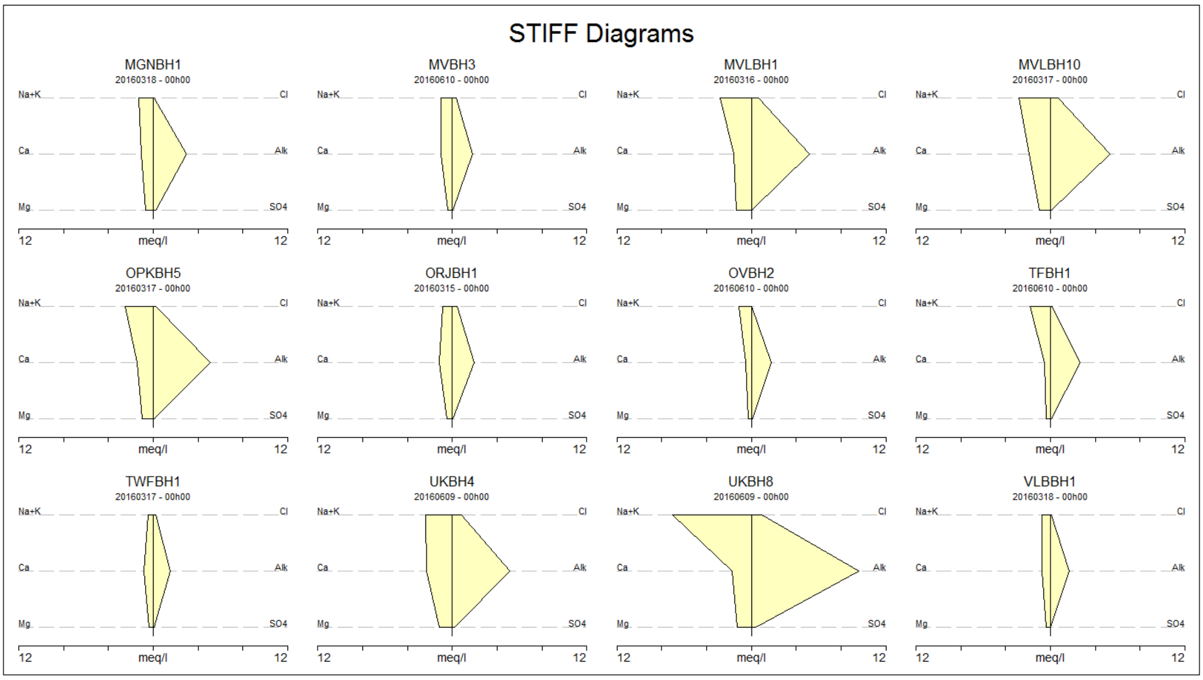


Figure 10-9: Stiff Diagram of the Baseline Water Chemistry

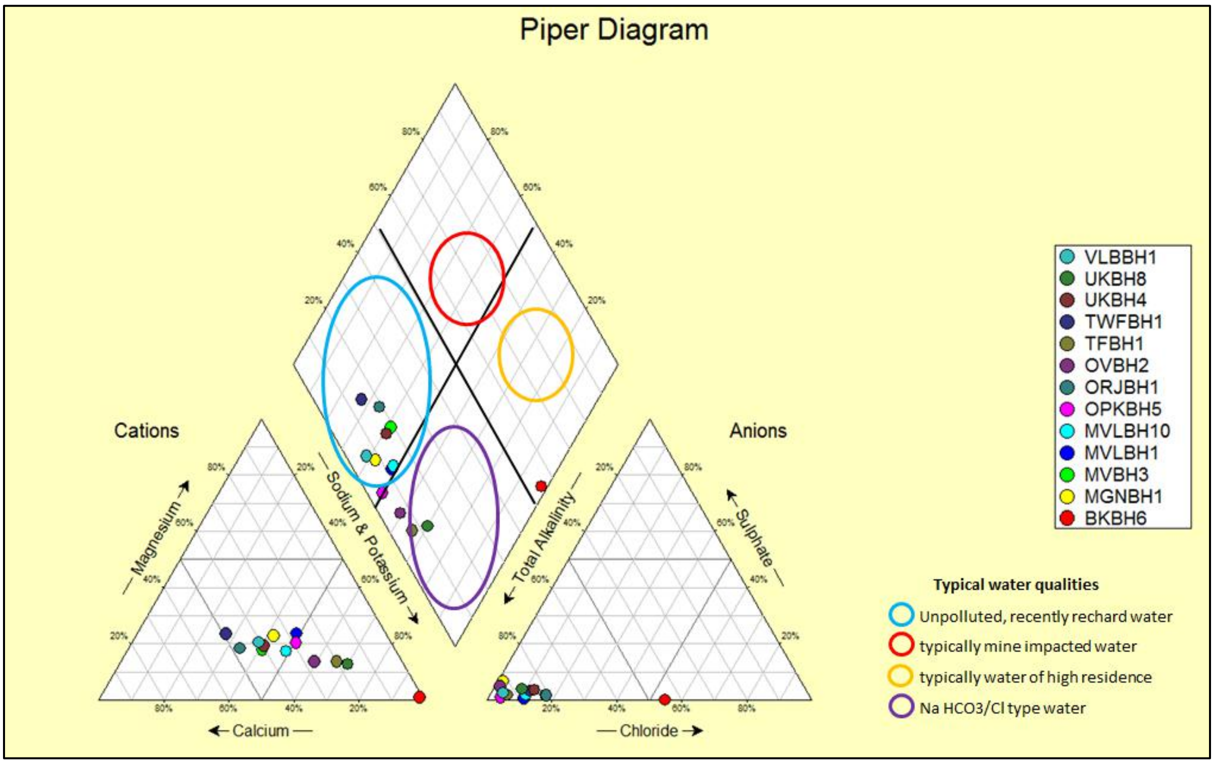


Figure 10-10: Piper Diagram of the Baseline Water Quality

Table 10-10: Baseline Water Quality as Classified Based on the SANS 241: 2015

SANS 241: 2015		Total Dissolved Solids	Conductivity at 25° C in mS/m	pH-Value at 25° C	Nitrate NO_3 as N	Chlorides as Cl	Sulfate as SO_4	Fluoride as F	Free and Saline Ammonia as N	Total Alkalinity as $CaCO_3$	Calcium as Ca	Magnesium as Mg	Sodium as Na	Potassium as K	Aluminium as Al	Iron as Fe	Manganese as Mn	Arsenic as As	Lead as Pb
Boreholes	**Date**	**1200**	**170**	**5-9.7**	**11**	**300**	**250**	**1.5**	**1.5**	**N/A**	**N/A**	**N/A**	**200**	**N/A**	**0.3**	**0.3**	**0.1**	**0.01**	**0.01**
MVLBH1	2016/03/16	341	52.50	8.65	0.81	23.60	1.58	0.75	0.41	260	30.70	16.10	62	2.84	-0.002	-0.004	-0.001	-0.010	-0.004
MVLBH10	2016/03/17	348	50.80	8.54	0.87	24.40	5.2	0.95	0.30	268	38.20	11.90	61	4.93	-0.002	-0.004	0.025	-0.010	-0.004
MGNBH1	2016/03/18	219	29.30	8.50	0.74	2.07	10.4	0.32	-0.01	148	21.40	8.50	28	4.08	-0.002	-0.004	-0.001	-0.010	-0.004
OPKBH5	2016/03/17	276	45.30	8.65	0.54	7.49	2.4	0.49	0.97	256	28.80	12.20	56	2.46	-0.002	-0.004	-0.001	-0.010	-0.004
ORJBH1	2016/03/15	182	24.20	8.30	1.69	14.80	1.8	0.28	0.01	96	23.10	5.40	17	4.38	-0.002	-0.004	-0.001	-0.010	-0.004
TWFBH1	2016/03/17	136	17.10	8.22	0.47	7.46	2.8	0.19	-0.01	76	16.80	4.88	9	2.79	-0.002	-0.004	-0.001	-0.010	-0.004
VLBBH1	2016/03/18	155	19.40	8.31	1.61	2.44	2.2	0.21	-0.01	85	15.50	4.75	14	5.14	-0.002	-0.004	-0.001	-0.010	-0.004
TFBH1	2016/06/10	192	25.10	8.18	0.53	5.59	2.5	0.77	0.28	134	11.20	4.60	40	3.73	-0.002	-0.004	-0.001	-0.010	-0.004
OVBH2	2016/06/10	146	19.50	7.71	0.61	1.22	4.4	0.17	0.34	89	9.81	3.03	22	4.75	-0.002	-0.004	-0.001	-0.010	-0.004
MVBH3	2016/06/10	166	24.40	7.08	4.08	13.70	1.9	0.22	0.48	91	19.90	5.27	18	8.66	-0.002	-0.004	0.231	-0.010	-0.004
BKBH6	2016/06/09	4776	823.00	8.02	0.55	1694.00	0.8	2.04	3.40	1969	16.30	11.70	2146	10.70	-0.002	-0.004	-0.001	-0.010	-0.004
UKBH8	2016/06/09	594	87.60	8.38	0.47	34.50	20.6	2.14	0.92	480	34.40	15.50	159	5.23	-0.002	-0.004	-0.001	-0.010	-0.004
UKBH4	2016/06/09	268	53.40	8.05	0.44	28.00	10.3	0.42	0.29	256	46.50	13.70	44	18.80	-0.002	-0.004	-0.001	-0.010	-0.004

Note: "-" values should be read as "<" (e.g. "-1" = "<1")

10.1.5.3 Water Level and Flow Direction

The water levels ranges between 0.6 m and 50.0 mbgl. This corresponds to a piezometric head of between 1 600.2 m and 1 814.1 metres above mean sea level (mamsl). A comparison of the water level elevation with topography shows a good correlation of 97.1% (Figure 10-11). This confirms that groundwater elevation mimics the topography and in the project area flows towards the northwest.

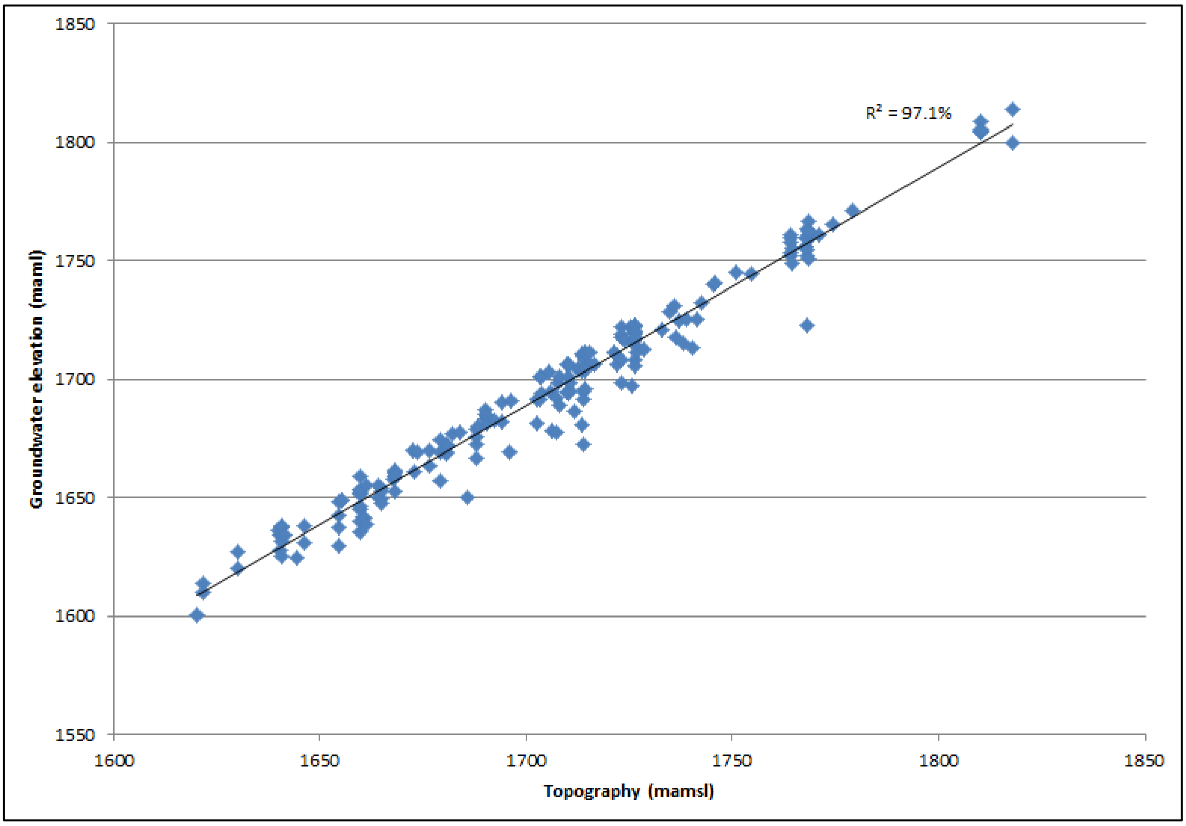


Figure 10-11: Correlation between Topography and Water Level

10.1.5.4 Aquifer Permeability

The result of the aquifer test is given in Table 10-11. The permeability is low, ranging between 10 to 5 m/d (borehole TFBH1) and 7×10^{-2} m/d (borehole BKBH6). The low permeability was also evident from the drilling results as no water strikes with significant blow yields were detected. The water level took considerable time in all of the boreholes (except for BKBH6) to recover to the static position following the drilling. For example it took more than two weeks for the water level to stabilise in borehole TFBH1.

The only exception is BKBH6 where a water strike of 2.4 L/s was recorded at a depth of 10 m, in the weathered sandstone. The borehole was pump tested while the rest of them were slug tested.

These permeability values were used as input values into the numerical model for impact assessment and groundwater inflow estimations.

Table 10-11: Aquifer Test Result

BH	Water strike (m)	Blow yield (L/s)	Final blow yield (l/s)	water level (m)	K (m/d)
BKBH6	10	2	2	11.78	0.0712
MVBH3	71	seepage	seepage	25.32	0.0002
OVBH2	28	seepage	seepage	9.05	0.01
UKBH4	12	seepage	seepage	5.45	0.0002
TFBH1		dry	seepage	35.78	0.00001
UKBH8		dry	seepage	11.09	0.00002

10.1.5.5 Geochemistry

Various geochemistry tests were completed on waste rock and tailings material to classify these waste streams as per the NEM: WA and DWS guidelines for classifying and identifying potential risks associated with the storage of waste material on site. The report is attached in Appendix I within Appendix 6 of the Groundwater Report.

10.1.5.5.1 *Sampling and Laboratory Tests*

Six rock samples that are considered to be representative of the project area were collected for acid mine drainage assessment. The samples were collected from two of the newly drilled boreholes, namely BKBH6 and TFBH1. This means that three samples were collected from each of the boreholes.

The six samples represent:

- Two samples from the coal seam;
- Two samples from the overburden (rocks immediately above the coal seam that could be exposed after mining); and
- Two samples from the underburden (rocks immediately below the coal seam that could be exposed after mining).

The following tests were performed on the six samples:

- Acid-Base Accounting (ABA);
- Nett Acid Generation (NAG);
- X-ray Diffraction (XRD);
- X-ray Florescence (XRF); and
- Reagent/Distilled Water leachate tests

10.1.5.5.2 *Results Interpretation*

The Sulfide-S analysis shows that the sulfur content of the six samples from the two sampling boreholes (i.e. BKBH6 and TFBH1) is different. While the rocks in the area of BKBH6 (Hendrina South) are unlikely to sustainably generate acid, the rocks in the area of TFBH1 (Mooivley West) have sufficient sulfide to generate acid.

This observation is also confirmed using mineralogical and ABA analysis, whereby the rocks from TFBH1 are potentially acid generating while those from BKBH6 are potentially acid neutralising. Borehole BKBH6 is located in Hendrina South and TFBH1 is located in Mooivley East. The two mine zones will not be connected hydraulically and are expected to have different geochemical properties. While the water in the Mooivley East is expected to be acidic, the water in Hendrina South is likely to be neutral. It should, however, be noted that this is based on limited number of samples that does not include the Mooivley West. More samples from across the entire project site will be required for a comprehensive conclusion.

Waste classification conducted on the overburden material showed that the waste material is classified as Type 3 waste because the total concentration of one or more constituents is between the TCT0 and TCT1 threshold values. The leachable concentrations of all constituents are below the LCT0 threshold value. Disposal is therefore required at a Class C or GLB- landfill, unless an exception is granted from the relevant authorities.

Mine dewatering will result in the lowering of the water table in the coal seam aquifer. Considering the limited vertical and horizontal conductivities of the Karoo aquifers and the fact that the majority of the groundwater users tap from the top shallow aquifer, dewatering in the coal seam aquifer is not expected to impact the boreholes in the top shallow aquifer. However, deep boreholes intersecting the coal seam aquifer could potentially be impacted by the lowering of the water table.

Model simulations and hydrostatic calculations show that the mine is likely to decant after closure. The decanting is expected to occur through the proposed shaft on Mooivley East. None of the other shafts are foreseen to decant. The decanting will start after 30 years since mine closure at a rate of 7 m^3/d. Once the contamination plume reaches the stream, it can migrate at a higher rate compared to groundwater flow and could have a negative impact on the down-gradient riverine ecosystem and land owners.

10.1.5.6 Waste Classification

Based on the classification method mentioned in the NEM: WA, the samples are classified as Type 3 waste because the total concentration of one or more constituent is between the TCT0 and TCT1 threshold values. The leachable concentrations of all constituents are below the LCT0 threshold value though. Disposal is therefore required at a Class C or GLB- lined waste facility, unless an exemption is granted from the relevant authorities. The Type C waste rock dump is to be designed as illustrated in Figure 10-12.

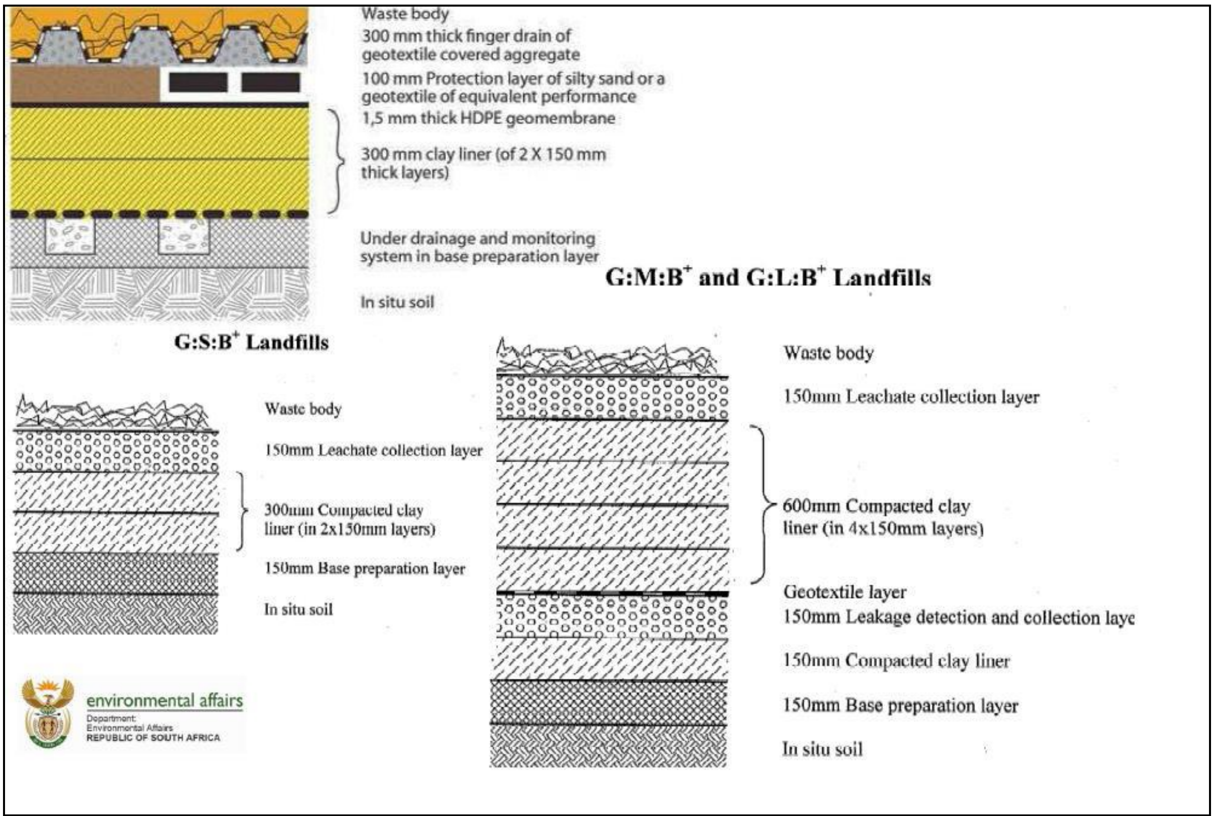


Figure 10-12: Class C Containment Barrier Requirements

10.1.5.7 Groundwater Numerical Modelling

Numerical groundwater modelling can be considered to be one of the most reliable methods of anticipating and quantifying the likely impacts on the groundwater regime. The model construction is summarised below and should be read with the details in Appendix 6.

10.1.5.7.1 *Steady State Simulation*

Prior to the simulation of the mining and dewatering activities, a baseline (pre-mining) steady state groundwater flow model was set-up and calibrated.

Since recharge and permeability are dependent on each other via the measured heads, the model was not calibrated by changing the permeability and recharge simultaneously. The permeability was calibrated based on the aquifer test results and literature reviews (Hodgson *et al*, 1998), while the recharge value was adjusted manually until a best fit was obtained.

The PCG2 package was used to solve the partial differential equations. Convergence criteria of a residual flux of 10^{-3} m^3/day and a head change of 10^{-3} m were selected.

After model calibration, an acceptable correlation of 98.6% was obtained between the simulated and observed groundwater elevation (Figure 10-13).

10.1.5.7.2 *Simulated Water Levels and Flow Direction*

The steady state (pre-mining) groundwater elevation is illustrated in Plan 9 in Appendix 3. The overall groundwater flow direction is towards the topographic low in the north. Locally, however, the flow direction could be different depending on the drainage patterns of the local streams and orientation of the weathered zones and fractures that act as preferential groundwater flow paths.

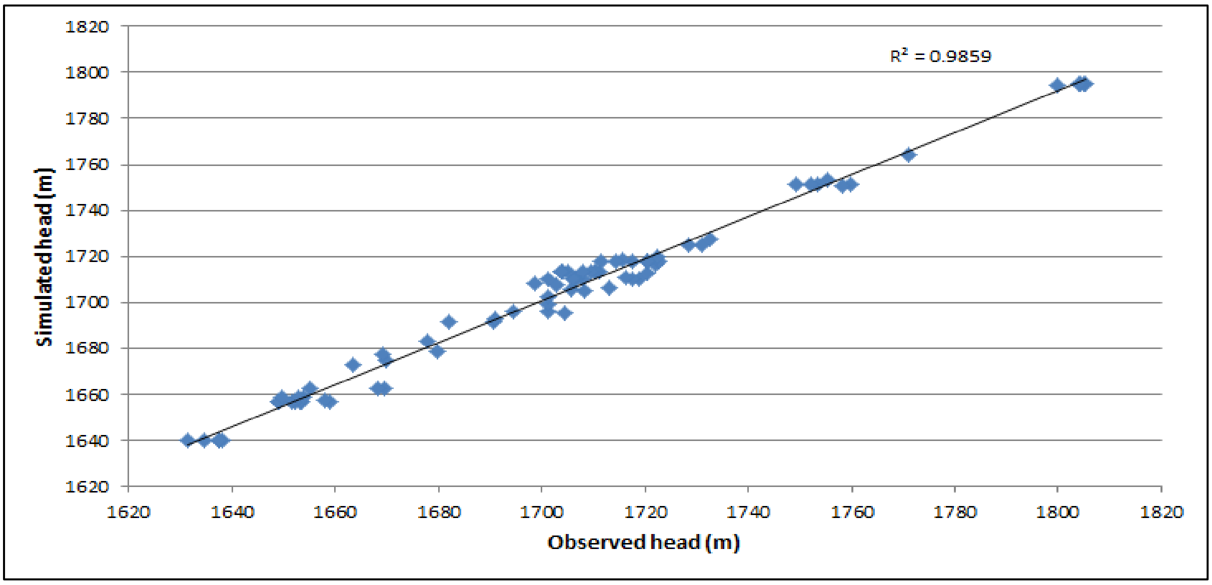


Figure 10-13: Correlation between Observed and Simulated Heads

10.1.6 Air Quality

An Air Quality Assessment (Appendix 7) was undertaken in support of the EIA to determine the air quality characteristics of the area and the impact associated with the proposed project.

The ambient air quality in the project area will be influenced by atmospheric pollutants from several local and regional sources, which include:

- Emissions from coal-fired power plants;
- Operational opencast and underground coal mines in the Mpumalanga Highveld; and
- Residential and agricultural activities in the vicinity.

In terms of Air Quality, the main pollutants of concern will be associated with particulate matter i.e. dust generated from mining activities and open sources during mining areas, and vehicular movement on dry and dusty roads.

10.1.6.1 Dust Fallout

The dust monitoring network was setup in April 2016 to assess deposition rates in the proposed project area. Results from three months of monitoring are incorporated in this impact assessment report. Results from the monitoring network are presented in Table 10-12 below. The graph showing the dust deposition rates compared to the NEM: AQA - National Dust Control Standard (NDCR, 2013) is presented (Figure 10-14). Deposition rates at the proposed mining area are within the standards, with no violation of the recommended observed during the sampling window.

Table 10-12: Dust Deposition Rates for Hendrina (mg/m²/day, 30 day average)

Dust levels measured in mg/m²/day, 30 day average			
	May 2016	**June 2016**	**July 2016**
XST 01	82	32	79
XST 02	63	98	594
XST 03	30	35	128
XST 04	82	48	92
XST 05	62	87	91
*No data			

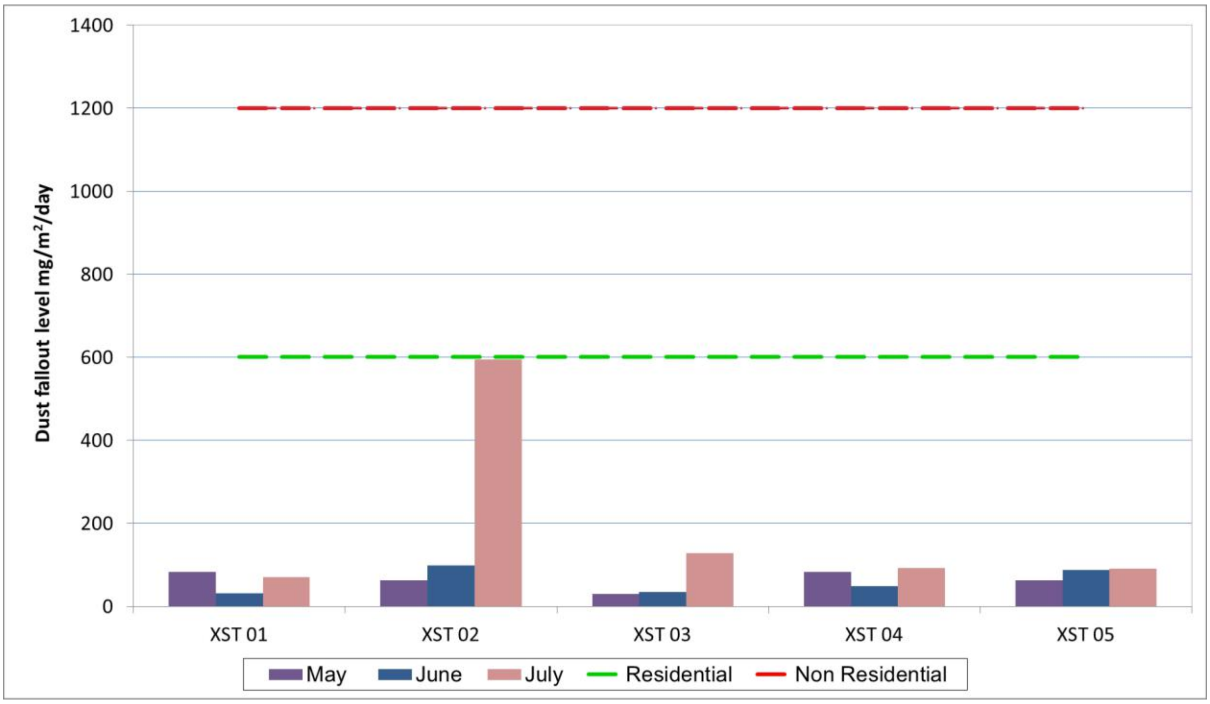


Figure 10-14: Hendrina Dust Deposition Rates

10.1.6.2 Particulates (PM2.5, PM10) and Gaseous Pollutants Baseline

The pollutants of concern associated with the proposed construction and operational phases of the Project will include particulate matter (whether in the form of dust fallout, PM10 or PM2.5) and gases such NOx (as NO_2), SO_2, and CO.

Short-term and long-term health effects associated with exposure to these pollutants are presented in Table 10-13.

Table 10-13: Short-Term and Long-Term Health Effects associated with Exposure to PM (WHO, 2004)

Pollutant	Short-Term Exposure	Long-Term Exposure
Particulate matter	▪ Lung inflammatory reactions ▪ Respiratory symptoms ▪ Adverse effects on the cardiovascular system ▪ Increase in medication usage ▪ Increase in hospital admissions ▪ Increase in mortality	▪ Increase in lower respiratory symptoms ▪ Reduction in lung function in children ▪ Increase in chronic obstructive pulmonary disease ▪ Reduction in lung function in adults ▪ Reduction in life expectancy ▪ Reduction in lung function development

There is no particulate matter monitoring in the project area or nearby vicinity for historical data required to assess background levels. This also applies to ambient monitoring of gaseous pollutants. Hence it was difficult to assess site specific background pollutant levels in the project area.

10.1.7 Fauna and Flora

A Fauna and Flora Assessment (Appendix 8) was undertaken in support of the EIA to determine the fauna and flora characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

10.1.7.1 Flora

The project area falls within the Eastern Highveld Grassland and Soweto Highveld Grassland as described by Mucina and Rutherford (2006) in the Grassland Biome. Flora

The majority of the project site (3 081 ha which is equivalent to 46% of the mining right area) had undergone transformation due to cultivation for maize and soy beans. Livestock were also observed throughout most of the site and evidence of overgrazing was recorded in grassland areas. Despite these impacts, areas that were left intact showed a high diversity of grasses and forbs, particularly members of the Asteraceae family and the *Helichrysum* genus. The natural areas associated with the project area are discussed in more detail below. The disturbed grassland areas included former cultivated fields that had been colonised by alien plants and pioneer species. The primary land uses and vegetation habitats identified on site are listed in Table 10-14.

Table 10-14: Vegetation Habitats (and other land use) and Approximate Areas

Vegetation Unit	Area (ha)	Proportion of total project area (%)
Pan/Depressions	31	0.5
Infrastructure	41	0.6
Disturbed Grassland	47	0.7
Alien Bushclumps	57	0.8
Gnidia - Diospyros Rocky Grassland	61	0.9
Crinum - Cymbopogon Riparian Habitat	428	6.4
Eragrostis Grassland	2970	44.2
Cultivation (maize and soybean)	3081	45.9
Total	**6716**	**100**

10.1.7.1.1 *Crinum –Arundinella Raparian Habitat*

The riparian habitat is associated with the Klein Olifants River and channelled valley bottom wetlands that run through the site. The channel was mostly bare; comprised of exposed bedrock or river sand. Where standing water was present, *Typha capensis* (Common Bulrush), *Imperata cylindrica* (Cottonwool Grass) and *Arundinella nepalensis* (River Grass) were found (examples in Figure 10-15). Terrestrial species typical of the *Eragrostis*-dominated Grassland were found on the banks of the Klein Olifants River. A single Red Data listed plant species was recorded in this habitat, namely: *Eucomis autumnalis* (Pineapple Flower), listed as Declining. In addition, *Crinum bulbispermum* (River Lily), which is dominant in this vegetation unit, is provincially protected (according to MNCA: Schedule 11). Alien plant species that had colonised this vegetation unit included *Acacia mearnsii* (Black Wattle), *Salix babylonica* (Babylon Willow) and *Cirsium vulgare* (Scotch Thistle).

Figure 10-15: Examples of Plant Species Characteristic of the Riparian Channel

(A: *Typha capensis* (Common Bulrush) and B: *Arundinella nepalensis* (River Grass)

10.1.7.1.2 *Gnidia - Diospyros Rocky Grassland*

The rocky grassland was comprised of relatively short grass (<1.8 cm) and a high diversity of epilithic (growing on rock surface) forb species. Rocky outcrops represented a type of ecological niche, characterised by shallow soils over sandstone outcrops. Rocky outcrops occurred primarily along riparian zones and were typified by shrubs such as: *Diospyros lycioides* (Bluebush); *Gnidia kraussiana*, *Searsia dentata* (Nana Berry), *Leonotis leonurus* (Lion's Ear), *Psammotropha myriantha* and *Haemanthus humilis* (Rabbit's Ear). Examples of common plant species identified in the Gnidia – *Diospyros Rocky* Grassland are represented in Figure 10-16.

Alien plant invasion was limited in this habitat, which represented the most intact vegetation of all units delineated for the project site. Alien plants included: *Tagetes minuta* (Khakibos) and *Bidens pilosa* (Blackjacks). A single Species of Special Concern (SSC) plant was recorded on site, namely: *Haemanthus humilis* (Rabbit's Ear), a provincially protected plant species.

Figure 10-16: Examples of Plant Species found in Rocky Outrops

(A: Psammotropha myriantha; B: Searsia dentata; C: Haemanthus humulis; D: Crassula sp.; E: Dicoma anomala; F: Diospyros lycioides in flower)

10.1.7.1.3 *Eragrostis - Dominated Grassland*

This Eragrostis-dominated Grassland covered the majority of the natural areas associated with the project site and can further be subdivided into wetland and terrestrial habitats. The substrate of the wetland areas was composed of moist clays and rocky outcrops which formed the top of hillslope seeps. *Eragrostis gummiflua* (Gum Grass), unfavoured by cattle, was dominant and additional Eragrostis species were prevalent, including: *Eragrostis curvula* (Lovegrass), *Eragrostis racemosa* (Narrow Heart Love Grass) and *Eragrostis chloromelas* (Curly Leaf). Additional grass species included *Aristida congesta subsp*. *congesta* (Spreading Three-awn), *Hyparrhenia hirta* (Common Thatching Grass), *Themeda triandra* (Red Grass), *Agrostis lachnantha* (Bent Grass) and *Imperata cylindrica* (Cottonwool Grass) along hillslope seeps.

Common and characteristic forbs and succulents included: *Aloe ecklonis* (Grass Aloe), *Chironia palustris* (Transvaal Chironia), *Haplocarpha scaposa* (False Gerbera), *Helichrysum oligocephala*, *Wahlenbergia spp*., and *Verbena brasiliensis* (Brazilian Vervain). Examples of the landscape and characteristic features are represented in Figure 10-17. Alien plant invasion was moderate in certain areas adjacent to cultivated fields and along roadsides, including species such as: *Datura stramonium* (Downy Thorn Apple), *Solanum sysimbriifolium* (Sticky Nightshade) and *Verbena brasiliensis* (Brazilian Vervain). A single plant SSC was recorded on site, namely: *Aloe ecklonis* (Grass Aloe); provincially protected (MNCA – Schedule 12).

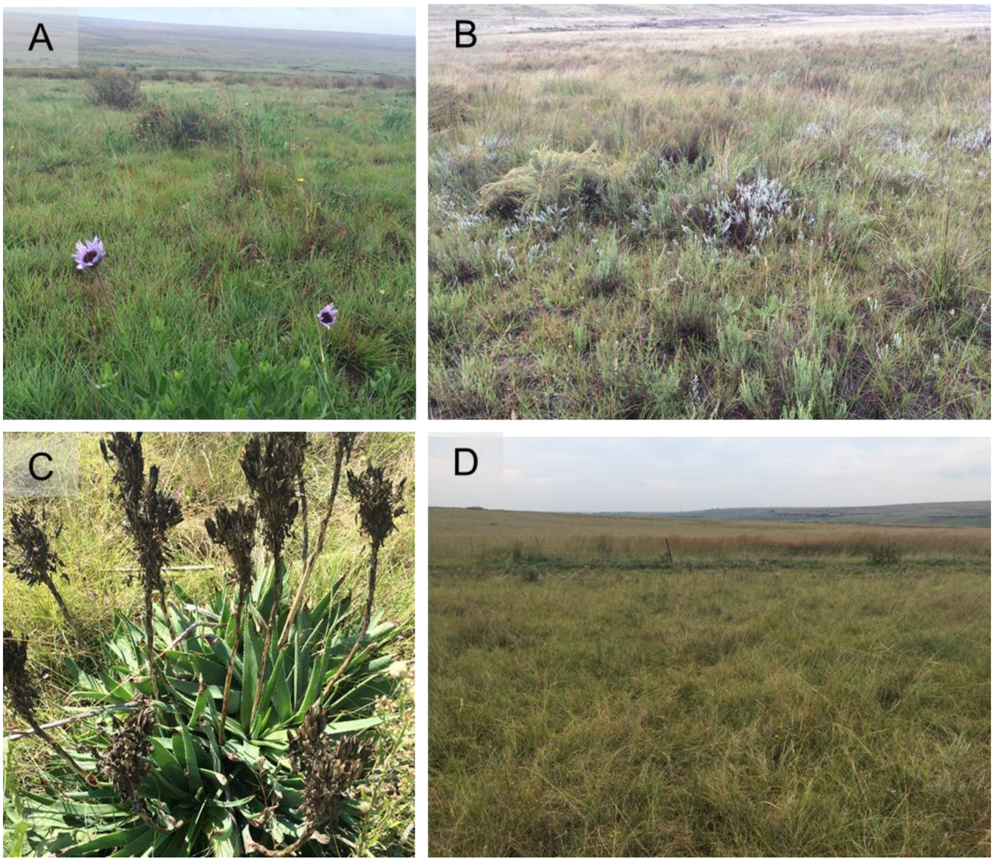


Figure 10-17: Examples of the Landscape and Common Features of the Eragrostis-dominated Grassland

(A: intact grassland on Tweefontein 203 Farm portion 15; B: grassland dominated by Helichrysum aureonitens; C: Aloe ecklonis on Bosmanskrans portion 8; D: typical Eragrostis-dominated grassland adjacent to maize fields)

10.1.7.1.4 *Ephemeral Pans*

Pans represented unique environments on site and were typically not colonised by plant species, except for the seepage areas around them. Common and characteristic plant species found to colonise pan edges included *Cyperus semitrifidus*; *Juncus effusus* (Common Rush), *Persicaria lapatholia* and *Agrostis lachnantha* (Bent Grass). No Red Data or any protected plant species were recorded in this habitat.

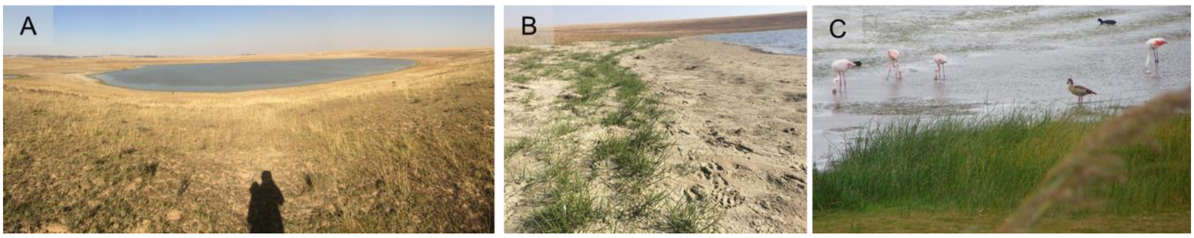


Figure 10-18: Examples of Ephemeral Pan Habitat on Site

The distribution of vegetation units is represented in Plan 11 in Appendix 3.

10.1.7.1.5 *Plant Species of Special Concern*

Table 10-15 lists the plant SSC that were recorded in the project area, as well as those recorded on the project site. The five plants SSC that were recorded are provincially protected, including two declining species.

Aspidoglossum xanthosphaerum is unlikely to occur since this species has only been recorded in four locations in montane grassland. *Khadia carolinensis* is likely to occur and has been recorded by Digby Wells in the project area before, but was not encountered in plant sampling plots. The *Satyrium* species was recorded just outside of the project site boundary and suitable habitat is found on the project site.

Table 10-15: Plant Species of Special Concern

Species	SA Red List	Provincial List	CITES	Recorded on site
Aloe ecklonis	LC	x	II	x
Aspidoglossum xanthosphaerum	VU	-		
Crinum bulbispermum	Declining	x		x
Gladiolus crassifolius	LC	x	-	
Gladiolus robertsoniae	NT	x	-	
Eucomis autumnalis	Declining	x		x
Haemanthus humilis subsp. hirsutus	-	x	-	x
Hypoxis hemerocallidea	Declining	-		
Pachycarpus suaveolens	VU	-		
Satyriums p.		x		x
Nerine gracilis	VU	-		
Zantedeschia pentlandii	VU	-		

10.1.7.1.6 *Alien Plant Species*

A total of 17 Alien Plant Species (AIP) were recorded on site (Table 10-16); seven of these have been assigned alien plant categories according to Conservation of Agricultural Resources Act 43 of 1983 (CARA, 1983) and NEM: BA. These species have established due to disturbance of the soil, largely due to cultivation in the area, as well as trampling by livestock.

Table 10-16: Alien Plant Species recorded on Site

Family	Species	Category (CARA/NEM:BA)
Amaranthaceae	*Guilleminea densa*	No category
	Gomphrena celesioides	No category
Asteraceae	*Bidens pilosa*	No category
	Cirsium vulgare	1; 1b
	Conyza albida	No category
	Cosmos bippinatus	No category
	Tagetes minuta	No category
	Taraxacum offininale	No category
	Xanthium strumarium	1; 1b
Cactaceae	*Opuntia ficus-indica*	1; 1b
Fabaceae	*Acacia mearnsii*	2; 2
Myrtaceae	*Eucalyptus camuldulensis*	2; 1b
Salicaceae	*Salix babylonica*	No category
Solanaceae	*Datura ferox*	1; 1b
	Solanum sp.	1
	Solanum sysimbriifolium	1; 1b
Verbenaceae	*Verbena brasiliensis*	No category

10.1.7.2 Fauna

10.1.7.2.1 *Mammals*

Table 10-17 lists mammals that were recorded in the project area and project site during this survey and identification made through personal communication with farmers. Five of these species are regarded as SSC; African Clawless Otter (*Aonyx capensis*) being Red Data species protected under International Union for the Conservation of Nature (IUCN). Steenbuck (*Raphicerus campestris*), Aardwolf (*Proteles cristatus*), Serval (*Felis serval*) and Aardvark (*Orycteropus afer*) are protected according to the MNCA. Examples of small mammal fauna identified on site are represented in Figure 10-19.

Table 10-17: Mammal Species Recorded

Scientific Name	English Name	IUCN (2014.3)	NEMBA TOPS List (2007)	Mpumalanga Protected (1998)
Aonyx capensis	African clawless Otter	Near Threatened	Not Listed	Protected
Atilax paludinosus	Water Mongoose	Not Listed	Not Listed	Not Listed
Galerella sanguinea	Slender Mongoose*	Not Listed	Not Listed	Not Listed
Hystrix africaeaustralis	Porcupine	Least Concern	Not Listed	Not Listed
Leptailurus serval	Serval	Least Concern	Near Threatened	Protected
Lepus saxatilis	Scrub Hare	Least Concern	Not Listed	Not Listed
Canis mesomelas	Black-backed Jackal	Not Listed	Not Listed	Not Listed
Caracal caracal	Caracal**	Least Concern	Not Listed	Not Listed
Cryptomys hottentotus	Common Mole Rat*	Least Concern	Not Listed	Not Listed
Crocidura cyanea	Reddish-grey Musk Shrew	Least Concern	Not Listed	Not Listed
Cynictis penicillata	Yellow Mongoose	Least Concern	Not Listed	Not Listed
Damaliscus pygargus phillipsi	Blesbok**	Least Concern	Not Listed	Not Listed
Ichneumia albicauda	White-tailed Mongoose	Least Concern	Not Listed	Not Listed
Mastomys coucha	Multimammate Mouse	Least Concern	Not Listed	Not Listed
Orycteropus afer	Aardvark*	Least Concern	Protected	Protected
Procavia capensis	Rock Hyrax	Least Concern	Not Listed	Not Listed
Proteles cristatus	Aardwolf*	Least Concern	Protected	Protected
Raphicerus campestris	Steenbok	Least Concern	Protected	Protected
Redunco arundinum	Reedbuck	Least Concern	Protected	Protected
Rhabdomys pumilio	Striped Mouse	Least Concern	Not Listed	Not Listed
Sylvicapra grimmia	Common Duiker	Least Concern	Not Listed	Not Listed
Tatera leucogaster	Bushveld Gerbil*	Least Concern	Not Listed	Not Listed

* - Recorded previously

** - Recorded via personal communication with farmers

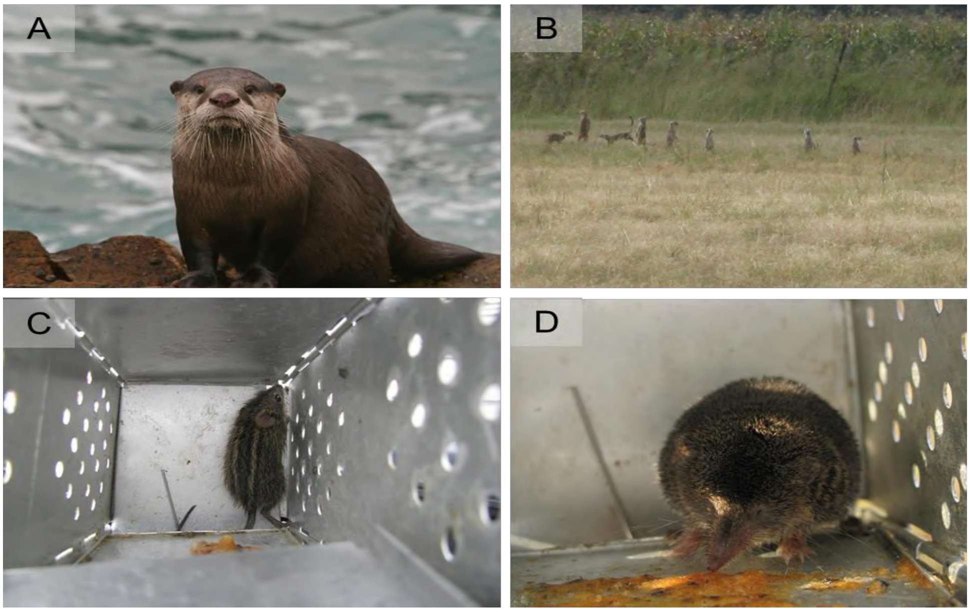


Figure 10-19: Examples of Small Mammals recorded on Site

(A: Aonyx capensis (Cape Clawless Otter); B: Suricata suricatta (Meerkat); C: Rhabdomys pumilio (Striped Mouse); D: Crocidura cyanea (Reddish-Grey Musk Shrew)

10.1.7.2.2 *Avifauna*

A total of 83 species were identified during the dry season and the wet season survey. It is generally accepted that vegetation structure, rather than the actual plant species, influences bird species distribution and abundance, therefore Table 10-18 provides a summary of the vegetation type and commonly found birds species that it would be associated with.

Table 10-18: Summary of the Vegetation Type and Commonly Found Birds Species

Vegetation Type	Description	Bird Species
Rocky Outcrops	Located near rivers and streams. Rocky outcrops are a sensitive landscape as determined by the Mpumalanga Tourism and Parks Agency (MTPA),	Southern Bald Ibis, Martin's and Swallows
Wetland Areas	These areas are dominated by marshy vegetation that grows in seasonally to permanent wet soil	Greater Flamingo (*Phoenicopterus roseus*) (Least Concern), African Grass Owl (*Tyto capensis* (Red Data Species), Sacred Ibis (*Threskiornis aethiopicus*), Redknobbed Coot (*Fulica cristata*), Grey Heron (*Ardea cinerea*), Purple Heron (*Ardea purpurea*), Egyptian Goose (*Alopochen aegyptiacus*), Cape Shoveler (*Anas smit*hii), Spurwinged Goose (*Plectropterus*

Vegetation Type	Description	Bird Species
		gambensis), Yellowbilled Duck (*Anas undulata*), Cattle Egret (*Bubulcus ibis*) and Three banded Plover (*Charadrius tricollaris*). During the site visit: Redeyed Dove (*Streptopelia semitorquata*), Laughing Dove (*Spilopelia senegalensis*), Cape Turtle Dove (*Streptopelia capicola*), Common Fiscal (*Lanius collaris*), Cape Sparrow (*Passer melanurus*), Neddicky (*Cisticola fulvicapilla*), Swainsons Spurfowl (*Pternistis swainsonii*), Helmeted Guineafowl (*Numida meleagris*), Black Shouldered Kite (*Elanus axillaris*) and large numbers of exotic Feral Pigeons (*Columba livia domestica*).
Transformed/ Cultivated areas	Transformed through dryland cultivation, mostly maize. Areas of current cultivation are situated on the areas with the least gradient, but also on the hill slopes with a slight gradient	African Quailfinch (*Ortygospiza fuscocrissa*), African Pipit (*Anthus cinnamomeus*), and Cape Longclaw (*Macronyx capensis*), endemic and endangered lark and pipit species such as Botha's Lark (*Spizocorys fringillaris*), Quail and Button-quail, Spurwinged Goose (*Plectropterus gambensis*), Black-headed Heron (*Ardea melanocephala*) and Grey Crowned Crane (*Balearica regulorum*). Blue Cranes (*Anthropoides paradiseus*).

The project site falls within the Amersfoort Bethal Carolina IBA. According to Barnes (1998), this IBA holds a proportion (>10%) of the global population of the endangered Botha's Lark (*Spizocorys fringillaris*), although confirmation is required as to whether this is still the case as it was not observed during the site visit.

Table 10-19: Red Data Species Recorded in by SABAP2 that could potentially occur on Umcebo Mining area

Common Name	Species Name	Status	Habitat requirements
White-bellied Korhaan	*Eupodotis senegalensis*	SA Red Data: VU IUCN: NT NEMBA, Threatened or Protected Species (TOPS): MTPA: Protected	Often in the interface between grassland and savanna. Avoids severely grazed and recently burnt sites. Could potentially be present in patches of tall grass.

Common Name	Species Name	Status	Habitat requirements
Secretarybird	*Sagittarius serpentarius*	SA Red Data: VU IUCN: VU NEMBA, TOPS: MTPA: Protected	Prefer open grassland, densities lower in maize growing areas. Occasional presence confirmed by locals.
Blue Crane	*Anthropoides paradiseus*	SA Red Data: VU IUCN: VU NEMBA, TOPS: Protected MTPA: Protected	Short grassland, pastures, stubble lands and wetlands. Unlikely to occur in the project site due to largely unsuitable fragmented habitat, extensive disturbance, and habitat transformation.
Black Stork	*Ciconia nigra*	SA Red Data: VU IUCN: LC NEMBA, TOPS: Protected MTPA B: Protected	Occurs as a nomad at lakes, rivers, wetlands. Unlikely to be seen on site unless flying overhead.
African Grass Owl	*Tyto capensis*	SA Red Data: VU IUCN: LC NEMBA, TOPS: Protected MTPA: Protected	Roosts on the ground near marshes and grassland. It is likely that this species is found on the project area.
African Marsh Harrier	*Circus ranivorus*	SA Red Data: EN IUCN: LC NEMBA, TOPS: Protected MTPA: Protected	Large permanent wetlands with dense reed beds. Sometimes forages over smaller wetlands and grassland. Wetland habitat present on the study site too small and fragmented to support this species.
Yellow-billed Stork	*Mycteria ibis*	SA Red Data: EN IUCN: LC NEMBA, TOPS: Protected MTPA: Protected	Dams, large mashes, swamps, estuaries, margins of lakes and seasonal wetlands. Unlikely to occur in the project site due to limited suitable habitat.

Common Name	Species Name	Status	Habitat requirements
Botha's Lark	*Certhilauda semitorquata*	SA Red Data: EN IUCN: EN NEMBA, TOPS: Protected MTPA: Protected	An uncommon and restricted species was only observed via SABAP1. In the region it would prefer shorter grazed grasslands. Unlikely to occur in the project site due to lack of suitable habitat and preferred range.
Lesser Kestrel	*Falco naumanni*	SA Red Data: LC IUCN: LC NEMBA, TOPS: Protected MTPA: Protected	Grassland and agricultural lands. Likely to be present in summer on the project site (Palearctic migrant).

10.1.7.2.3 *Herpetofauna*

All species identified on site are listed in Table 10-20. The species listed as encountered below were all encountered within the wetlands habitat types.

Table 10-20: Amphibian Species Recorded in the Umcebo Project Area

Scientific Name	English Name	IUCN (2014.3)	NEMBA TOPS List (2007)	Mpumalanga Protected (1998)
Afrana angolensis	Common River Frog	-	-	-
Bufo gutturalis	Guttural Toad	-	-	-
Cacosternum boettgeri	Common Caco	-	-	-
Strongylopus fasciatus	Striped Stream Frog	-	-	-

Two species of reptile, a Rinkhals (*Hemachatus haemachatus*) and Brown House Snake (*Lamprophis fuliginosus*) were identified during the field survey through opportunistic observations (Table 10-21). No IUCN protected species were encountered; however 10 species were recorded that is protected according to Mpumalanga protected species list (1998).

Table 10-21: Reptile Species of Umcebo

Scientific Name	English Name	IUCN (2014.3)	NEMBA TOPS List (2007)	Mpumalanga Protected (1998)
Agama aculeata	Ground Agama	Not Listed	Not Listed	Protected
*Bitis arietans***	Puff Adder	Not Listed	Not Listed	Protected
Cordylus vittifer	Common Girdled Lizard	Not Listed	Not Listed	Protected
*Hemachatus haemachatus***	Rinkhals	Not Listed	Not Listed	Protected
*Lamprophis fuliginosus***	Brown House Snake	Not Listed	Not Listed	Protected
*Mabuya capensis**	Cape Skink	Not Listed	Not Listed	Protected
*Mabuya striata**	Striped Skink	Not Listed	Not Listed	Protected
*Pachydactylus affinus**	Transvaal gecko	Not Listed	Not Listed	Protected
*Psammophylax rhombeatus**	Spotted or Rhombic Skaapsteker	Not Listed	Not Listed	Protected
*Typhlops bibronii**	Bibron's Blind Snake	Not Listed	Not Listed	Protected

* - Recorded previously

** - Recorded via personal communication with farmers

The Montane Dwarf Burrowing Skink Scelotes mirus, a South African endemic, has also been recorded in the IBA that this project falls within. The IBA (refer to Avifauna section) may hold other endemic reptiles, such as the rare Many-Spotted Snake *Amplorhinus multimaculatus*, berg adder *Bitis atropos*, Thin-tailed Legless Skink *Acontias gracilicauda*, Breyer's Long-tailed Seps *Tetradactylus breyeri*, Black-spotted Dwarf Gecko *Lygodactylus nigropunctatus* and Spotted Dwarf Gecko *L. ocellatus*, as well as Rough-haired Golden Mole *Chrysospalax villosus*.

10.1.7.2.4 *Macro – Invertebrates*

Five butterfly species were observed within the project site, these included the Spotted Jonker (*Byblia ilythia*), African Monarch (*Danaus chrysippus*), Brown-veined White (*Belenois aurota*), Broad Bordered Grass Yellow (*Eurema brigitta*) and the Citrus Swallowtail (*Papilio demodocus*). All the species were located within mixed grassland or the wetland areas adjacent to the farm. No butterfly species observed were considered to be SSC. However according to SANBI, it is possible that the Near Threatened Marsh Sylph (*Metisella meninx*) can be located on the site which is endemic to this region. Wasp robber flies (*Philodicus sp*) were located in the mixed grasslands area south of the existing overburden stockpile. Dung beetles (*Scarabeus sp*) were located throughout the property and wherever cattle faeces were evident.

The diversity and density of the invertebrates was relatively high for the proposed Umcebo mining development footprint area and surroundings, and this in general could assist in providing an indication of the health of the regional ecology. Although existing mining activities has modified the immediate area, there is sufficient habitat within the surrounding unaffected areas to sustain moderate populations of the typical highveld grassland species of fauna. It would however be recommended that the management of any encroachment of alien invasive plant species is strictly enforced to retain the preferred faunal species types that currently dominate the grassland biome of Mpumalanga Province.

10.1.8 Wetlands

A Wetland Assessment (Appendix 9) was undertaken in support of the EIA to determine the wetland characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

The project site is found predominantly within the quaternary catchment B12A, which is characterised by the Klein Olifants River (sub-quaternary reach B12A-01309).

In-field wetland assessments were done in March, April and May 2016, which followed the methodology described below.

10.1.8.1 Wetland Delineation and Classification

The wetland delineation procedure considers four attributes to determine the limitations of the wetland, in accordance with DWAF guidelines (2005). The four attributes are discussed below.

10.1.8.1.1 *Terrain Indicator*

The topography is typical of the Highveld lower ecoregion with gentle slopes and many valley systems present. This landscape and the wetlands are characterised by seven local catchments within which the wetlands are delineated.

10.1.8.1.2 *Soils Indicator*

Soils were a major indicator during the wetland assessments and examples of soils assessed are shown in Figure 10-20. A separate soil study was undertaken and the major soil types and their characteristics are defined (ESS, 2016).

Figure 10-20: Examples of Soil Samples a) Terrestrial Red Uniform Soil; b) Temporary Wetland Zone Soils such as Longlands where an E-horizon is Present Indicating Lateral Movement of Water; c-e) Soils Showing Iron Mottling Indicating Seasonally Wet Soils; and f) Wetland Soils Showing Gleying

10.1.8.1.3 *Vegetation Indicators*

Natural or near-natural floristic indicators were present in many parts of the project site that aided in the confirmation of wetland presence. However, large areas of wetlands were transformed by cultivated fields and soil was the major indicator. The three broad types of wetlands (valley bottoms, hillslope seeps and pans) differed in vegetation composition from each other as well as from the terrestrial habitats. Refer to the Fauna and Flora Report (Digby Wells, 2016) for further detail on the different broad habitat types. Species that were characteristic of the permanently wet zones where standing water are shown in Figure 10-21.

Figure 10-21: Common Characteristic Flora Species Associated with the Wetlands a) Cyperus congestus; b) Pennisetum sphacelatum (Bull Grass); c) Schoenoplectus brachycerus; d) Cyperus denudatus (Winged Sedge); e) Eleusine coracana (Goose Grass); f) Agrostis lacnantha (Bent Grass); g) Eragrostis gummiflua (Gum Grass)

10.1.8.1.4 *Wetland Delineation*

The project site is characterised by large areas of wetlands as delineated according to the indicators discussed in the above section and are shown in Plan 12 in Appendix 3, totalling 2 830.2 ha. Wetlands were delineated beyond and between the boundaries of the three underground reserve blocks to show the connectedness of these ecosystems in the catchment areas. Extensive hillslope seep wetlands were found in the project area with channelled and unchannelled wetlands in the valley bottoms. In addition, pan wetlands were found typically on the catchment divide in high lying areas. The project site was therefore found to be in alignment with the land and vegetation type where Highveld grassland is the dominant natural terrestrial habitat and seasonal seep wetlands are present on the mid-to-lower slopes of the landscape with non-perennial wetlands in the drainage lines. This is generalised in Figure 10-22 below where the landscape is characterised by a typical change in soil and floral species composition.

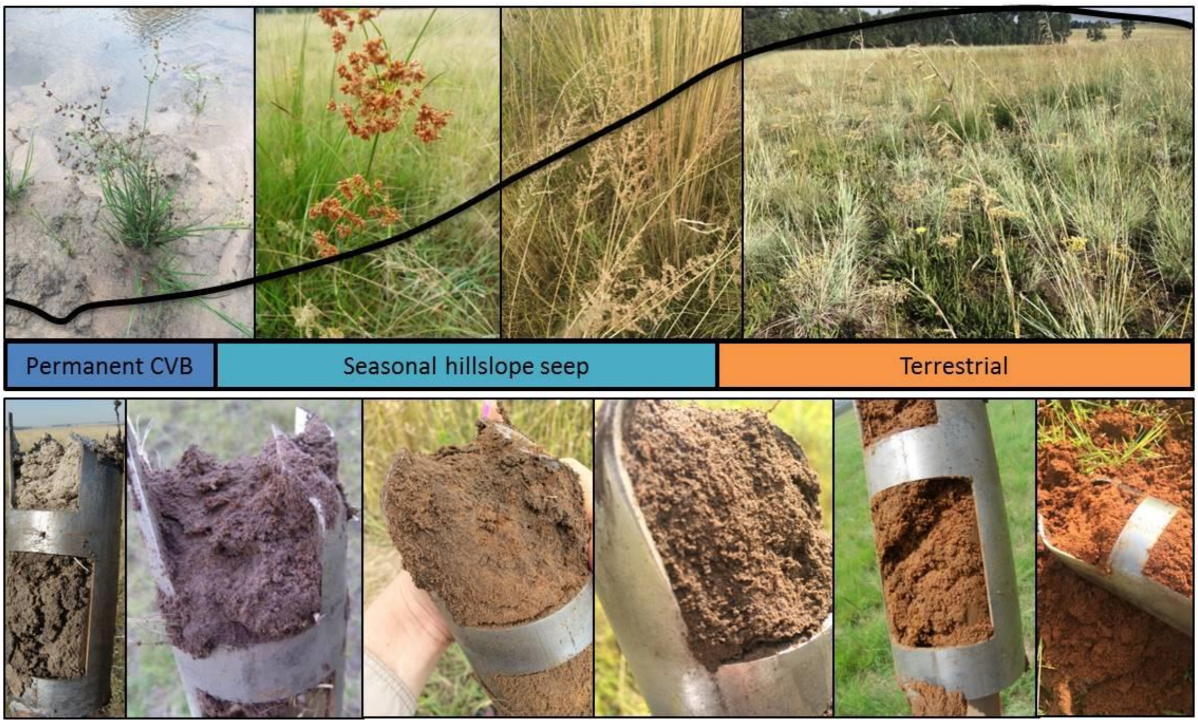


Figure 10-22: Generalised Landscape Slope Gradient with Changing Flora and Soil Types of the Project Site

10.1.8.2 Wetland Health and Sensitivity

The dominant land use of the area is agro-pastoral including large areas of cropland and natural grassland for grazing and grass-bailing. The wetlands of the project site are overlaid on the land use map (see Plan 13 in Appendix 3) to show the impact of the current land use practices on the wetlands and their catchment areas. This has led to negative impacts such as the removal of natural wetland vegetation of the hillslope seeps, increased sediment load reporting to the wetlands, erosion, damming of valley bottom wetlands altering the natural hydrological regime and presence and spread of alien and invasive species. Examples of these impacts recorded on site are shown in Figure 10-23 below.

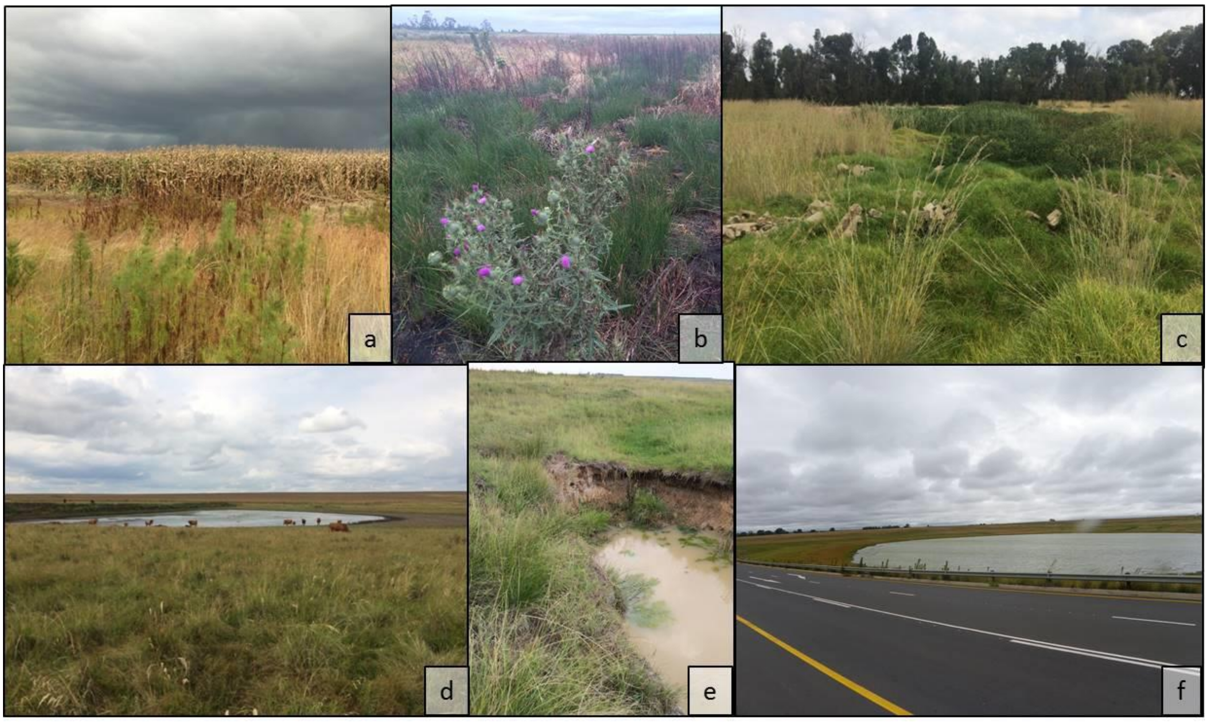


Figure 10-23: Main impacts to wetlands a) agriculture; b) alien invasive plant species such as *Cirsium vulgare* (Scottish Thistle); c) evidence of abandoned land uses and dumping as well as large stands of alien invasive trees; d) damming of valley bottoms and use of wetland by cattle; e) headcut erosion; and f) major roads bisecting the catchment areas

The project site can be classified into four Hydrogeomorphic (HGM) units, which are defined as land forms characterised by a specific origin, geomorphic setting, water source, and hydrodynamic. These units are assessed using the methodology which has been discussed in the wetland specialist study (Appendix 9) to determine their Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) as well as their ecosystem services provided. The PES and EIS scores are presented in Table 10-22.

Table 10-22: Wetland PES and EIS

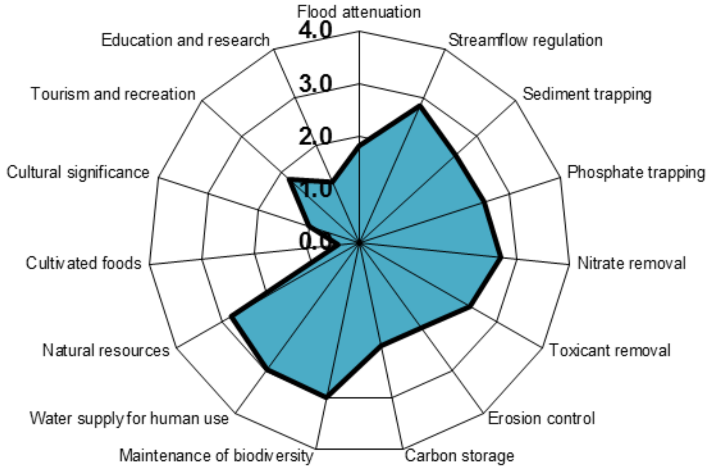
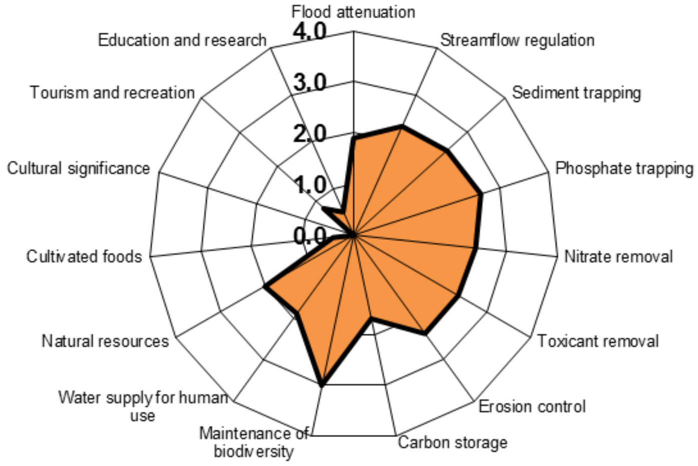
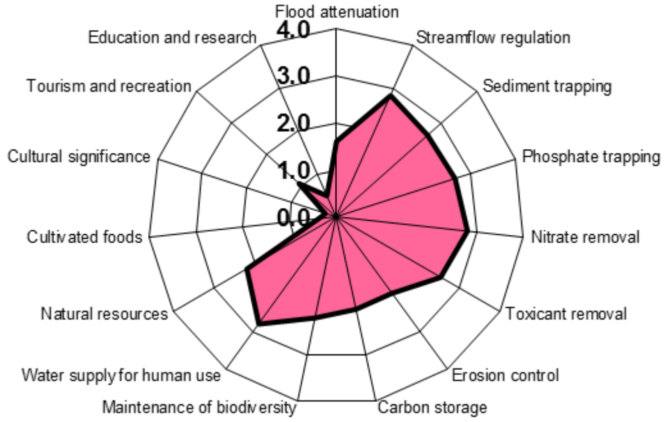
Wetland HGM Unit		PES with Overall Score	Overall EIS Score	Photographic evidence
1	Klein Olifants River	4.3 – D/C	High (2.0)	
2	Unchannelled valley bottom systems	4.2 – D/C	High (2.3)	
3	Channelled valley bottom systems	3.6 – C/D	High (2.3)	

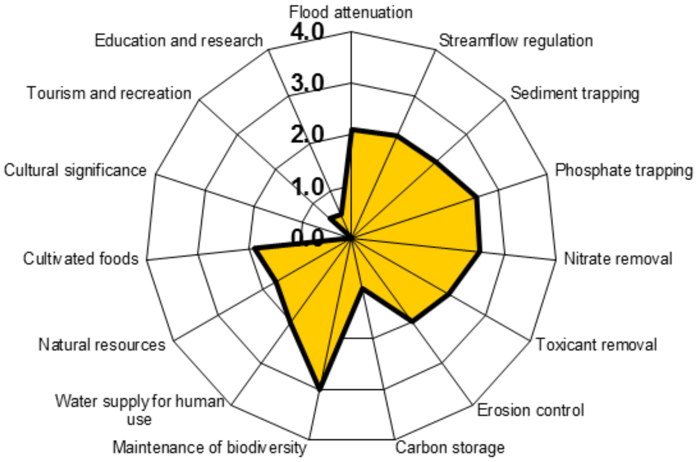
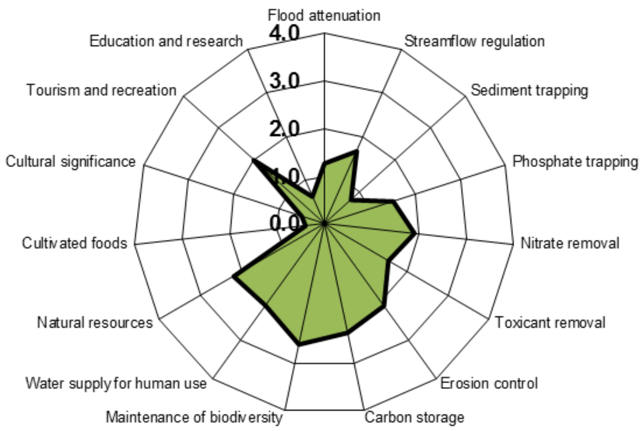
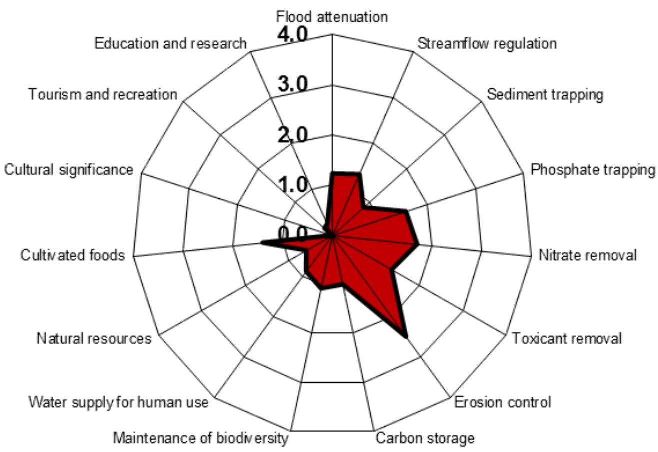
Wetland HGM Unit		PES with Overall Score	Overall EIS Score	Photographic evidence
4	Hillslope Seep Wetlands	4.3 – D/C	High (2.0)	
5	Natural Pan Wetlands	2.9 – C	High (2.7)	
6	Impacted Pan Wetlands	5.6 – D/E	Low (0.7)	

10.1.8.3 Wetland EcoServices

The general features of each wetland unit were assessed in terms of functioning and the overall importance of the HGM unit was then determined at a landscape level. The results from the Wet EcoServices tool for the respective wetland units are presented below in Table 10-23 and the EcoServices that were rated as high (≥2.8) are listed. The major EcoServices provided by the wetland in the project area are Natural Resources and Erosion Control.

Table 10-23: EcoServices Radial Plots and High Scores for each HGM Unit

Unit	Radial Plot	Top EcoServices
1		Water Supply for Human Use and Maintenance of Biodiversity
2		Maintenance of Biodiversity
3		Streamflow regulation, Nitrate Removal and Water Supply for Human Use

Unit	Radial Plot	Top EcoServices
4		Maintenance of Biodiversity
5		Maintenance of Biodiversity
6		Erosion Control

10.1.9 Aquatic Ecology

An Aquatic Assessment (Appendix 10) was undertaken in support of the EIA to determine the aquatic characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

10.1.9.1 Water Quality

The results of the *in situ* water quality analysis are presented in Table 10-24 for the high flow (March 2016) and Table 10-25 for the low flow (June 2016) surveys.

Table 10-24: *In Situ* Water Quality Results for the March 2016 Survey

Constituent	Temperature (ºC)	pH	Conductivity (µS/cm)	Dissolved oxygen (mg/l)
Guidelines	**5-35**	**6-9**	**<700**	**>5**
KO1A	24	7.8	386	6.2
KO1B	25	8.1	419	7.6
KO2	18	7.5	357	5.5
KO3A	27	7.1	586	6.2
KO3B	DRY	DRY	DRY	DRY
KO4	23	7.3	313	5.1
KO5A	No Access	No Access	No Access	No Access
KO5B	DRY	DRY	DRY	DRY
KO6	No Access	No Access	No Access	No Access
KO7	29	7.7	255	5.3
O1	28	7.6	205	5.2

The *in situ* water quality analysis shows that temperature ranged from 18 ºC to 29 ºC as observed during the high flow period. The pH values were shown to range from 7.1 at KO3A to 8.1 at KO1B. Conductivity values ranged from 205 µS/cm at O1 to 586 µS/cm at KO3A. Dissolved oxygen concentrations were shown to range from 5.1 mg/l at KO4 to 7.6 mg/l at KO1B.

Table 10-25: *In Situ* Water Quality Results for the June 2016 Survey

Constituent	Temperature (ºC)	pH	Conductivity (µS/cm)	Dissolved oxygen (mg/l)
Guidelines	**5-25**	**6-9**	**<700**	**>5**
KO1A	8	7.8	828	5.3
KO1B	DRY	DRY	DRY	DRY
KO2	9.2	7.2	438	6.7
KO3A	DRY	DRY	DRY	DRY
KO3B	DRY	DRY	DRY	DRY
KO4	7.2	7.4	452	5.6
KO5A	14	7.0	311	6.8
KO5B	DRY	DRY	DRY	DRY
KO6	17	6.9	351	6.4
O1	15	7.2	278	5.4

The *in situ* water quality analysis shows that temperature ranged from 7.2 ºC to 17 ºC as observed during the low flow period. The pH values were shown to range from 7.0 at KO5A to 7.4 at KO4. Conductivity values ranged from 278 µS/cm at O1 to 828 µS/cm at KO1A. Dissolved oxygen concentrations were shown to range from 5.3 mg/l at KO1A to 6.8 mg/l at KO5A.

These results indicate that the water quality of the reach of the Klein Olifants River assessed has modified water quality with elevated dissolved solid content.

10.1.9.2 The Intermediate Habitat Integrity Assessment

The results of the Intermediate Habitat Integrity Assessment (IHIA) on instream habitat are presented in the table below (Table 10-26) with the riparian integrity assessment presented in Table 10-35.

Table 10-26: Intermediate Habitat Integrity Assessment for Instream Habitat

Instream	Average score	Score
Water abstraction	15.33	8.59
Flow modification	16.67	8.67
Bed modification	19.00	9.88
Channel modification	16.67	8.67
Water quality	11.67	6.53

Instream	Average score	Score
Inundation	13.33	5.33
Exotic macrophytes	5.00	1.80
Exotic fauna	15.00	4.80
Solid waste disposal	5.00	1.20
Total Instream	**44**	
Category		**class D**

Table 10-27: Intermediate Habitat Integrity Assessment for Riparian Habitat

Riparian	Average score	Score
Indigenous vegetation removal	14.33	5.20
Exotic vegetation encroachment	11.67	4.80
Bank erosion	20.67	11.20
Channel modification	16.67	9.60
Water abstraction	13.33	5.20
Inundation	13.33	4.40
Flow modification	15.33	7.20
Water quality	11.67	5.20
Total Riparian	**47.2**	
Category		**class D**

The IHIA results of the instream and riparian habitats within the SQR are classified as class D or largely modified. The central cause for the largely modified nature of the SQR habitat can be attributed to local livestock and dryland agricultural practices. Erosion, bed and flow modification criteria were rated high due to impacts from livestock. The upper reaches of the Klein Olifants River is extensively utilised for livestock watering. This has resulted in the sedimentation of the river system and alteration to the stream banks (Figure 10-24).

Figure 10-24: Erosion within the Klein Olifants River below Site KO2 (March 2016)

10.1.9.3 Macroinvertebrates

Sites which were inundated were selected for macroinvertebrate assessment.

10.1.9.3.1 *Integrated habitat assessment system and Biotope Assessment*

The results of the IHAS completed during the surveys are presented in the table below (Table 10-28).

Table 10-28: Integrated Habitat Assessment System Results for the 2016 surveys

Site	Score	Suitability
KO1A	55	Fair
KO2	48	Poor
KO3A	48	Poor
KO4	63	Fair
KO5A	58	Fair
KO6	46	Poor
KO7	56	Fair

The results of the biotope diversity assessments are presented in the table below (Table 10-29).

Table 10-29: Invertebrate Biotope Diversity (2016)

Biotope	KO1A	KO2	KO3A	KO4	KO5A	KO6	KO7
Stones in current	0	0	0	0	0	0	0
Stones out of current	0	1	0	0	0	0	0
Bedrock	1	1	0	2	1	0	0
Aquatic Vegetation	0	3.5	3	3.5	3	3.5	1
Marginal Vegetation In Current	0	0	0	0	0	0	0.5
Marginal Vegetation Out Of Current	3.5	3	3	2.5	3	3	3
Gravel	0	0	0	0	0	3	0
Sand	0	2	2	3	2	3	3
Mud	3	2	2	3	2	2	3
Biotope Score	7.5	12.5	10	14	11	14.5	10.5
Biotope Score (%)	**16**	**27**	**22**	**31**	**24**	**32**	**23**
Biotope suitability	**Poor**	**Fair**	**Poor**	**Fair**	**Poor**	**Fair**	**Poor**

10.1.9.3.2 *South African Scoring System*

The results of the South African Scoring System (SASS5) assessments completed for the study are presented below (Table 10-30 and Table 10-31).

Table 10-30: SASS5 Results of the High Flow Survey

Site	KO1A	KO2	KO3A	KO4	KO7
SASS5	63	36	71	94	67
Taxa	14	11	16	20	18
ASPT	4.5	3.2	4.4	4.7	3.7
Category	D	E	C	B	D

The SASS5 scores obtained during the high flow survey ranged from 94 at KO4 to 36 at KO2. The taxa diversity at the sites ranged from 20 at KO4 to 11 at KO2. The ASPT values derived from the SASS5 scores ranged from 3.2 at KO2 to 4.7 at KO4.

Table 10-31: SASS5 Results of the Low Flow Survey

Site	KO1A	KO2	KO4	KO5A	KO6
SASS5	51	90	91	99	72
Taxa	14	22	20	22	17
ASPT	3.6	4.1	4.5	4.5	4.2
Category	D	B	B	B	C

The SASS5 scores obtained during the low flow survey ranged from 99 at KO5A to 51 at KO1A. The taxa diversity at the sites ranged from 22 at KO5A to 14 at KO1A. The ASPT values derived from the SASS5 scores ranged from 4.5 at KO5A and KO4 to 3.6 at KO1A.

The results of the SASS5 assessment provide an indication that instream conditions have modified the local aquatic macroinvertebrate assemblages. Although the SASS5 interpretation guidelines indicate that conditions were largely natural at several sites, several taxa were absent from the samples obtained at the sites.

Typical SASS5 scores in the Klein Olifants River show the presence of largely tolerant taxa adapted to marginal and instream vegetation and slow flowing water. Taxa specifically adapted to stones in current or flowing conditions were absent from the sites assessed. The Macroinvertebrate Response Assessment Index (MIRAI) will provide further insight into the conditions in the assessed river system.

10.1.9.3.3 *Macroinvertebrate assessment index*

The results of the MIRAI assessment are presented in the table below (Table 10-32).

Table 10-32: MIRAI scores for the 2016 surveys

Invertebrate Metric Group	Score Calculated
Flow modification	42
Habitat	59
Water Quality	43
Ecological Score	**61**
Invertebrate Category	**class C**

The result of the MIRAI shows that the ecological category of the river reach was determined to be a class C or moderately modified.

The results of the MIRAI show that flow within the Klein Olifants River is modified from reference conditions. This conclusion is drawn from the fact that flow sensitive taxa, such as Heptageniidae were absent from the reach assessed. In addition, poor water quality within the reach assessed has had an impact on the macroinvertebrate assemblage and confirms the concluding remarks on dissolved solids and general water quality. It is further noted that although dissolved solid content was below threshold effect concentrations at many sites, the use of the river system to water livestock has resulted in the sedimentation and input of excessive nutrients into the system. The overall result of the invertebrate assessment provides an indication that the habitat and water quality is degraded in the assessed river reach.

10.1.9.3.4 *Fish Response Assessment Index*

The results of the Fish Response Assessment Index (FRAI) assessment are presented in Table 10-33. It is noted that no red data species were captured during this assessment.

Table 10-33: FRAI Results of the 2016 Study

Fish Species	Reference Frequency of Occurrence	Observed Frequency of Occurrence
Barbus anoplus	4	2
Barbus neefi	4	0
Barbus paludinosus	4	3
Clarias gariepinus	1	1
Pseudocrenilabrus philander	3	2
Tilapia sparmanni	3	3
FRAI (Adjusted) %		71
Ecological category		Class C

The overall FRAI category was calculated to be moderately modified (class C). The assessment of the river reaches assessed in this study was used to derive the reference Frequency of Occurrence (FROC) rating. As observed in the above table, the sampled FROC of fish differed from the reference FROC. The expected species Barbus neefi is considered to be sensitive to habitat and water quality modification. The absence of this species from the study sites provides further confirmation that the upper reaches of the Klein Olifants River are impacted by local activities. In addition, the FROC for tolerant taxa such as Pseudocrenilabrus philander and Barbus anoplus was also below the expected/reference FROC. This can be attributed to the alteration of aquatic instream habitats whereby siltation and trampling of marginal vegetation has resulted in the loss of habitat for the above-mentioned taxa.

10.1.9.4 Present Ecological Status

The results of the ecological classification and PES for the river reach considered are provided in the table below (Table 10-34).

Table 10-34: The Present Ecological Status of the River Reach in this Study

Category	Score	Ecological category
Riparian Habitat Ecological Category	47	Largely modified
Fish Ecological Category	71	Moderately modified
Macroinvertebrate Ecological Category	61	Moderately modified
Ecostatus		class C/D Moderately/largely modified

The results of the ecological classification indicate that the PES of the reach assessed in this study is a class C/D or moderately/largely modified.

As discussed in the various sections above, modification of water and habitat quality within the upper reaches of the Klein Olifants River has resulted in the loss of suitable aquatic habitat which in turn has resulted in the alteration of the expected aquatic communities.

10.1.10 Cultural Heritage and Palaeontological

A Heritage Assessment (Appendix 11) was undertaken in support of the EIA to determine the cultural heritage characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

The tangible cultural landscape is predominantly associated with a historical, agrarian landscape, with a significant palaeontological[7] and archaeological component.

Archaeologically, identified heritage resources are primarily associated with the Later Stone Age (LSA). The LSA dates from approximately 40 000 years ago (kya) to the historical period. Lithics which are specialised stone tools that utilises bone within its assemblage is specific to the LSA (Mitchell, 2002). LSA sites commonly contain diagnostic artefacts, such as microlithic scrapers and segments. In a southern African context, the LSA is closely associated with hunter-gatherer groups, such as the San. Due to the nomadic nature of LSA people, open sites are difficult to identify and usually poorly preserved. In addition to the production of LSA lithics, this period is characterised by evidence of ritual practises and complex societies, as well as rock art (Deacon & Deacon, 1999).

[7] Refer to Section 8.1.1 and 8.2.1 in the HSR, and Appendix C for information pertaining to the palaeontological context of the project site.

Identified rock art panels in the site specific project site are representative of LSA fine line and finger painting traditions associated with hunter-gatherer and pastoralist groups. Hunter-gatherer rock art was produced using fine brushes, quills or sticks predominantly done in red, white and black, and more rarely bichrome and polychrome. Realistic and proportionally correct animals such as various antelope species are often found. In addition, human figures and more symbolic beings are also represented (Eastwood, van Schalkwyk, & Smith, 2002).

In contrast, pastoralist rock art is characterised by predominantly finger-painted geometric images. Initially identified by Ben Smith and Sven Ouzman, the tradition extends in linear bands following the proposed migration routes of the pastoralists from southern Angola/western Zambia to the southern Cape (Smith & Zubieta, 2007). The geometric designs are composed entirely of circles, finger lines, finger dots, and handprints that are mostly painted in red pigment, sometimes in red and white, and occasionally only in white (Eastwood, van Schalkwyk, & Smith, 2002; Smith & Zubieta, 2007).

While these tangible heritage resources have been identified in the project area[8], the landscape is dominated by heritage resources from the historical period identified by farmsteads/ werfs and burial grounds. Historically, the Boers moved into the region from approximately the late 1840's. The influx of this group created tensions between themselves and the local Swazi and Pedi groups, which culminated in conflict. Subsequent to the initial influx of Boers into the region, tension between the *Zuid Afrikaansche Republiek* (ZAR) and the British increased through time, culminating in the South African War of 1899 – 1902 (also known as the Second Anglo-Boer War). Significantly in this region, the Boers enlisted the help of the San hunter-gatherers to help monitoring the movement of the British (Jones, 1999; Delius & Cope, 2007; Anonymous, 2013).

After the war, the region continued predominantly as an agrarian landscape with the working of farms and establishment of farmsteads recorded has the historical built environment.

Identified heritage resources attest to the pre-dominantly agrarian landscape described. A summary of the heritage resources within the project site is presented in Table 10-35 and on Plan 14 in Appendix 3. No heritage resources were identified in the project area, i.e. proposed development footprint. However, heritage resources commonly occur at sub-surface levels with no or limited trace evidence on the surface, thereby increasing potential of unidentified heritage resources to be exposed through the life of the Project.

Table 10-35: Identified Heritage Resources in the Project Site

Heritage Resource Type	Site Name	Description Detail
Archaeological - MSA	1722/S.35-014	Single stone flake
Archaeological - LSA	1722/S.35-015	Rock Art - San

[8] It is important to note that no heritage resources were identified within the project site, i.e. the proposed development footprint of surface infrastructure for the Project.

Heritage Resource Type	Site Name	Description Detail
	1722/S.35-019	Rock Art - Finger Painted, red lines. Possible deposit with LSA microlith
	1722/S.35-029	Rock art/graffiti
	RA-001	Rock art comprising a panel with very faded images including humans and antelope. Antelope may represent eland (yellow pigment) and hartebeest or tsessebe (red pigment). Humans painted in reddish-brown pigment. Site is situated in a low shelter, fronted by black wattle (*Acacia mearnsii*) and blue gum (*Eucalyptus* sp.) bush. Active decay (exfoliation) evident.
	RA-002	Rock art comprising a panel with very faded images including antelope. Site is situated in a low shelter, fronted by wattle and eucalyptus. Very active decay (exfoliation) evident.
Archaeological - LFC	1722/S.35-013	Grinding area in sandstone outcrop. *Isifuba* game engraved into sandstone. Some historic glass found.
	LFC-001	Remnants of at least three hut foundations. No other surface features identified associated with the site. Potential to be associated with historic farm labourer settlement.
Burial Grounds & Graves	1722/S.36-017	Informal cemetery - 1 with formal dressing, Bhesy Johanna Mpila, died 1973. Total of 22 graves.
	BGG-001	Burial ground containing at least 17 graves. Two graves have concrete slabs with rocks as headstones. Remainder either ferricrete cairns or with rock headstones.
	BGG-002	Burial ground containing at least eight graves, associated with an occupied werf.
	BGG-005	Burial ground containing at least 27 graves. Two graves with formal dressings and headstones associated with Lekgari and Marazwani families. Remainder stone cairns or rocks as headstones.
	BGG-006	Burial ground containing at least 6 graves, four with headstone but no inscription, and two with concrete surface dressing.
Historical Built Environment	1722/S.34-030	Stonewall in between a sandstone ridge and a sandstone outcrop; and a metal fragment and fence post on the sandstone ridge.

Heritage Resource Type	Site Name	Description Detail
	1722/S.35-018	Stone walled enclosures amongst sandstone outcrop. 30 m apart.
	Ste-003	Structural remains identified through recent aerial imagery. Relative age not determined.
	Wf-001	
	Wf-002	
	Wf-004	
	Wf-005	
	Wf-006	
	Wf-007	
	Wf-008	
	Wf-009	Abandoned werf comprising a residence, cow shed and several other structures such as troughs, broken down pens and water tank structure. Residence is constructed of clay brick, cinder blocks and dressed sandstone, with a corrugated roof. Building U-shaped with additions to back.
	Wf-010	Structural remains identified through recent aerial imagery. Relative age not determined.
	Wf-011	
	Wf-012	
	Wf-013	
	Wf-014	
	Wf-015	
	Wf-016	
	Wf-017	
	Wf-018	
	Wf-019	
	Wf-020	
	Wf-021	
Palaeontological	1722/S.35-034	Fossilised *Breytenia* on a flat sandstone outcrop.
	1722/S.35-035	Fossilised plant leaf on a flat sandstone outcrop.
	1722/S.35-036	Fossilised *Breytenia* on a flat sandstone outcrop.
	1722/S.35-040	Fossil plant on a sandstone ridge.

10.1.11 Socio-Economic

A Socio-Economic Assessment (Appendix 12) was undertaken in support of the EIA to determine the socio-economic characteristics of the area and the impacts associated with the Hendrina Underground Coal Mine.

The project area for an impact assessment can be defined as the area that is likely to experience impacts arising from, or exert influence on, the Project or activity being assessed (IFC, 2012). In the case of a SIA, this task is complicated by the fact that different types of social impacts make themselves felt over different geographical areas, as opposed to specific areas affected by specific activities. Therefore the project has been divided into three study areas namely:

- The primary study area – the area likely to experience impacts related to the physical intrusion of Project infrastructure and project-related activities (i.e. up to a hundred metres from the edges of the respective mining right areas). This study area is defined as the extent of the farm portions comprising the footprint of the existing mining right areas and a 100 m buffer surrounding it;
- The secondary study area – the area likely to experience impacts related to the "economic pull" exerted by the Project (i.e. up to a 10 km from the edges of the primary study area). This area was approximated as the geographical extent of the municipal wards that encompass and surround the proposed Project footprint – namely, Wards 10 and 13 of Msukaligwa Local Municipality (MLM) and Wards 1, 2, and 3 of STLM; and
- The tertiary study area – the area likely to experience the indirect or induced impacts of the proposed Project. The typical reach of such impacts mentioned above (i.e. an area circumscribed by a radius of up to a 50 km) includes most of MLM, STLM, as well as a small section of the neighbouring Albert Luthuli Local Municipality. However, due to the fact that the greater majority of nearby human settlements (e.g. Hendrina, Breyten, Kwazamokuhle, etc.) are located in MLM and STLM, the tertiary study area for the purposes of this assessment is defined to include only MLM and STLM.

The tertiary study area have been discussed in further detail in the Social report, 2016 (Appendix 12) and therefore have not been included in this EIA Report.

The secondary and primary study areas have been discussed in the sections below.

10.1.11.1 Secondary Study Area

The secondary study area has been defined as the combined land surface area of Ward 1, 2 and 3 of STLM, as well as Ward 10 and 13 of MLM.

10.1.11.1.1 *Population Growth and Distribution*

The relatively high population growth rate is experienced in the secondary study, which increased considerably since 2001. Human settlement within the secondary study area is characterised by contrasting patterns. The vast majority of land is sparsely populated with residential uses being limited to stand alone homesteads and worker residences on farms which are usually a cluster of several homesteads; the majority of residential uses within the study area are concentrated within three major population centres, namely Breyten, Hendrina and Kwazamokuhle Township. Kwazamokuhle is situated adjacent to Hendrina.

These settlements comprise less than 3% of the land surface area of the study area, but account for more than 89% (or 37 133) of its total population, Kwazmokuhle 49% (20 247), Breyten 34% (14 347) and Hendrina 6% (2 359).

10.1.11.1.2 *Age and Gender Distribution*

Table 10-36 presents the gender distribution of the study area, and indicates a gender ratio of 102.3, which translates to 102 males for every 100 females, which is similar to the tertiary study area's gender distribution (StatsSA, 2013). The male to female ratio is considerably higher in Hendrina and reversed in Breyten. The gender distribution of household heads indicates that a third of all households in the secondary study area are headed by women (StatsSA, 2013). Female headed households are especially common in Breyten, where 40% of households are headed by women.

Table 10-36: Gender-and age distribution

Area	% of total population			
	Sex ratio[9]	Age category (in years)		
		0-14	15-64	65+
Secondary	102.3	30 %	65 %	4 %
Kwazamokuhle	105.9	31 %	66 %	3 %
Breyten	96.2	32 %	64 %	4 %
Hendrina	108.4	16 %	69 %	15 %

10.1.11.1.3 *Language and Racial Distribution*

Similar to the tertiary area, the population within the secondary study area is somewhat differentiated from an ethnic and language perspective, with isiZulu being the most common language, spoken by 64% of individuals, followed by several other prominent languages (i.e. Afrikaans, IsiNdebele, SiSwati and Sesotho) (StatsSA, 2013). With regards to race, black Africans constitute the overwhelming majority (92%) of the population, followed by Whites (6%). The majority of the black African population reside in townships within and surrounding

[9] *Sex ration* indicates the number of males in a given population compared to every 100 females

Hendrina and Breyten, while the white minority mostly reside in Hendrina town, smallholdings or surrounding farms.

10.1.11.1.4 *Education*

A population's average level of education is commonly used as an indicator of human capital and is measured by the percentage distribution of the population older than 20 years and the highest level of schooling they completed. Education levels among the study area's population indicates a relatively modest level of formal education, with just more than half of individuals (53%) attaining some secondary schooling, irrespective of their gender grouping. This trend is similar to the tertiary study area, although the latter has a slightly higher proportion of people that have completed secondary and tertiary levels of education (StatsSA, 2013).

Education levels vary considerably across settlements in the study area, with the Hendrina population characterised by the highest proportion of individuals who completed secondary (44%) and tertiary education (15%). In contrast Kwazamokuhle (12%) and Breyten (10%) far outnumber Hendrina (1%) in terms of the proportion of adults with no education.

10.1.11.1.5 *Economic Profile*

Economic activity within the secondary study area mostly derives from activities within the agricultural sector, business activities (mostly trade and services) in Hendrina and Breyten, and industry servicing the coal mining sector. The secondary economy also contributes to economy of the study area; economic activity in this sector is mostly driven by informal enterprises undertaken by the self-employed, micro-entrepreneurs, street trading and other informal business activities. Activity in the informal sector is mostly located within depressed socio-economic areas such as Kwazamokuhle and Kwazanele. The economic profile has been described below:

Land Use, Economic Activities and Spatial Development

The land use profile and settlement dynamics within the secondary study area are important indicators reflecting the status quo and possible future land uses and growth patterns. Given the nature of the study area, conflict exists between high potential agricultural land and (mainly) coal mining.

Mining: The study area is characterised by the coal mining industry, operating mainly in the southern parts of the STLM near Hendrina, south of the N4 national road, where the proposed Project would be located. Conflictingly, this area is also where the highest potential for commercial agriculture is found, in particular arable land under irrigation (STLM, 2015).

Business and industry: Hendrina and Breyten comprise the primary industrial and business nodes within the study area. These business nodes are fairly unstructured, and limited business activities in Kwazamokuhle and Kwazanele force local residents to travel to either Hendrina or Breyten for goods and services. Informal traders, spaza shops and a few general dealers provide daily goods and services in Kwazamokuhle (STLM, 2015; MLM, 2015).

Commercial agriculture: Commercial agriculture is the most prominent land use activity in the secondary study area; it dominates the central and western parts of the GSDM and southern parts of the NDM, where the secondary study area is situated. Commercial agriculture within the study area comprises maize, soya bean, potato, sunflower, wheat and grazing crops (SRK Consulting, 2009). Animal production includes dairy farming, commercial beef farming, animal stud breeding, sheep farming, feedlots and to a lesser extent game farming (GSDM, 2015).

Subsistence agriculture is also practiced throughout the study area on communal and state land surrounding major settlements such as Kwazamokuhle and Kwazanele (SRK Consulting, 2009).

Employment

In 2011, the employment rate among the secondary study area's labour force was 39% of the total population (older than 15) and 68% among the economically active population (StatsSA, 2013). Employment was mostly provided within the formal sector (66%), which is centred on the social and personal (community services), wholesale and retail trade, as well as service sectors (StatsSA, 2013). Although agriculture contributes only slightly to the local economy, the sector is considered a major source of employment within the area, especially in the Hendrina and Breyten (STLM, 2015; MLM, 2015).

Unemployment among the economically active population (32%) is relatively high, when compared to the tertiary study area. The level of unemployment amongst economically active females is almost 30% higher than for males (21%) (StatsSA, 2013). There are also 6 % more females than males (5%) who are classed as discouraged job-seekers. Youth unemployment is also a major challenge throughout the study area.

Income

Generally, income levels within the study area are extremely low, with 70% of people earning less than R 800 a month (StatsSA, 2013). The proportion of people earning no income is high (46%); of those not earning any income, females (54%) outnumber males with 16%. It is notable that of those earning an income, females are worse off than males, this gender discrepancy tends to increase considerably within the higher income brackets (StatsSA, 2013). The large number of people who earn nothing and a small number (2%) of people who earn over R 12 801 per month (StatsSA, 2013), is indicative of a very high Gini-coefficient[10]. The majority of the study area is affected by inequality with the Gini-coefficient of 0.60, this figure increases to 0.62 in the tertiary study area (Statistics South Africa, 2011).

[10] The Gini-coefficient, developed in 1912 by Italian statistician Corrado Gini, is a mathematical measure of income inequality. Its theoretical maximum value is 1 – which would imply that a single person receives 100% of the total income and the remaining people receive none – and its theoretical minimum value is 0 – in which

10.1.11.1.6 *Service Delivery*

This section reports on household access to public service delivery.

Water and Sanitation

Safe drinking water and adequate sanitation is a necessity for good health, as households without safe water and suitable sanitation systems are more vulnerable to water borne diseases. Government water schemes provide most households within the secondary study area with piped water, with only a small proportion of households (4%) depending on groundwater resources (abstracted from boreholes by pumps) for domestic and agricultural use (StatsSA, 2013). Most of these households are located in Kwazamokuhle, where only 51% of households have piped water inside their dwelling, which is considered poor when compared to Breyten (76%) and Hendrina (89%) (StatsSA, 2013). There is a strong reliance on groundwater sources for commercial agricultural activities throughout the area. Farmers rely on ground and surface water to cultivate their crops and water their livestock.

In terms of sanitation, the majority of households (86%) within the study area have access to flush toilet facilities, irrespective of whether they reside in Hendrina or Kwazamokuhle, followed by a small number of households (6%) that rely on a bucket system (StatsSA, 2013). This trend is similar to that of the tertiary study area.

Energy Source used for Lighting, Cooking and Heating

The majority of households (85%) within the secondary study area have access to electricity for lighting purposes. With regards to cooking and heating there seems to be a greater reliance on alternative energy sources, especially coal, which is used by 34% of households for cooking, while 37% also uses it for heating (StatsSA, 2013)

Housing and Tenure Status

The majority of households (84%) within the secondary study area reside in formal dwellings, 12% occupy informal dwellings and only 4% reside in traditional dwellings. Housing types in Kwazamokuhle and Breyten follow this trend, whereas housing in Hendrina is almost exclusively formal (StatsSA, 2013). As mentioned previously, housing type is also linked to ownership with security of tenure being linked to more permanent and conventional housing types. Just more than 50 % of dwellings in the study area are privately owned, of these the majority (47%) have been fully paid off, which is considerably higher compared to the tertiary study area. Just more than a third of all dwellings are rented, while another 14% are occupied at no cost (StatsSA, 2013). The number of households who occupy their dwellings on a rent-free basis crudely corresponds to the number of households residing in informal housing or in traditional dwellings (StatsSA, 2013). Both these categories of occupancy are associated with a lack of formal land ownership rights.

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case everyone receives exactly the same income. The Gini-coefficient of the United States of America is between 0.45 and 0.5, while that of Sweden is 0.23.

Transport and Road Networks

Transport corridors formed by road networks usually play a pivotal part in facilitating and supporting development initiatives. Transport corridors also offer advantages to mining, manufacturing and other business developments planned for the area. Major roads running through the secondary study area includes the N11 national road, which connects Hendrina to Ermelo and Middelburg, as well as the R38 which runs in an East-West direction through the study area connecting Hendrina to Carolina and Bethal. There is concern among LMs about the rapid pace of road deterioration. Generally the deterioration is ascribed to combination of heavy motor vehicles, especially trucks transporting coal, and a lack of maintenance and rehabilitation.

The immobility of communities within the study area was noted as a concern (MLM, 2015). Car ownership within the study area is reserved for those household who can afford it, with a relatively large number of household not having access to private transport. Most commuters in township areas such as Kwazamokuhle, depend on public transportation, usually bus and taxi operators; however households residing on surrounding farms rarely have direct access to public transport, and have to walk significant distances to access transport.

10.1.11.1.7 *Poverty and Vulnerable Groups*

People or groups can be classified as vulnerable for a number of reasons. Often they are classified according to demographic or social profiles. As adapted from the IFC definition, vulnerable groups are people who by virtue of gender, ethnicity, age, physical or mental disability, economic disadvantage, or social status may be more adversely affected by Project impacts than others, and who may be limited in their ability to claim and/or take advantage of Project related benefits (IFC, 2006). The most common groups identified as vulnerable are children, the elderly, child or female headed households, the poor and the disabled. Other socio-economic aspects also make certain people and groups more vulnerable such as low levels of education and high levels of unemployment. The low average monthly income combined with the high dependency ratio, high unemployment rates and a relatively low level of education implies high levels of poverty and vulnerability among households within the secondary study area. The aforementioned factors, together with the high prevalence of HIV/AIDS throughout the tertiary study area and the number of household which are indirectly affected by the disease, increase the vulnerability of a significant number of families in the secondary study area.

10.1.11.2 Primary Study Area

The primary study area focuses on the characteristics of the primary study area which includes the farm portions located within the proposed mining right area, as well as a 100 m buffer surrounding this area.

During field investigations it was established that the socio-economic well-being of the population residing within this primary study area tend to follow tenure status, with landowners and those formally leasing homesteads situated at the high end of the socio-economic scale and farm/ domestic worker households located at the opposite pole, often characterised by socio-economic vulnerability. Discussions with representatives from the latter group highlighted the plight of these occupants. They are generally poor households, while almost all of them have little or no formal education or skills; however some individuals have acquired a range of informal skills relevant to farm work.

Some workers have been living on the farms for many years and they have no other livelihood or home. Farm/ domestic worker salaries are relatively low, and are increasingly linked to the compulsory minimum wage (R 120 per day according to some respondents). In many cases these households are heavily reliant on social grants, due to high unemployment, as a primary source of cash income. Households often rely on diverse subsistence strategies, including small scale poultry, livestock and vegetable farming to supplement any cash income.

In the majority of cases where farmworkers reside on the farm, they are granted free accommodation, as part of their employment agreement. Most of these households have no other homes and/or livelihoods apart from that provided by the landowner or user. According to interviewed landowners, most of these occupants have been awarded the right to reside at the property for the remainder of their lives (e.g. occupants of Mooivley and Elim communities and occupant of Mooivley 219 IS Ptn 4). In terms of Extension of Security of Tenure (Act No. 62 of 1997) (ESTA, 1997), these land occupiers are entitled to certain land tenure rights, which prevents new landowners and government from evicting them unless the provisions of ESTA have been strictly followed.

Generally, these households reside in underdeveloped dwellings and have no access to public services and facilities, as the nearest public services are available in areas such as Hendrina and Ermelo. Hence, they usually have to travel long distances often by foot to access public transport available on the N11 roadway. Households mostly have access to very basic services such as pit latrines and water abstracted from boreholes or community standpipes. In some cases land owners provide households with electrical connections, however this is not the case in either of the Mooivley or Elim communities. In comparison, land owners and formal occupants have access to electricity and have established self-sustaining water and sanitation services.

10.1.11.2.1 *Land Ownership*

The primary study area comprises mostly private, but also state-owned land. Usually, where a landowner owns several farms, these are generally all run as one business. Therefore, the sale of, or impact on, one farm could impact on the business operations of several farms. This is especially relevant for the aforementioned land owners who also own properties on which surface infrastructure will be developed, as these properties will likely be partially or wholly acquired by Umcebo. Table 10-37 provides a list of directly impacted land owners.

State-owned land is mostly situated adjacent to the proposed mining right area, with the only exception being Orpenskraal 298 IS Ptn RE, which is situated inside. Several properties within and surrounding the proposed mining right area have in recent years been purchased from farmers by the Department of Rural Development and Land Reform and allocated to community trusts or communal property associations. While most of these farm portions are allocated for the purposes of commercial farming, some farms appear to be used mainly for subsistence farming.

Table 10-37: Location of surface infrastructure

Surface infrastructure components	Properties	Landowner/s
Mooivley West shaft, crushing and screening plant and associated infrastructure; and Sections of the conveyor belt and access roads	Mooivley 219 IS Ptn 5	Mr. Jacobus J. Oosthuizen
Conveyor and access roads connecting infrastructure on Mooivley West to Hendrina South	De Wittekrans 218 IS Ptn 5; and Groblershoek 191 IS Ptn RE	Marmic Trust; and Riccor Boerdery (Pty) Ltd
Hendrina South shaft and associated infrastructure	Bosmanskrans 217 IS Ptn 6	Mr. Riaan Kuiper
Mooivley East shaft, crushing and screening plant and associated infrastructure	Oranje Vallei 201 IS Ptn 3	Mr. Jannie Davel

10.1.11.3 Mine – Community Relations

Community perceptions about and attitudes towards the proposed Project can be shaped by socio-political events and / or existing attitudes towards mining activities within the project area. The Optimum Coal Mine (formerly owned by Glencore) and Exxaro's Arnot Coal Mine are located relatively close to the proposed operation. The relationship between these mines and several of the surrounding labour sending communities have deteriorated considerably after Optimum was sold to new owners (Tegeta Exploration and Resources) and Arnot Coal Mine was closed down and retrenched a large proportion of their workforce. Several labour unions have indicated that they will oppose the mine closures, through protest actions (Business News, 2016). The fact that one Glencore Mine will be sold and another one will be developed through one of Glencore's subsidiaries might be perceived in a negative light by communities who will be affected by job-losses (if any) induced by the sale of Optimum Mine. Similarly the closure of Arnot Coal Mine and associated retrenchments could contribute to negative community sentiments to Coal Mining.

10.1.11.4 Stakeholder Perceptions

Stakeholder perceptions of a proposed development are critical inputs into the Social Impact Assessment (SIA) process. While perceptions are frequently based on insufficient information, this in itself may lead to, or increase, resistance to the proposed development. Insufficient project information could also raise unrealistic expectations amongst affected parties and/or host communities. A thorough understanding of the origin of stakeholder perceptions is therefore required, not only to put impacts into perspective, but also to identify mitigation measures that will address potential social risks to the proposed project.

During the interview process for the Social Impact Assessment (SIA), a variety of stakeholders were consulted. In addition, the SIA takes into account the stakeholder issues and concerns raised during the public participation process for the EIA study (which is on-going). The EIA PPP has already consulted key stakeholders and government departments at the regional level, as well as some farm owners and other local-level stakeholders. Consultations for the SIA focused on potentially affected parties in the project area. The main issues that were identified have been recorded in the SIA, 2016 (Appendix 12)

10.1.12 Visual

A Visual Assessment (Appendix 13) was undertaken in support of the EIA to determine the Visual characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

The project area falls within both the STLM in the NDM and the MLM in the GSDM of the Mpumalanga Province, South Africa. The nearest towns are Hendrina and Kwazamokuhle situated approximately 3.3 km north-west and 4.6 km north of the project area respectively. The nearest major town is Ermelo situated 26.7 km south-east of the project area.

The residential areas in the project area are potential visual receptors of the project. The closest towns and settlements, as well as their direct distance and direction from the project area summarised in Table 10-38. All distances are straight line distances measured from the edge of the project area to the centre of the towns/ settlements.

Table 10-38: Closest Towns and Settlements

Name	Type	Direct Distance	Direction
Hendrina	Other Town	3.3 km	NW
Kwazamokuhle	Settlement	4.6 km	N
Breyten	Secondary Town	12.6 km	E
Gloria	Settlement	17.1 km	NW
Davel	Other Town	20.5 km	SW
Ermelo	Major Town	26.7 km	SE
Voorslag	Settlement	29.5 km	S
Carolina	Secondary Town	34.5 km	NE
Bethal	Major Town	35.0 km	SW
Chrissiesmeer	Settlement	35.2 km	E

Road users in the project areas are potential visual receptors of the project. The N11 national road runs through the project area. The R38 regional road is situated 2.5 km north of the project area. The R542 regional route intersects the R38 regional road 4.6 km north-west of the project area and follows the R38 and N11 for a while before splitting from the N11 approximately 1.1 km east of the project area.

The project area has a largely agricultural sense of place. With the exception of the Hendrina and Kwazamokuhle towns the surrounding land use is agriculture (maize) and cattle grazing. There are numerous farm residences and farm workers houses scattered throughout the project area. The people living and working in these agricultural areas are potential visual receptors of the project.

Several mines occur in the vicinity of the project area with the majority of these being underground mines. The nearest operational mines are Weltevreden Coal located 5.4 km west of the project area and Spitzkop Colliery located 6.7 km south-east of the project area. The nearest power station is the Hendrina power station located 21.4 km north-north-west of the project area.

The project area and surrounds have numerous heritage sites including archaeological sites, palaeontological sites, burial grounds and graves, and historical buildings. Visitors to these heritage sites are potential visual receptors of the project.

People visiting the area for birdwatching and fishing are potential visual receptors of the project. The project area falls within the Olifants River Catchment and is bordered by the Inkomati River Catchment on the east. The Klein Olifants River has its source 2.3 km south of the project area and then the river and its tributaries flow in a northerly direction through the project area. Wetlands occur along these streams and there are numerous small dams and pans within the project area. The Vaalwaterspruit River and the Olifants River flow in a northerly direction on the east and west of the project area respectively. The surrounding area is interspersed with streams and wetlands.

Protected areas such as nature reserves, and recreational and tourism areas are considered sensitive visual receptors. The Project falls within the Amersfoort-Bethal-Carolina IBA. Other nearby IBAs include the Chrissie Pans IBA located 17.4 km east of the project area, the Steenkampsberg IBA located 28.8 km north of the project area and the Grasslands IBA located 46.3 km south-east of the project area.

The closest protected areas identified from the South African Protected Areas Database (Department of Environmental Affairs, 2015), as well as their direct distance and direction from the project area are summarised in Table 10-39. All distances are straight line distances measured from the edge of the project area to the edge of the protected area.

Table 10-39: Protected Areas

Name	Type	Direct Distance	Direction
Rietvlei Private Nature Reserve	Nature Reserve	21.7 km	S
Chrissiesmeer Protected Environment	Protected Environment	24.2 km	E
Ahlers Private Nature Reserve	Nature Reserve	25 km	SE
Nooitgedacht Dam Nature Reserve	Nature Reserve	30.3 km	NE
Rentia Kritzinger Private Nature Reserve	Nature Reserve	33.7 km	ENE
St Louis Private Nature Reserve	Nature Reserve	35. 2km	ENE
Heyns Private Nature Reserve	Nature Reserve	38.8 km	NW
Cecilia Private Nature Reserve	Nature Reserve	39.2 km	NNE
Langcarel Private Nature Reserve	Nature Reserve	42.0 km	SSE
Burnside Private Nature Reserve	Nature Reserve	42.8 km	NW
Vaalbank Private Nature Reserve	Nature Reserve	45.1 km	NNW
Bewerwyk Private Nature Reserve	Nature Reserve	48.0 km	ENE
Maffia Private Nature Reserve	Nature Reserve	48.4 km	ENE
Paulina van Niekerk Private Nature Reserve	Nature Reserve	49.1 km	NE
Krugerdam Private Nature Reserve	Nature Reserve	49.2 km	NNW

10.1.13 Noise

A Noise Assessment (Appendix 14) was undertaken in support of the EIA to determine the noise characteristics of the area and the impacts associated with the Hendrina Underground Coal Mine.

The project area is likely characterised by noise sources attributed to the town of Hendrina and the township of Kwazamokuhle as well as vehicle noise attributed to the main roads in the area such as the N11 national road and the Davel Road. The main noise sources for the town of Hendrina are likely to include coal trucks moving through town and the town's Central Business District (CBD) with its typical noise sources which include vehicle activity. The residential areas of town will typically have noise sources such as birdsong, domestic animals such as dogs barking and intermittent vehicle activity. The project site noise levels during the day are likely to be predominantly agricultural such as farm animals, birdsongs and vehicles, while at night they are likely to be farm animals.

The results from the noise meter recordings for all the sampled points as well as the rating limits according to the SANS 10103:2008 guidelines are presented in Table 10-40.

Table 10-40: Results of Baseline Noise Measurements

Sample ID	SANS rating limit			Measurement details			
	Type of district	Period	Acceptable rating level dBA	$L_{Areq,T}$ dBA	Maximum/ Minimum dBA	LA90	Date
N1	Rural	Daytime	45	49	82 / 35	41	14/03/2016
		Night time	35	40	66 / 30	35	14/03/2016
N2	Rural	Daytime	45	44	76 / 21	27	15/03/2016
		Night time	35	33	68 / 18	22	15/03/2016
N3	Rural	Daytime	45	46	91 / 26	35	16/03/2016
		Night time	35	42	71 / 25	30	16/03/2016
N4	Rural	Daytime	45	50	88 / 26	36	17/03/2016
		Night time	35	50	82 / 21	25	17/03/2016
	Indicates $L_{Aeq,T}$ levels above either the daytime rating limit or the night time rating limit						

10.1.13.1 Daytime Results

Based on the daytime results from the noise measurements it is noted that the LAeq levels predominantly measured above the SANS guideline for the maximum allowable outdoor daytime rating level for ambient noise in rural districts (45 dBA), with the background noise levels (LA90) measuring below the daytime rating level guideline. The average daytime LAeq levels measured 47 dBA, while the average LA90 levels measured 35 dBA. The main noise sources at the monitoring locations were from vehicles and farm animals specifically poultry and cows, which were intermittent in nature.

10.1.13.2 Night Time Results

Based on the night time results from the noise measurements it is noted that the LAeq levels also predominantly measured above the SANS guideline for the maximum allowable outdoor night time rating level for ambient noise in rural districts (35 dBA), with the background noise levels (LA90) measuring below the night time rating level guideline. The average night time LAeq levels measured 41 dBA while the average LA90 levels measured 28 dBA.

The farm animal sounds have a significant impact during the night with specific reference from the roosters crowing in the early hours of the morning between 03:00 and 05:00 which constitutes as night time according to the SANS guidelines.

10.1.14 Traffic

A Traffic Assessment (Appendix 15) was undertaken by Aurecon South Africa (Pty) Ltd in support of the EIA to determine the traffic characteristics of the area and the impact associated with the Hendrina Underground Coal Mine.

A road network exists around the project area which has been discussed below.

10.1.14.1 Existing Road Network

The individual project sites are currently accessible via Davel Road which branches off the N11 and connects the site to major regional and national routes. The roads likely to be affected considering the possible routes that the traffic generated by the mining activities might travel along, are described in Table 10-41. Refer to Figure 4 of the Traffic Impact Assessment (Appendix 15).

Table 10-41: Description of the Existing Road Network

	**N11** is a Class 1 road past the sites. Generally, the N11 has one lane in each direction but extends at intersections to include separate turning lanes and also extends to two lanes on uphill sections to accommodate slow moving heavy vehicles, thus allowing faster moving vehicles to overtake. The N11 runs in a north south direction from its intersection with the R38 in the north in Hendrina. South of the site the N11 intersects with the R542 towards Breyten. The speed limit on this road, in the vicinity of the project site, is 120 kilometres per hour (km/h). The pavement condition of the N11 is very good.
	**Davel Road** is a gravel road which links Hendrina to a small settlement south east of the three sites.

R542 is a Class 2 surfaced regional road with one lane in each direction. It has a speed limit of 100 km/h. It is a regional road to the town of Breyten and the surrounding settlements.

R38 Class 2 regional dual carriageway with one lane in each direction and on-street parking on either side along its length in Hendrina CBD. The R38 provides connections to Kendal and Kusile power stations.

10.1.14.2 Existing Traffic Volumes

A site visit was carried out on 15 May 2016 to assess road geometric layout, intersection layout, available public and non-motorised transport modes, traffic safety aspects, road condition, traffic flow and land use.

Vehicles were observed along N11, R542 and R38 during the site visit with the presence of a large amount of heavy vehicle traffic passing through the town of Hendrina. It should be noted that the site visit was conducted during off peak hours.

10.1.14.2.1 *Traffic Survey*

Classified morning and afternoon peak hour traffic counts were undertaken on Thursday, the 23 June 2016, between 06h00 – 09h00 and 15h00 to 18h00 at the following intersections:

- N11 and R38 (Hendrina Town);

- N11 link count, (close to the proposed Mooivley East mine access);
- N11 and Davel Road; and
- N11 and R542.

Refer to Figure 7 and Figure 8 of the Traffic Impact Assessment report which shows the 2016 weekday AM and PM peak volume distribution, respectively.

The existing traffic volumes indicate the following:

- N11 in Hendrina CBD: This road carries volumes of approximately 160 vehicles per hour (veh/hr) northbound and 240 veh/hr southbound during the AM peak. The PM peak has slightly higher traffic volumes, with approximately 260 veh/hr northbound and 320 veh/hr southbound;
- R38: This road carries traffic volumes of approximately 85 veh/hr eastbound and 110 veh/hr westbound during the AM peak. The PM peak has higher traffic volumes with approximately 175 veh/hr eastbound and 275 veh/hr westbound.
- Davel Road: this road carries very low traffic volumes of not more than 5 veh/hr in both directions during the AM peak. The PM peak experiences slightly higher traffic volumes of less than 15veh/hr in each direction;
- R542: the road carries traffic volumes of approximately 20 veh/hr per direction during the AM peak. The PM peak experiences slightly higher traffic volumes with approximately 30 veh/hr eastbound and 20 veh/hr westbound; and
- N11 from Ermelo: this road carries traffic volumes of approximately 110 veh/hr northbound and 160 veh/hr southbound during the AM peak. The PM peak has higher traffic volumes with approximately 204 veh/hr northbound and 213 veh/hr southbound.

Considering the national and provincial road traffic volume design standards, these levels of traffic are fairly moderate to low.

10.1.14.3 Existing Road Conditions

The pavement condition of the N11 is in a good condition, as it is a national road maintained by SANRAL, particularly along the section that will be used by traffic generated by the Hendrina Underground Coal Mine when travelling to and from Hendrina and Ermelo.

10.1.14.4 Transportation

Transportation can be divided into two categories namely Public Transportation and Non-motorised transportation as discussed below.

10.1.14.4.1 *Public Transportation*

No modes of public transport were observed along the N11 in the vicinity of the site during the site visit. No public transport lay-bys or stopping facilities were observed along the N11 or R542, or in the vicinity of the sites. Minibus taxis were the only mode of public transport observed within Hendrina CBD. However, the traffic count survey indicates that there are taxi services along N11.

10.1.14.4.2 *Non-Motorised Transportation*

Very few pedestrians were observed walking in the vicinity of the site. Although there are no paved sidewalks, pedestrians were seen walking on wide cleared verges on N11.

10.1.14.5 Road Safety

Based on observations, road safety conditions along N11, R38 and R542 are generally acceptable. Sight distances at intersections and around road bends are within acceptable standards. Vehicles were observed driving within the displayed speed limits ranging between 80 km/h and 120 km/h along N11. The observed traffic volumes did not appear to cause an abnormal safety risk to pedestrians.

10.1.14.6 Water Courses and Bridge/Culvert Structures

In the immediate vicinity of the sites, the Klein Olifants River crosses the N11 and Davel Road, with bridges at these locations. It is important to note that the bridge on Davel Road can only accommodate one vehicle at a time. Table 10-42 below shows the bridge along Davel Road and the road signage indicating the bridge restriction.

Table 10-42: Bridge along Davel Road and the Road Signage

10.2 Description of the Current Land Uses

The land uses found on the project site have been discussed below.

10.2.1.1 Commercial Agriculture

Plan 15 in Appendix 3 below shows the farms comprising the primary study area, as well as the land-use activities experienced on each property.

Agricultural activities within the primary study area comprise of dry-land commercial maize and soya farming operations (Figure 10-25). These farms are privately owned and generally produce for the local market within the Province. Each farming operation is dependent on extensive support infrastructure and equipment, which includes warehouses, workshops, farm worker accommodation, machinery, etc. Several farmers have invested substantially in precision farming methods and equipment to optimise land capability of their property.

Commercial farming is practiced on all properties directly affected by the proposed Project's infrastructure. However, the only section of irrigated farming land which will coincide with the infrastructure footprint is located on Mooivley 219 IS Ptn 5.

Figure 10-25: Commercial Maize Farming

10.2.1.2 Grazing of Cattle, Sheep and Game

Various types of grazing uses were identified during the field investigation. Several landowners are involved in commercial livestock farming and use their properties to graze cattle and/or sheep on areas specifically designated for grazing, or on harvested agricultural fields (Figure 10-26). Commercial livestock farmers have established herds of cattle and/or flocks of sheep, of which they periodically sell off the young at local auctions and abattoirs or to feedlots; while other livestock farmers purchase animals annually and raise them to sell. One indirectly affected landowner also owns exotic game, which are grazed in designated camps directly adjacent to the mining right area on the farm Vaalbank 199 IS Ptn 3.

Figure 10-26: Cattle Grazing within Proposed Mining Right Area

10.2.1.3 Residential land use

Land within the primary study area is also used for residential purposes by numerous households. These households can be divided into three broad categories: households of property owners, households with formally leased residences on properties and households of domestic/ farm workers or non-landowning farm dwellers/ occupants (Figure 10-27).

It should be reiterated that the Chief Inspector of Mines will not allow mining beneath any residential areas without first being satisfied that sufficient support will remain underground to support the surface of the land and that the structures will be adequately protected from possible ground subsidence. In addition Section 48 of the MPRDA also prohibits the granting of a mining right on land comprising residential areas. Consequently occupants might have to be relocated, depending on the exact location of the infrastructure, areas to be undermined and the likelihood of surface subsidence.

Figure 10-27: Homesteads Comprising the Mooivley Community (Mooivley 219 Ptn RE)

10.2.1.4 Infrastructure

Infrastructure within the primary study area includes formal and informal residential dwellings, buildings used for business purposes (e.g. commercial farming infrastructure), privately owned service infrastructure (e.g. boreholes, wind pumps and dams), public infrastructure (e.g. Davel Road, gravel roads, community standpipes, and transmission lines), grave sites (e.g. burial ground located within the Mooivley Community and communal infrastructure). Roads within the Project site include both tarred and gravel roads; the majority of these roads are deteriorated due to lack of maintenance and become unusable after heavy rains. These roads are used on a daily basis to commute to urban centres such as Hendrina, Middelburg and Breyten.

10.3 Description of Specific Environmental Features and Infrastructure on the Site

The infrastructure currently on site has been discussed in Section 10.2.

10.3.1 Rivers and Wetlands

The specific river and wetland characteristics of the site has been divided into three aspects namely, wetlands, aquatic ecology and river systems which have been discussed below.

10.3.1.1 Wetlands

According to the guidelines from the Mpumalanga Biodiversity Sector Plan (MSBP), Critical Biodiversity Areas (CBAs) must be kept in a natural state with no further loss of habitat, where only low-impact, biodiversity-sensitive land-uses are appropriate.

According to the Mining and Biodiversity Guideline (SANBI, 2013), parts of the Klein Olifants River and some natural grassland that remains in the project site are considered to be highly sensitive to mining activities. The majority of the project area is regarded as being of moderate risk from mining projects, which is again mostly associated with the wetland bodies of the landscape and any remaining natural habitats. Where intensive agriculture is present, no risk level has been mapped for these areas.

Buffer areas are important to note when discussing sensitivities of ecosystems, where a buffer is the area surrounding the wetland within which land-use activities may directly affect the ecological character of the wetland itself, and the objective for land-use within the buffer zone should be one of sustainable use through ecosystem management, consistent with the maintenance of the ecological character of the wetland (Ramsar Convention Secretariat, 2010). The proposed project is largely within 500 m of the wetland edges, which can be seen as their legislated “buffer” zone as the mining activities will have to be granted a WUL in terms of Section 21 of the NWA, unless it qualifies for a General Authorisation as prescribed in GN R509 of 26 August 2016.

Similarly, the proposed project is within 100 m of the wetlands, which is another legislated buffer where material and activities within 100 m of a wetland and the potential to impact on a water resource should be licenced according to GN704. It must be noted that the DWS have recently recommended that a buffer of 200 m be placed around all wetlands that are linked to the Olifants River.

The wetland assessment allowed these sensitivities to be ground-truthed and the project wetlands were mapped according to their ecological sensitivities to the proposed project (Plan 16 in Appendix 3

10.3.1.2 Aquatic Ecology

Sensitive areas in respect to aquatic ecology include any areas associated with riverine or wetland habitats. Due to the rich, concentrated vertebrate and invertebrate diversity within the assessed river systems, further modification to habitat associated with the aquatic ecosystem could result in the decline PES. Considering this, a buffer zone of 100 m from rivers and wetlands (as delineated in the wetland assessment) are considered sensitive no go areas. These areas are illustrated in the Plan 16 in Appendix 3.

10.3.1.3 Rivers

The Klein Olifants River is the only major perennial river which drains the B12A quaternary catchment. Several non-perennial streams exist within the quaternary and those flow to the

Klein Olifants. The quaternary is also characterised by several dams and pans that form part of these non-perennial streams.

The Klein Olifants River traverses the Hendrina South mining right area in the middle; other four streams which are tributaries to the Klein Olifants also exist in this mining right area with two of them on the eastern side of the Klein Olifants and the other two on the western side. Several farm dams exist within this MRA.

The Mooivley West consists of three streams, and few dams and pans. The identified streams within the Mooivley West mining right area drains in a north-easterly direction and feeds into the Klein Olifants River.

The Mooivley East mining right area is also traversed by the Klein Olifants River with two unnamed streams on both sides of the Klein Olifants River. The unnamed stream on the western side confluence with the Klein Olifants River at the northern boundary of the Mooivley East, whilst the other confluence at a downstream point which is outside of the mining right area. Areas within the 1:100 year floodline must be deemed to be sensitive no-go areas and be protected by a buffer zone. These areas are illustrated in the Plan 17 in Appendix 3.

10.3.2 Terrestrial Landscape and Habitat

The ecological sensitivity map for the site is represented in Plan 18 in Appendix 3, overlayed with the infrastructure plan. The Crinum – Arundinella Riparian and pan vegetation units were allocated a very high sensitivity since wetlands are regarded as an important habitats that should be conserved due to the presence of plant SSC and habitat diversity. Further to this, a portion of Eragrostis-dominated Grassland in Mooivley West was assigned high ecological sensitivity due to the presence of plant SSC and high species diversity. High sensitivity was assigned to the Gnidia – Diospyros Rocky Grassland and moderate sensitivity was assigned to the remaining natural areas. Areas that were cultivated, disturbed or built up were allocated a low ecological sensitivity.

10.3.3 Cultural Heritage

Identified heritage resources attest to the pre-dominantly agrarian landscape described. No heritage resources were identified in the proposed development footprint of the project site. However, as noted in Section10.1.10 above, heritage resources commonly occur at sub-surface levels with no or limited trace evidence on the surface, thereby increasing potential of unidentified heritage resources to be exposed through the life of the Project.

10.4 Environmental and Current Land Use Map

The environmental and current land use features have been illustrated in Plan 19 in Appendix 3.

11 Item 3(g)(v): Impacts and Risks Identified including the Nature, Significance, Consequence, Extent, Duration and Probability

This section aims to rate the significance of the identified potential impacts pre-mitigation and post-mitigation. The potential impacts identified in this section are a result of both the environment in which the project activity takes place, as well as the activity itself. The potential impacts are discussed per environmental feature/ aspect and according to each phase of the project i.e. the Construction, Operational and Decommissioning/ Post Closure Phases. The proposed project activities that have been assessed hereunder are summarised below in Table 11-1. Lists of unplanned events that may happen at the project site have been identified and the proposed mitigation plan is set out in Part B: Table 11-1.

It must be noted that the blasting impacts assessed in each specialist study has been considered based on the Blasting Impact Assessment undertaken prior to there being a change in blast methodology. Therefore the blast impacts for each specialist study are based on a more conservative approach and may not reflect the true impact which has been considered negligible by the blasting and vibration specialist due to the change in methodology which is discussed in further detail in Section 11.13.

Table 11-1: Description of Activities to be assessed

Project Phase	Project Activity	Project Structures
Construction	Site Clearance	Topsoil Stockpiles
	Blasting and excavation	Shafts
	Construction of Surface Infrastructure	Crushing and screening plant Mine Offices Change House Workshop Overburden and Product Stockpiles Site Fencing Access and Service Roads (with weighbridge) Overland Conveyor Sewage Treatment Plant Three Pollution Control Dam Water Treatment Plant Diesel Storage Tanks Ventilation and incline Shaft per mining right area
	Power Generation	Diesel Generator

Project Phase	Project Activity	Project Structures
Operations	Hauling/Conveying of Coal	Overland Conveyor Belt Haul and Access Roads
	Plant and Equipment Operations	Crushing and screening plant Workshop and Diesel Storage Tanks
	Power Generation	Diesel Generator
Mine Closure and Rehabilitation	Removal of infrastructure and surface rehabilitation	Crushing and screening plant Mine Offices Change House Workshop Overburden and Product Stockpiles Site Fencing Access and Service Roads (with weighbridge) Overland Conveyor Sewage Treatment Plant Three Pollution Control Dam Water Treatment Plant Diesel Storage Tanks Ventilation and incline Shaft per mining right area

11.1 Soils Impact Assessment

A soils impact assessment was compiled for the proposed construction and operation of the Hendrina Underground Coal Mine. The relative differences between the soils classified (structure, texture and hydromorphy), their position in the landscape and their pedogenisis (soil forming systems and characteristics, in-situ versus transported materials etc.) will have an influence on the impact significance, which in turn will have an influence on the mitigation measures that will be required to manage the impacts to a reasonable and acceptable level.

The impacts have been assessed according to three phases namely, construction phase, operational phase and decommissioning and closure. The impact assessment is detailed below.

The following construction activities will have an impact on soils:

- Site clearance (boxcut, roads and infrastructure placement);
- Development of haul/access roads;
- Construction of pipelines, conveyer routes;

The following soil forms will be impacted on by the construction activities on site:

- Moderately deep sandy loams (Hutton, Clovelly and deeper Glenrosa soils);
- Shallow sandy loam (Glenrosa, Mispah and Dresden);
- Deep wet based sandy loam (Avalon, Pinedene and Bainsvlei); and
- Shallow wet based clay loam (Glencoe and Bloemdal).

Friable soils will be susceptible to erosion and compaction once disturbed and will be difficult to manage, or lost if left unprotected.

11.1.1 Construction Phase

During the construction phase loss of utilisable soil resources due to erosion, compaction and possible contamination may occur. The extent of impact will be confined to a relatively small spatial area (shaft area, crushing and screening plant and support infrastructure). The loss of the soil resource to the overall environment due to stripping of footprint areas to mining infrastructure, construction of the water management facilities, crushing and screening plants, the conveyancing system and support infrastructure (Workshops, Offices etc.) will definitely occur and be of significance for the life of mine and restricted to the immediate mining area.

Disturbance of the surface restrictive layers associated with the relatively more sensitive soils (Ferricrete and soft plinthic layers) will take place for all founding areas. With specific reference to soils associated with the relict land forms that occupy the upper portions of the transition zone/ moist grasslands. These will be affected in some cases by the surface infrastructure and mine entrance, while the deeper foundations required for the heavier structures (Plant, PCD etc.) will require that the underlying restrictive layers (inhibiting barrier layer) is broken through.

The majority of the infrastructure, and all of the proposed structures associated with the mining development, are outside of the alluvial/ riverine environment and are for the most part associated with the moderately shallow to shallow soils of the sedimentary host rock, with only small areas of transitional zone soil forms affected.

The variation in soil sensitivity is marked, with the dry friable sandy loams and silty loams being far easier to manage than the hydromorphic soils that comprise the transition zone upslope of the wetlands. The impact of removing the topsoil's and upper portion of the subsoil horizon (Utilisable soil) will destroy any surface capping that might be in place, will remove all vegetative cover, and will expose the subsoil's to wind and water affects and induce possible erosion and compaction if not well managed and protected. The sensitive and highly sensitive soils (friable soils) will be susceptible to erosion and compaction once disturbed, and will be difficult to manage, or lost if left unprotected.

The impacts on soil during the construction phase are rated in the Table 11-2.

Table 11-2: Loss of Utilisable Soil Resource due to – Erosion, Compaction and possible Contamination during construction

Dimension	Rating	Motivation	Significance
Impact Description: Loss of utilisable soil as a resource through sterilisation, compaction, erosion, and salinisation/contamination			
Prior to mitigation/ management			
Duration	Beyond Project Life (6)	Utilisable soil will be stripped and stockpiled. If this is done without following the mitigation measures the impact will have a long term affect.	Moderate (negative) – 91
Extent	Limited (2)	Loss of soil will only occur within and immediately around the Project site.	
Intensity	Very Serious (5)	Loss of soil may result in loss of land capability and land use. Soil regeneration takes a very long time.	
Probability	Definite (7)	By excavating the soil it will certainly impact on the soil.	
Nature	Negative		
Mitigation/ Management actions			
▪ Effective soil stripping during the dryer and less windy months (autumn) when the soils are less susceptible to erosion and compaction. This will assist the stockpiling and vegetative cover to propagate before the following wet season; ▪ Ensure minimising of the height (< 3 m) of all stockpiles wherever possible will help to			

Dimension	Rating	Motivation	Significance
reduce wind erosion and the loss of materials; ▪ Soil replacement to all areas (temporary) that are not required for the operational phase, and the preparation of a seed bed to facilitate the re-vegetation program for these areas will limit potential erodibility during the operational phase and into the rehabilitation and closure phases; ▪ Soil amelioration (cultivation) to enhance the growing capability of the topsoil stockpiled soils so that they can be used for rehabilitation at closure and to maintain the soils viability during storage; ▪ Backfilling of any voids and deep excavations with rock and soft overburden, and the creation through compaction of a barrier layer at the soil backfill interface using the relatively more impermeable clay rich subsoil and soft overburden. This is recommended as the ferricrete layer and any hard impermeable sedimentary layers will have been destroyed and will not be available to re-create this barrier; ▪ Replacement of the growing medium (Utilisable soil) in the correct order and as close as possible to its original position in the topography will help to maintain the soil pedogenisis and utilisation potential relative to the ecology and biological constraints; and ▪ Soil replacement and the preparation of a seed bed to facilitate the re-vegetation program and to limit potential erodibility during the rehabilitation process.			
Post- mitigation			
Duration	Beyond Project Life (6)	Loss of utilisable soil makes land less productive. Effects will occur long after the project life.	Negligible (negative) – 30
Extent	Very limited (1)	Loss of topsoil will only occur within and immediately around the Project infrastructure area.	
Intensity	Moderate (3)	Loss of topsoil may result in loss of land capability and land use.	
Probability	Unlikely (3)	If the mitigation is followed then it is unlikely that the impacts will occur.	

11.1.2 Operational Phase

During the operational phase, all of the construction activities for the infrastructure and major by-product storage structures will have been completed, the crushing and sizing of materials and the deposition of by-product will have begun along with the continuous opening up of additional mining areas (underground 30 m to 120 m deep).

The loss of the soil utilisation due to surface collapse, ponding and/or the covering of materials for extended periods of time will lead to both the loss of the utilisable resource as well as salinisation, compaction and sterilisation. If this occurs it will result in a major negative impact that will last for the duration of the mine activities. The consequence is major with an overall significance of minor. The movement of vehicles, the conveyancing of the raw product, the use of access roads and the on-going additions of by-product to the stockpiles and storage facilities will all impact on the size of area being affected, and ultimately on the area of soil affected. Un-managed soil stockpiles and soil that is left uncovered/not vegetated will be lost to water and wind erosion, and will be prone to compaction. All of these soils will be impacted upon to differing degrees, while the stockpiled materials will be available for future use during the rehabilitation phase and at closure.

The significance of the impact during the operational phase will differ both in intensity and duration, with the soils associated with the shaft complex, infrastructure and stormwater management remaining in a stockpile/stored state for the full life of the mining and processing operations. It is inevitable that the soils utilisation potential will be lost during the operational phase, and possibly for ever if they are not well managed and a mitigation plan is not implemented.

The impacts on soil during the operational phase are rated in the Table 11-3.

Table 11-3: Operational Phase - Loss of Soil Usability/Utilisation Potential

Dimension	Rating	Motivation	Significance
Impact Description: The operation and maintenance of the utilisable soil and stockpiles will require the minimisation of compaction and erosion and the on-going management of contamination.			
Prior to mitigation/ management			
Duration	Permanent (7)	When the soil has eroded the impact will be permanent and is potentially irreversible even with management.	Minor (negative) – 70
Extent	Limited (2)	Compaction and erosion will occur on a limited scale and in the unmitigated situation the erosion will extend beyond the direct infrastructure.	
Intensity	Very Serious (5)	Loss of soil may result in loss of land capability and land use. Soil regeneration takes a very long time.	
Probability	Probable (4)	By excavating and clearing, the impact on the soil could occur, 50% probability	
Nature	Negative		
Mitigation/ Management actions			
▪ Maintenance on the soil stockpiles must be done monthly to check for compaction and erosion. Where prevalent, corrective measures must be taken so as to minimise the loss of utilisable soil as a resource and minimise the effects of sedimentation on the receiving water bodies. These would include keeping a soil balance, inspection for erosion and loss of soil, fertility of stockpiles and vegetation establishment on these stockpiles; ▪ Minimisation of disturbed areas; ▪ Replacement of the soils should occur regularly so as to minimise the area of disturbance (concurrent rehabilitation where possible);			

<table>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Adequate protection from erosion (wind and water) must be undertaken such as corrective actions (erosion berms) to minimise erosion;
Effective vegetative and soil cover and protection from wind (dust) and dirty water contamination;
Servicing of all vehicles on a regular basis and in well-constructed and bunded areas, well-constructed and maintained oil traps and dirty water collection systems;
Cleaning of all roadways and haulage/conveyancing ways, drains and stormwater control facilities;
Prevent any spills from occurring by having clean up kits in place, vehicles should be serviced off site or in a concrete area;
Soil replacement and the preparation of a seed bed to facilitate and accelerate the re-vegetation program and to limit potential erosion; and
Soil amelioration to enhance the growth capability of the soils on the topsoil stockpiles and sustain the soils ability to retain oxygen and nutrients, thus sustaining vegetative material during the storage stage.</td></tr>
<tr><td colspan="4">Post- mitigation</td></tr>
<tr><td>Duration</td><td>Short term (2)</td><td>If the mitigation measures are implemented the impact will be for less than a year.</td><td rowspan="5">Negligible (negative) – 12</td></tr>
<tr><td>Extent</td><td>Very limited (1)</td><td>Compaction and erosion will occur on a very limited scale.</td></tr>
<tr><td>Intensity</td><td>Moderate (3)</td><td>The intensity of the impact will be reduced if mitigation is implemented.</td></tr>
<tr><td>Probability</td><td>Rare / improbable (2)</td><td>If mitigation is followed the impact will rarely occur</td></tr>
<tr><td>Nature</td><td>Negative</td><td></td></tr>
</table>

11.1.3 Decommissioning and Closure

The impact will remain the net loss of the soil resource if no intervention or mitigating strategy is implemented. The impact will be of a negative intensity, local extent, and permanent over the area of disturbance, with a moderate consequence and resultant minor significance rating. Un-managed closure will result in a long term depletion of soil utilisation potential.

The impacts of the decommissioning and closure phase are rated in the Table 11-4.

Table 11-4: Decommissioning Phase - Net loss of soil potential due to change in materials (Physical and Chemical) and loss of nutrient base.

Dimension	Rating	Motivation	Significance
Impact Description: Decommissioning and rehabilitation phase of the project could cause compaction and erosion if rehabilitation is not done correctly. This could be as a result of poor vegetation establishment which would result in exposed surfaces and increase the risk of erosion. Heavy machinery driving continuously over rehabilitated areas may result in compaction, which would impact on plant rooting depth which then would have a further impact to vegetation establishment.			
Prior to mitigation/ management			
Duration	Permanent (7)	When the soil has eroded the impact will be permanent and is potentially irreversible even with management.	Minor (negative) – 42
Extent	Limited (2)	Compaction and erosion will occur on a limited scale and in the unmitigated situation the erosion will extend beyond the direct infrastructure.	
Intensity	Very Serious (5)	Loss of topsoil may result in loss of land capability and land use. Soil regeneration takes a very long time.	
Probability	Unlikely (3)	Impact on soils is unlikely to occur	
Nature	Negative		
Mitigation/ Management actions			
▪ Only designated access routes are to be used to reduce any unnecessary compaction; ▪ Ensure proper stormwater management designs are in place; ▪ Correction actions (erosion berms) must be taken to minimise any further erosion from taking place; ▪ Soils must be replaced according to the soil types; ▪ Deep rip compacted areas to allow for natural vegetation regrowth; ▪ A bowl scraper is to be avoided as this piece of machinery compacts soil; ▪ The positive impacts of rehabilitating an area are the reduction in the area previously disturbed, the amelioration of the affected soils and oxygenation of the growing medium. ▪ The stabilising of slopes and revegetation of areas decommissioned with a reduction in areas previously subjected to wind or water erosion; and ▪ Rehabilitate according to the approved rehabilitation plan (Appendix 17).			
Post- mitigation			
Duration	Short term (2)	If the mitigation measures are implemented the impact will be for less than a year.	Negligible (negative) – 12

Dimension	Rating	Motivation	Significance
Extent	Very limited (1)	Compaction and erosion will occur on a very limited scale.	
Intensity	Moderate (3)	The intensity of the impact will be reduced if mitigation is implemented.	
Probability	Rare (2)	If mitigation is followed the impact will rarely occur	

11.2 Surface Water Impact Assessment

An impact assessment for surface water has been undertaken and discussed in the section below.

11.2.1 Construction Phase

The assessed activities related to the construction phase include site clearance by removing vegetation to allow space for construction of surface infrastructure such as crushing and screening plant, mine offices, pollution control dams, access roads, etc. These activities have the potential to impact on the surface water resources.

Clearing and stripping of vegetation leaves the soils prone to erosion during rainfall events, and as a result runoff from these areas which will be high in suspended solids and will cause an increase in turbidity in the nearby surface water resource/ stream.

Dust generated during the construction activities and caused by increased vehicle movements and excavation can also be deposited into the local water course, thereby contributing to the accumulation of suspended solids in the water course, leading to the siltation of the water.

Dirty or contaminated runoff emanating from fuels storage areas, other liquid waste and general waste areas have the potential to contaminate the nearby streams.

The construction activity will generate waste which includes general wastes (paper, glass, plastic and cans), biological sewage waste and other hazardous waste that may be generated during construction. The handling and disposal of these waste poses a risk to the surface water resources if not managed appropriately.

These impacts will lead to the deterioration of water quality and impacting on the aquatic life and the downstream water users. However, these impacts can greatly be prevented and/or reduced if the recommended measures in the following section are implemented.

Mine activities during the construction phase that could result in surface water impacts are discussed in Table 11-5.

Table 11-5: Surface Water - Interactions and Impacts of Activity during Construction Phase

Interaction	Impact
Exposure of soils due to loss of vegetation (site clearance and construction of infrastructure such as PCDs, Stockpiles, berms, substations and office and workshops areas).	Siltation of Klein Olifants River and its non-perennial tributaries leading to deteriorated water quality
	Deterioration of water quality due to dirty water reporting into Klein Olifants River and its non-perennial tributaries

The significance rating of the potential impacts before and after mitigation is provided in Table 11-6 and Table 11-7.

Table 11-6: Siltation of Surface Water Resources during Construction Phase

Dimension	Rating	Motivation	Significance
Impact: Siltation of surface water resources leading to deteriorated water quality			
Pre-Mitigation			
Duration	Medium term (3)	With no measures in place, siltation may occur for as long as the construction takes place The tributaries of the Klein Olifants River will be impacted by Infrastructure at Hendrina South and Mooivley West. The pan at Mooivley East will be impacted as well as the Klein Olifants River	Minor - negative (70)
Extent	Local (3)	The impacts will be localized to the nearby water resources from where the silt is being generated and the immediate downstream	
Intensity	Serious - negative (-4)	This will have moderate impacts resulting in a poor water quality for downstream users relying on Klein Olifants River water	
Probability	Certain (7)	Without appropriate mitigation there will definitely be significant erosion	
Mitigation/ Management Actions			
▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised so as to minimise construction of new access roads in these areas; ▪ If possible, construction activities must be prioritised to the dry months of the year (May-			

Dimension	Rating	Motivation	Significance
October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing; ▪ The proposed topsoil and overburden stockpiles must be covered or vegetated as soon as possible to prevent sediment erosion. Location of measures as per SWMP ; ▪ Contaminated stormwater runoff from this area will be routed through trenches to silt trap sumps at the bottom of the stockpiles; ▪ Contaminated storm water runoff from the sump will be routed through channels to the PCDs for reuse; ▪ Water quality monitoring should be implemented as an management option; Haul roads must be well compacted to avoid erosion of the soil into the streams; ▪ Dust suppression on the haul roads and cleared areas must be regularly undertaken; and ▪ All dirty water channels must be constructed and placed within the dirty water infrastructure areas, such that all dirty water runoff emanating from these areas are captured and contained to a dirty water containment facility. The proposed channels should be lined and sized to cater for the 1:50 year storm event.			
Post-Mitigation			
Duration	Medium term (3)	The tributaries of the Klein Olifants River will be impacted by Infrastructure at Hendrina South and Mooivley West. The pan at Mooivley East will be impacted as well as the Klein Olifants River	Minor - negative (36)
Extent	Local (3)	Only immediate sub catchment, and the impacts can be collected in management measures	
Intensity	Moderate - negative (-3)	Mitigation will reduce the impacts	
Probability	Probable (4)	Necessary mitigations will reduce the erosion probability significantly	

Table 11-7: Deterioration of water quality during Construction Phase

Dimension	Rating	Motivation	Significance
Impact: Deterioration of water quality due to dirty water reporting into natural water resources			
Pre-Mitigation			
Duration	Medium term (3)	With no measures in place, this impact may occur for as long as the construction takes place.	Minor - negative (55)
Extent	Local (3)	The impacts will be localized to the nearby the Klein Olifants tributaries and the pan at Mooivley East from where the	

Dimension	Rating	Motivation	Significance
		contaminated runoff enters the stream and the immediate downstream	
Intensity	Moderately high - negative (-5)	This may have serious impacts on the downstream water users due to elevated hydrocarbon, ammonium and chloride levels from waste in the nearby tributaries of the Klein Olifants and the pan at Mooivley East.	
Probability	Certain (5)	Without appropriate mitigation, the probability of the impact occurring is <65%	
Mitigation/ Management Actions			
- All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; - Vehicles should regularly be maintained as per any good practice maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; - Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to dispose of the waste properly; and - The ECO should be appointed to ensure implementation of the recommended mitigation/ management measures during construction			
Post-Mitigation			
Duration	Medium term (3)	With no measures in place, this impact may occur for as long as the construction takes place.	Negligible - negative (33)
Extent	Local (3)	The impacts will be localized to the nearby the Klein Olifants tributaries and the pan at Mooivley East from where the contaminated runoff enters the stream and the immediate downstream	
Intensity	Moderate - negative (-5)	This may have serious impacts on the downstream water users due to elevated hydrocarbon, ammonium and chloride levels from waste in the nearby tributaries of the Klein Olifants and the pan at Mooivley East.	
Probability	Probable (3)	Necessary mitigations will reduce the probability of impact occurrence significantly (<25%)	

11.2.2 Operational Phase

Activities that may have surface water impacts during the operational phase include stockpiling, hauling/ conveying of coal, plant and equipment operations, water use and storage, and waste generation and storage.

Dirty water runoff from the contaminated surfaces and the infrastructure within the mine (ROM stockpiles, crushing plant, conveyors and product stockpile) has the potential to contaminate and silt up the natural water resources or streams, should it not be contained within the mine. This impact will therefore deteriorate the water quality and hence impact the downstream water users and the aquatic life.

Containment of dirty water runoff from the within the mining area will reduce the amount of runoff reporting to the Klein Olifants River and other unnamed streams. A decrease in the catchment yield may have an impact on the downstream water users as they may not have sufficient water for their needs, while also decreasing the flow required for the ecological reserve.

However, the total provided infrastructure footprint area amounts to approximately 1.5 km^2 and makes up less than 1% of total quaternary catchment area of 405 km^2. The percentage decrease in MAR as a result of the proposed development of an underground coal mine and associated infrastructure will amount to 0.04% for B12A quaternary catchment. This percentage loss in MAR is negligible and therefore considered to be insignificant; this will not be rated further as an impact.

As stated in the aquatics assessment report, it should be noted that at the time of the impact ratings, no geotechnical data or any safety factors of the underground workings were available. The assumption was made that detailed geotechnical investigations would be conducted and that the required safety factor will be sufficient to prevent any subsidence and associated surface cracks of the undermined areas to prevent any serious negative impacts with regards to subsidence within the undermined surface water resources.

Mine activities during the operational phase that could result in surface water impacts have been discussed in Table 11-8.

Table 11-8: Surface water interactions and Impacts of Activity during Operational Phase

Interaction	Impact
Runoff from the dirty water areas (waste rock, crushing plant, conveyors and product stockpile)	Runoff reporting into the Klein Olifants River and other unnamed streams resulting in water contamination or the deterioration of the water quality
Development and operation of surface infrastructure (pollution control dams, stockpiles, workshops & offices, crushing and screening plant)	Reduction of Catchment Yield as dirty water runoff within the mine will be contained in the PCD

The significance rating of the potential impacts before and after mitigation is provided in Table 11-9.

Table 11-9: Water Contamination Leading to Deterioration of Water Quality during Operation Phase

Dimension	Rating	Motivation	Significance
Impact: Water Contamination leading to deterioration of water quality			
Pre-Mitigation			
Duration	Project Life (5)	Due to the nature of the mining activities the contamination of water resources may occur over the project life if mitigation measures are not in place.	Moderate - negative (90)
Extent	Region (5)	The impacts may affect the Klein Olifants River	
Intensity	Serious - negative (-5)	This may have serious impacts on the water quality that will be made available to the downstream water users (agricultural- livestock watering and crop irrigation)	
Probability	Almost Certain (6)	Without appropriate mitigation, there probability of the impact occurring is almost certain <80%	
Mitigation Measures			
▪ All the dirty water emanating from the dirty water areas should be collected via silt traps before entering the PCD for re-use within the mine, to prevent unnecessary discharge into the environment; ▪ The dirty water collection trenches should be cleaned regularly to reduce silt build up and ensure they are able to accommodate and convey the 1:50 year peak flows; ▪ Stockpiling should be monitored so that the side slopes do not encourage erosion of the slopes resulting in silt transported into the trenches from the stockpiles, allowing some silt to settle on the dirty water site rather than in the channels; ▪ In addition to the control of stormwater, water quality monitoring should form part of the system where water in the PCDs is monitored for quality. This ensures that pollution sources are monitored during the mines operational process and in the unlikely event of any spillages the downstream impacts can be estimated. The main constituents to check would be the TSS, EC, Salts and chemical parameters such as (pH, SO_4 and other metals); ▪ Should subsidence occur during operation, it should be rehabilitated as soon as possible to avoid impoundment of surface water; and ▪ Water quality monitoring on the upstream and downstream points of the proposed coal mine must continue as set out in Section 9 part B.			
Post-Mitigation			

Dimension	Rating	Motivation	Significance
Duration	Medium term (5)	Impact may occur at any time over the project life even with control	Negligible - negative (45)
Extent	Region (5)	The impacts may affect the flow in the Klein Olifants and possibly contributes to the Olifants River	
Intensity	Moderate - negative (-5)	This may have serious impacts on the downstream agricultural water users	
Probability	Probable (3)	Necessary mitigations will reduce the probability of impact occurrence significantly (<25%)	

11.2.3 Decommissioning and Closure

Activities during this phase include dismantling and removal of infrastructure and surface rehabilitation. The major impacts to consider in the decommissioning and rehabilitation of the site will be siltation of surface water resources as a result of soil erosion influenced by removal of infrastructures.

Removal of infrastructure will expose the soil surfaces and leave it prone to erosion, resulting in siltation of the natural water resources (Klein Olifants and unnamed streams) when runoff reports to these rivers. This will deteriorate the water quality and hence impact the downstream water users, as well as the aquatic life.

Groundwater model simulated that the mine is likely to decant through the proposed shaft in Mooivley East. The decanting is likely to start 30 years after mine closure, at a rate of 7 m^3/d (Groundwater Report, 2016 (Digby Wells)). This will report into the nearby streams and likely result in acidification of surface water.

Mine activities during the decommissioning and closure phase that could result in surface water impacts have been discussed in Table 11-10.

Table 11-10: Surface Water Interactions and Impacts of Activity during Decommissioning and Closure

Interaction	Impact
Exposure of soils after the removal of infrastructure	Siltation of surface water resources leading to deteriorated water quality on the Klein Olifants River, the pan at Mooivley East will be impacted as well as the Klein Olifants River.
Mine decant	Deterioration of surface water quality on the pan at Mooivley East and under extreme conditions to the Klein Olifants River. The levels of Sulfate, Sodium and TDS could affect the agricultural and domestics uses downstream.

The significance rating of the potential impacts before and after mitigation is provided in Table 11-11and Table 11-12.

Table 11-11: Siltation of Surface Water Resources during the Decommissioning and Closure Phase

<table>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Impact: Siltation Of Surface Water Resources Leading To Deteriorated Water Quality</td></tr>
<tr><td colspan="4">Pre-Mitigation</td></tr>
<tr><td>Duration</td><td>Medium term (3)</td><td>Equal to the duration of 1-5 years during which decommission will occur</td><td rowspan="4">Minor - negative (70)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>Siltation may only affect the tributaries of the Klein Olifants and the pan at Mooivley East within the immediate sub catchments</td></tr>
<tr><td>Intensity</td><td>Serious - negative (-4)</td><td>This may have serious impacts on the downstream agricultural water users in the Klein Olifants Catchment</td></tr>
<tr><td>Probability</td><td>Certain (7)</td><td>Without appropriate mitigation there will definitely be significant erosion</td></tr>
<tr><td colspan="4">Mitigation Measures</td></tr>
<tr><td colspan="4">
Use of accredited contractors for removal or demolition of infrastructures; this will reduce the risk of waste generation and accidental spillages;
The PCDs, constructed dirty water trenches and berms will have to remain until post closure. It should be removed last form the site so that the silt trap and the dirty water can be contained for treatment before discharge until rehabilitation is completed.
Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams;
Water quality monitoring on the upstream and downstream points of the coal mine must be undertaken and suspended solids and turbidity levels accessed
</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Medium term (3)</td><td>With mitigation, the impact may occur at any time during the decommissioning phase although at a reduced frequency.</td><td rowspan="2">Minor - negative (36)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>Siltation may only affect the tributaries of the Klein Olifants and the pan at Mooivley East within the immediate sub catchment only in extreme rainfall more that the 1:50 year storm lasting more than 24 hours (more than the acceptable design specifications).</td></tr>
</table>

Dimension	Rating	Motivation	Significance
Intensity	Moderate - negative (-3)	Mitigation will reduce the impacts	
Probability	Probable (4)	Necessary mitigations will reduce the erosion probability significantly	

Table 11-12: Mine decanting resulting in contamination of surface water bodies

Dimension	Rating	Motivation	Significance
Impact: Mine decanting resulting in contamination of surface water bodies			
Pre-Management/Enhancement Measures			
Duration	Permanent (7)	Once the mine starts to decant from the shaft in Mooivley East to the Pan it is not expected to stop naturally	Moderate (negative) – 105
Extent	Local (3)	Decant is likely to flow to the pan at Mooivley East and under extreme conditions to the Klein Olifants River.	
Intensity	Serious-negative (-5)	Deterioration of surface water quality on the pan at Mooivley East and under extreme conditions to the Klein Olifants River. The levels of Sulfate, Sodium and TDS could seriously affect the agricultural and domestics uses downstream.	
Probability	Certain (7)	Based on analytical and numerical modelling, it is certain that there will be a decant after mine closure	
Mitigation Measures			
▪ Capture decanting water before it flows into the stream, treat it and re-introduce it into the streams. Please refer to the ground water report for detailed decant simulation results and management measures; ▪ The decant should be treated to the acceptable water quality levels (Olifants RWQO; and ▪ Water quality monitoring on the upstream and downstream points of the coal mine must continue as set out in Section 9 of the Surface Impact Assessment (Appendix 5).			
Post- Management/Enhancement Measures			
Duration	Permanent (7)	The decant is expected to continue for the foreseeable future	Negligible (negative) – 30
Extent	Very Limited (1)	With the re-introduction of the treated water into the Klein Olifants River or the Pan, the extent of impact will be limited	

Dimension	Rating	Motivation	Significance
Intensity	Minimal - negative (-1)	Once the decanted water is treated and re-introduced to the streams, the environmental significance is rated as minimal to no loss	
Probability	Unlikely (3)	Decant will be treated to the acceptable water quality levels (Olifants RWQO) making the impact unlikely.	

11.3 Groundwater Impact Assessment

The proposed project has the potential to impact the groundwater environment negatively through the depletion of the groundwater resource and possible release of undesired contamination plumes. The leach test conducted on the sampled rocks during this study indicated sulfate concentrations of less than 10.3 mg/L. However, the groundwater quality at most of the coal mines in the country is characterised by sulfate concentrations in the order of 2 500 mg/L. Similar impacts could also occur at the proposed project site and management plans should be put in place with this assumption.

Potential impacts are assessed in this section considering the construction, operational and closure phases.

11.3.1 Result of the Numerical Model

The proposed mining could potentially impact the groundwater quantity and quality.

11.3.1.1 Cone of Dewatering

Mine dewatering will result in the lowering of the water table in the coal seam aquifer. Considering the limited vertical and horizontal conductivities of the Karoo Aquifers and the fact that the majority of the groundwater users abstract from the top shallow aquifer, dewatering in the coal seam aquifer is not expected to impact the Klein Olifants River or the boreholes in the top shallow aquifer. However, deep boreholes intersecting the coal seam aquifer could potentially be impacted by the lowering of the water table.

After mine closure and decommissioning of the dewatering programme, the water level will start to recover. The cone of dewatering will therefore be at its maximum at the end of operation.

The cone of dewatering at the end of operation in the coal seam aquifer is given in Plan 11 in Appendix 3. In this study, the size of the no-go area is defined by a drawdown of 5 m. If the water table is lowered by less than 5 m, the impact is not considered to be significant and is not shown in the figure. The maximum drawdown in the top weathered aquifer is estimated to be less than 1 m and will not be significant unless subsidence occurs and that the vertical permeability is enhanced. The streams are generally fed by groundwater as a baseflow. The lowering of the groundwater level could therefore potentially lower the amount of water fed by the groundwater.

The no-go area is predominantly within the mine zones. The no-go size is predicted to be largest in Hendrina South due to the relatively higher rock permeability detected from the pump testing.

11.3.1.2 Contamination Plume

Mining is likely to alter the natural geochemistry by exposing the sulfides for oxygenation. This could result in sulfate contamination as observed in the coal mines in the region, where the concentration could reach up to 2 500 mg/L.

Contaminant plumes predominantly migrate as a result of advection (i.e. with the flow of the groundwater). Any contamination plume during the mine operation will predominantly be intercepted at the underground sumps due to the dewatering programme. No or limited contamination is expected to reach the rivers during operation, due to the hydraulic gradient being towards the mining and abstraction areas.

After mine closure, however, the dewatering will cease and the groundwater will recover and start to flow towards the rivers and streams. The contamination plume will be transported with the groundwater flow, but due to the limited hydraulic permeability of the region, the plume is expected to remain in the vicinity of the mine zones.

The numerical model was used to predict the size and shape of the contamination plume 100 years after closure and is illustrated in Plan 10 in Appendix 3.

A relative source-term concentration of 100% has been simulated and the no-go concentration area has been defined by 0.1%. The plume is not expected to reach and contaminate rivers during mine operation or after closure. However, shaft 3 (located in Mooivley East) could potentially decant after closure at 7 m^3/d and could have a negatively effect on the river quality if not properly managed

11.3.2 Construction Phase

The water table within the proposed mine area is shallow, ranging between 0.37 m and 15 m below ground surface. Any site clearing or construction activities that would involve excavation below the water table depth will have a potential impact on the groundwater quantity and quality.

Mine activities during the construction phase that could result in groundwater impacts have been discussed in Table 11-13.

Table 11-13: Groundwater Interactions and impacts during the construction phase

Interaction	Impact
Site clearing	Lowering of the water table, if the site clearing will take place below the water table

Interaction	Impact
PCD and stockpile established	Lowering of the water table, if the construction activities are going to take place below the water table

The significance rating of the potential impacts before and after mitigation is provided in Table 11-14.

Table 11-14: Groundwater - Potential Impacts during the Construction Phase

Activity & Interaction: Site clearing for the development of surface infrastructure through the removal of the top soil and weathered rocks			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Lowering of the water table			
Prior to mitigation/ management			
Duration	Short term (2)	Construction activities are expected to be short-lived (i.e. during the construction phase)	Negligible (negative) – 18
Extent	Limited (2)	Site clearing will only occur within and immediately around the Project site	
Intensity	Minor - negative (-2)	Any dewatering will have minor environmental significance	
Probability	Unlikely (3)	Dewatering during the construction phase (if any) is unlikely to cause environmental impact considering limited rock permeability, the duration and excavation depth.	
Mitigation/ Management actions			
▪ If any trenches are excavated below the water table, dewatering of the aquifer to lower the water table locally can be considered to ensure that the construction takes place in a dry environment and the water quality remains acceptable. The abstracted water can be utilised for dust suppression, vegetation irrigation or discharged to local stream (if quality permits). Since the groundwater is not expected to be polluted at this stage, the utilisation of the water for activities such as dust suppression or irrigation will not cause negative environmental impacts; and ▪ Install long term monitoring boreholes.			
Post- mitigation			

Activity & Interaction: Site clearing for the development of surface infrastructure through the removal of the top soil and weathered rocks			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Short term (2)	Any lowering of the water table during the construction phase is expected to be shallow and recover relatively quickly	Negligible (negative) – 15
Extent	Limited (2)	Only the area in the site clearing area will be affected	
Intensity	Minimal - negative (-1)	Considering that the construction phase will be for a short period, the intensity will be minimal	
Probability	Unlikely (3)	It is unlikely for groundwater impact to occur during the construction phase, especially with the implementation of the above proposed mitigation.	

11.3.3 Operational Phase

Mine dewatering is crucial to keep the mine workings dry for safe working conditions. Dewatering is recommended to start with the starting of the excavations. This, however, can potentially impact the groundwater environment negatively by lowering the water level and creating a cone of depression in the coal seam aquifer. This is unlikely to impact the top weathered aquifer where the interaction occurs with the surface water bodies and where the majority of private boreholes are located, due to the limited vertical permeability and relatively deep underground mine.

The estimated groundwater inflow rate at various stages of the life of mine is illustrated in Figure 11-1. The total inflow rate is expected to increase as the mine area increases to a maximum inflow of 1,010 m^3/d. It should be noted that this estimate is based on permeability studies conducted on 6 boreholes only. Due to this, together with the other limitations stated in Section 20.3, the inflow rate should be considered with a certainty of around 60%.

Inflow rate is not only a function of the aquifer properties, but also the mine plan (mined area, depth and excavation rate). The area expected to be impacted by mine dewatering is graphically illustrated in Plan 20 in Appendix 3 (for the top weathered aquifer) and Plan 21 in Appendix 3 (for the coal seam aquifer).

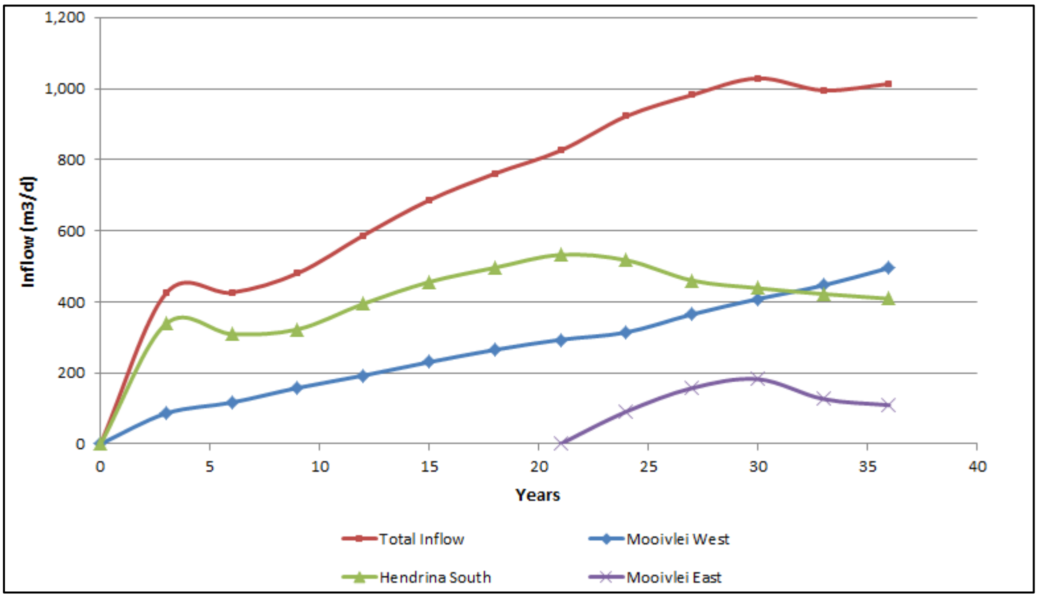

Figure 11-1: Estimated Groundwater Inflow Rates

Although the static leach tests conducted on the sampled rocks did not show contaminants of concerns, a study of various coal mines show that saline water with acidic or alkaline pH can be released from the mine workings and stockpiles once the coal and rocks are exposed to oxygen and moisture. This is also true in the nearby mines in Mpumalanga where the sulfate contamination is at around 2 500 mg/L. It is therefore reasonable to assume that such contamination could occur at the project site.

During operation any contaminants that will originate from the mine workings will be pumped out as part of the mine dewatering process. No or limited contaminants are expected to migrate away from the mine area into streams or private boreholes (the limited migration is expected to occur due to diffusion, which is a result of a concentration gradient).

The mine activities associated with the operational phase that could result in negative groundwater impact have been discussed in Table 11-15.

Table 11-15: Groundwater - Interactions and Impacts during the Operation Phase

Interaction	Impact
Groundwater dewatering	Water level lowering
Pollution control dams	Groundwater contamination due to seepage from the dams
Topsoil and overburden stockpile	Groundwater contamination due to seepage

The significance rating of the potential impacts before and after mitigation plans is provided in Table 11-16 and Table 11-17.

Table 11-16: Mine dewatering impacts on Groundwater during the operational phase

Activity & Interaction: Mine dewatering and creation of cone of dewatering			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Lowering of the water table			
Prior to mitigation/ management			
Duration	Beyond Project Life (6)	The water level will remain below its natural level for some time after the life of a project	Minor (negative) – 40
Extent	Limited (2)	The radius of influence will be limited to the coal seam aquifer within the site and to limited extent to the aquifer above	
Intensity	Minor - negative (-2)	Mine dewatering will result in lowering of the water table within the site, but no impact on the wetlands and streams is foreseen due to the limited aquifer permeability and depth of the underground mine	
Probability	Probable (4)	It is likely that there will be a cone of drawdown formed due to the mine dewatering	
Mitigation/ Management actions			
▪ Store the dewatered water in PCDs and ensure that the dams will have sufficient storage volume. If that is not possible, re-introduce treated water into the streams after ensuring that they meet the required standards as per specified by the WUL; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and groundwater inflow rates; and ▪ Update numerical model every three years for the life of the mine as more information becomes available.			
Post- mitigation			
Duration	Beyond project life (6)	The water level will remain below its natural level for some time after the life of a Project.	Minor (negative) – 27
Extent	Limited (2)	With the above stated mitigation methods, the extent is expected to be limited.	

Activity & Interaction: Mine dewatering and creation of cone of dewatering			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Minor - negative (-1)	If the abstracted water is stored in PCDs or treated and re-introduced to the streams, the environmental significance is considered as minor.	
Probability	Unlikely (3)	With the application of the proposed mitigation plans, the probability of the impact will be unlikely.	

Table 11-17: Groundwater contamination impact during construction phase

Activity & Interaction: Groundwater contamination as a result of underground mining and, seepage from the PCD and waste stockpiling			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Contamination plume in the groundwater			
Prior to mitigation/ management			
Duration	Beyond project life (6)	Groundwater contamination due to mine disturbance will occur during the operational phase and is expected to persist even after closure.	Minor (negative) – 40
Extent	Limited (2)	The contaminated groundwater is unlikely to feed the rivers and will not contaminate an area larger than the mine footprint.	
Intensity	Minor – negative (-2)	The mine dewatering is expected to maintain the hydraulic head of the mine area to be below the regional groundwater level, thus containing the contamination plume to within the mine property.	
Probability	Probable (4)	The impact is likely to occur, although the plume is unlikely to not migrate beyond the mine area during the operational phase.	
Mitigation/ Management actions			

<table>
<tr><th colspan="4">Activity & Interaction: Groundwater contamination as a result of underground mining and, seepage from the PCD and waste stockpiling</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">
If subsidence is formed during operation, it should be rehabilitated as soon as possible to minimise water and oxygen inflow from the atmosphere;
Management solutions should be provided following an agreement with the farmers with impacted groundwater or mine purchase land;
The use of nitrate based explosives should be limited as far as practicable to minimise groundwater contamination;
Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals.
The following management activities can be implemented to minimise contamination that originates from the PCDs:

Avoid placement of the PCDs on areas with the potential for increased infiltration to groundwater, such as over fault zones;
Implementation of adequate stormwater management to contain all waste water and/or volatile organic compounds, for treatment and recycling;
PCD should be lined to pro-actively prevent infiltration of contaminated seepage water; and
PCD should be operated in such a way that it will not overflow more than once in 50 years.

</td></tr>
<tr><td colspan="4">Post management</td></tr>
<tr><td>Duration</td><td>Beyond project life (6)</td><td>Groundwater contamination due to mine disturbance will occur during the operational phase and is expected to persist even after closure</td><td rowspan="4">Negligible (negative) – 30</td></tr>
<tr><td>Extent</td><td>Limited (2)</td><td>With the implementation of the above stated mitigation methods, the impact extent can be minimised to the site only</td></tr>
<tr><td>Intensity</td><td>Minimal – negative (2)</td><td>The dewatering of the underground mine will contain the pollution plume during the operational phase, with minor effects on the groundwater environment</td></tr>
<tr><td>Probability</td><td>Unlikely (3)</td><td>The impact is unlikely to be significant with the implementation of the above stated mitigation methods</td></tr>
</table>

11.3.4 Decommissioning and Closure

Once the mine is closed and dewatering ceases, groundwater will start to recover to its pre-mining level. Following full recovery (expected to be around 30 years after closure as shown in Figure 11-2) the contaminants will start to migrate away from the mine site. The simulated contamination plumes 100 years after closure are displayed in Plan 22 in Appendix 3. This plume is for the coal seam aquifer; the plume is not expected to migrate vertically to the top weathered aquifer.

Model simulations and hydrostatic calculations show that the mine is likely to decant after closure. The decanting is expected to occur through the proposed shaft on Mooivley East. None of the other shafts are foreseen to decant.

- The decanting will start 30 years after mine closure, at a rate of 7 m^3/d as shown in Figure 11-2; and
- Once the contamination plume reaches the stream, it can migrate at a higher rate compared to groundwater flow and could have a negative impact on the down-gradient riverine ecosystem and land owners.

It should be noted that the possibility of subsidence has not being considered in the decant simulation. Should subsidence be formed at elevations lower than the hydraulic head, decanting is likely to occur at those points as well. Any unsealed prospecting boreholes or geological fractures enhanced by mine blasting could also be decant zones if their topographic elevation is lower than the hydraulic head. It is impossible to inform at this moment if and when such structures will be formed. Bi-annual monitoring for subsidence followed by rehabilitation will be required.

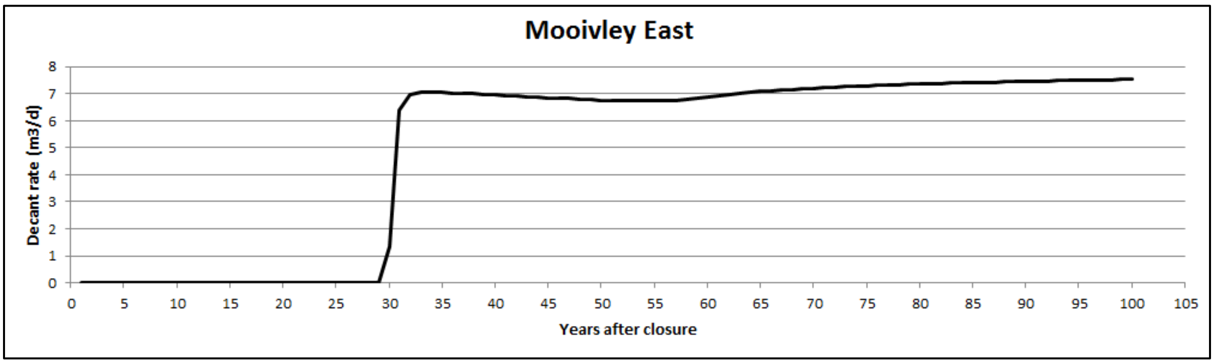

Figure 11-2: Predicted Decanting Period and Rate

The following project activities are likely to cause an impact to groundwater during the decommissioning and closure phases are discussed in Table 11-18.

Table 11-18: Groundwater - Interactions and Impacts during the Decommissioning and Closure Phase

Interaction	Impact
Mine contamination	Groundwater and stream contamination
Mine decanting	Surface water contamination

The significance rating of the potential impacts during the decommissioning and post-closure is provided in Table 11-19 and Table 11-20.

Table 11-19: Mine decanting and contamination of surface water Impacts after Mine Closure

Activity & Interaction: Mine decanting and contamination of surface water bodies			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Decanting of the closed mine			
Prior to mitigation/ management			
Duration	Permanent (7)	Once the mine starts to decant, it is not expected to stop naturally	Moderate (negative) – 105
Extent	Local (3)	The decant is likely to flow to the Klein Olifants River and associated tributaries and affect the surface water quality negatively	
Intensity	Serous- negative (-5)	Decant is expected to have a significant impact and require effective management and rehabilitation measures to prevent irreplaceable impacts. The predicted decant rate is, however, relatively low at 7 m^3/d	
Probability	Certain (7)	Based on analytical and numerical modelling, it is certain that there will be a decant after mine closure	
Mitigation/ Management actions			
▪ Capture decanting water before joining the streams; treat it and re-introduce it into the streams. As experienced from other coal mines, the decant quality could be up to 2 500 mg/L of sulfate; ▪ Management solutions should be provided by Umcebo following an agreement with the farmers or communities with impacted rivers; ▪ Monitoring of groundwater water levels in the weathered and coal seam aquifers; ▪ If sinkholes from subsidence are formed after closure, they should be rehabilitated as soon as			

Activity & Interaction: Mine decanting and contamination of surface water bodies			
Dimension	**Rating**	**Motivation**	**Significance**
possible to minimise water and oxygen inflow from the atmosphere; and ▪ Update numerical model every three years for the life of the mine as more information becomes available.			
Post- mitigation			
Duration	Permanent (7)	The decant is expected to continue for the foreseeable future	Negligible (negative) – 30
Extent	Limited (2)	With the re-introduction of the treated water into the surface water system, the extent of impact will be limited	
Intensity	Minimal - negative (-1)	Once the decanted water is treated and re-introduced to the streams, the intensity is rated as minimal.	
Probability	Unlikely (3)	The decant will be treated to the SANS or river quality objectives, therefore the impact is unlikely	

Table 11-20: Groundwater contamination as a result of underground mining

Activity & Interaction: Groundwater contamination as a result of underground mining			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Contamination plume in the groundwater			
Prior to mitigation/ management			
Duration	Beyond project life (6)	Groundwater contamination due to potential acid mine drainage or dissolution of heavy metals will occur even after the mine closure	Minor (negative) – 48
Extent	Local (3)	The contaminated groundwater can feed deep boreholes intersecting the coal seam aquifer	
Intensity	Moderate – negative (-3)	Overall the streams are gaining from groundwater baseflow. There will be a risk of contaminants migrating from the underground mine to the Klein Olifants and its tributaries	
Probability	Likely (4)	The impact is likely to occur since the groundwater will recover after closure and start to decant	

Activity & Interaction: Groundwater contamination as a result of underground mining			
Dimension	**Rating**	**Motivation**	**Significance**
Mitigation/ Management actions			
▪ Groundwater will flow away from the mine footprint if the hydraulic head within the mine is higher than the surrounding elevation. Ensure (through dewatering or decant management) that the hydraulic head in the mine void is always lower than that of the river or the regional head; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and mine inflow rates; and ▪ Update numerical model every three years for the life of the mine as more information becomes available.			
Post management			
Duration	Beyond project life (6)	Groundwater contamination due to mine disturbance will continue even after mine closure	Negligible (negative) – 30
Extent	Limited (2)	With the implementation of the above stated mitigation methods, the impact extent can be minimised to the site only	
Intensity	Minor – negative (2)	If the decanting spot is managed properly, the contaminant plume can be contained, with minor effects on the groundwater environment	
Probability	Unlikely (3)	The impact is unlikely to occur if the above stated mitigation plans are implemented	

11.4 Air Quality Impact Assessment

Potential impacts that the project will have on air quality include the reduction in air quality through the increase of pollution sources. These have been discussed in further detail during the construction, operation and decommissioning phases.

11.4.1 Construction Phase

As part of the Construction Phase, the following activities are identified that may impact on the air quality of the proposed project mining area i.e. increasing particulate matter concentration in the ambient atmosphere:

- Site clearing;
- Blasting and excavation;

- Construction of surface infrastructure;
- Waste generation and disposal; and
- Use of diesel generators.

The removal of vegetation using a range of construction equipment will lead to the generation of fugitive dust comprising TSP, PM_{10} and $PM_{2.5}$. Site clearing is short-term, less than a year and clearing will occur in phases, hence impacts on the atmospheric environment will be minimal and will cease once this activity ends.

There will be movement of contractors and permanent workforce, vehicle activity on constructed access roads, and the levelling and compacting of surfaces during this activity. During the establishment of the access roads, haul roads, mine offices, crushing and screening plant and power plant, topsoil will be moved using Scrapers and Bull Dozers and stockpiled. The activity will involve the use of heavy equipment which leads to the generation of fugitive dust – TSP, PM_{10} and $PM_{2.5}$.

Waste generation will encompass overburden from blasting and excavation of the shafts and consumption of raw material needed for construction purposes, including hazardous products like waste oil, chemicals, metallic scraps, trash and litter, garbage, sewage, amongst others.

The production of power from diesel generators will result in the release of gaseous pollutants to the ambient environment, such as: NOx, SO_2, CO, and particulate matter. The dispersion modelling shows that emissions from the use of generator sets will reduce the quality of air in the area.

The construction phase activities that will have an impact on the air quality are summarised in Table 11-21.

Table 11-21: Air Quality - Interactions and Impacts during Construction Phase

Interaction	Impact
Dust generation from site clearing	Reduction in air quality
Wind erosion from exposed surfaces from the construction of surface infrastructure	
Dust and Gaseous Emissions from waste generation and storage	
Emissions of gaseous pollutants from the diesel generator	

The rating table below summarises and calculates the air quality impact and its significance during construction phase in terms of the duration, extent; intensity and probability (refer to Table 11-22- Table 11-25).

Table 11-22: Impact on Air Quality during Construction from Site Clearing

Activity and Interaction (Site clearing results in the generation of dust)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Dust generation leads to poor air quality			
Prior to mitigation/ management			
Duration	Short term (2)	Dust generation will be short-term, limited to site clearing activities	Minor (negative) – 54
Extent	Local (3)	Since site clearing will be conducted using a phased approach, impacts will be local.	
Intensity	Minor - negative (-4)	Dust emission during this activity can have major impacts on ambient air quality.	
Probability	Almost certain (6)	It is almost certain that dust will be generated from this activity	
Mitigation/ Management actions			
▪ Application of wetting agents or dust suppressant on the dirt road and exposed areas to minimise emissions; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing or digging must occur; and ▪ Drop heights when loading and offloading material should be minimised (i.e. reduce distance between the excavator bucket and truck bed).			
Post- mitigation			
Duration	Short term (2)	Dust will be short-term, limited to site clearing activities	Negligible (negative) – 18
Extent	Limited (2)	Dust generated will be limited to the Project site and immediate surroundings due to the mitigation measures applied.	
Intensity	Minor - negative (-2)	Emissions will result in minimal impact on the ambient air quality after mitigation.	
Probability	unlikely (3)	It is unlikely that dust emissions will have an effect on air quality after mitigation	

Table 11-23: Impact from Construction of Surface Infrastructure on Air Quality

Activity and Interaction (Construction of Surface Infrastructure results in Dust Generation)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Deterioration of ambient air quality			
Prior to mitigation/ management			
Duration	Medium term (3)	Dust will be generated for duration of the construction phase	Minor (negative) – 54
Extent	Local (3)	Airborne dust may extend across the development site area.	
Intensity	Moderate (-3)	Emissions will have moderate intensity on the surrounding areas since construction will happen in phases.	
Probability	Almost certain (6)	It is almost certain that dust will be generated and will impact ambient air quality.	
Mitigation/ Management actions			
▪ Application of dust suppressant on the dirt road and exposed areas; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging must occur; and ▪ The drop heights when loading onto trucks and at tipping points should be minimised (i.e. reduce distance between the excavator bucket and truck bed).			
Post- mitigation			
Duration	Medium term (3)	Dust will be generated for duration of the construction phase	Negligible (negative) – 15
Extent	Very Limited (1)	After mitigation measures are implemented, it is expected that dust impacts will be limited to isolated parts of the site.	
Intensity	Minimal (-1)	Dust emissions will be minimal after mitigations are applied.	
Probability	Unlikely (3)	Unlikely that impact on ambient air quality will occur after mitigation measures are applied.	

Table 11-24: Impact of Waste Generation and Disposal on Air Quality during Construction

Dimension	Rating	Motivation	Significance
Activity and Interaction (Waste Generation and Disposal can result in Dust and Volatiles Emissions)			
Impact Description: Reduction in air quality due to dust and gaseous emissions			
Prior to mitigation/ management			
Duration	Medium term (3)	Emissions will be medium term during the construction phase	Moderate (negative) – 54
Extent	Local(3)	Impact can be felt at a local level extending beyond the project boundary.	
Intensity	Moderate (-3)	Emissions will have moderate impacts on the surrounding areas since construction will happen in phases.	
Probability	Almost certain (6)	It is almost certain that emissions, VOCs, and dust will impact ambient air quality.	
Mitigation/ Management actions			
▪ Application of dust suppressant on the dirt road and exposed areas; ▪ The drop heights when loading onto trucks and at tipping points should be minimised (i.e. reduce distance between the excavator bucket and truck bed); ▪ Handling and storage of hazardous waste in clearly labelled containers; ▪ Training on the handling and storage of hazardous materials; and ▪ Training on the emergency procedures and action plans i.e. spillage of dangerous substances.			
Post- mitigation			
Duration	Medium term (3)	Emissions will be medium term during the construction phase	Negligible (negative) – 24
Extent	Limited (2)	Impacts will be limited to the Project site.	
Intensity	Moderate - negative (-3)	The concentrations of pollutants emitted will decrease after mitigation measures are applied	
Probability	Unlikely (3)	It is unlikely that emissions will have an impact on ambient air quality after mitigation measures are applied	

Table 11-25: Impact from the Generation of Power using Diesel Generators on Air Quality during Construction

Activity and Interaction (Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality due to gaseous emissions			
Prior to mitigation/ management			
Duration	Medium term (3)	Emissions of gases during construction phase	Moderate (negative) – 77
Extent	Local(3)	Impact can be felt at a local level extending beyond the project boundary.	
Intensity	Very serious - negative (-5)	Significant release of NOx, SO_2 and particulate matter resulting in changes to ambient atmosphere	
Probability	Definite (7)	It is definite that gases will be released resulting in poor air pollution	
Mitigation/ Management actions			
▪ Ensure generators are working at optimal conditions; ▪ Fitting of gas scrubbers; ▪ Use of low sulfur diesel; and ▪ Fitting electrostatic precipitators or bag house.			
Post- mitigation			
Duration	Medium term (3)	Emissions of gases during construction	Negligible (negative) – 24
Extent	Limited (2)	Impacts will be limited to the Project site.	
Intensity	Moderate - negative (-3)	The concentrations of pollutants emitted will decrease after mitigation measures are applied	
Probability	Unlikely (3)	It is unlikely that emissions will have an effect on ambient air quality after mitigation measures are applied	

11.4.2 Operational Phase

As part of the Operational Phase of the project, the following activities are identified that may impact on the ambient air quality of the area i.e. increasing the concentration of pollutants in the atmosphere:

- Underground Blasting and Mining;
- Stockpiling: Waste Rock Stockpile, Product, Topsoil Stockpiles;

- Hauling/conveying of coal;
- Waste generation and storage; and
- Generation of power using diesel generators.

Underground blasting and mining will result in venting of fugitive emissions i.e. gaseous pollutants from underground operation. The pollutants generated encompass PM_{10}, $PM_{2.5}$, NO_2 and SO_2. These pollutants are capable of inducing health problems due to the depth of penetration in the human respiratory system.

The stockpiling of overburden, product, and topsoil will result in emissions from loading, tipping, and associated wind erosion, resulting in fugitive emissions: dust fall, PM_{10} and $PM_{2.5.}$

The ore crusher and screening process releases fugitive dust. The dust generated encompasses dust fall-out, PM_{10} and $PM_{2.5}$. The PM_{10} and $PM_{2.5}$ fractions are capable of health implications due to the depth of penetration in the human respiratory system.

The production of power from diesel generators will result in the release of gaseous pollutants to the ambient environment, such as: NOx, SO_2, CO, and particulate matter. The area impacted can be extensive reaching localities nearby since gaseous pollutants are easily dispersed in the atmosphere. Results from the dispersion model show that emissions from the use of the generator sets will reduce the quality of air.

The operational phase activities that will have an impact on the air quality are summarised in Table 11-26.

Table 11-26: Air Quality - Interactions and Impacts during Operational Phase

Interaction	Impact
Dust generation from Underground Blasting and Mining	Reduction in air quality
Dust generation from stockpiling: overburden, product, and topsoil	
Dust generation from plant and equipment operations	
Emissions of gaseous pollutants from using diesel generator	

The rating table below summarises and calculates the air quality impact and its significance during operational phase in terms of the duration, extent; intensity and probability (refer to Table 11-27 to Table 11-32).

Table 11-27: Impacts on Air Quality associated with Underground Blasting and Mining during Operational Phase

<table>
<tr><th colspan="4">Activity and Interaction (Underground Blasting and Mining will result in poor air quality)</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Impact Description: Deterioration of ambient air quality</td></tr>
<tr><td colspan="4">Prior to mitigation/ management</td></tr>
<tr><td>Duration</td><td>Project life (5)</td><td>Venting of underground emissions will occur for the project life</td><td rowspan="4">Minor (negative) – 72</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>Emissions may extend across the development site area</td></tr>
<tr><td>Intensity</td><td>Medium - negative (-4)</td><td>Emissions may have discernible impact on ambient air quality of the area</td></tr>
<tr><td>Probability</td><td>Almost certain (6)</td><td>It is certain that the ambient air quality will be impacted.</td></tr>
<tr><td colspan="4">Mitigation/ Management actions</td></tr>
<tr><td colspan="4">▪ Catalytic converters should be fitted to all vehicles and generators that will generate greenhouse gases;
▪ Use of baghouse to collect underground emissions from the ventilation shaft; and
▪ Use of wet scrubbers to filter gaseous pollutants from underground operations.</td></tr>
<tr><td colspan="4">Post- mitigation</td></tr>
<tr><td>Duration</td><td>Project life (5)</td><td>Venting of underground emissions will occur for the project life</td><td rowspan="4">Negligible (negative) – 27</td></tr>
<tr><td>Extent</td><td>Limited (2)</td><td>After mitigation measures are implemented, It is expected that emissions will be limited to the project site.</td></tr>
<tr><td>Intensity</td><td>Minor - negative (-2)</td><td>Impacts will be confined to the project boundary after mitigation measures are applied</td></tr>
<tr><td>Probability</td><td>Unlikely (3)</td><td>It is unlikely that emissions will have an effect on ambient air quality after mitigation measures are applied</td></tr>
</table>

Table 11-28: Impact of Air Quality from Stockpiling: Overburden, Product and Topsoil

Activity and Interaction (Stockpiling will result in dust emissions and reduced air quality)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality			
Prior to mitigation/ management			
Duration	Project life (5)	Dust erosion will occur throughout the project life	Moderate (negative) – 78
Extent	Local (3)	Dust emissions will affect the site and nearby settlements in the area.	
Intensity	Very serious long-term negative (-5)	Long term impacts on the environment, as emissions have the potential to air quality beyond the Project boundary.	
Probability	Highly probable (6)	It is highly possible that impact will occur from stockpiling and operation of this activity.	
Mitigation/ Management actions			
▪ Application of wetting agents or dust suppressant; ▪ Minimise drop heights when loading and offloading material; ▪ Set maximum speed limits and have these limits enforced on stockpiles; and ▪ Vegetation of side walls of overburden and topsoil stockpiles.			
Post- mitigation			
Duration	Project life (5)	Dust erosion will occur throughout the project life	Negligible (negative) – 30
Extent	Limited (2)	Limited to the Project site once mitigation measures are applied.	
Intensity	Moderate - negative (-3)	Emissions will impact project site and surroundings	
Probability	unlikely (3)	It is unlikely that fugitive emissions from stockpiles will worsen air quality after mitigation measures are applied.	

Table 11-29: Impact of Hauling/Conveying of coal on Air Quality during Operational Phase

Activity and Interaction (Hauling leads to emission and poor air quality			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality			
Prior to mitigation/ management			
Duration	Project life (5)	Impact will cease after the operational life span of the Project	Moderate (negative) – 105
Extent	Regional (5)	Dust impact will affect the entire region	
Intensity	Very serious – negative (-5)	Very serious long-term environmental impacts as the NAAQS are exceeded	
Probability	Definite (7)	It is definite that emissions will occur leading to poor air quality	
Mitigation/ Management actions			
▪ Application of wetting agents or dust suppressant (various grades depending on proximity to receptors) on the dirt road and exposed areas; and ▪ Set maximum vehicle speed limits and have these limits enforced.			
Post- mitigation			
Duration	Project life (5)	Impact will continue for the operational life span of the Project	Negligible (negative) – 30
Extent	Limited (2)	Dust emissions will only occur within and around the Project site after mitigation measures are applied.	
Intensity	Local- negative (-3)	Emissions will be reduced to within compliance after mitigation measures are applied	
Probability	Unlikely (3)	It is unlikely that dust emissions will have considerable impact on air quality	

Table 11-30: Impacts associated with Plant and Equipment Operations on Air Quality during the Operational Phase

Activity and Interaction (Crushing of ore results in fugitive dust emissions)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Airborne dust leads to reduced air quality			
Prior to mitigation/ management			
Duration	Project life (5)	Crushing and screening will occur for the Project life	Moderate (negative) – 84
Extent	Municipal (4)	Airborne dust may extend across the development site area.	
Intensity	Long-term environmental impairment - negative (-5)	Emissions from the crushers have the potential to exceed regulatory guideline	
Probability	Almost certain (6)	Highly possible that emissions will occur from the crushers leading to poor air quality	
Mitigation/ Management actions			
▪ Application of wetting agents (water spray); and ▪ Enclosure of crusher will be considered only if emissions are in exceedance of the regulatory limits.			
Post- mitigation			
Duration	Project life (5)	Crushing and screening will occur for the Project life	Negligible (negative) – 27
Extent	Limited (2)	Dust emissions will be limited to the site and its immediate surroundings after mitigation measures are applied.	
Intensity	Minor - negative (-2)	Emissions will be reduced considerably after mitigation with minor impact on ambient air quality.	
Probability	unlikely (3)	It is unlikely that dust emissions will have an effect after mitigation measures are applied.	

Table 11-31: Impact of Waste Generation and Storage on Air Quality during Operational Phase

Activity and Interaction (Waste Generation and Storage will result in release of Dust and Volatiles)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality due to release of dust and gaseous emissions.			
Prior to mitigation/ management			
Duration	Project life (5)	Emissions will be for the project life	Minor (negative) – 66
Extent	Local(3)	Impact can be felt at a local level extending beyond the project boundary.	
Intensity	Moderate (-3)	Emissions will have moderate impacts on the surrounding areas since construction will happen in phases.	
Probability	Almost certain (6)	It is highly probable that emissions, volatiles and dust will impact ambient air quality.	
Mitigation/ Management actions			
- Vegetation of stockpiles; - Handling and storage of hazardous waste in clearly labelled containers; - Training on the handling and storage of hazardous materials; and - Training on the emergency procedures and action plans on the handling of leaks, spillages of hazardous materials.			
Post- mitigation			
Duration	Project life (5)	Emissions will be for the project life	Negligible (negative) – 30
Extent	Limited (2)	Impacts will be limited to the Project site.	
Intensity	Moderate - negative (-3)	The concentrations of pollutants emitted will decrease after mitigation measures are applied	
Probability	Unlikely (3)	It is unlikely that emissions will have an impact on ambient air quality after mitigation measures are applied	

Table 11-32: Impact of Generation of power using Diesel Generators on Air Quality during Operational Phase

Activity and Interaction (Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality due to gaseous emissions			
Prior to mitigation/ management			
Duration	Project life (5)	Emissions of gases during operational phase will occur for the project life	Moderate (negative) – 91
Extent	Local (3)	Impact can be felt locally, extending outside the mine boundary as gaseous pollutants are easily dispersed	
Intensity	Very serious - negative (-5)	Significant changes to the ambient air quality baseline	
Probability	Definite (7)	It is certain that emissions will occur	
Mitigation/ Management actions			
▪ Ensure generators are working at optimum conditions; ▪ Fitting of gas scrubbers; ▪ Use of low sulfur diesel; and ▪ Fitting electrostatic precipitators or bag house.			
Post- mitigation			
Duration	Project life (5)	Emissions of gases will occur for the operational life or project life	Negligible (negative) – 30
Extent	Limited (2)	Impacts will be limited to the Project site	
Intensity	Moderate - negative (-3)	The emissions rate will be minimised after mitigation measures are applied	
Probability	Unlikely (3)	It is unlikely that emissions will have considerable impact on air quality after mitigation measures are applied	

11.4.3 Decommissioning and closure

As part of the Decommissioning and Closure Phase, the following activities are identified that may impact on the ambient air quality of the area i.e. increasing particulate matter concentration in the atmosphere:

- Dismantling and removal of infrastructure; and
- Surface rehabilitation

The dismantling of mine infrastructure and removal of rubble and materials leads to the generation of dust. This will involve the use of heavy machinery and vehicles similar to the construction phase. This will result in the release of fugitive dust containing TSP, PM_{10} and $PM_{2.5}$.

The decommissioning and closure phase activities that will have an impact on the air quality are summarised in Table 11-33.

Table 11-33: Air Quality - Interactions and Impacts during Decommissioning and Closure Phase

Interaction	Impact
Dust generation from the removal of infrastructure	Reduction in air quality
Dust generation from rehabilitation activities	

The rating table below summarises and calculates the air quality impact and its significance during decommissioning phase in terms of the duration, extent, intensity and probability (refer to Table 11-34 - Table 11-35).

Table 11-34: Impact from the Removal of Infrastructure on Air Quality during the Decommissioning Phase

Activity and Interaction (Removal of Infrastructure results in dust emission)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduced air quality due to dust emission			
Prior to mitigation/ management			
Duration	Medium term (3)	Impact on air quality is limited to the duration of the decommissioning phase	Negligible (negative) – 24
Extent	Limited (2)	Emission will be limited to the site and its immediate surroundings	
Intensity	Minor (1)	Emissions will have minimal impacts on ambient air quality since a phased approach be will adopted	
Probability	Probable (4)	It is probable that emissions will impact on ambient air quality	
Mitigation/ Management actions			
▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when offloading materials for rehabilitation must be minimised; ▪ Limit demolition activities to non-windy days (with wind speed less than 5.4 m/s); and ▪ Dust suppression on exposed surfaces.			

Activity and Interaction (Removal of Infrastructure results in dust emission)			
Dimension	**Rating**	**Motivation**	**Significance**
Post- mitigation			
Duration	Short term (2)	Dust impact will be limited to the duration of this activity	Negligible (negative) – 12
Extent	Very limited (1)	Dust emitted from this activity will be limited to project site after mitigation.	
Intensity	Minimal (1)	Emissions will have minimal impact on ambient air quality	
Probability	Unlikely (3)	It is unlikely that the ambient air quality will be impacted since emissions will be localised.	

Table 11-35: Impact from rehabilitation on Air Quality during the Decommissioning Phase

Activity and Interaction (Rehabilitation will result in dust emission)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Reduction in air quality			
Prior to mitigation/ management			
Duration	Medium term (3)	Impact on air quality will be medium term for the duration of the rehabilitation which might last for more than 2 years.	Minor (negative) – 45
Extent	Local (3)	Limited to the site and its immediate surroundings	
Intensity	Moderate short term (3)	Emission can have an impact on ambient air quality	
Probability	Likely (5)	Emission from the rehabilitation activities will likely impact the quality of air.	
Mitigation/ Management actions			
▪ Drop heights should be minimised when offloading materials for rehabilitation; ▪ Limit rehabilitation activities to non-windy days (with wind speed less than 5.4 m/s); ▪ Rehabilitation in accordance with rehabilitation plan; and ▪ Dust suppression on exposed surfaces.			
Post- mitigation			
Duration	Medium term (3)	Impact on air quality will be medium term for the duration of the rehabilitation	Negligible

Activity and Interaction (Rehabilitation will result in dust emission)			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Limited (2)	Emissions will be limited to the development site and surrounding areas.	(negative) – 18
Intensity	Minimal (1)	Emission will not have discernible impacts on air quality.	
Probability	Unlikely (3)	It is unlikely that emissions will impact air quality after mitigation measures are applied.	

11.5 Fauna and Flora Impact Assessment

Potential impacts that the project will have on flora and fauna include loss of sensitive habitat, rapid spread of alien invasive species and potential loss of Species of Special Concern. The baseline flora and fauna study established that portions of natural areas (i.e. *Crinum Arundinella* Riparian, *Gnidia Diospyros* Rocky Grassland, *Eragrostis* dominated Grassland and Ephemeral Pans) which exist within the project site (mine boundary area) have been incorporated into the objectives of the Mpumalanga Biodiversity Sector Plan and thus considered to have a high to very high sensitivity. It must be noted that SSC were recorded within the project site during the site surveys. The field investigations revealed that the project site is largely transformed due to agricultural activities however; there is conservation value in the natural areas that remain on the project site.

The potential impacts to fauna and flora are:

- Loss of SSC;
- Loss of sensitive habitat;
- Establishment and spread of alien invasive plants; and
- Habitat fragmentation.

11.5.1 Construction Phase

During the construction phase (construction of surface infrastructure), cultivated areas (43 ha), Eragrostis-dominated Grassland (58 ha) and alien bushclumps (7 ha) will be cleared. For site clearing, none of the habitats that have been rated as high or very high will be impacted on.

The impacts on fauna and flora during the construction phase are rated in the Table 11-36.

Table 11-36: Potential Impacts of the Construction Phase – Loss of Habitat/Vegetation Types

Activity and Interaction: Site Clearing			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Loss of *Eragrostis* – dominated Grassland			
Prior to Mitigation/Management			
Duration	Permanent (7)	Native vegetation will be removed for surface infrastructure and the impact will be permanent. Fauna species will move away with no permanent impact to them	Moderate (negative) 84
Extent	Very limited (2)	The area to be cleared is minor in comparison to the extent of the vegetation unit, as well as the extent of the total project site. No fauna and flora SSC was encountered in the area of disturbance; therefore no direct impact is expected.	
Intensity	Moderate (-3)	Since the vegetation unit has been assigned moderate ecological sensitivity and as CBA areas are avoided, the impact is not regarded as particularly significant for terrestrial biodiversity.	
Probability	Certain (7)	Clearing of vegetation will definitely take place for the establishment of infrastructure.	
Nature	Negative	The impact will be negative.	
Mitigation/Management Actions			
▪ Rehabilitation of the disturbed area should take place after construction, whereby a mixture of native grass species harvested from climax Themeda grassland and native grass species (such as *Cynodon dactylon*) are planted immediately to prevent erosion; and ▪ The footprint area should be limited as far as possible.			
Post-Mitigation			
Duration	Project Life (5)	The area can be reinstated to the former land use after decommissioning.	Minor (negative) 49
Extent	Very limited (1)	The area to be cleared is minor in extent.	
Intensity	Minimal (1)	Loss of cultivated areas has a negligible impact on flora and fauna.	

Activity and Interaction: Site Clearing			
Dimension	**Rating**	**Motivation**	**Significance**
Probability	Unlikely (7)	It is unlikely that compaction will have an effect after rehabilitation, should the area be compacted, however the area can be ripped to combat compaction.	
Nature	negative	The impact will be negative.	

11.5.2 Operational phase

During the operational phase of the development, underground mining will take place with incline shafts at a depth of 75 m. No planned loss of habitat or flora and fauna species is expected. The only activity that is considered at this time is increased vehicular movement and associated human activities on the site. The following impacts on fauna are expected per activity.

- Waste Rock Berms – noise during operational phase/expansion;
- Product Stockpile – noise and vehicle movement;
- Overland Conveyor Belt – noise impacts on animals/ coal dust on vegetation/ spills;
- Haul and Access Roads, faunal road deaths, dust and noise; and
- Crushing and screening plant – noise/dust on neighbouring vegetation and fauna.

The impacts on fauna and flora during the operational phase are rated in the Table 11-37.

Table 11-37: Potential Risks of the Operational Phase – Increased Vehicular Movement on Site

Activity and Interaction: Increased vehicular movement and noise on site			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Disturbance to fauna on site (noise, roadkill).			
Prior to Mitigation/Management			
Duration	Project life (5)	The impact will last for the project life.	Minor (negative) 40
Extent	Very limited (2)	The extent is limited since surface infrastructure is minimal.	
Intensity	Moderate (3)	No Red Data fauna species are expected to be at risk and the impact will not be frequent.	
Probability	Probable (4)	This is a commonly observed impact but it is not definite.	

Activity and Interaction: Increased vehicular movement and noise on site			
Dimension	**Rating**	**Motivation**	**Significance**
Nature	negative	The impact will be negative.	
Mitigation/Management Actions			
▪ Erect signage on site; ▪ Adhere to speed limits; and ▪ Minimise vehicle movement at night.			
Post-Mitigation			
Duration	Project Life (5)	The impact will last for the project life.	Negligible(negative) 14
Extent	Very limited (1)	The extent is limited since surface infrastructure is minimal.	
Intensity	Minimal (1)	No Red Data fauna species are expected to be at risk and the impact will not be frequent.	
Probability	Rare (2)	Roadkill will be minimal if the speed limit is adhered to and activity is restricted to daylight hours.	
Nature	negative	The impact will be negative.	

11.5.3 Decommissioning and Closure Phase

Decommissioning will take place after mining has completed in 36 years. The dismantling of surface infrastructure will involve increased activity on site and minor disturbance of the soil. This may promote the establishment of alien plant species if seeds persist in the seedbank. The impact of this will be minor.

The impact ratings on fauna and flora during the Decommissioning and Closure phase are listed in the Table 11-38. Recommendations for the rehabilitation phase are included in the Rehabilitation Plan Report (Appendix 17)

Table 11-38: Potential Impacts of the Decommissioning Phase – Establishment of Alien Plant Species

Activity and Interaction: Dismantling and removal of infrastructure			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Alien plant invasion may take place			
Prior to Mitigation/Management			
Duration	Medium-term (3)	Alien plant invasion may occur for a short period of time.	Minor (negative) 36

Activity and Interaction: Dismantling and removal of infrastructure			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Limited (2)	Alien plants will establish around disturbed areas associated with the decommissioning phase.	
Intensity	Serious (4)	Alien plant invasion is a serious problem with significant ecological consequences; hence its reference in the NEM: BA and CARA legislation.	
Probability	Probable (4)	Since alien plants have already been recorded on site, the spread of these species due to disturbance will invariably take place. The seedbank in the soil will contain alien species.	
Nature	negative	The impact will be negative	
Mitigation/Management Actions			
▪ An alien plant species management plan should be implemented for two years post closure.			
Post-Mitigation			
Duration	Medium-term (3)	As seedlings emerge, they will be removed quarterly as part of an alien management plan.	
Extent	Limited (2)	Alien plants will establish around disturbed areas associated with decommissioned infrastructure.	
Intensity	Minimal (1)	The impact is significantly reduced if controls are implemented.	Negligible (negative) 24
Probability	Probable (4)	Since alien plants have already been recorded on site, the spread of these species due to disturbance will invariably take place. The seedbank in the soil will contain alien species.	
Nature	Negative	The impact will be negative.	

11.6 Wetlands Impact Assessment

Plan 23 in Appendix 3 shows the underground coal resource and proposed surface infrastructure together with the final wetland delineations. The project interacts with wetlands as well as their ecological buffer areas (100 m and 500 m) and catchment zones that are described in the above sections. The Geotechnical Report (RE_GEN 01_12-16) indicates that all areas to be mined at a depth of less than 40 m will have a risk of subsidence;

however, the following outcomes must result from a comprehensive geotechnical investigation to reduce the overall impact:

- Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties,
- Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters,
- Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and
- If the risk is deemed too high in a sensitive area the mine plan must be adjusted.

Table 11-39 summarises the areas of wetland directly impacted by the underground mining and the surface infrastructure.

Table 11-39: Areas of Wetlands Directly Associated with the Mine Plan and Infrastructure

HGM Unit	Mooivley East	Mooivley West	Hendrina South	Total
Surface infrastructure (ha)				
Channelled Valley Bottom		1.05		1.05
Seep	5.84	3.38	8.43	17.66
			Total	**18.71**
Underground Mining (ha) below 40 m				
Klein Olifants River	10.93		78.56	89.49
Channelled Valley Bottom	5.60		24.27	29.87
Valley Bottom		45.08	51.80	96.88
Seep	119.69	467.72	347.36	934.77
Pan	0.73	3.90		4.63
			Total	**1155.64**
Underground Mining (ha) above 40 m				
Klein Olifants River	2.51		13.34	
Channelled Valley Bottom	5.22		15.12	
Valley Bottom			0	
Seep	59.59	30.23	21.53	
Pan				

Total	**147.54**

11.6.1 Construction Phase

The construction activities will have a direct negative impact to the wetlands of the project area as wetland soils and vegetation will need to be removed for the construction of mining-related infrastructure. These activities will alter the baseline state as the wetlands, being predominantly agricultural, are not currently affected by significant industrial or mining activities. Not all wetlands will be impacted and not all wetlands have the same sensitivities. The greatest impacts are focussed around the large natural pan on Mooivley East where infrastructure is within the seep wetland leading to the pan and the channelled valley bottom wetland and seeps that the conveyor will cross between Hendrina South and the Mooivley East Mining Right Area.

These impacts can be mitigated before the start of the project through avoidance and minimisation efforts in the design phase and they can be managed during the implementation phase. Avoidance of the wetlands and their 100 m buffer is the major mitigation measure as there is little mitigation for the loss of wetland soil. The natural pans are particularly sensitive receptors as they are inward draining systems and play unique roles in the landscape.

The construction phase activities that will have an impact on the wetlands are summarised in Table 11-40.

Table 11-40: Construction Phase Interactions with Wetlands

Interaction		Impact
1	Site Clearance within wetlands and their buffer areas	Removal of wetland soils and vegetation; totalling 18.7 ha.
2	Construction of general infrastructure within wetlands and their buffer areas	Development within a natural ecosystem is a negative impact to habitat integrity.
3	Construction of Overland Conveyor across an NFEPA channelled valley bottom wetland	Heavy machinery working within wetland channel and surrounds impacting upon soil, vegetation and disturbing fauna.

The tables below summarise the results of the quantitative impact assessment with pre and post mitigation values. These cover the impacts listed in Table 11-40.

Table 11-41: Potential Impacts of Construction Phase Interaction 1 on Wetlands: Site Clearance Activities

Activity and Interaction: Site Clearance within wetlands and their buffer areas			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Loss of wetland soil and vegetation with degradation to ecological integrity and functioning. This includes a total of 18.7 ha.			
Prior to Mitigation/Management			
Duration	Permanent (7)	The removal of sensitive wetland soils and intact vegetation will be a near permanent change as integrity can be lost if the minimum mitigation measures are not followed.	Moderate (negative) 105
Extent	Local (3)	Only small localised areas of wetland are impacted by this. 18.7 ha of total 2830.2 ha of wetlands (0.7 %).	
Intensity	Serious loss of highly sensitive environment (5)	Wetlands are identified as being NFEPA wetlands or part of. Wetlands are sensitive natural ecosystems. Wetlands in the area are under a greater amount of stress leading to the remaining natural wetlands being even more important and sensitive to impacts that threaten their ecological integrity.	
Probability	Definite (7)	According to the given infrastructure layout this impact will occur.	
Nature	Negative		
Mitigation/Management Actions			

<table>
<tr><th colspan="4">Activity and Interaction: Site Clearance within wetlands and their buffer areas</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">

Mitigation measures already employed by Umcebo to avoid wetlands during the scoping phase of the project include:

Relocation of Mooivley East surface infrastructure out of the small seep leading to the small pan and its 100 m buffer. This relocation north-west however is now within the seep wetlands leading to the larger natural pan; and
Relocation of the Hendrina South surface infrastructure to the western end of the project area to avoid crossing of a second stream. However, this infrastructure is still placed within seep wetlands and the conveyor is crossing the stream to Mooivley West. This was an avoidance measure that decreased the impact from surface infrastructure on the wetlands.

The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer. However should this not be possible as no alternative location is available specifically for Mooivley East and Hendrina South, the conditions highlighted in the WUL should be adhered to. Additionally these wetlands should be closely monitored as discussed in Section 9.1.6 to ensure minimal impact occurs to these wetlands;
The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. A 100 m buffer from the edge of the wetland is recommended (Refer to Plan 12 in Appendix 3); and
Wetland monitoring must be carried out during the construction phase by a wetland specialist to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.

</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Medium term (5)</td><td>With no direct impacts to wetlands, the impact will last as long as the construction phase.</td><td rowspan="5">Minor (negative) 66</td></tr>
<tr><td>Extent</td><td>Limited (2)</td><td>The construction activities will be limited to a small extent within a wetland area.</td></tr>
<tr><td>Intensity</td><td>Serious loss of sensitive environment (4)</td><td>The construction of the industrial infrastructure in close proximity to wetlands and their buffers will have some damaging impacts to natural functioning wetland ecosystems. This will affect hillslope seep wetlands in Mooivley East, Mooivley West and Mooivley South.</td></tr>
<tr><td>Probability</td><td>Highly probable (6)</td><td>If development takes place within the wetland areas and buffer zones, the impact will be realised.</td></tr>
<tr><td>Nature</td><td>Negative</td><td></td></tr>
</table>

Table 11-42: Potential Impacts of Construction Phase Interaction 2 on Wetlands: General Construction Activities

Activity and Interaction: Construction of general infrastructure within wetlands and their buffer areas			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Industrial activity within a natural ecosystem is a negative impact to habitat integrity. This is realised through habitat fragmentation, spreading of alien and invasive species, increased incidence of erosion, potential water quality deterioration and disturbance to avifauna and other fauna utilising the wetlands.			
Prior to Mitigation/Management			
Duration	Project Life (5)	The impacts caused during the construction phase will have a long lasting effect if not mitigated.	Minor (negative) 70
Extent	Municipal (4)	The impact could spread beyond the local development boundaries due to the ability of degraded water quality or alien invasive species to travel significant distances; especially downstream. Habitat fragmentation is also a municipal scale impact.	
Intensity	Serious damage to or loss of sensitive environments (5)	These impacts are serious threats to sensitive habitats such as wetlands; especially in an area with high level of cumulative habitat loss and water quality deterioration.	
Probability	Likely (5)	There is at least a 65% chance of the impact occurring.	
Nature	Negative		
Mitigation/Management Actions			
▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer. However should this not be possible as no alternative location is available specifically for Mooivley East and Hendrina South, the conditions highlighted in the WUL should be adhered to. Additionally these wetlands should be closely monitored as discussed in Section 9.1.6 to ensure minimal impact occurs to these wetlands; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during the construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, minimal bright lights should be left on at night time and they should be facing outwards of the site; and an alien			

Activity and Interaction: Construction of general infrastructure within wetlands and their buffer areas			
Dimension	**Rating**	**Motivation**	**Significance**
and invasive plant species management programme must be in place from the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised, and if so that a remedy is put in place as soon as possible.			
Post-Mitigation			
Duration	Medium term (3)	The potential impacts caused during the construction will remain a threat throughout the project life but the managed impact will have a medium term impact on the ecosystem.	Negligible (negative) 32
Extent	Local area (3)	Management and mitigation measures will prevent the impacts from spreading beyond the local development site.	
Intensity	Minor (2)	With fully functional management, monitoring and mitigation plans, the impact to the ecosystem functioning will be minimal.	
Probability	Probable (4)	Despite all intentions to prevent impacts, it is probable that impacts will still be realised due to the nature of the activity and the proximity to sensitive wetland receptors. These impacts must be managed accordingly.	
Nature	Negative		

Table 11-43: Potential Impacts of Construction Phase Interaction 3 on Wetlands: Construction of Conveyor

Activity and Interaction: Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Activities with the wetland channel and the surrounds will impact negatively upon sensitive wetland soils as well as the vegetation. This will lead to direct disturbance of fauna during construction and could also lead to the spreading of alien and invasive species and increased incidence of erosion.			
Prior to Mitigation/Management			

Activity and Interaction: Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Project Life (5)	The impacts caused during construction could have a long lasting effect if not mitigated and designed with proactive management.	Moderate (negative) 84
Extent	Municipal (4)	The impact could spread downstream beyond the local development boundaries. It is important to note the ability of polluted water or alien invasive species to travel significant distances. Water pollution and habitat fragmentation is a municipal scale impact.	
Intensity	Serious damage to or loss of sensitive environments (5)	These impacts are serious threats to sensitive habitats such as wetlands; especially in an area with high level of cumulative habitat loss and water quality deterioration.	
Probability	Almost Certain (6)	These impacts are very common with industrial stream crossings and thus have an 80 % chance of occurring	
Nature	Negative		
Mitigation/Management Actions			
▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. This area must receive particular attention and a careful construction approach to minimize all impacts; ▪ Wetland monitoring must be carried out to ensure no unnecessary impact to wetlands is realised. If an impact is realised and recorded during monitoring, a remedial action must put in place as soon as possible and reported upon; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, an alien and invasive plant species management programme must be in place from the construction phase; ▪ Construction must be done in the dry season (late March to November); ▪ The conveyor should be placed on plinths above the ground so as to allow movement safely underneath for faunal species utilising the wetland and to prevent hydrological alterations to the stream channel and; ▪ The conveyor must be closed to ensure that coal fallout does not reach wetlands.			
Post-Mitigation			

Activity and Interaction: Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Long term (4)	The impact will still have long term presence but it could be reversed with rehabilitation and management interventions.	Minor (negative) 50
Extent	Limited (2)	Impact will now be limited to the immediate conveyor footprint.	
Intensity	Serious damage or loss of sensitive environment (4)	The intensity will be serious, since wetlands are protected by the NWA. Further to this, the watercourse in question is linked to the Klein Olifants River.	
Probability	Likely (5)	The residual impacts to the stream crossings are still likely to occur and thus have at least a 65 % chance of occurring.	
Nature	Negative		

11.6.2 Operational Phase

Mining of coal within and around wetland ecosystems represents significant negative impacts to these ecosystems that function from a combination of surface and groundwater inputs. The undermining will occur from a depth of 32 m in some areas to deeper than 100 m in the deeper sections. The shallower mining activities will have greater negative impacts as this has a stronger link to the wetland systems and the surface is at great risker from surface destabilisation, leading to subsidence if mitigation measures are not carried out. Groundwater is a significant water source in the area and this is seen in the extensive hillslope seep wetlands.

The handling and storage of the coal will have some impacts to the wetlands. This is particularly with respect to the conveyor that will cross the NFEPA channelled valley bottom wetland as movement of coal through the environment will likely result in deposition of some coal fines that will negatively impact the water quality. Furthermore, the maintenance of this conveyor will require activities within the wetlands to continue through operational phase. Stockpiling of the coal may also negatively impact the surrounding environment and the risk of seepage must be managed (refer to Section 11.1).

The operational phase activities that will have an impact on the wetlands are summarised in Table 11-44.

Table 11-44: Operational Phase Interactions with Wetlands

Interaction	**Impact**

Interaction		Impact
1	Underground Blasting and Mining	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.
2	Hauling, Conveying and Stockpiling of Coal	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment. Stockpiling of coal also presents a risk to the environment that must be managed.

The tables below summarise the results of the quantitative impact assessment with pre and post mitigation values. These cover the impacts listed in Table 11-44.

Table 11-45: Potential Impacts of Operational Phase Interaction 1 on Wetlands: Underground Mining

Activity and Interaction: Underground Blasting and Mining			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.			
Prior to Mitigation/Management			
Duration	Permanent (7)	Undermining of sensitive wetlands may have an irreversible impact to the functioning of these ecosystems. The mining will also be a permanent change to the wetland setting and groundwater functioning as mine dewatering will result in the lowering of the water table; which is estimated at 1 m (Groundwater Report, Digby Wells, 2016). This is particularly the case for the top seam (seam SB) and where shallower coal resources are found. Most of the seam is above 100 m and much of the top seam is above 60 m	Moderate (negative) 90
Extent	Limited (2)	The Klein Olifants River and the associated wetlands are within an important catchment and further impacts to this area may have municipal level significance. Total area at risk is 147.54 ha	
Intensity	Irreplaceable loss of highly sensitive environments (6)	These rivers and wetlands are important for the ecological services they provide to society; particularly due to the high level of cumulative loss of wetland functioning in the area. Undermining of these wetlands may lead to the	

Activity and Interaction: Underground Blasting and Mining			
Dimension	**Rating**	**Motivation**	**Significance**
		loss of some of these areas and this is seen as an irreplaceable loss of these moderate to highly sensitive systems.	
Probability	Highly Probable (6)	If the possibility of subsidence is reduced to a negligible risk through the use of appropriate safety factors, the probability is considerably reduced.	
Nature	Negative		
Mitigation/Management Actions			
- Where possible avoid all undermining of channelled valley bottom wetlands and the Klein Olifants River; especially if vary shallow. (Plan 16 in Appendix 3); - Due to the potential risk of subsidence associated with shallow mining a safety factor must be determined by a rock engineer and used for areas of shallow mining (35 to 100 m at least). This is mostly associated with the top seam where many wetlands are known. The safety factors and final mine plan must be determined by the relevant engineers; and - A comprehensive geotechnical investigation must be undertaken for the following: - Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties, - Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters, - Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and - If the risk is deemed too high in a sensitive area the mine plan must be adjusted. - Mining through underground dykes and sills must be undertaken carefully since the puncturing of aquifers could lead to the dewatering of wetlands.			
Post-Mitigation			
Duration	Permanent (7)	Although mitigation measures may lessen the impact somewhat, the mining will be a permanent change to the wetland setting and groundwater functioning.	Minor (negative) 42
Extent	Local (3)	The impacts may be managed to be contained within the development area and not to have negative impacts of a municipal scale.	
Intensity	Serious damage to sensitive environments (4)	Even with mitigation, the residual impact will still have serious damaging effects on the natural functioning of the sensitive wetland ecosystems.	
Probability	Highly Probable (3)	Undermining of these wetlands is very likely to lead to the impacts described.	

Activity and Interaction: Underground Blasting and Mining			
Dimension	**Rating**	**Motivation**	**Significance**
Nature	Negative		

Table 11-46: Potential Impacts of Operational Phase Interaction 2 on Wetlands: Coal Handling, Transport and Stockpiling

Activity and Interaction: Hauling, Conveying and Stockpiling of Coal			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland (and is a tributary to the Klein Olifants River) will negatively impact water quality as coal fines that will very likely be transported from the conveyor into the surrounding environment. Negative impacts from maintenance of the conveyor servitude may also be incurred.			
Prior to Mitigation/Management			
Duration	Beyond Project Life (6)	Carbonaceous material will cause pollution of the water that may reside for a time longer than the operation of the conveyor. Additionally, if erosion occurs from the increased vehicular activity around this area, the impact will last longer than the operation of the conveyor.	Moderate (negative) 84
Extent	Municipal (4)	The Klein Olifants River and the associated wetlands are within an important catchment and further impacts to this area may have municipal level significance.	
Intensity	Serious damage to sensitive environments (4)	These wetlands are sensitive receptors and this represents a moderate impact to the ecological functioning.	
Probability	Highly Probable (6)	Transporting coal on the conveyor across the wetlands is very likely to lead to the impacts described.	
Nature	Negative		
Mitigation/Management Actions			
▪ The conveyor must be designed in such a way so as to minimise the windblown coal fines and any potential coal fallout and should be covered. If possible, the conveyor should be fully enclosed over the wetlands and within the 100 m buffer area; ▪ The conveyor servitude must also have a well-designed stream crossing and this should be maintained. The wetlands outside of this must be demarcated as no-go areas; ▪ The conveyor must be monitored and maintained to best operating standards and per the design criteria that capture mitigation measures.; and ▪ The wetland must be monitored quarterly to ensure no residual impact to the wetland and river is realised; and if so that remediation measures are followed. It is recommended that at			

Activity and Interaction: Hauling, Conveying and Stockpiling of Coal			
Dimension	**Rating**	**Motivation**	**Significance**
least 100 m on either side for the conveyor is assessed for any sign of ecological decline and pollution such as coal fines deposition and runoff, die back of vegetation and increased erosion.			
Post-Mitigation			
Duration	Project Life (5)	The conveyor and the potential impacts will be present for the operational life of the project.	Minor (negative) 40
Extent	Limited (2)	The mitigation measures can ensure any impacts will be limited to the site and its immediate surroundings.	
Intensity	Moderate damage to sensitive environments (3)	These wetlands are sensitive receptors and the activities associated with the conveyor will still represent a moderate impact to the ecological functioning.	
Probability	Probable (4)	Transporting coal on the conveyor across the wetlands is still likely to lead to the impacts described.	
Nature	Negative		

11.6.3 Decommissioning and Closure

The Decommissioning and Closure phase activities that will have an impact on the wetlands are summarised in Table 11-47.

Table 11-47: Rehabilitation Phase Interactions with Wetlands

Interaction		**Impact**
1	Removal of infrastructure and surface rehabilitation.	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the hillslope seep wetland underlying the proposed infrastructure for Hendrina South.
2	Underground mine closure and rehabilitation	Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.

The tables below summarise the results of the quantitative impact assessment with pre and post mitigation values.

Table 11-48: Potential Impacts of Rehabilitation Phase Interaction 1 on Wetlands: Removal of infrastructure and surface rehabilitation

Activity and Interaction: Removal of infrastructure and surface rehabilitation.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems.			
Prior to Mitigation/Management			
Duration	Long term (4)	The impacts caused during the rehabilitation activities will have a long lasting effect if not mitigated.	Minor (negative) 65
Extent	Municipal (4)	The impact could spread beyond the local development boundaries due to the ability of degraded water quality or alien invasive species to travel significant distances; especially downstream.	
Intensity	Serious damage to or loss of sensitive environments (5)	These impacts are serious threats to sensitive habitats such as wetlands; especially in an area with high level of cumulative habitat loss and water quality deterioration.	
Probability	Likely (5)	These impacts are common of mining and industrial construction sites and project and thus have at least a 65% chance of occurring.	
Nature	Negative		
Mitigation/Management Actions			
▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the rehabilitation phase; ▪ The rehabilitation footprint kept as small as possible and non-impacted wetlands must be avoided; ▪ Careful attention must be given to handling wetland soils, if any; and ▪ Wetland monitoring must be carried out during the rehabilitation phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.			
Post-Mitigation			
Duration	Medium term (3)	Impacts will last as long as rehabilitation activities are ongoing.	Minor (negative) 36
Extent	Local (3)	Mitigation will allow impacts to be within the local site.	

Activity and Interaction: Removal of infrastructure and surface rehabilitation.			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Moderate damage to sensitive environments (3)	Rehabilitation activities may still have a moderate effect on the wetlands on the project area. These wetlands are sensitive environments and must be managed with caution.	
Probability	Probable (4)	Negative impacts to the wetlands during rehabilitation could occur given the nature of the task.	
Nature	Negative		

Table 11-49: Potential Impacts of Rehabilitation Phase Interaction 2 on Wetlands: Underground mine closure and rehabilitation

Activity and Interaction: Underground mine closure and rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.			
Prior to Mitigation/Management			
Duration	Permanent (7)	Decant of polluted underground water into the catchment at the Mooivley East incline shaft will have negative impacts beyond the project life and will be irreversible if no managed or mitigated against.	Major (negative) 114
Extent	Regional (5)	The Klein Olifants River and the associated wetlands are within an important catchment and impacts to this area will have a regional level significance.	
Intensity	Irreplaceable damage to highly sensitive environments (7)	These wetlands are sensitive receptors and this represents serious impacts to these systems that could lead to irreplaceable damage to and loss of ecological functioning.	
Probability	Highly Probable (6)	It is very likely to lead to the impacts described.	
Nature	Negative		
Mitigation/Management Actions			

Activity and Interaction: Underground mine closure and rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
▪ Groundwater and wetlands must be monitored post-mining for potential decant; and ▪ Long-term water treatment options will need to be investigated by Umcebo to prevent polluted decant water from entering the catchment.			
Post-Mitigation			
Duration	Permanent (7)	It is likely that the issue of polluted underground water will be a permanent catchment impact to manage.	Moderate (negative) 90
Extent	Local (3)	If adequate water treatment is carried out before discharge then the impact can be managed at the local site.	
Intensity	Serious damage to highly sensitive environments (5)	These wetlands are sensitive receptors and altered water quality represents serious impacts to these systems that must be managed.	
Probability	Highly Probable (6)	It is very likely to lead to the impacts described.	
Nature	Negative		

11.7 Aquatics Impact Assessment

As observed in Plan 23 in Appendix 3, the surface infrastructure is limited to particular sections of the mining right areas. Based on the surface infrastructure layout, river crossings by access roads, fences and conveyor systems are proposed. In addition, the underground mine plan layout, depicted below along with the interactions between mine plan and the delineated wetlands, show that several wetland and riverine habitats will be undermined. These specific impacts will be discussed for each project phase.

11.7.1 Construction Phase

The interactions between the construction phase activities and the impacts to aquatic ecology are summarised below (Table 11-50).

Table 11-50: Interactions and impacts to aquatic ecology for the construction phase

Interaction	Impact
Site clearance within associated wetland habitats and river catchment and construction of surface infrastructure	Increased runoff resulting in erosion and sedimentation of downstream habitats. Increased runoff from man-made structures (offices, conveyer belt, paved areas, mining infrastructure etc.)resulting in the erosion and sedimentation of downstream river reaches such as the Klein Olifants and its associated tributaries
Construction over watercourses	Construction over sensitive riparian habitats resulting in the loss and/or degradation of aquatic habitat
Waste generation and disposal	Runoff containing pollutants and solid waste resulting in water and habitat quality degradation in downstream river reaches

The rating table below summarises and calculates the aquatic impact and its significance during construction phase in terms of the duration, extent; intensity and probability (refer to Table 11-51 - Table 11-53).

Table 11-51: Site clearance within associated wetland habitats and river catchment impact assessment

Activity and Interaction: Site clearance within associated wetland habitats and river catchment			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Increased runoff and erosion within the Klein Olifants River			
Prior to Mitigation/Management			
Duration	Project Life (5)	Revegetation will take place concurrently (where applicable).	Moderate (negative) – 78
Extent	Local (3)	The extent of the impact will likely affect the downstream regions.	
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Almost Certain (6)	It is highly likely this impact will occur.	
Nature	Negative		
Mitigation/Management Actions			

<table>
<tr><th colspan="4">Activity and Interaction: Site clearance within associated wetland habitats and river catchment</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Minimise and keep the footprint as small as possible;
Revegetation of the construction footprint as soon as possible should these areas not be required for the operational phase;
Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow;
Stormwater from the adjacent area must be diverted around the construction site and activities to ensure that clean stormwater is not contaminated;
Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow;
Sequential removal of the vegetation (not all vegetation immediately); and
The revegetation of unpaved roadsides.</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>Once vegetation is cleared, no re-vegetation will occur until the closure phase of the project. Although stormwater management will mitigate sediment deposition.</td><td rowspan="5">Minor (negative) – 52</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>The extent of the impact will likely affect the downstream regions.</td></tr>
<tr><td>Intensity</td><td>High - Negative (-5)</td><td>Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.</td></tr>
<tr><td>Probability</td><td>4 (Probable)</td><td>The likelihood of the impact occurring is reduced by the mitigation.</td></tr>
<tr><td>Nature</td><td colspan="2">Negative</td></tr>
</table>

Table 11-52: Construction over sensitive riparian habitats impact assessment

<table>
<tr><th colspan="4">Activity and Interaction: Construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Impact Description: The loss of aquatic habitat as a result of construction activities within a river channel</td></tr>
<tr><td colspan="4">Prior to Mitigation/Management</td></tr>
</table>

Activity and Interaction: Construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Beyond Project Life (6)	Once the riverine soils and instream habitat has been modified, rehabilitation of the footprint will likely take longer than the closure phase.	Moderate (negative) – 84
Extent	Local (3)	The extent of the impact will likely only affect the immediate downstream regions.	
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Almost Certain (6)	It is highly likely this impact will occur.	
Nature	Negative		
Mitigation/Management Actions			
▪ No crossings over riffle/rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured (Plan 16 in Appendix 3); ▪ All crossings should be designed in such a way that it will reduce the potential for erosion and downstream sedimentation; ▪ The crossing points should be stabilised with gabions to reduce the resulting erosion and downstream sedimentation; ▪ Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years; ▪ The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled and avoided; ▪ Erosion prevention mechanisms must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ▪ The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions; ▪ Diversion trenches and berms should convey dirty water to the PCDs so as to contain runoff; and ▪ Soils adjacent to the river that have been compacted must be loosened to allow for germination.			
Post-Mitigation			
Duration	Beyond Project Life (6)	Once the riverine soils and instream habitat has been modified, rehabilitation of the footprint will likely take longer than the closure phase.	Moderate (negative) – 78

Activity and Interaction: Construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Limited (2)	The extent of the impact will be reduced to the footprint area by mitigation actions.	
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Almost Certain (6)	It is highly likely this impact will occur.	
Nature	Negative		

Table 11-53: Runoff Containing Pollutants and Increased Water Velocity Impact Assessment

Activity and Interaction: Waste storage and generation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Runoff containing pollutants and increased water velocity resulting in water and habitat quality degradation in downstream river reaches			
Prior to Mitigation/Management			
Duration	Medium Term (3)	The impact will likely occur throughout the construction phase.	Minor (negative) – 66
Extent	Local (3)	The extent of the impact will likely only affect the immediate downstream regions.	
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Almost Certain (6)	It is highly likely this impact will occur.	
Nature	Negative		
Mitigation/Management Actions			
▪ Diversion trench and berm systems which diverts clean stormwater around pollution sources and convey and contain dirty water to central PCDs; ▪ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from entering the local aquatic systems.			

Activity and Interaction: Waste storage and generation			
Dimension	**Rating**	**Motivation**	**Significance**
▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation (*Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas* and *Panicum maximum*) around pollution control dams and structures should be completed as this has been shown to be effective in erosion and nutrient control.			
Post-Mitigation			
Duration	Medium Term (3)	The impact will likely occur throughout the construction phase.	Minor (negative) – 44
Extent	Local (3)	The extent of the impact will likely only affect the immediate downstream regions.	
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Probable (4)	Mitigation actions will reduce the likelihood of the impact occurring.	
Nature	Negative		

11.7.2 Operational Phase

The interactions between the operational phase activities and the impacts to aquatic ecology are summarised below (Table 11-54).

A geotechnical study detailing the degree of risk associated with the subsidence of areas located under wetlands/rivers was completed (Petho et al. 2016). Based on the report the following findings were provided. The mining of the coal reserve at a depth of 40 m or more would result in stable surface conditions (no subsidence), provided that appropriate pillar designs are conducted and implemented. There was however approximately 251 hectares of coal reserve which is located at a depth less than 40 m and directly associated with wetlands, buffer zones and rivers.

Although a basic geotechnical study has been completed, recommendations from the report indicate that a comprehensive geotechnical study must still be conducted to assess the risk for subsidence in areas associated with the Klein Olifants River. Mitigation actions to increase stability should be used in delineated high risk areas. These mitigation actions include limiting roads underneath the river system and thicker support pillars, however, detailed mitigation actions should be defined in the geotechnical study.

Table 11-54: Interactions and impacts to aquatic ecology for the operation phase

Interaction	Impact

Interaction		Impact
1	Underground blasting and mining	Undermining of wetlands and rivers leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts
2	Storage, hauling, processing, conveying and stockpiling of coal	Runoff water which comes into contact with the carboniferous material will contain various pollutants that may contaminate downstream river reaches

The rating table below summarises and calculates the aquatic impact and its significance during operational phase in terms of the duration, extent; intensity and probability (refer to Table 11-55 - Table 11-56).

Table 11-55: Subsidence of Land within the River Catchment during operational phase

Activity and Interaction: Underground blasting and mining			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Subsidence of land within the river catchment and subsidence of land underneath river channels (32 m to 128 m)			
Prior to Mitigation/Management			
Duration	Permanent (7)	The undermining of a river course and resulting subsidence will be a permanent impact.	Moderate (negative) – 102
Extent	Municipal (4)	The impact would likely impact on the water balance of the Klein Olifants River and thus beyond a local extent.	
Intensity	Serious - negative (-6)	The loss of the headwaters of a river system will seriously affect the functioning of the downstream river reaches.	
Probability	Almost certain (6)	Should mining occur, there is a very high likelihood of the impact occurring.	
Nature	Negative		
Mitigation/Management Actions			
• Complete a geotechnical study to identify possible high risk subsidence, areas all mitigation measures identified by the rock engineer must be implemented; • Ensure sufficient pillar support and safety factors to prevent subsidence of undermined wetland areas; and • The highest safety factor must possible must be used for areas of shallow mining (35 m to 70 m at least).			

Activity and Interaction: Underground blasting and mining			
Dimension	**Rating**	**Motivation**	**Significance**
Post-Mitigation			
Duration	Permanent (7)	The impact, should it occur, would still be a permanent feature.	Minor (negative) – 68
Extent	Municipal (4)	Should subsidence occur, the impact to the Klein Olifants River specifically the water balance is likely to extend beyond the project site (local extent)	
Intensity	Serious - negative (-6)	The impact may result in a loss of headwater of the Klein Olifants River which may have a direct effect on the downstream areas and ultimately limit ecosystem functioning	
Probability	Probable (4)	Should high risk areas be avoided and the avoidance of the undermining of rivers, the likelihood of subsidence is reduced.	
Nature	Negative		

Table 11-56: Contamination of the aquatic ecosystem through contaminated runoff impact assessment

Activity and Interaction: **Storage, hauling, processing, conveying and stockpiling of coal**			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Contamination of surface water impact on the aquatic ecosystem through contaminated runoff and contaminated seepage influx			
Prior to Mitigation/Management			
Duration	Project life (5)	The impact will occur throughout the life of mine.	Moderate (negative) – 84
Extent	Local (3)	Water quality impacts would likely only affect the upper reaches of the Klein Olifants River until dilution with clean water reduces the concentration of contaminants.	

Activity and Interaction: Storage, hauling, processing, conveying and stockpiling of coal			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Serious - negative (-6)	The degradation of water quality will likely impact on all sensitive aquatic biota thereby resulting in their loss from the ecosystem.	
Probability	Almost certain (6)	There is a high likelihood of the impact occurring.	
Nature	Negative		
Mitigation/Management Actions			
▪ Effective surface water management (see surface water report); ▪ Clean and dirty water separation should be managed in accordance with the surface water report (Appendix 5); ▪ Exposed topsoil stockpiles must be revegetated to reduce erosion and subsequent sedimentation; and ▪ PCDs must allow for collection of classified dirty water in the event of a 1:50 year storm event.			
Post-Mitigation			
Duration	Project life (5)	The impact will occur throughout the life of mine.	Minor (negative) – 56
Extent	Local (3)	Water quality impacts would likely only affect the upper reaches of the Klein Olifants River until dilution with clean water reduces the concentration of contaminants.	
Intensity	Serious - negative (-6)	The degradation of water quality will likely impact on all sensitive aquatic biota thereby resulting in their loss from the ecosystem.	
Probability	Probable (4)	Mitigation actions will reduce the likelihood of the impact.	
Nature	Negative		

11.7.3 Decommissioning and Closure

The following interactions between the closure and rehabilitation phase activities and the impacts to aquatic ecology are summarised below (Table 11-57).

Table 11-57: Rehabilitation and Closure Phase Interactions

Interaction		Impact
1	Removal of infrastructure and surface rehabilitation	The removal of the infrastructure will lead to potential negative impacts on the habitat integrity of the associated aquatic ecosystems
2	Underground mine closure and rehabilitation	Post-mining decant of groundwater will have negative impacts on the downstream water quality

The rating table below summarises and calculates the aquatic impact and its significance during Decommissioning and Closure phase in terms of the duration, extent; intensity and probability (refer to Table 11-58 and Table 11-59).

Table 11-58: Removal of infrastructure and surface rehabilitation

Activity and Interaction: Removal of infrastructure and surface rehabilitation.			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Increased runoff and erosion within the Klein Olifants River			
Prior to Mitigation/Management			
Duration	Medium term (3)	The impact will only occur during the closure and decommissioning phase.	Minor (negative) – 66
Extent	Local (3)	The extent of the impact will likely affect the downstream regions.	
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Almost Certain (6)	It is highly likely this impact will occur.	
Nature	Negative		
Mitigation/Management Actions			
▪ Established buffer zones: 100 m from wetland and 100 m from riparian areas; and ▪ Stormwater management plan.			
Post-Mitigation			
Duration	Medium term (3)	The impact will only occur during the phase.	Minor (negative) – 44
Extent	Local (3)	The extent of the impact will likely affect the downstream regions.	

Activity and Interaction: Removal of infrastructure and surface rehabilitation.			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	High - Negative (-5)	Aquatic ecosystems are sensitive to disturbance and thus any impact is regarded as serious.	
Probability	Probable (4)	The impact is a common consequence of rehabilitation.	
Nature	Negative		

Table 11-59: Decant of Severely Contaminated Water

Activity and Interaction: Underground mine closure and rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Decant of severely contaminated water into local aquatic ecosystems			
Prior to Mitigation/Management			
Duration	Permanent (7)	Decant of contaminated water will likely be permanent.	Major (negative) – 119
Extent	Municipal (4)	Decant is likely to flow to the pan at Mooivley East and which may result in a change in salt balance to the entire upper reach of the Klein Olifants River.	
Intensity	Serious - negative (-6)	The change of water quality in the headwaters of a river system will seriously affect the functioning of the downstream river reaches.	
Probability	Definite (7)	Should mining occur, there is a very high likelihood of the impact occurring.	
Nature	Negative		
Mitigation/Management Actions			
▪ Decant treatment plan; and ▪ Water treatment options.			
Post-Mitigation			
Duration	Permanent (7)	The decanting water of contaminated water will likely be permanent.	Minor (negative) – 51
Extent	Municipal (4)	The impact will change salt balances of the entire upper reach of the Klein Olifants River.	
Intensity	Serious - negative (-6)	The change of water quality in the headwaters of a river system will seriously affect the functioning of the downstream river reaches.	
Probability	Unlikely (3)	If water treatment is completed, there will likely be no impact.	
Nature	Negative		

11.8 Heritage Impact Assessment

The potential impacts were considered through an examination of the project phase and activity, the environmental aspect, the interdependencies between aspects, an assessment and classification of categories, and consideration of the potential impact on heritage resources. Different heritage impacts may manifest in different geographical areas and diverse communities. They influence the CS of heritage resources without any actual physical impact on the resources taking place. The impact assessment compiled for heritage has been assessed in accordance with each heritage resources' cultural significance.

No heritage resources were identified within the development footprint (Location of surface infrastructure). Therefore, this section considers the potential impacts to identified heritage resources as presented in Table 10-35, by relevant project related activities summarised in Table 11-1 only. Heritage resources with a negligible CS designation have furthermore been excluded from additional assessment as these resources have been sufficiently recorded and require no further mitigation[11] based on the definitions as presented in the SAHRA Minimum Standards (SAHRA, 2007).

11.8.1 Construction Phase

Construction activities that may have a direct negative impact on identified heritage resources include blasting and excavation and construction of surface infrastructure. These construction activities can result in an impact to heritage resources which include the following:

- Vibrations created through blasting may affect the integrity of rock art sites through structural damage to shelters, i.e. cracks or collapse. Furthermore, surface dressing of burial grounds and graves, may be damaged through intense or repetitive vibrations;
- Dust generation created during construction may affect the integrity of rock art sites, altering the status quo; and
- Degradation of the intrinsic CS of burial grounds and graves associated with living heritage.

The ratings for pre- and post-mitigation scenarios for the identified impacts are summarised in Table 11-60 and Table 11-61.

[11] This does not preclude any requirements that may be applicable to heritage resources afforded general protection in terms of Section 34 of the NHRA

Table 11-60: Summary of Assessment of the Potential Loss of Integrity of Rock Art Sites

Dimension	Rating	Motivation	Significance
Impact Description: Loss of integrity of rock art sites			
Prior to Mitigation/Management			
Duration	Permanent (7)	Any damage to rock art panels during construction will be permanent, resulting in loss of integrity that cannot be restored.	Moderate (Negative) 80
Extent	National (6)	Bushmen and Khoi rock art in the region is not widespread. It is a regional expression that needs to be considered in context of southern African rock art heritage; therefore any negative changes to known rock art sites could reduce the number of extant sites in the region, thereby limiting and / or reducing the holistic, national integrity of the rock art expression.	
Intensity	Extremely high - negative (-7)	The rock art sites were determined to have high CS, therefore any negative changes to sites must be considered as extremely high.	
Probability	Probable (4)	There is a likelihood that blasting can impact on the integrity of rock art sites, especially recurring blasting and vibrations that can exacerbate inherent weaknesses in the geological formations, causing cracking or collapse of rock shelters.	
Mitigation			
It is recommended that, in the event that EA and mining rights are granted, a specialist permitted (or so-called Phase 2) assessment of rock art sites be done by rock art experts to record the sites fully, prior to any blasting activities. A Phase 2 rock art assessment will enable: ▪ Detailed documentation of the rock art, using latest available technology, to enable 'preservation through record' of the sites; and ▪ Develop an accurate pre-impact baseline that can be used to adequately monitor any changes to the rock art sites. In addition, a project-specific Conservation Management Plan (CMP or so-called Phase 3 assessment) for all identified rock art sites must be developed, taking into consideration findings from the specialist Phase 2 assessments.			

Dimension	Rating	Motivation	Significance
Mitigation measures proposed in the blasting impact assessment should also be implemented (Appendix 16).			
Post-Mitigation			
Duration	Permanent (7)	Any damage to rock art panels during construction will be permanent, resulting in loss of integrity that cannot be restored.	Major (positive) 112
Extent	Limited (2)	Detailed monitoring of rock art sites will enable the identification of negative impacts to specific sites. Furthermore, the preservation through record will reduce the intensity of the potential impacts by maintaining a holistic expression of rock art in the region.	
Intensity	Extremely high - positive (7)	Given the high CS of rock art, the proposed mitigation measures will enable rock art sites to be monitored in detail, thereby limiting impacts on sites. In the event that the integrity of rock art sites are negatively impacted, the proposed mitigation, especially through Phase 2 assessments, will ensure that these sites are at least 'preserved through record'.	
Probability	Certain (7)	Implementing Phase 2 assessments will create a permanent record of the rock art sites, whilst developing and implementing the CMPs will enable adequate monitoring of sites.	

Table 11-61: Summary of Assessment of the Potential Degradation of CS of Burial Grounds and Graves

Dimension	Rating	Motivation	Significance
Impact Description: Degradation of intrinsic CS of burial grounds and graves			
Prior to Mitigation/Management			
Duration	Project Life (5)	The degradation of the intrinsic CS through unconditioned restricted access to burial grounds should only occur during the LoM, and can be restored post-mining.	Major (Negative) 112

Dimension	Rating	Motivation	Significance
Extent	National (6)	A conservative approach, assuming Next of Kin (NoK) could be distributed throughout South Africa, has been adopted. Any unpermitted changes to burial grounds can at the very least affect descendent communities and possibly result in social and/ or legal repercussions that may require intervention by national structures (e.g. SAHRA).	
Intensity	High - negative (-5)	Burial grounds are assigned very high CS in addition to be generally protected under the NHRA and other national and provincial legislation. Any unpermitted changes to burial grounds are therefore considered highly negative.	
Probability	Certain (7)	The reduction in intrinsic CS through unconditioned restricted access is certain to occur during the LoM.	
Mitigation			
- If the Project is awarded an EA and mining right, the Procedure for consultation regarding burial grounds and graves contained in Chapter XI of the SAHRA regulations must be implemented. Where the outcomes of this process include agreements for the in situ conservation of graves, such agreements must be integrated into a project-specific CMP; and - Where graves are at risk of direct impacts, or where agreements with identified bona fide Next-of-Kin include relocation, the graves may need to be relocated in accordance with the Application for permit: Burial grounds and graves process contained in Chapter IX of the SAHRA Regulations.			
Post-Mitigation			
Duration	Immediate (1)	Implementing Chapter XI of the SAHRA Regulations will enable negotiated agreements with NoK to be reached. The degradation of intrinsic CS through agreed upon conditional access can therefore be eliminated or reduced.	Minor (Positive) 60
Extent	National (6)	A conservative approach, assuming NoK could be distributed throughout South Africa, has been adopted. Changes to burial grounds, including approval of CMPs or issuing permits to exhume and relocate contents of graves, will need to be authorised by national, provincial and local authorities.	
Intensity	High - positive (5)	If the proposed mitigation measures are implemented, burial grounds will be conserved, access will be subject to conditional access as agreed upon, or graves can be relocated to formal cemeteries.	

Dimension	Rating	Motivation	Significance
Probability	Likely (5)	It is likely that by following the proposed mitigations, nearly all impacts on identified burial grounds can be removed or avoided.	

11.8.2 Operational Phase

Project related activities during the operational phase of the proposed project generally have limited impacts to identified heritage resources as direct impacts would have either occurred during the construction phase, or would have been mitigated to remove impacts. Nevertheless, activities during the operational phase of the Project considered in the impact assessment comprise underground mining and blasting.

The ratings for pre- and post-mitigation scenarios for the identified impacts for the loss of integrity of Rock Art sites will be similar to the impacts compiled during the construction phase (Table 11-60). Table 11-62 provides and impact assessment for the damage to surface dressing of burial grounds and gravels from underground blasting during operational phase.

Table 11-62: Summary of Assessment of the Potential Damage to Surface Dressing of Burial Grounds and Graves

Dimension	Rating	Motivation	Significance
Impact Description: Damage to surface dressing of burial grounds and graves			
Prior to Mitigation/Management			
Duration	Project Life (5)	Unmitigated damage to surface dressing of graves will be permanent	Minor (Negative) 64
Extent	National (6)	A conservative approach, assuming NoK could be distributed throughout South Africa, has been adopted. Any unpermitted changes to burial grounds can result in social and / or legal repercussions that may require intervention by national structures (e.g. SAHRA).	
Intensity	High - negative (-5)	Burial grounds are assigned very high CS in addition to be generally protected under the NHRA and other national and provincial legislation. Any unpermitted changes to burial grounds are therefore considered highly negative. However, accidental or unintended impacts may be reversible.	
Probability	Probable (4)	It is likely that where potential impacts are not mitigated, the identified impacts will	

Dimension	Rating	Motivation	Significance
		manifest.	
Mitigation			
▪ If the Project is awarded an EA and mining right, the Procedure for consultation regarding burial grounds and graves contained in Chapter XI of the SAHRA regulations must be implemented. Where the outcomes of this process include agreements for the in situ conservation of graves, such agreements must be integrated into a project-specific CMP; and ▪ Where graves are at risk of direct impacts, or where agreements with identified bona fide Next-of-Kin include relocation, the graves may need to be relocated in accordance with the Application for permit: Burial grounds and graves process contained in Chapter IX of the SAHRA Regulations.			
Post-Mitigation			
Extent	National (6)	A conservative approach, assuming NoK could be distributed throughout South Africa, has been adopted. Changes to burial grounds, including approval of CMPs or issuing permits to exhume and relocate contents of graves, will need to be authorised by national, provincial and local authorities.	
Intensity	High - positive (5)	If the proposed mitigation measures are implemented, burial grounds will be conserved, access will not be lost, or graves can be relocated to formal cemeteries.	
Probability	Likely (5)	It is likely that by following the proposed mitigations, nearly all impacts on identified burial grounds can be removed or avoided.	

11.8.3 Decommissioning and Closure Phase

Although no impacts during the decommissioning and closure phase of the proposed project have been identified, Umcebo should be cognisant that if, at the time of decommissioning and closure any infrastructure is older than 60 years, it will be subject to permitting requirements as required under Section 34 of the NHRA and Chapter III of the SAHRA Regulations.

11.9 Socio-Economic Impact Assessment

The assessment of potential socio-economic impacts that are expected to arise as a result of a project is challenging for a number of reasons. Potential social impacts and the elements that combine to determine the socio-economic status of affected populations are generally multi-dimensional and interrelated.

11.9.1 Construction Phase

This section assesses the social impacts that will originate during the construction phase of the proposed Project. Construction will be completed in two stages. Firstly, infrastructure required for the Mooivley West and Hendrina South operations will be constructed during the first three years of the Project, while infrastructure required for the Mooivley East operation will only be constructed during year 23 of the proposed Project (Umcebo, 2016b).

Predicted construction phase impacts include three positive and seven negative impacts (Table 11-63). The majority of these impacts will continue into the operational phase and decommissioning and closure, and should, therefore, be mitigated or enhanced continuously during the life of the project.

Table 11-63: Socio-Economic Impacts Associated with the Construction Phase

Type	Impact name	Activities triggering impact
Positive	Employment creation during construction	Although most project activities during construction and operation will require a workforce, the following activities will contribute the most: ▪ Employment and capital expenditure; and ▪ Construction of surface infrastructure
	Multiplier effects on the local economy	All project activities, which involves expenditure, especially the following ▪ Employment and capital expenditure; ▪ Construction of surface infrastructure; and ▪ Implementation of SLP and Social Performance Policies.
	Community development and social upliftment	All project activities which are necessary to sustain the construction and functioning of the Project, as the Project as a whole is obligated to adhere to its SLP and other community development triggers, however the following activities will be the primary triggers: ▪ Employment and capital expenditure; ▪ Construction of surface infrastructure; and ▪ Implementation of SLP and Social Performance Policies.
Negative	Displacement-related impacts	The following activities will be the primary triggers of direct displacement related impacts: ▪ Land acquisition; ▪ Undermining of surface and business structures; ▪ Site clearance; and ▪ Blasting and excavation.
	Disruption of movement patterns	The following activities will disrupt movement: ▪ Blasting and excavation; ▪ Construction of surface Infrastructure; and ▪ Hauling/conveying of Coal.

Type	Impact name	Activities triggering impact
	Influx related impacts	All project activities will contribute to this impact, as it is the perception of the entire Project, as opposed to particular activities, which triggers influx. However, the following activities are usually the main drivers of influx: ▪ Employment and operational expenditure; ▪ Construction of surface Infrastructure; and ▪ Plant and equipment operations.
	Impact on community health and safety	All project activities will have some inherent risk for human health, however the following activities could have the most significant health and safety impacts: ▪ Blasting and excavation; ▪ Construction of surface infrastructure; ▪ Water abstraction and use; ▪ Underground blasting and mining; ▪ Hauling/conveying of coal; ▪ Plant and equipment operations; ▪ Water use and storage; and ▪ Waste generation and storage.
	Loss of farm/ other labour	Activities triggering impact: ▪ Employment and operational expenditure; and ▪ Dismantling of major equipment and infrastructure.

Type	Impact name	Activities triggering impact
	Impacts on surrounding land users	Most project activities will contribute to impacts on surrounding land users (e.g. noise, dust, etc.), especially: ▪ Blasting and excavation; ▪ Construction of surface infrastructure; ▪ Water abstraction and use; ▪ Underground blasting and mining; ▪ Hauling/conveying of coal; ▪ Plant and equipment operations; and ▪ Water use and storage.
	Opposition because of perceived negative impacts	All project activities. Stakeholders usually form perceptions on the Project as whole and not individual activities. However it is anticipated that stakeholders would be inclined to submit grievances in relation to the impacts of the following activities: ▪ Blasting and excavation; ▪ Construction of surface infrastructure; ▪ Water abstraction and use; ▪ Underground blasting and mining; ▪ Hauling/conveying of coal; ▪ Plant and equipment operations; ▪ Water use and storage; and ▪ Waste generation and storage.
Positive	Employment creation during operational phase	Most project activities during operation will require a workforce.
	Economic development	The following activities will be the primary triggers of economic growth and diversification: Employment and project expenditure; ▪ Payment of royalties and taxes; ▪ Successful implementation of SLP; and ▪ Plant and equipment operations.

Type	Impact name	Activities triggering impact
Negative	Dependency on mine for sustaining the local economy, including	Activities triggering impact: ▪ Employment and operational expenditure; and ▪ Dismantling of major equipment and infrastructure.

The impacts of the construction phase are rated in the Table 11-64 to Table 11-73.

Table 11-64: Impact of Employment Creation

Dimension	Rating	Motivation	Significance
Impact Description: Employment Creation During Construction			
Prior to mitigation/ management			
Duration	Medium term (3)	Construction activities will take place during the first three years of the life of Mine and again during year 23	Minor - positive (36)
Extent	Local (3)	Majority of workforce will likely originate from the local labour pool, but it is likely that some employees will be from areas outside the tertiary study area	
Intensity	Moderate - positive (3)	Recruitment policies already promote local employment; however employment numbers expected to be low and for short period. It is possible that contractors will use their existing workforce, thereby sustaining current employment with these companies.	
Probability	Probable (4)	Without appropriate mitigation, local employment targets might not be achieved.	
Mitigation			
▪ It is recommended that Umcebo host a consultation meeting with the Hendrina community should their applications for the relevant authorizations be successful. This meeting should take place prior to the commencement of any construction activities. The objective of the meeting should be to share information relating to opportunities (jobs, procurement, LED projects etc.) and to establish communication lines between the mine and the community; ▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle); ▪ Promotion of local, female and youth employment; ▪ Where possible labour-intensive construction methods should be promoted; ▪ Verification of local status in consultation with community representatives, municipal structures and landowners ▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available; ▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit; ▪ Expand skills development to surrounding communities; ▪ Recruitment via a registry of job seekers and potentially coordinated through the Department of Labour (DoL); ▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training; and			

Dimension	Rating	Motivation	Significance
▪ Monitoring subcontractors in terms of local employment targets.			
Post-Mitigation			
Duration	Medium term (3)	Construction activities will take place during the first three years of the life of Mine and again during year 23	Moderate - positive (84)
Extent	Local (3)	Majority of workforce will likely originate from the local labour pool, but it is likely that some employees will be from areas outside the tertiary study area	
Intensity	Very high - positive (6)	Measures will ensure and potentially increase employment from local labour sending area, which will intensify positive change, especially among economically depressed households.	
Probability	Certain (7)	Mitigation will maximise probability that local recruitment targets are achieved and benefits optimised.	

Table 11-65: Impact on Multiplier Effects on the Local Economy

Dimension	Rating	Motivation	Significance
Impact Description: Multiplier Effects On The Local Economy			
Pre-Enhancement			
Duration	Project Life (5)	Will continue throughout the life of mine as per stipulations of MPRDA and will only taper down after closure	Minor - positive (44)
Extent	Regional (4)	Will mostly include impacts in the secondary but also in the tertiary study area	
Intensity	Low - positive (2)	Will derive from increased cash flow, stimulation of economic sectors, procurement, economic growth, increased local markets, and LED and HRD initiatives	
Probability	Probable (4)	Will depend on: proportion of local spending by employees; capacity of local enterprises to supply; effectiveness of LED and HRD initiatives.	
Mitigation			

Dimension	Rating	Motivation		Significance
▪ Give preference first to capable local service providers; ▪ Develop local service provision capacity; ▪ Monitoring of sub-contractors procurement; ▪ Development of a register of local Small, Medium and Micro-sized Enterprises (SMMEs); ▪ Linkages with skills development/ SMME development institutions and other mining operations; ▪ SMME skills development as part of mine SLP/ LED commitments; and ▪ Local procurement targets should be formalised in Umcebo's procurement policy.				
Post-Mitigation				
Duration	Project Life (5)	Will continue throughout the life of mine as per stipulations of MPRDA and will only taper down after closure	Consequence: Highly beneficial (15)	Moderate - positive (90)
Extent	Regional (4)	Will mostly include impacts in the secondary but also in the tertiary study area		
Intensity	Very high - positive (6)	Mitigation will likely increase intensity of multiplier effects as it will concentrate impact to local area; sustainability of initiatives outlined in the SLP will also be increased if aligned with other those of other institutions		
Probability	Highly probable (6)	Increased local employment and procurement as well as skilled SMMEs will enhance likelihood of benefits to local economy		

Table 11-66: Impact on Community Development and Social Upliftment

Dimension	Rating	Motivation	Significance
Impact Description: Community Development And Social Upliftment			
Pre-Mitigation			
Duration	Project Life (5)	Will continue for the life of mine (36 years).	Minor - positive (36)
Extent	Limited (2)	Will benefit mine workers and some beneficiaries of LED projects, as well as HDSA vendors within local communities	
Intensity	Low - positive (2)	Small percentage of local population will benefit	

Dimension	Rating	Motivation	Significance
Probability	Probable (4)	Without adequate stakeholder involvement, LED and Skills Development projects is unlikely to be sustainable.	
Mitigation:			
• Liaison with beneficiaries to ensure needs are met; • Collaboration with other developmental role players during implementation; • Expanding skills development and capacity building programmes to non-employees; • Establish external monitoring system to regulate HDSA procurement • Where feasible, training should be National Qualifications Framework (NQF) accredited; and • A record of training courses completed per individual should be kept.			
Post-Mitigation			
Duration	Beyond project life (6)	If well managed, LED and skills development benefits could be sustainable beyond project life	Moderate - positive (84)
Extent	Local (3)	Will benefit mine workers and some beneficiaries of LED projects, as well as HDSA vendors within local communities	
Intensity	High - positive (5)	Recommended measures will result in greater development within surrounding communities	
Probability	Highly probable (6)	Recommended measures will increase probability of socio-economic development initiatives having the desired effect	

Table 11-67: Displacement Related Impacts

Dimension	Rating	Motivation	Significance
Impact Description: Displacement Related Impacts			
Pre-Mitigation			
Duration	Permanent (7)	Affected households and agricultural uses will be permanently displaced.	Major - negative (-112)
Extent	Limited (2)	A relatively small number of individuals in the primary study area will be directly displaced, with a comparatively larger number of people being exposed to indirect displacement impacts	
Intensity	Extremely high - negative (-7)	Displacement will have a major impact on the livelihood of especially vulnerable individuals and their dependants	

Dimension	Rating	Motivation	Significance
Probability	Certain (7)	Nature and location of the Project will inevitably result in the displacement of households, agricultural land, grazing and associated livelihoods, if existing mining plan is executed	
Mitigation:			
▪ Umcebo should where possible endeavour to minimise the extent of, displacement through project design, where displacement cannot be minimised the following measures are recommended to alleviate the adverse impacts: ▪ Umcebo should finalise the Project layout plan and determine its policy and approach to displacement, as this would inform the extent of resettlement, i.e. whether it will recognise both direct and indirect forms of displacement; ▪ Where a selling price cannot be determined by negotiation a sales agreement should be negotiated which reflects the holistic value (determined by a professional valuer) of the land and should also be inclusive of the potential relocation cost of commercial farms and/or business operations; ▪ The displacement of non-vulnerable households and individuals should be considered on a case-by-case basis; ▪ Areas impacted upon during construction should be rehabilitated upon completion of the construction activities to ensure that the land is returned in the same condition; ▪ Prior to finalising the sales agreement of land, it should be clear who will assume responsibility for the resettlement of the vulnerable household; ▪ If Umcebo assumes responsibility for the physically displaced household, due process should be followed when the household is relocated. It is recommended that the process be aligned to IFC Performance Standards (PS) 5; ▪ Consider including employees and other impacted businesses in the aforementioned process; and ▪ The conveyor between Mooivley West and Hendrina South should be aligned along farm boundaries as far as practically possible to reduce the degree of property fragmentation.			
Post-Mitigation			
Duration	Permanent (7)	Affected households and agricultural uses will be permanently displaced.	Moderate - negative (-78)
Extent	Very limited (1)	Mitigation measures could minimize the extent of displacement if the undermining areas where settlements occur are avoided.	
Intensity	High - negative (-5)	Adequate mitigation will reduce adverse effects of displacement	
Probability	Highly probable (6)	Measures would decrease the probability of impacts occurring to the extent predicted	

Table 11-68: Impacts on Disruption of Daily Movement Patterns

<table>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Impact Description: Disruption Of Daily Movement Patterns</td></tr>
<tr><td colspan="4">Pre-Mitigation</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>Will be most pronounced during construction phase, but continue into operations as a result of haul trucks, as well as into decommissioning when infrastructure will be removed</td><td rowspan="4">Moderate - negative (-78)</td></tr>
<tr><td>Extent</td><td>Regional (4)</td><td>Will mostly affect road users using the N11, Davel Road and affected gravel roadways; as well as livestock farmers</td></tr>
<tr><td>Intensity</td><td>Moderately high - negative (-4)</td><td>Traffic impact assessment, predicted a significant impact on traffic loads in the local road network; however some impact will stem from deterioration of local roads due to HMV.</td></tr>
<tr><td>Probability</td><td>Highly probable (6)</td><td>Construction and operational traffic will affect travelling on major roads</td></tr>
<tr><td colspan="4">Mitigation:</td></tr>
<tr><td colspan="4">
Measures to prevent deterioration of roads suggested in Traffic Impact Assessment (Aurecon, 2016);
Regulation of traffic at intersections between the N11 and Davel Road and access roads to construction and operational sites;
Road upgrading measures should be investigated and implemented in conjunction with the relevant government department;
Inform communities of planned construction activities that would affect vehicle/ pedestrian traffic;
Ensure that access to key services in areas such as Hendrina are uninterrupted by providing alternative access routes;
Construction of livestock crossings at suitable intervals should be incorporated into project design; and
Livestock farmers and regular road users should be consulted with regard to placement of crossings.
</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>Will be most pronounced during construction phase, but continue into operations as a result of haul trucks, as well as into decommissioning when infrastructure will be removed</td><td rowspan="2">Minor - negative (-44)</td></tr>
<tr><td>Extent</td><td>Regional (4)</td><td>Will mostly affect road users using the N11, Davel Road and affected gravel roadways; as well as livestock farmers</td></tr>
</table>

Dimension	Rating	Motivation	Significance
Intensity	Low - negative (-2)	Mitigation measures should be effective in reducing severity of impacts	
Probability	Probable (4)	Mitigation will reduce the likelihood of this impact occurring to the extent predicted	

Table 11-69: Influx Related Impacts

Dimension	Rating	Motivation	Significance
Impact Description: Influx Related Impacts			
Pre-Mitigation			
Duration	Beyond project life (6)	Likely to extend into the decommissioning phase, especially if social pathologies such as HIV/ AIDs and other communicable diseases are left un-mitigated	Moderate - negative (-90)
Extent	Local (3)	Will mostly affect settlements within the primary and secondary study area	
Intensity	Very high - negative (-6)	Influx will likely exacerbate existing negative social conditions in several ways: increased social pathologies, pressure on service, conflict between locals and non-locals and establishment of informal settlements	
Probability	Highly probable (6)	Pressure on services and growth of informal settlements is already a problem	
Mitigation:			
▪ Develop an Influx management plan together with other industry role players and government; ▪ Discourage influx of job-seekers by prioritising employment of unemployed members of local communities; ▪ Liaise with local municipalities to ensure that expected population influx is taken into account in infrastructure development and spatial development planning; ▪ Create synergies with local government IDP and other companies' SLP/ Corporate Social Responsibility (CSR) projects to promote infrastructure development; ▪ Extensive HIV/ AIDS awareness and general health campaign; ▪ Identify if recorded criminal activities involving members of the mine's workforce; ▪ Establishment of anti-poaching mechanism in consultation with potentially affected land owners; - Clear identification of workers; prevention of loitering; ▪ Liaison with police, community policing forum; ▪ Promote projects providing housing, especially low cost housing; and ▪ Measures to address potential conflict between locals and non-locals.			
Post-Mitigation			
Duration	Project Life (5)	Likely to extend into the decommissioning phase, especially if social pathologies such as HIV/ AIDs and other communicable diseases are left un-mitigated	Minor - negative (-40)
Extent	Limited (2)	Measures to address influx will limit the extent, especially through proactive spatial development planning	

Dimension	Rating	Motivation	Significance
Intensity	Moderate - negative (-3)	Mitigation measures should be effective in reducing severity of impacts to a limited degree	
Probability	Probable (4)	Mitigation will reduce the likelihood of this impact occurring to the extent predicted	

Table 11-70: Impacts on Community Health and Safety (Refer to Section 11.1.7.1 of the SIA Appendix 12)

Dimension	Rating	Motivation	Significance
Impact Description: Impacts On Community Health And Safety			
Pre-mitigation			
Duration	Beyond project life (6)	Will continue for the duration of the project	Moderate - negative (-90)
Extent	Local (3)	Will affect the primary study area and likely affect local roads	
Intensity	Very high - negative (-6)	Accidents could have fatal consequences. Could place the lives of employees, land occupants and road users at risk, especially those travelling on the Davel and N11 Roads.	
Probability	Highly probable (6)	The activities to be undertaken by the proposed project (Table 11-1) will result in an increase of health and safety impacts.	
Mitigation:			
▪ Access control to all project elements, including fencing; ▪ Notification of blasting activities; ▪ Storage of blasting and hazardous materials should adhere to prescribed regulation (Explosives Act, 1956 (Act No. 26 of 1956)); ▪ Measures suggested minimising the impact of fly-rock on surrounding roads and structure (Blast Management and Consulting, 2016); ▪ Measures suggested in the Traffic Impact Assessment to minimize traffic related accidents (Aurecon, 2016); and ▪ Road maintenance.			
Post-mitigation			
Duration	Beyond project life (6)	Will continue for the duration of the project	Minor - negative (-39)

Dimension	Rating	Motivation	Significance
Extent	Local (3)	Will affect the primary study area and likely affect local roads	
Intensity	Moderately high - negative (-4)	Appropriate mitigation will reduce the risk of this impact; however, fatal accidents will not be entirely prevented	
Probability	Unlikely (3)	Impacts will still occur, albeit not to the degree it was initially expected	

Table 11-71: Loss of Farm/Other Labour to the Mine

Dimension	Rating	Motivation	Significance
Impact Description: Loss Of Farm/Other Labour To The Mine			
Pre-Mitigation			
Duration	Medium term (3)	Is expected to peak during ramp-up of construction, when new workers are recruited	Minor - negative (-36)
Extent	Local (3)	Will impact on surrounding landowners	
Intensity	Moderate - negative (-3)	Local labour pool unlikely to be depleted	
Probability	Probable (4)	Mining will likely offer more desired employment	
Mitigation:			
▪ Avoid recruitment on farms; ▪ Persons applying for jobs with construction or operational contractors are to be informed that such jobs are temporary; and ▪ Adhere to labour legislation.			
Post-Mitigation			
Duration	Medium term (3)	Is expected to peak during ramp-up of construction, when new workers are recruited	Negligible - negative (-32)
Extent	Local (3)	Will impact on surrounding landowners	
Intensity	Low - negative (-2)	Mitigation is likely to reduce the severity of the impact on farm owners	
Probability	Probable (4)	Mining will likely offer more desired employment	

Table 11-72: Impact on Surrounding Land Users

Dimension	Rating	Motivation	Significance

Dimension	Rating	Motivation	Significance
Impact Description: Impact On Surrounding Land Users			
Pre-Mitigation			
Duration	Beyond project life (6)	Residual impacts could occur beyond the life of mine, especially if rehabilitation is not executed	Moderate - negative (-84)
Extent	Limited (2)	Project area and neighbouring settlements	
Intensity	Very high - negative (-6)	- Mine could impact on visual character of area and on peoples' sense of place. - Mine could impact on viability of current economic activities on neighbouring properties - Mine may impact on existing water sources.	
Probability	Highly probable (6)	Impacts are largely unavoidable as a result of mining activities	
Mitigation:			
▪ Refer to recommendations of specialist studies; ▪ Optimise mine plan/infrastructure placement to avoid/minimise negative impacts, especially in terms of visual intrusion, displacement, air quality and disruptions of traffic; ▪ Implement measure to create an environment that can contribute positively to stakeholders affected by it. For example, farmers might have to fend against poachers stealing livestock from farms or fight veld fires. The Project has resources that can assist the farmers, and should reach an understanding with these stakeholders about how it could assist them in this regard; ▪ Undertake continuous information sharing and consultation with adjacent/affected farm owners; and ▪ Implement communication mechanisms to report changes in water quality/quantity, air quality or vibrations.			
Post-Mitigation			
Duration	Project Life (5)	Adequate mitigation of bio-physical and socio-economic impacts and successful decommissioning will likely limit duration of impacts	Minor - negative (-40)
Extent	Limited (2)	Project area and neighbouring settlements	
Intensity	Moderate - negative (-3)	Mitigation will lessen physical impacts. Affected people likely to adapt over time	
Probability	Probable (4)	Impacts will still occur, albeit not to the degree initially expected	

Table 11-73: Opposition Because of Perceived Negative Impacts

<table>
<tr><th>Dimension</th><th>Rating</th><th colspan="2">Motivation</th><th>Significance</th></tr>
<tr><td colspan="5">Impact Description: Opposition Because Of Perceived Negative Impacts</td></tr>
<tr><td colspan="5">Pre-Mitigation</td></tr>
<tr><td>Duration</td><td>Beyond project life (6)</td><td colspan="2">May continue throughout the life of the operation, and potentially affecting Umcebo's Social Licence to Operate neighbouring mines.</td><td rowspan="4">Minor - negative (-70)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td colspan="2">Will not only elicit opposition from primary study area, but stakeholders in the broader area (e.g. activist groups).</td></tr>
<tr><td>Intensity</td><td>High - negative (-5)</td><td colspan="2">Could lead to negative publicity for the company; community mobilisation against the project affecting construction progress or operational efficiency.</td></tr>
<tr><td>Probability</td><td>Likely (5)</td><td colspan="2">Stakeholders, especially private landowners, are sensitive towards many possible impacts that may result from development.</td></tr>
<tr><td colspan="5">Mitigation</td></tr>
<tr><td colspan="5">
Communicate commitments regarding LED projects;
Transparency regarding employment practices;
Presentation of EIA findings in clear and understandable manner;
Monitor community attitudes to anticipate/prevent active opposition through grievances lodged through community forum and a formal grievance mechanism;
Establish a community forum; and
Appointment of a CLO / Stakeholder Engagement / Community offices to enhance communication.
</td></tr>
<tr><td colspan="5">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Beyond project life (6)</td><td>May continue throughout the life of the operation, and potentially affecting Umcebo's Social Licence to Operate neighbouring mines.</td><td rowspan="3">Consequence: Moderately detrimental (-10)</td><td rowspan="3">Negligible - negative (-30)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>Will not only elicit opposition from primary study area, but stakeholders in the broader area (e.g. activist groups).</td></tr>
<tr><td>Intensity</td><td>Very low - negative (-1)</td><td>Widespread awareness of project benefits will increase probability of generating goodwill</td></tr>
</table>

Dimension	Rating	Motivation	Significance
Probability	Unlikely (3)	Mitigation will reduce the probability of the impact occurring as opposed to reversing the nature of the impact.	

11.9.2 Operational Phase

This section deals with the socio-economic impacts that will be triggered by activities that will commence during the operational phase of the proposed Project. The only impacts identified in Section 11.9.1 that will not continue into the operational phase are construction-related employment creation. Additional impacts expected to arise during the operational phase have been summarised in Table 11-74 and include three positive impacts (operational employment, growth and diversification of the economy and skills development).

Table 11-74: Socio-Economic Impacts Associated with the Operational Phase

Type	Impact name	Activities triggering impact
Positive	Employment creation during operational phase	Most project activities during operation will require a workforce.
	Economic development	The following activities will be the primary triggers of economic growth and diversification: ▪ Employment and project expenditure; ▪ Payment of royalties and taxes; ▪ Successful implementation of SLP; and ▪ Plant and equipment operations.

The impacts of the operational phase are rated in the Table 11-75 and Table 11-76.

Table 11-75: Employment Creation during Operation

Dimension	Rating	Motivation	Significance
Impact Description: Employment Creation During Operation			
Pre- Mitigation			
Duration	Project Life (5)	Equal to the duration of the operational phase	Minor - positive (55)
Extent	Regional (4)	Many positions will be filled by persons living in the municipal ward and regional municipal area; some from elsewhere in the Province.	
Intensity	Low - positive (2)	Limited employment opportunities will be available for un- and semi-skilled individuals	
Probability	Likely (5)	Without appropriate mitigation, forecasts of majority local recruitment might not be achieved	

<table>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Mitigation</td></tr>
<tr><td colspan="4">Apply measures to enhance local employment during construction phase where possible e.g:
▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle);
▪ Promotion of local, female and youth employment;
▪ Where possible labour-intensive construction methods should be promoted;
▪ Verification of local status in consultation with community representatives, municipal structures and landowners;
▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available;
▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit;
▪ Expand skills development to surrounding communities;
▪ Recruitment via a registry of job seekers and potentially coordinated through the Department of Labour (DoL);
▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training;
▪ Monitoring subcontractors in terms of local employment targets; and
▪ Provide focused training to construction phase employees from the host communities to increase their chances for employment during the operations.
Measures recommended to maximise benefits from local employment, and economic multiplier effects:
▪ Give preference first to capable local service providers;
▪ Develop local service provision capacity;
▪ Monitoring of sub-contractors procurement;
▪ Development of a register of local SMMEs;
▪ Linkages with skills development/ SMME development institutions and other mining operations;
▪ SMME skills development as part of mine SLP/LED commitments;
▪ Local procurement targets should be formalised in Umcebo's procurement policy; and
▪ The Project’s database of the local labour pool should be updated to include people who were employed by the Project during the construction phase.</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>Equal to the duration of the operational phase</td><td rowspan="3">Moderate - positive (90)</td></tr>
<tr><td>Extent</td><td>Regional (4)</td><td>Many positions will be filled by persons living in the municipal ward and regional municipal area; some from elsewhere in the Province.</td></tr>
<tr><td>Intensity</td><td>Very high - positive (6)</td><td>Mitigation will maximise local job creation</td></tr>
</table>

Dimension	Rating	Motivation	Significance
Probability	Highly probable (6)	Mitigation will maximise probability that local recruitment targets are achieved and local benefits optimised.	

Table 11-76: Impact on Economic Growth and Diversification

Dimension	Rating	Motivation	Significance
Impact Description: Economic Growth And Diversification			
Pre-Mitigation			
Duration	Project Life (5)	Expenditure on procurement, wages and royalties will continue for the entire life of Mine	Minor - positive (44)
Extent	Regional (4)	Royalties and taxes will aid regional development; contribution to regional infrastructure projects (if any) - culmination of positive economic effects will stimulate regional economic growth, mining will diversify current economic profile	
Intensity	Low - positive (2)	Effects on regional economy will not be as pronounced (Impacts on the local economy are discussed under Multiplier effects on the local economy – see Section 11.1.2 of the SIA (Appendix 12)	
Probability	Probable (4)	Umcebo is obliged by law to pay royalties and taxes, and some economic multiplier effects will spill-over into regional economic development	
Mitigation			

<table>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Measures recommended to maximise benefits from local employment, economic multiplier effects, as well as community, economic and skills development, as follows:
▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle);
▪ Promotion of local, female and youth employment;
▪ Where possible labour-intensive construction methods should be promoted;
▪ Verification of local status in consultation with community representatives, municipal structures and landowners;
▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available;
▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit;
▪ Expand skills development to surrounding communities;
▪ Recruitment via a registry of job seekers and potentially coordinated through the Department of Labour (DoL);
▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training;
▪ Monitoring subcontractors in terms of local employment targets; and
▪ Provide focused training to construction phase employees from the host communities to increase their chances for employment during the operations.
Measures recommended to maximise benefits from local employment, and economic multiplier effects:
▪ Give preference first to capable local service providers;
▪ Develop local service provision capacity;
▪ Monitoring of sub-contractors procurement;
▪ Development of a register of local SMMEs;
▪ Linkages with skills development/ SMME development institutions and other mining operations;
▪ SMME skills development as part of mine SLP/LED commitments;
▪ Local procurement targets should be formalised in Umcebo's procurement policy.
▪ Procure from local HDSA suppliers throughout the life of the mine, where applicable; and
▪ Establish a monitoring system to ensure that the mine and its contractors comply with government regulations.</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Beyond Project Life (6)</td><td>Successful mitigation will prolong benefits of economic development beyond life of mine</td><td rowspan="2">Moderate - positive (90)</td></tr>
<tr><td>Extent</td><td>Regional (4)</td><td>Royalties and taxes will aid regional development; contribution to regional infrastructure projects (if any) - culmination of positive economic effects will stimulate regional economic growth, mining will diversify current economic profile</td></tr>
</table>

Dimension	Rating	Motivation	Significance
Intensity	High - positive (5)	Successful mitigation will create an environment conducive for economic growth	
Probability	Highly probable (6)	Mitigation will increase the chance of the manifestation of this impact	

11.9.3 Decommissioning and Closure Phase

The eventual termination of the Mine's operating life would inevitably result in several socio-economic consequences. It should be noted that any predictions concerning the characteristics of the receiving socio-economic environment at the time of decommissioning (LoM is a minimum of 36) are subject to a large margin of error, thus significantly reducing the accuracy of impact assessment. Several socio-economic impacts could arise when the Mine is decommissioned and should therefore form part of the scope of study when the EIA for decommissioning of the Project is planned.

Most socio-economic impacts related to decommissioning are related to dependencies created by the Project throughout its operations. A summary of the socio-economic impacts for the decommissioning and closure phase are provided in Table 11-77. A more detailed description of this impact and potential mitigation measures are provided below in Table 11-78.

Table 11-77: Socio-Economic Impacts Associated with the Decommissioning and Closure Phase

Type	Impact name	Activities triggering impact
Negative	Dependency on mine for sustaining the local economy, including	Activities triggering impact: ▪ Employment and operational expenditure; and ▪ Dismantling of major equipment and infrastructure.

Table 11-78: Dependency on Mine for Sustaining Local Economy

Dimension	Rating	Motivation	Significance
Impact Description: Dependency On Mine For Sustaining Local Economy			
Pre-Mitigation			
Duration	Long term (4)	Effects of retrenchments/ decommissioning will be long-lasting	Moderate - negative (-84)
Extent	Regional (4)	Will most severely affect employees and service providers from the local municipal area	

Dimension	Rating	Motivation	Significance
Intensity	Very high - negative (-6)	Local economy may become increasingly dependent on mining	
Probability	Highly probable (6)	The project will come to an end, and retrenchments are certain due to the finite duration of operational phase	
Mitigation:			
▪ Develop alternative and sustainable livelihoods for instance through LED programmes listed in the Mine's SLP; ▪ Collaborate with other industries to support the diversification of the local economy; ▪ The Mine's SLP should provide strategies and measures that reduce job loss through redeployment at other operations; ▪ Where feasible alternatives to save jobs/avoid downscaling should be investigated beforehand, including LED, potential redeployment at other operation; ▪ Develop a Mine Closure Plan; ▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where; retrenchment and/or closure of the mine are certain. In particular through promoting economic diversification, portable skills development and local economic development where possible; and ▪ Partner with the relevant government departments, to jointly manage Closure process.			
Post-Mitigation			
Duration	Medium term (3)	Successful mitigation will reduce the duration of the impact	Minor - negative (-40)
Extent	Regional (4)	Will most severely affect employees and service providers from the local municipal area	
Intensity	Moderate loss - negative (-3)	Mitigation will slightly reduce the impact of retrenchment; however job losses will still have major implications for a large number of people and their dependants.	
Probability	Probable (4)	Mitigation will reduce the probability of impact occurring to the severity predicted	

11.10 Visual Impact Assessment

The project activities listed in Table 11-1 will be rated according to the visual impact they will have on the receiving environment, i.e. the environment before development. Negative visual impacts decrease the visual character of the pre-development environment. Neutral visual impacts assist to minimise the negative visual impacts of a development but don't result in a positive visual impact. A positive visual impact only occurs when an area is rehabilitated to a state that is better than the state of the pre-development environment, e.g. a mining area on previously agricultural land is rehabilitated to an area of natural vegetation and all visible signs of agriculture and mining are removed. Positive visual impacts rarely occur.

Where the impact ratings are the same for the two mining areas (Mooivley West and Hendrina South on the one hand, and Mooivley East on the other) only one impact rating table is provided. Two impact rating tables are provided where the impact ratings differ for the two mining areas. These differences are due to the proximity of receptors to the proposed activities and the LOM for each of the mining areas.

This impact assessment is based on the viewshed model that was run for Mooivley West and Hendrina South and Mooivley East. These viewsheds can be viewed in the visual specialist study (Appendix 13).

11.10.1 Construction Phase

The construction phase will have negative visual impacts on the receiving environment. The following interactions and resultant impacts that may have a visual impact during the construction phase have been discussed in Table 11-79.

Table 11-79: Interactions and Impacts during the Construction Phase on Visual Aspects

Interaction	Impact
Site clearance and vegetation removal	Site clearance and vegetation removal will have a negative visual impact on the receiving environment. The project area will become noticeable to nearby receptors as it will contrast the surrounding areas.
Topsoil removal and stockpiling	Topsoil removal and stockpiling will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact.
Blasting and excavation	Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment.
Change of land use from agriculture to mining	Change of land use from agriculture to mining will have a negative visual impact on the receiving environment. This change of land use will change the sense of place of the project area and surrounds from an agricultural sense of place to an industrial/ mining sense of place resulting in a loss of scenic character and increased visual disturbance.
Construction of surface infrastructure	The construction of surface infrastructure will have a negative visual impact on the receiving environment. The surface infrastructure will change the sense of place of the project area from a rural sense of place to an industrial/ mining sense of place. Construction area lighting at night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place.

The rating table below summarises and calculates the visual impact and its significance during the construction phase in terms of the duration, extent, intensity and probability (refer to Table 11-80 - Table 11-86).

Table 11-80: Potential Impacts of Site Clearance on the Visual Aspects – Mooivley West and Hendrina South

<table>
<tr><th colspan="4">Activity and Interaction (Site Clearance)</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Impact Description: Site clearance and vegetation removal will have a negative visual impact on the receiving environment. The project area will become noticeable to nearby receptors as it will contrast the surrounding areas.
Topsoil removal and stockpiling will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact.</td></tr>
<tr><td colspan="4">Prior to Mitigation / Management</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>The impact will occur during the construction phase which is expected to last for three years and remain for the duration of the proposed project.</td><td rowspan="5">Minor negative (-77)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>The practical viewshed model indicates that the Project will be visible from a distance of up to five km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.</td></tr>
<tr><td>Intensity</td><td>Moderate (3)</td><td>The activity is expected to cause a moderate visual disturbance. The project area will become noticeable to nearby receptors as it will contrast the surrounding areas. Dust from the stockpiles will have a negative visual impact on the receiving environment.</td></tr>
<tr><td>Probability</td><td>Definite (7)</td><td>The impact will definitely occur.</td></tr>
<tr><td>Nature</td><td>Negative</td><td></td></tr>
<tr><td colspan="4">Mitigation / Management Actions</td></tr>
<tr><td colspan="4">Vegetation should only be removed when and where necessary;
Topsoil should only be removed when and where necessary;
Topsoil stockpiles should be vegetated with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum) where possible so as to blend into the surrounding landscape and reduce dust generation;
Limit footprint area of topsoil stockpiles where possible;
Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; and
Apply dust suppression techniques to limit the dust generated from stockpiles.</td></tr>
</table>

Activity and Interaction (Site Clearance)			
Dimension	**Rating**	**Motivation**	**Significance**
Post-Mitigation			
Duration	Project Life (5)	The impact will occur during the construction phase which is expected to last for three years and remain for the duration of the proposed project.	Minor negative (-63)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minor (2)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-81: Potential Impacts of Site Clearance on the Visual Aspects – Mooivley East

Activity and Interaction (Site Clearance)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Site clearance and vegetation removal will have a negative visual impact on the receiving environment. The project area will become noticeable to nearby receptors as it will contrast the surrounding areas. Topsoil removal and stockpiling will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact.			
Prior to Mitigation/ Management			
Duration	Project Life (5)	The impact will occur during the construction phase which is expected to last for three years and remain for the duration of the proposed project.	Minor negative (-84)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to five km. There are 62 farm residences and seven heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual exposure) towns are within the	

Activity and Interaction (Site Clearance)			
Dimension	**Rating**	**Motivation**	**Significance**
		practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Serious (4)	The activity is expected to cause a serious visual disturbance. The project area will become noticeable to nearby receptors as it will contrast the surrounding areas. Dust from the stockpiles will have a negative visual impact on the receiving environment.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation / Management Actions			
▪ Vegetation should only be removed when and where necessary; ▪ Topsoil should only be removed when and where necessary; ▪ Topsoil stockpiles should be vegetated with grasses (*Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas* and *Panicum maximum*) where possible so as to blend into the surrounding landscape and reduce dust generation; ▪ Limit footprint area of topsoil stockpiles where possible; ▪ Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.			
Post-Mitigation			
Duration	Project Life (5)	The impact will occur during the construction phase which is expected to last for three years.	Minor negative (-70)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Moderate (3)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-82: Potential Impacts of Blasting and Excavation on the Visual Aspects – Mooivley West and Hendrina South

Activity and Interaction (Blasting and Excavation)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment.			
Prior to Mitigation / Management			
Duration	Medium Term (3)	The impact will occur during the construction phase which is expected to last for three years.	Minor negative (-48)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to five km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.	
Intensity	Minor (2)	Dust from blasting and excavation for shaft development is expected to cause a minor visual disturbance.	
Probability	Almost Certain / Highly Probable (6)	The impact will almost certainly occur.	
Nature	Negative		
Mitigation/ Management Actions			
▪ Apply dust suppression techniques to limit the dust generated from blasting.			
Post-Mitigation			
Duration	Medium Term (3)	The impact will occur during the construction phase which is expected to last for 3 years.	Negligible negative (-24)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minimal (1)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Probable (4)	The probability of the impact occurring will be reduced by mitigation.	

Activity and Interaction (Blasting and Excavation)			
Dimension	**Rating**	**Motivation**	**Significance**
Nature	Negative		

Table 11-83: Potential Impacts of Blasting and Excavation on the Visual Aspects – Mooivley East

Activity and Interaction (Blasting and Excavation)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment.			
Prior to Mitigation / Management			
Duration	Medium Term (3)	The impact will occur during the construction phase which is expected to last for 3 years.	Minor negative (-54)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 7 heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Moderate (3)	Dust from blasting and excavation for shaft development is expected to cause a moderate visual disturbance.	
Probability	Almost Certain / Highly Probable (6)	The impact will almost certainly occur.	
Nature	Negative		
Mitigation / Management Actions			
▪ Apply dust suppression techniques to limit the dust generated from blasting.			
Post-Mitigation			

Activity and Interaction (Blasting and Excavation)			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Medium Term (3)	The impact will occur during the construction phase which is expected to last for 3 years.	Negligible negative (-28)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minor (2)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Probable (4)	The probability of the impact occurring will be reduced by mitigation.	
Nature	Negative		

Table 11-84: Potential Impacts of Construction of Surface Infrastructure on the Visual Aspects

Activity and Interaction (Change of Land Use)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Change of land use from agriculture to mining will have a negative visual impact on the receiving environment. This change of land use will change the sense of place of the project area and surrounds from an agricultural sense of place to an industrial / mining sense of place resulting in a loss of scenic character and increased visual disturbance.			
Prior to Mitigation / Management			
Duration	Beyond Project Life (6)	The impact will remain until after the project area has been rehabilitated.	Major negative (-112)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 21 heritage sites within the practical viewshed area of Mooivley West and Hendrina South. There are 62 farm residences and 7 heritage sites within the practical viewshed area of Mooivley East. Road users on the N11 national route, the R38 and R542 regional routes, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina	

Activity and Interaction (Change of Land Use)			
Dimension	**Rating**	**Motivation**	**Significance**
		(mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Highly Irreplaceable (7)	Change of land use will result in a permanent change in the sense of place of the project area and surrounds.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation / Management Actions			

- Apply dust suppression techniques to limit the dust from the demolition area;
- Ensure all infrastructure is demolished;
- Limit the quantity and time of rubble stored on site;
- Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms;
- Rehabilitate all disturbed areas;
- Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography;
- Spread topsoil over the rehabilitated area;
- Ensure that surface water and drainage lines are rehabilitated;
- Re-vegetate the rehabilitated areas with grasses (*Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas* and *Panicum maximum*); and
- Ensure all the mitigation measures outlined in the Closure and Rehabilitation reports are conducted.

Post-Mitigation			
Duration	Beyond Project Life (6)	The impact will remain until after the project area has been rehabilitated.	Moderate negative (-91)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Very Serious (5)	The impact will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-85: Potential Impacts of Construction of Surface Infrastructure on the Visual Aspects – Mooivley West and Hendrina South

<table>
<tr><th colspan="4">Activity and Interaction (Construction of Surface Infrastructure)</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td colspan="4">Impact Description: The construction of surface infrastructure will have a negative visual impact on the receiving environment. The surface infrastructure will change the sense of place of the project area from a rural sense of place to an industrial / mining sense of place.
Construction area lighting at night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place.</td></tr>
<tr><td colspan="4">Prior to Mitigation / Management</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>The impact will occur for the duration of the project. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).</td><td rowspan="5">Moderate negative (-84)</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.</td></tr>
<tr><td>Intensity</td><td>Serious (4)</td><td>Construction of surface infrastructure is expected to cause a serious visual disturbance.</td></tr>
<tr><td>Probability</td><td>Definite (7)</td><td>The impact will definitely occur.</td></tr>
<tr><td>Nature</td><td>Negative</td><td></td></tr>
<tr><td colspan="4">Mitigation/ Management Actions</td></tr>
<tr><td colspan="4">▪ Ensure screening vegetation is left intact around the project area and near receptors;
▪ Ensure the surface infrastructure does not exceed the proposed heights;
▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible;
▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and
▪ Down lighting must be implemented for construction activities taking place at night to minimise light pollution.</td></tr>
<tr><td colspan="4">Post-Mitigation</td></tr>
<tr><td>Duration</td><td>Project Life (5)</td><td>The impact will occur for the duration of the project. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).</td><td>Moderate negative (-70)</td></tr>
</table>

Activity and Interaction (Construction of Surface Infrastructure)			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Moderate (3)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-86: Potential Impacts of Construction of Surface Infrastructure on the Visual Aspects – Mooivley East

Activity and Interaction (Construction of Surface Infrastructure)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: The construction of surface infrastructure will have a negative visual impact on the receiving environment. The surface infrastructure will change the sense of place of the project area from a rural sense of place to an industrial/ mining sense of place. Construction area lighting at night will have a negative visual impact on the receiving environment. The construction area lighting will be visible from afar and will draw attention to the project area. This will also have a negative impact on the sense of place.			
Prior to Mitigation/ Management			
Duration	Long Term (4)	The impact will occur for the duration of the project. Mooivley East will be mined from Year 23 to Year 31 (9 years). Construction activities for Mooivley East will commence during the mine life of Hendrina South and Mooivley West	Moderate negative (-84)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 7 heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	

Activity and Interaction (Construction of Surface Infrastructure)			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Very Serious (5)	Construction of surface infrastructure is expected to cause a very serious visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation/ Management Actions			
- Ensure screening vegetation is left intact around the project area and near receptors; - Ensure the surface infrastructure does not exceed the proposed heights; - Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; - Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and - Down lighting must be implemented for construction activities taking place at night to minimise light pollution.			
Post-Mitigation			
Duration	Long Term (4)	The impact will occur for the duration of the project. Mooivley East will be mined from Year 23 to Year 31 (nine years). Construction activities for Mooivley East will commence during the mine life of Hendrina South and Mooivley West.	Moderate negative (-70)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Serious (4)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

11.10.2 Operational Phase

The operational phase is characterised by mining, stockpiling, hauling and crushing processes. The operational phase is expected to have negative visual impacts on the receiving environment. The following interactions and resultant impacts that may have a visual impact during the operational phase have been discussed in Table 11-87.

Table 11-87: Interactions and Impacts during the construction phase on Visual Aspects

Interaction	Impact
Stockpiling	Stockpiling of material on the overburden stockpiles, waste rock berms and product stockpiles will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. The impact of the overburden stockpiles and waste rock berms will occur for the life of the Project. This impact will be reversed when the material is used to backfill the shafts during the closure phase.
Hauling of coal	Vehicular activity to haul coal will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact.
Plant and equipment operations	Dust from the crushing and screening plants will have a negative visual impact on the receiving environment. Operational area lighting at night will have a negative visual impact on the receiving environment. The operational area lighting will be visible at night and will draw attention to the project area. This will also have a negative impact on the sense of place.

The rating table below summarises and calculates the visual impact and its significance during operational phase in terms of the duration, extent, intensity and probability (refer to Table 11-88 - Table 11-93).

Table 11-88: Potential Impacts of Stockpiling on the Visual Aspects – Mooivley West and Hendrina South

Activity and Interaction (Stockpiling)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Stockpiling of material on the overburden stockpiles, waste rock berms and product stockpiles will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. The impact of the overburden stockpiles and waste rock berms will occur for the life of the Project. This impact will be reversed when the material is used to backfill the shafts during the closure phase.			
Prior to Mitigation/ Management			
Duration	Project Life (5)	The impact will occur for the duration of the operational phase. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).	Moderate negative (-84)

Activity and Interaction (Stockpiling)			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.	
Intensity	Serious (4)	Stockpiling of material and the associated dust is expected to cause a serious visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation/ Management Actions			
▪ Ensure the overburden stockpiles do not exceed the proposed height of 18 m; ▪ Ensure the product stockpiles do not exceed the proposed height of 10 m; ▪ Ensure the waste rock berms do not exceed the proposed height of 3 m; ▪ Limit the quantity and time of ROM stored on site; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.			
Post-Mitigation			
Duration	Project Life (5)	The impact will occur for the duration of the operational phase. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).	Moderate negative (-70)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Moderate (3)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-89: Potential Impacts of Stockpiling on the Visual Aspects – Mooivley East

Activity and Interaction: Stockpiling			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Stockpiling of material on the overburden stockpiles, waste rock berms and product stockpiles will have a negative visual impact on the receiving environment. Dust from the stockpiles will also have a negative visual impact. The impact of the overburden stockpiles and waste rock berms will occur for the life of the Project. This impact will be reversed when the material is used to backfill the shafts during the closure phase.			
Prior to Mitigation/ Management			
Duration	Long Term (4)	The impact will occur for the duration of the operational phase. Mooivley East will be mined from Year 23 to Year 31 (nine years).	Moderate negative (-84)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and seven heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Very Serious (5)	Stockpiling of material and the associated dust is expected to cause a very serious visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation / Management Actions			
▪ Ensure the overburden stockpiles do not exceed the proposed height of 18 m; ▪ Ensure the product stockpiles do not exceed the proposed height of 10 m; ▪ Ensure the waste rock berms do not exceed the proposed height of 3 m; ▪ Limit the quantity and time of ROM stored on site; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.			
Post-Mitigation			
Duration	Long Term (4)	The impact will occur for the duration of the operational phase. Mooivley East will be mined from Year 23 to Year 31 (nine years).	Moderate negative (-70)

Activity and Interaction: Stockpiling			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Serious (4)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-90: Potential Impacts of Hauling of Coal on the Visual Aspects – Mooivley West and Hendrina South

Activity and Interaction: Hauling of Coal			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Vehicular activity to haul coal will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact.			
Prior to Mitigation/ Management			
Duration	Project Life (5)	The impact will occur for the duration of the operational phase. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).	Minor negative (-60)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.	
Intensity	Minor (2)	Hauling of coal and the associated dust is expected to cause a minor visual disturbance.	
Probability	Almost Certain / Highly Probable (6)	The impact will almost certainly occur.	
Nature	Negative		
Mitigation/ Management Actions			

Activity and Interaction: Hauling of Coal			
Dimension	**Rating**	**Motivation**	**Significance**
▪ Limit the speed of vehicles on the haul roads to reduce dust; and ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust.			
Post-Mitigation			
Duration	Project Life (5)	The impact will occur for the duration of the operational phase. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).	Negligible negative (-32)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minimal (1)	The visual disturbance will be reduced by implementing the mitigation measures above.	
Probability	Probable (4)	The probability of the impact occurring will be reduced by mitigation.	
Nature	Negative		

Table 11-91: Potential Impacts of Hauling of Coal on the Visual Aspects – Mooivley East

Activity and Interaction: Hauling of Coal			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Vehicular activity to haul coal will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact.			
Prior to Mitigation/ Management			
Duration	Long Term (4)	The impact will occur for the duration of the operational phase. Mooivley East will be mined from Year 23 to Year 31 (nine years).	Minor negative (-60)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and seven heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual	

Activity and Interaction: Hauling of Coal			
Dimension	**Rating**	**Motivation**	**Significance**
		exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Moderate (3)	Hauling of coal and the associated dust is expected to cause a moderate visual disturbance.	
Probability	Almost Certain / Highly Probable (6)	The impact will almost certainly occur.	
Nature	Negative		
Mitigation/ Management Actions			
▪ Limit the speed of vehicles on the haul roads to reduce dust; and ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust.			
Post-Mitigation			
Duration	Long Term (4)	The impact will occur for the duration of the operational phase. Mooivley East will be mined from Year 23 to Year 31 (nine years).	Negligible negative (-32)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minor (2)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Probable (4)	The probability of the impact occurring will be reduced by mitigation.	
Nature	Negative		

Table 11-92: Potential Impacts of Plant and Equipment Operations on the Visual Aspects – Mooivley West and Hendrina South

Activity and Interaction: Plant and Equipment Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Dust from the crushing and screening plants will have a negative visual impact on the receiving environment. Operational area lighting at night will have a negative visual impact on the receiving environment. The operational area lighting will be visible at night and will draw attention to the project area. This will also have a negative impact on the sense of place.			
Prior to Mitigation / Management			
Duration	Project Life (5)	The impact will occur for the duration of the operational phase. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).	Moderate negative (-84)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.	
Intensity	Serious (4)	Dust from the crushing and screening plant and operational area lighting are expected to cause a serious visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation/ Management Actions			
▪ Apply dust suppression techniques to limit the dust generated from the crushing and screening plant; and ▪ Down lighting must be implemented for operational activities taking place at night to minimise light pollution.			
Post-Mitigation			
Duration	Project Life (5)	The impact will occur for the duration of the operational phase. Mooivley West and Hendrina South will be mined from Year 1 to Year 36 (36 years).	Moderate negative (-70)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	

Activity and Interaction: Plant and Equipment Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	Moderate (3)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Table 11-93: Potential Impacts of Plant and Equipment Operations on the Visual Aspects – Mooivley East

Activity and Interaction: Plant and Equipment Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Dust from the crushing and screening plants will have a negative visual impact on the receiving environment. Operational area lighting at night will have a negative visual impact on the receiving environment. The operational area lighting will be visible at night and will draw attention to the project area. This will also have a negative impact on the sense of place.			
Prior to Mitigation / Management			
Duration	Long Term (4)	The impact will occur for the duration of the operational phase. Mooivley East will be mined from Year 23 to Year 31 (nine years).	Moderate negative (-84)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and seven heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and Kwazamokuhle (mostly a very low visual exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Very Serious (5)	Dust from the crushing and screening plant and operational area lighting are expected to cause a very serious visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

Activity and Interaction: Plant and Equipment Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Mitigation/ Management Actions			
▪ Apply dust suppression techniques to limit the dust generated from the crushing and screening plant; and ▪ Down lighting must be implemented for operational activities taking place at night to minimise light pollution.			
Post-Mitigation			
Duration	Long Term (4)	The impact will occur for the duration of the operational phase. Mooivley East will be mined from Year 23 to Year 31 (nine years).	Moderate negative (-70)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Serious (4)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		

11.10.3 Decommissioning and Closure Phase

The decommissioning and closure phase is characterised by removal of infrastructure and surface rehabilitation. This phase will have a negative visual impact on the receiving environment; however, once the rehabilitation is complete there will be an overall neutral visual impact on the receiving environment.

Table 11-94: Interactions and Impacts during decommissioning and closure on the Visual Aspects

Interaction	Impact
Removal of infrastructure Surface Rehabilitation	Removal of infrastructure will have a negative visual impact on the receiving environment. Dust from the demolition process will also have a negative visual impact. Once the infrastructure is removed and rehabilitation is complete, there will be an overall neutral visual impact on the receiving environment. Surface rehabilitation will have a negative visual impact on the receiving environment. Once the rehabilitation is complete, there will be an overall neutral visual impact on the receiving environment.

The rating table below summarises and calculates the visual impact and its significance during decommissioning and closure phase in terms of the duration, extent; intensity and probability (refer to Table 11-95 - Table 11-98).

Table 11-95: Potential Impacts of Removal of Infrastructure and Surface Rehabilitation on the Visual Aspects – Mooivley West and Hendrina South

Activity and Interaction: Removal of Infrastructure and surface rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Removal of infrastructure will have a negative visual impact on the receiving environment. Dust from the demolition process will also have a negative visual impact. Surface rehabilitation will have a negative visual impact on the receiving environment. Once the infrastructure is removed and rehabilitation is complete, there will be an overall neutral visual impact on the receiving environment.			
Prior to Mitigation/ Management			
Duration	Medium Term (3)	The impact will occur during the decommissioning and closure phase which is expected to last for 2-5 years.	Minor negative (-56)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and 21 heritage sites within the practical viewshed area. Road users on the N11 national route, the R542 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors.	
Intensity	Minor (2)	Removal of infrastructure and surface rehabilitation is expected to cause a minor visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation/ Management Actions			
▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated;			

Activity and Interaction: Removal of Infrastructure and surface rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
▪ Re-vegetate the rehabilitated areas with grasses (*Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas* and *Panicum maximum*); and ▪ Ensure all mitigation measures in the Closure and Rehabilitation reports are conducted.			
Post-Mitigation			
Duration	Medium Term (3)	The impact will occur during the decommissioning and closure phase which is expected to last for 2-5 years.	Minor negative (-36)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minimal (1)	The visual disturbance will be reduced by implementing the mitigation measures above.	
Probability	Almost Certain/ Highly Probable (6)	The impact will almost certainly occur.	
Nature	Negative		

Table 11-96: Potential Impacts of Removal of Infrastructure and Surface Rehabilitation on the Visual Aspects – Mooivley East

Activity and Interaction: Removal of Infrastructure and Surface Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Removal of infrastructure will have a negative visual impact on the receiving environment. Dust from the demolition process will also have a negative visual impact. Surface rehabilitation will have a negative visual impact on the receiving environment. Once the infrastructure is removed and rehabilitation is complete, there will be an overall neutral visual impact on the receiving environment.			
Prior to Mitigation/ Management			
Duration	Medium Term (3)	The impact will occur during the decommissioning and closure phase which is expected to last for 2-5 years.	Minor negative (-63)
Extent	Local (3)	The practical viewshed model indicates that the Project will be visible from a distance of up to 5 km. There are 62 farm residences and seven heritage sites within the practical viewshed area. Road users on the N11 national route, the R38 regional route, secondary roads and farm roads within the practical viewshed area are also potential visual receptors. Some areas of the Hendrina (mostly a low visual exposure) and	

Activity and Interaction: Removal of Infrastructure and Surface Rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
		Kwazamokuhle (mostly a very low visual exposure) towns are within the practical viewshed of Mooivley East and are likely to be visually impacted by the Mooivley East mining activities.	
Intensity	Moderate (3)	Removal of infrastructure and surface rehabilitation is expected to cause a moderate visual disturbance.	
Probability	Definite (7)	The impact will definitely occur.	
Nature	Negative		
Mitigation/ Management Actions			
▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (*Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas* and *Panicum maximum*); and ▪ Ensure all mitigation measures in the Closure and Rehabilitation reports are conducted.			
Post-Mitigation			
Duration	Medium Term (3)	The impact will occur during the decommissioning and closure phase which is expected to last for 2-5 years.	Minor negative (-42)
Extent	Limited (2)	The extent of the impact will be reduced by implementing the mitigation measures listed above.	
Intensity	Minor (2)	The visual disturbance will be reduced by implementing the mitigation measures listed above.	
Probability	Almost Certain / Highly Probable (6)	The impact will almost certainly occur.	
Nature	Negative		

11.11 Noise Impact Assessment

Predictive modelling was performed for the proposed activities through the use of the modelling software SoundPlan. The software specialises in computer simulations of noise pollution dispersion. Estimates of the cumulative mining noise levels from the project area were derived from the noise emissions from all the major noise-generating components and activities of the project. According to the project, the underground reserve blocks Mooivley West and Hendrina South are to be mined simultaneously and have therefore been run as one scenario with a construction and operational phase. Mooivley East has subsequently been run as a separate scenario.

The noise dispersion modelling software was used to assess whether the noise from the proposed activities will impact on the relevant noise sensitive receivers, by comparing the predicted propagating noise levels with the current ambient baseline noise levels.

11.11.1 Construction Phase

The construction phase involves the following proposed activities that may cause a noise disturbance at the surrounding farmsteads:

- Site clearance and topsoil removal across the project area;
- The construction of surface infrastructure; and
- Power generation.

The construction noise dispersion models run for the two scenarios during the daytime only (Mooivley West/ Hendrina South and Mooivley East) can be found in the Noise specialist study Appendix 14.

The results of the Mooivley West/Hendrina South scenarios indicated that the expected noise during the construction will cause a noise disturbance, by measuring between 45 dBA and 65 dBA at the following surrounding farmsteads:

- Mooivley 219 IS Remaining Extent;
- Knapdaar 221 IS Portion 8;
- Groblershoop 192 IS Remaining Extent
- Tranendal 231 IS Portion 2;
- Groblershoek 191 IS Remaining Extent;
- Israel 207 IS Remaining Extent;
- Bosmanskrans 217 IS Portion 1;
- De Wittekrans 218 Portion 3;
- De Wittekrans 218 Portion 5;
- De Wittekrans 218 Portion 10; and

- De Wittekrans 218 Portion Remaining Extent.

The results of the Mooivley East scenario indicate that the expected noise during the construction will cause a noise disturbance, i.e. measure above 45 dBA, at the following surrounding farmsteads:

- Vaalbank 177 IS Portion 8;
- Grasfontein 199 IS Portion 3;
- Grasfontein 199 IS Portion 8;
- Oranje Vallei 201 IS Remaining Extent of Portion 1;
- Tweefontein 203 IS Portion 2; and
- Tweefontein 203 IS Portion 4.

The rating table below summarises and calculates the impact significance of the construction phase in terms of the duration, extent; intensity and probability (refer to Table 11-97).

Table 11-97: Potential Impacts of the construction phase activities

Activity and Interaction: The construction phase requires site clearing, construction of surface infrastructure as well as power generation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Noise will emanate from the machinery and vehicles operating during the construction activities			
Prior to Mitigation/Management			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase of two years	Minor (negative) – 55
Extent	Municipal area (4)	It is expected that during construction noise will extend beyond the site area (1 500 m from Mooivley West/Hendrina South and 1 300 m from Mooivley East during the day time and 3 000 m from Mooivley West/Hendrina South and 3 300 m from Mooivley East during the night time) with exceedances above 45 dBA expected at adjacent farmsteads and therefore given the rating of 4. The noise impact however will not affect the entire municipal area.	
Intensity	High - negative (-5)	It is expected that during construction noise will have a serious impact	

Activity and Interaction: The construction phase requires site clearing, construction of surface infrastructure as well as power generation			
Dimension	**Rating**	**Motivation**	**Significance**
Probability	Likely (5)	It is likely that noise will measure above 45 dBA at the surrounding farmsteads, however it is only rated at <65% probability bearing in mind that the models were run as a conservative approach and that the intensity of the impact is therefore overestimated.	
Nature	negative		
Mitigation/Management Actions			
▪ Restricting construction activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Locating diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/ vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels; and ▪ Switching off equipment when not in use.			
Post-Mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the construction phase of three years	Minor (negative) – 36
Extent	Municipal area (4)	The noise levels are still expected to measure between 45 dBA and 65 dBA at adjacent farmsteads post mitigation, however it is expected that it will affect less surrounding farmsteads	
Intensity	Moderate - negative (-3)	It is expected that during construction noise will have a moderate impact post mitigation	
Probability	Probable (4)	A <50% probability is expected post mitigation bearing in mind that the models were run as a conservative approach and that the intensity of the impact is therefore overestimated.	

11.11.2 Operational Phase

The operational phase involves the following activities that may cause a disturbance at the surrounding farmsteads:

- Hauling/ conveying of coal;
- Plant and equipment operations (including crushing and screening); and
- Power generation.

The operational noise dispersion models for the two scenarios (Mooivley West/ Hendrina South and Mooivley East) were run for day and night time conditions. The daytime results for Mooivley West/ Hendrina South (Noise specialist study Appendix 14) scenarios indicated that the expected noise during the mining operations will cause a noise disturbance, by measuring between 45 dBA and 60 dBA at the following surrounding farmsteads:

- Mooivley 219 IS Remaining Extent;
- Groblershoop 192 IS Remaining Extent;
- Groblershoek 191 IS Remaining Extent;
- Bosmanskrans 217 IS Portion 1;
- De Wittekrans 218 Portion 5; and
- De Wittekrans 218 Remaining Extent.

The night time results for Mooivley West/Hendrina south (Noise specialist study Appendix 14) scenario indicated that the expected noise during the mining operations will cause a noise disturbance, by measuring between 35 dBA and 60 dBA at the following surrounding farmsteads:

- Mooivley 219 IS Portion 2;
- Mooivley 219 IS Remaining Extent;
- Uitkyk 220 IS Portion 2;
- Uitkyk 220 IS Portion 3;
- Knapdaar 221 IS Portion 5;
- Knapdaar 221 IS Portion 8;
- Groblershoop 192 IS Remaining Extent;
- Tranendal 231 IS Portion 2;
- Nooitgedacht 237 IS Portion 7;
- Nooitgedacht 237 IS Portion 9;
- Nooitgedacht 237 IS Remaining Extent;

- Groblershoek 191 IS Remaining Extent;
- Israel 207 IS Remaining Extent;
- Bosmanskrans 217 IS Portion 1;
- Bosmanskrans 217 IS Portion 7;
- De Wittekrans 218 Portion 1;
- De Wittekrans 218 Portion 3;
- De Wittekrans 218 Portion 4;
- De Wittekrans 218 Portion 5;
- De Wittekrans 218 Portion 10;
- De Wittekrans 218 Portion 11; and
- De Wittekrans 218 Remaining Extent.

The daytime results (Noise specialist study Appendix 14) of the Mooivley East scenario indicate that the expected noise during the mining operations will cause a noise disturbance, by measuring between 45 dBA and 60 dBA, at the following surrounding farmsteads:

- Vaalbank 177 IS Portion 8;
- Grasfontein 199 IS Portion 3;
- Grasfontein 199 IS Portion 8;
- Oranje Vallei 201 IS Remaining Extent of Portion 1;
- Oranje Vallei 201 IS Portion 2;
- Tweefontein 203 IS Portion 2; and
- Tweefontein 203 IS Portion 4.

The night time results (Noise specialist study Appendix 14) of the Mooivley East scenario indicate that the expected noise during the mining operations will cause a noise disturbance, by measuring between 35 dBA and 60 dBA, at the following surrounding farmsteads:

- Vaalbank 177 IS Remaining Extent of Portion 6;
- Vaalbank 177 IS Portion 7;
- Vaalbank 177 IS Portion 8;
- Vaalbank 177 IS Remaining Extent of Portion 11;
- Grasfontein 199 IS Portion 3;
- Grasfontein 199 IS Portion 7;
- Grasfontein 199 IS Portion 8;

- Grasfontein 199 IS Portion 19;
- Grasfontein 199 IS Portion 21;
- Grasfontein 199 IS Remaining Extent;
- Garsfontein 591 IS Remaining Extent;
- Uitkyk 220 IS Portion 3;
- Oranje Vallei 201 IS Remaining Extent of Portion 1;
- Oranje Vallei 201 IS Portion 2;
- Oranje Vallei 201 IS Remaining Extent;
- Tweefontein 203 IS Portion 2;
- Tweefontein 203 IS Portion 3;
- Tweefontein 203 IS Portion 4;
- Tweefontein 203 IS Portion 15
- Tweefontein 203 IS Portion 17; and
- Tweefontein 203 IS Portion 21.

The rating table below summarises and calculates the impact significance of the operational phase in terms of the duration, extent; intensity and probability (refer to Table 11-98).

Table 11-98: Potential Impacts of the operational phase activities

Activity and Interaction The operational phase requires hauling/conveying of coal, plant and equipment operations as well as power generation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Noise will emanate from the machinery and vehicles during the operational activities			
Prior to Mitigation/ Management			
Duration	Project Life (5)	Noise will be produced for the duration of the project's life.	Minor (negative) – 70
Extent	Municipal area (4)	It is expected that during operations the noise will extend beyond the site area ((1 500 m from Mooivley West/ Hendrina South and 1 300 m from Mooivley East during the day time and 3 000 m from Mooivley West/ Hendrina South and 3 300 m from Mooivley East during the night time) with exceedances between 45 dBA and 60 dBA during the daytime and between 35 dBA and 60 dBA during the	

Activity and Interaction The operational phase requires hauling/conveying of coal, plant and equipment operations as well as power generation			
Dimension	**Rating**	**Motivation**	**Significance**
		night time expected at adjacent farmsteads and therefore given the rating of 4. The noise impact however will not affect the entire municipal area.	
Intensity	High - negative (-5)	It is expected that during operations, noise will have a serious impact.	
Probability	Likely (5)	It is likely that noise will measure above the day and night time limits at the surrounding farmsteads, however it is only rated at <65% probability bearing in mind that the models were run as a conservative approach and that the intensity of the impact is therefore overestimated.	
Nature	negative		
Mitigation/Management Actions			
▪ Locating diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Fitting ventilation silencers to the ventilation fans; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installation of low noise rollers for conveyor belts as well as enclosing the conveyor belt; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Maintenance of low noise rollers for conveyor belts; and ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels.			
Post-Mitigation			
Duration	Project Life (5)	Noise will be produced for the duration of the project's life	Minor (negative) – 36
Extent	Municipal area (4)	The noise levels are still expected to measure above 45 dBA at adjacent farmsteads post mitigation, however it is expected that it will affect less surrounding farmsteads	
Intensity	Moderate - negative (-3)	It is expected that during operations, noise will have a moderate impact post	

Activity and Interaction The operational phase requires hauling/conveying of coal, plant and equipment operations as well as power generation			
Dimension	**Rating**	**Motivation**	**Significance**
		mitigation	
Probability	Probable (4)	A <50% probability is expected post mitigation bearing in mind that the models were run as a conservative approach and that the intensity of the impact is therefore overestimated.	

11.11.3 Decommissioning and Closure Phase

The demolition of the infrastructure and surface rehabilitation activities may cause a noise disturbance at surrounding farmsteads. Due to the relatively small footprint of the infrastructure as well as surface area needing rehabilitation however, it is expected that the decommissioning activities will have a negligible impact on the surrounding farmsteads.

The closure phase involves the removal of infrastructure and surface rehabilitation that may cause a noise disturbance at the surrounding farmsteads, summarized in Table 11-99.

Table 11-99: Interactions and Impacts of construction activities

Interaction	Impact
Removal of infrastructure and surface rehabilitation	Noise disturbance at surrounding farmsteads

The rating table below summarises and calculates the impact significance of the decommissioning and closure phase in terms of the duration, extent; intensity and probability (refer to Table 11-100).

Table 11-100: Potential Impacts of the decommissioning phase activities

Activity and Interaction: The closure phase requires removal of infrastructure and surface rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Noise will emanate from the machinery and vehicles operating during the decommissioning activities.			
Prior to Mitigation/ Management			
Duration	Short term (2)	Noise will be produced for the duration of the closure phase which is estimated to last two years.	Negligible (negative) – 21

Activity and Interaction: The closure phase requires removal of infrastructure and surface rehabilitation			
Dimension	**Rating**	**Motivation**	**Significance**
Extent	Local (3)	It is expected that during decommissioning noise will extend only as far as the development site area.	
Intensity	Minor - negative (-2)	It is expected that during decommissioning noise will have a minor impact due to the project footprint and the closure phase being less machinery intensive than the construction and operational phases.	
Probability	Unlikely (3)	It is unlikely that noise will measure above 45 dBA at the surrounding farmsteads.	
Nature	Negative		
Mitigation/Management Actions			
▪ Restricting decommissioning activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.			
Post-Mitigation			
Duration	Short term (2)	Noise will be produced for the duration of the closure phase which is estimated to last two years.	Negligible (negative) – 14
Extent	Local (3)	It is expected that during decommissioning noise will extend only as far as the development site area.	
Intensity x type of impact	Minimal - negative (-2)	It is expected that during decommissioning noise will have a minor impact due to the project footprint and the closure phase being less machinery intensive than the construction and operational phases.	
Probability	Improbable (2)	It is improbable that noise will measure above 45 dBA at the surrounding farmsteads.	

11.12 Traffic Impact Assessment

The construction, operations and decommissioning activities are expected to generate additional private vehicle, public transport and pedestrian traffic on the existing road within the project site as a result of workers travelling to and from work; and the transportation of construction materials and mined coal. During the three stages of the project (i.e. construction, operations and decommissioning), the additional traffic is expected to have direct or indirect impacts on the following:

- Increase in traffic volumes and vehicle delays;
- Increase in delays for cyclists and pedestrians as result of the additional traffic on the network
- Road safety conditions could be impacted negatively by an increase in heavy vehicles; and
- Impact on road surface conditions of the local road network as a result of an increase in heavy vehicles.

In addition, the traffic impact will have an impact on the following aspects:

- Noise;
- Visual impacts;
- Vibration;
- Air Quality;
- Ecological; and
- Heritage and conservation areas.

11.12.1 Construction Phase

During the construction phase, the following traffic impacts have been identified.

11.12.1.1 Impact on Traffic Condition and Driver Delays

During the construction period, the peak hour volume along N11 in the vicinity of the site is expected to increase by no more than 10%. This could have had a relatively noticeable impact on the traffic flow had the current and future background traffic volumes been high but considering this road carries low traffic volumes, a minor impact on traffic flow and intersection operations are anticipated. Drivers are expected to experience an increase in delays of not more than 35 seconds, which is negligible.

11.12.1.2 Impact on Pedestrians and Cyclists

The mine plans to employ people from the nearby residential areas thus the majority of construction workers are likely to reside within a reasonable walking distance from the mine. As discussed in Section 6, the mine is expected to generate about 125 Non-motorised Transport (NMT) trips per day during the construction phase (both AM and PM peak).

11.12.1.3 Impact on Road Safety Conditions and Road Surface Conditions

During construction, the mine is expected to generate about four additional heavy vehicle trips on to the road network during both AM and PM peak. This is a negligible increase of heavy vehicle. However to promote safety in the vicinity of the site it is recommended that measures be introduced to reduce the frustration experienced by the motorist on public roads due to heavy vehicles. It is therefore recommended that the drivers of all heavy vehicles be required to attend a specialised road safety and driving course that sensitises them to the impact that they have on driving conditions for other vehicles on these roads.

The rating table below summarises and calculates the impact significance of traffic during construction phase in terms of the duration, extent, intensity and probability (refer to Table 11-101 - Table 11-104).

Table 11-101: Impact on Traffic Condition and Driver Delays during Construction Phase

Activity and Interaction (Development Traffic during Construction)			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Increase in traffic volumes and vehicle delays			
Prior to Mitigation/ Management			
Duration	Medium term (3)	The construction phase is not expected to last more than 3 years.	Minor (negative) - 50
Extent	Local (3)	Most of the impact will be on the local road network, more so in the vicinity of the site. Although the development traffic will make use of regional freight corridors, the number of vehicles assigned to any individual route will reduce as multiple route choices exist outside the project site. The increased delays are therefore only expected on the local road network.	

Activity and Interaction (Development Traffic during Construction)			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	On-going serious social issues (4)	Increased traffic will result in minor increase in delays across most of the network. The proposed access to Mooivley East off N11 is expected to lower the mobility standards of N11 as a Class 1 road, with speed limit of 120 km/h, as vehicles accessing the mine will slow down to turn into the mine access road and thus slowing down through traffic.	
Probability	Likely (5)	It is likely that the additional development traffic could result in slight increase in average vehicle delays and minor deterioration of service levels on the surrounding road network.	
Nature	Negative	Increase delays are negative to both the environment and driver behaviour.	

Mitigation/Management Actions

- Introduce the following road upgrades at the new proposed N11/ Mooivley East Access Road intersection:
  - Priority controlled intersection with mine access road stop controlled.
  - Separate 100 m left lane is proposed on the N11 northern approach;
  - Separate 100 m right turn lane; and
  - 100 m right-turn refuge lane and 100 m taper acceleration lane are recommended on the northern and southern approaches respectively.
- The new proposed Davel Road and Mooivley West intersection is to be priority controlled with Davel Road having priority; and
- Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions.

Post-Mitigation			
Duration	Medium term (3)	The construction phase in not expected to last more than 3 years.	Negligible (negative) – 32
Extent	Local (3)	Most of the impact will be on the local road network as discussed above.	
Intensity	Minor medium term social impact (2)	With mitigation, the impact of the additional development traffic will be minor.	

Activity and Interaction (Development Traffic during Construction)			
Dimension	**Rating**	**Motivation**	**Significance**
Probability	Probable (4)	The separate turning lanes will reduce the conflict between through and turning movements.	
Nature	Negative (-1)	Increased delays are negative to both the environment and driver behaviour.	

Table 11-102: Impact on Pedestrians and Cyclists during Construction Phase

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Increase in delays for cyclists and pedestrians as result of the additional traffic on the network.			
Prior to Mitigation/ Management			
Duration	Medium Term (3)	The construction phase in not expected to last more than three years.	Minor (negative) -36
Extent	Local (3)	Most of the impact will be on the local road network.	
Intensity	On-going social issues (3)	There is currently low level of pedestrian and cycling activity. The construction activities are expected to increase pedestrian volumes notably in the vicinity of the sites.	
Probability	Probable (4)	As a result of increases in pedestrians and vehicles on the road network, there would be an increase in the probability of pedestrian and vehicle conflicts.	
Nature	Negative (-1)	Increased delays are negative to both the environment and NMT users	
Mitigation/Management Actions			
▪ Regular pedestrian and cycling activity awareness by drivers as part of the formal driver training and regular Health and Safety briefings; and ▪ Site related heavy vehicles need to avoid low order roads in residential areas, as far as reasonably practicable.			
Post-Mitigation			

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
Duration	Medium Term (3)	The construction phase in not expected to last more than three years	Negligible (negative) -24
Extent	Local (3)	Most of the impact will be on the local road network	
Intensity t	On-going social issues (2)	With mitigation, the impact of the additional development traffic will be minor.	
Probability	Probable (3)	Even with mitigation, pedestrians and cyclist delays would still experience some delay. However providing NMT infrastructure and avoidance of roads that are prone to pedestrian and cycling traffic can reduce the probability of delays increasing significantly.	
Nature	Negative (-1)	Increased delays are negative to both the environment, NMT and driver behaviour.	

Table 11-103: Impact on Road Safety conditions during Construction Phase

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Road safety conditions could be impacted negatively by an increase in heavy vehicles.			
Prior to Mitigation/ Management			
Duration	Medium Term (3)	The construction phase in not expected to last more than three years.	Minor (negative) -40
Extent	Local (3)	Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple routes (i.e. either using N4 or R38) choices become available.	

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
Intensity	On-going social issues (4)	Increase in heavy vehicles could result in increased speed differential on the major roads. Some drivers may not be tolerant of heavy vehicles on their path and this could lead to increased driver aggressiveness. Heavy vehicles require more time when turning right at major intersections. There is a risk of drivers taking less than optimal gaps if the delays are high.	
Probability	Probable (4)	It is probable that an increased number of heavy vehicles on the network could trigger some deterioration in the road safety conditions on the local road network.	
Nature	Negative (-1)	Deterioration of road safety conditions is negative in nature.	
Mitigation/Management Actions			

▪ Regular driver awareness campaigns/ training;
▪ Prescribe routes for construction traffic to:
  ▪ Discourage right turns by heavy vehicles on busy roads where heavy vehicles have to give way to fast moving vehicles; and
  ▪ Discourage routing of heavy vehicles through residential areas
▪ Heavy vehicle deliveries to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of Heavy Goods Vehicles (HGVs) waiting to access the site or at road junctions.			

Post-Mitigation			
Duration	Medium Term (3)	The construction phase in not expected to last more than three years.	Negligible (negative) -27
Extent	Local (3)	Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple routes (i.e. either using N4 or R38) choices become available.	
Intensity	On-going social issues (3)	With mitigation, the severity of road safety impact by the development is expected to reduce.	

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
Probability	Likely (3)	The probability of the road safety conditions deteriorating is likely to be reduced with implementation of the recommended mitigation measures.	
Nature	Negative (-1)	Deterioration of road safety conditions is negative in nature.	

Table 11-104: Impact on Road Surface Conditions during Construction Phase

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Impact on road surface conditions of the local road network as a result of an increase in heavy vehicles.			
Prior to Mitigation/Management			
Duration	Medium Term (3)	The construction phase in not expected to last more than three years.	Negligible (negative) -18
Extent	Local (3)	Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple routes (i.e. either using N4 or R38) choices become available.	
Intensity	On-going social issues (3)	Heavy vehicles increase the rate at which road surfacing wear out and other structural pavement defects/ deformations that could lead to formation of potholes.	
Probability	Minimal (2)	The minimal increase of heavy vehicles on the network will not have a large influence in the road conditions on the local road network.	
Nature	Negative (-1)	Deterioration of road surface conditions is negative in nature.	
Mitigation/Management Actions			

Activity and Interaction: Development Traffic during Construction			
Dimension	**Rating**	**Motivation**	**Significance**
▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/ from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.			
Post-Mitigation			
Duration	Medium Term (3)	The construction phase in not expected to last more than three years.	Negligible (negative) -16
Extent	Local (3)	Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple routes (i.e. either using N4 or R38) choices become available.	
Intensity	On-going social issues (2)	Heavy vehicles volumes during construction are very low. The mitigation measures are expected to minimise impact.	
Probability	Minimal (2)	The minimal increase of heavy vehicles on the network will not have a large influence in the road safety conditions on the local road network	
Nature	Negative (-1)	Deterioration of road surface conditions is negative in nature.	

11.12.2 Operational Phase

During the operational phase, the following traffic impacts have been identified.

11.12.2.1 Impact on Traffic Condition and Driver Delays

During the operational period, peak hour volumes along N11 past the site are expected to increase by less than 5%. These volumes decrease when compared to the construction period, the additional traffic generated by the proposed mine is not expected to have any significant impact on background traffic. Drivers are expected to experience negligible delays of no more than two seconds, close to the proposed site, and not more than 35 seconds delay in the town of Hendrina.

11.12.2.2 Impact on Pedestrians and Cyclists

The number of NMT users is expected to decrease to 77 trips per day (AM and PM peak) during the operational phase of the mines. Similarly, sidewalks as describe above are recommended.

11.12.2.3 Impact on Road Safety Conditions

The mine is expected to generate 26 heavy vehicle trips per hour (AM and PM) during the operation period contributing to about 10% increase of heavy vehicle in the vicinity of the site during both the AM and PM. Safety precautions as discussed in the section above are also recommended.

11.12.2.4 Impact on Road Condition

Overall, the increase in heavy vehicles during both construction and operation phases will accelerate the deterioration of these roads although only slightly and certainly not noticeably. With the exception of the Mine Access Road, all other roads that the mine generated traffic are likely to use are under the jurisdiction of the Mpumalanga Department of Transport and South African National Road Agency (Ltd) SANRAL. It is these departments' responsibilities to maintain repair and rehabilitate these roads.

It is, however, proposed that the mine make a contribution to the maintenance of the section of N11 between Ermelo and Hendrina. This action demonstrates to the roads authorities the conscientiousness and willingness of the project applicant to contribute and the care for the area in which it operates.

The rating table below summarises and calculates the impact significance of traffic during operational phase in terms of the duration, extent, intensity and probability (refer to Table 11-105 - Table 11-108).

Table 11-105: Increase in Traffic Volumes and Vehicle Delays during Operational Phase

Activity and Interaction: Development Traffic during Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Increase in traffic volumes and vehicle delays.			
Prior to Mitigation/Management			
Duration	Project life (5)	Duration of the project will be 36 years.	Negligible (negative) -22
Extent	Local (3)	Most of the impact will be on the local road network. Although the development traffic will make use of regional freight corridors, the number of vehicles assigned to any individual route will reduce as multiple route choices exist	

Activity and Interaction: Development Traffic during Operations			
Dimension	**Rating**	**Motivation**	**Significance**
		outside the project site. The increased delays are therefore only expected on the local road network.	
Intensity	On-going serious social issues (3)	Increased traffic will result in minor increase in delays across most of the network. The proposed access to Mooivley East off N11 is expected to lower the mobility standards of N11 as a Class 1 road, with speed limit of 120 km/h, as vehicles accessing the mine will slow down to turn into the mine access road and thus slowing down through traffic.	
Probability	Minimal (2)	Additional traffic is likely to increase average vehicle delays on the network, however these delays are minimal.	
Nature	Negative (-1)	Increased delays are negative to both the environment and driver behaviour.	
Mitigation/Management Actions			
▪ Maintenance of proposed road upgrades at the new proposed N11/ Mooivley East Access Road and Davel Road/ Mooivley West Access Road ; and ▪ Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions.			
Post-Mitigation			
Duration	Project life (5)	Duration of the project will be 36 years.	Negligible (negative) – 20
Extent	Local (3)	Most of the impact will be on the local road network.	
Intensity	On-going serious social issues (2)	With mitigation, there impact of the additional development traffic will be minor.	
Probability	Minimal (2)	It is probable for delays to occur on the local road network; this not expected to occur on regular basis.	
Nature	Negative (-1)	Increased delays are negative to both the environment and driver behaviour.	

Table 11-106: Increase in Delays for Cyclists and Pedestrians during Operational Phase

Activity and Interaction: Development Traffic during Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Increase in delays for cyclists and pedestrians as result of the additional traffic on the network due to the proposed development.			
Prior to Mitigation/Management			
Duration	Project Life (5)	Duration of the project will be 36 years.	Negligible (negative) -20
Extent	Local (3)	Most of the impact will be on the local road network.	
Intensity	Minor medium Term social impact (2)	There is currently low volume of pedestrian and cycling activity on the affected roads. The development impact on pedestrians and cyclist is therefore expected to be minor.	
Probability	Minimal (2)	As a result of increases in pedestrians and vehicles on the road network, there would be an increase in the probability of pedestrian and vehicle conflicts.	
Nature	Negative (-1)	Increased delays are negative to both the environment and driver behaviour.	
Mitigation/Management Actions			
▪ Regular pedestrian and cycling activity awareness by drivers as part of the formal driver training and regular Health and Safety briefings; and ▪ Site related heavy vehicles need to avoid low order roads in residential areas, as far as reasonably practicable.			
Post-Mitigation			
Duration	Project Life (5)	Duration of the project.	Negligible (negative) -18
Extent	Local (3)	Most of the impact will be on the local road network, with some traffic distributing on the key freight corridors beyond the extent of the project site.	
Intensity	Low level of impact (1)	Reduced routing of development related traffic and better awareness of other road users will result in reduced friction between drivers and pedestrians/ cyclist.	

Activity and Interaction: Development Traffic during Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Probability	Minimal (2)	Even with mitigation, pedestrians and cyclist delays would still experience some delay. However avoidance of roads that are prone to pedestrian and cycling traffic can reduce the probability of delays increasing significantly.	
Nature	Negative (-1)	Increased delays are negative to both the environment and driver behaviour.	

Table 11-107: Road Safety Conditions during Operational Phase

Activity and Interaction: Development Traffic during Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Road safety conditions could be impacted negatively by an increase in heavy vehicles due the proposed development.			
Prior to Mitigation/ Management			
Duration	Project life (5)	Duration of the project.	Minor(negative) -36
Extent	Local (3)	Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple route choices become available.	
Intensity	On-going serious social issues (4)	Increase in heavy vehicles could result in increased speed differential on the major roads. Some drivers may not be tolerant of heavy vehicles on their path and this could lead to increased driver aggression and impatience. Heavy vehicles require more time when turning right at major intersections. There is a risk of drivers taking less than optimal gaps if the delays are long.	

<table>
<tr><th colspan="4">Activity and Interaction: Development Traffic during Operations</th></tr>
<tr><th>Dimension</th><th>Rating</th><th>Motivation</th><th>Significance</th></tr>
<tr><td>Probability</td><td>Likely (3)</td><td>It is likely that increased number of heavy vehicles on the network could trigger some deterioration in the road safety conditions on the local road network.</td><td rowspan="2"></td></tr>
<tr><td>Nature</td><td>Negative (-1)</td><td>Deterioration of road safety conditions is negative in nature.</td></tr>
<tr><th colspan="4">Mitigation/Management Actions</th></tr>
<tr><td colspan="4">Regular driver awareness campaigns / training;
Prescribe routes for delivery vehicles to:
Discourage right turns by heavy vehicles on busy roads where heavy vehicles have to give way to fast moving vehicles; and
Discourage routing of heavy vehicles through residential areas
Heavy vehicle deliveries to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of HGVs waiting to access the site or at road junctions.</td></tr>
<tr><th colspan="4">Post-Mitigation</th></tr>
<tr><td>Duration</td><td>Project life (5)</td><td>Duration of the project.</td><td rowspan="5">Negligible (negative) - 30</td></tr>
<tr><td>Extent</td><td>Local (3)</td><td>Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple route choices become available.</td></tr>
<tr><td>Intensity</td><td>Minimal (2)</td><td>With mitigation, the severity of road safety impact by the development is expected to reduce.</td></tr>
<tr><td>Probability</td><td>Likely (3)</td><td>The probability of the road safety conditions deteriorating is likely to be reduced with implementation of the recommended mitigation measures.</td></tr>
<tr><td>Nature</td><td>Negative</td><td>Deterioration of road safety conditions is negative in nature.</td></tr>
</table>

Table 11-108: Impact on Road Surface Conditions during Operational Phase

Activity and Interaction: Development Traffic during Operations			
Dimension	**Rating**	**Motivation**	**Significance**
Impact Description: Impact on road surface conditions of the local road network.			
Prior to Mitigation/ Management			
Duration	Project life (5)	Duration of the project.	Negligible (negative) -33
Extent	Local (3)	Most of the impact will be on the local road network. The number of heavy vehicles assigned to roads outside the project site will reduce as multiple route choices become available.	
Intensity	On-going issues (3)	Although the number of heavy vehicles is expected to increase during operations, the impact is expected to be minimal.	
Probability	Likely (3)	It is probable that increased number of heavy vehicles on the network could trigger some deterioration in the road safety conditions on the local road network.	
Nature	Negative	Deterioration of road surface conditions is negative in nature.	
Mitigation/Management Actions			
▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/ from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.			
Post-Mitigation			
Duration	Project life (5)	Duration of the project	Negligible (negative) -22
Extent	Local (3)	Most of the impact will be on the local road network.	
Intensity	On-going issues (3)	The mitigation measures are expected to further minimise impact.	
Probability	Likely (2)	Regular maintenance of the road conditions would minimise the wearing out of the road surface.	
Nature	Negative	Deterioration of road surface conditions is negative in nature.	

11.12.3 Decommissioning and Closure Phase

During the decommissioning and closure phase it is not anticipated that any impact would be expected due to the negligible impact that is expected during the operational and construction phase. Although no impacts have been identified, all mitigation measures imposed during the construction phase should be implemented until such time that no vehicle movement is anticipated.

11.13 Blasting Impact Assessment

A blasting impact assessment was compiled and attached as Appendix 16. The original report was considered a worst case scenario for the influences evaluated. However the possible impact from drilling and blasting operations had to be reviewed due to a change in development of the decline shafts. The development of the decline shafts may be possible without establishing a box-cut. The development will consist of removing soft material to a level where a free face can be drilled and blasted for the declines only.

The blasting operation uses significantly less charge than the original assessment blasting impact assessment. An estimate of maximum 18 kg charge per delay is anticipated for this design. The ground vibration and air blast result from this blast is estimated to be 6.3 mm/s and 135 dBL at 100 m direct distance from the blast. Air blast will be less due to the depth at which blasting will be done. The specific reduction is difficult to calculate and only a direct distance value is presented. The levels of ground vibration and air blast are significantly lower than the levels expected from a full box-cut. The depth at which the first blast will be done will add further reduction of the blast effects to the point that the possible effects may be negligible. It is also certain that for each blast developed the effects will be further reduced with progress of the decline. The first five to 10 blasts are expected still to have some effect from sound, ground vibration, fly rock and air blast within the immediate vicinity of the shaft but will start subsiding thereafter. Further assessment will not be required.

11.14 Unplanned Events, Risks and their Management Measures

The unplanned events that may happen at the project site and the proposed mitigation plan are listed in Table 11-1.

Table 11-109: Unplanned events, risks and their management measures

Unplanned event	Mitigation/ Management/ Monitoring
Accidental exposure of previously unidentified heritage resources during the construction of the Project.	▪ Project specific Chance Find procedure (CFP)s must be developed and included in the EMP as a condition of authorisation; ▪ The CFPs must clearly describe the type of heritage resources that may occur within the site specific project area, the protocol

Unplanned event	Mitigation/ Management/ Monitoring
Accidental exposure of human remains during the construction phase of the Project.	to follow in the event of accidental exposure of previously unidentified heritage resources, and the appropriate management measures and reporting structures to be adhered to; and ▪ The CFPs must be defined and established prior to the construction phase of the proposed Project.
Blasting will create fly rock that may result in accidental damage to historic structures or werfs situated within a 500 m blasting radius	A CMP must be developed to monitor and gauge any potential negative impacts to identify heritage resources during the construction and operational phases of the proposed project. The CMP must at a minimum include: ▪ All identified heritage resources with the sit specific project site; ▪ Identify all heritage resources within a 100 m buffer of the proposed infrastructure and 500 m blasting radius; ▪ Identify all heritage resources that fall within the underground mining development footprint; ▪ Have a detailed baseline record of the conditions of identified heritage resources; ▪ Ensure a roles and responsibilities matrix; ▪ Establish a monitoring process and schedule; ▪ Define conditions and protocols for access; and ▪ Define the project specific management and monitoring protocol. The CMP must be defined and established prior to the pre-construction phase of the proposed Project.
Voids created through underground mining has the potential to result in subsidence that could potentially affect the status quo of heritage resources protected under Section 34 – 36 of the NHRA that are being under-mined.	
Access to heritage resources protected under Section 34 – 36 of the NHRA by non-employees of the mine pose a health and safety risk to visitors.	
Hauling of coal along access routes pose a risk to heritage resources protected under Section 34 -36 of the NHRA in proximity to the established routes that could be damaged in the event a vehicular accident occurs.	
Ineffectiveness or failure of fitted silencers on generators and ventilation fans.	▪ Implement monitoring programme to assess effectiveness of noise abatement measures; ▪ Regular servicing of generators as per maintenance manual; and ▪ Enclosing generators in isolation mounts and installing secondary silencers;

Unplanned event	Mitigation/ Management/ Monitoring
Hydrocarbon spills from bulk storage tanks, vehicles and heavy machinery or hazardous materials or waste storage facilities.	▪ Hydrocarbons and hazardous substances must be stored in bunded areas and refuelling should take place in contained areas; ▪ The fuel, lubricant and explosives storage facilities must be located on a hard standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilization of leaked hazardous substances. ▪ Ensure that the bunded areas can contain 110% of the largest container and are constructed according the necessary SANS standards; ▪ An emergency spillage response plan should be in place and accessible to the responsible monitoring team. The MSDS should be kept on site for the LoM for reference to anytime in terms of handling, storage and disposal of materials. ▪ A spill response kit must be available at all times. The incident must be reported on and if necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations. Areas of high risk must be managed with particular care and impact must be kept to the smallest area possible; for example areas where planned inspection of vehicles is carried out; ▪ Ensure that oil traps are well maintained; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; ▪ Monitoring boreholes, particularly those located within the construction area, have to be monitored for both water level and quality to detect any changes in quality; and ▪ If a considerable amount of fluid is accidentally spilled, the contaminated soil should be scraped off and disposed of at an acceptable dumping facility. The excavation should be backfilled with soil of good quality.
Uncontrolled erosion	▪ Erosion control measures must be put in place and if necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.

Unplanned event	Mitigation/ Management/ Monitoring
PCD overflow	▪ Spill protection berms must be in place to manage such an event and protect the water resources. The overflow must be stopped immediately as soon as possible and the impacted area remediated. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations. Monitoring of the impact to wetlands and success of the remediation actions must be carried as often as needed; and ▪ Paddocks should be placed adjacent to the PCD spillway to contain any spill and prevent erosion and water reporting in to the nearby stream
Airborne coal dust settling in wetlands	▪ Wetland monitoring must be done throughout the life of the project to ensure that this impact is not reaching a critical level. All areas of coal handling and stockpiling must be seen as high risk areas and monitored. Dust suppression will need to be improved and the wetland rehabilitated as far as possible. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Illegal activities within wetlands from staff or other parties; such as dumping, squatting; burning of rubbish; washing of clothes and more.	▪ The edge of the wetlands and a 100 m buffer must be demarcated where they are in close proximity to the infrastructure areas and at risk of being impacted from illegal activities; ▪ The impact must be identified, investigated and removed as soon as possible. Mine staff must be educated if they identified as the source of the impact; and ▪ Wetland monitoring must be done throughout the life of the project to ensure that this impact is not reaching a critical level. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Failure in the functioning of the clean-dirty water separation and stormwater management plan leading to uncontrolled spilling of polluted material (including oils, coal fines etc.) from the infrastructure areas (such as the coal stockpiles)	▪ The spilling of the contaminant must be stopped immediately and the impacted area remediated. Spill protection berms must be in place as well. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.

Unplanned event	Mitigation/ Management/ Monitoring
Subsidence of undermined areas, particularly where coal resource was shallow (above 50)	▪ Ensure that sufficient pillars are left in place for high extraction underground mining areas to prevent surface subsidence; ▪ A geotechnical study should be undertaken to determine possibilities of subsidence. Mitigation measures should the recommended, should there be chance of subsidence. ▪ A wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations; and ▪ An aquatic ecologist specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Community expectations and actions	▪ Expectations of communities must be managed by informing them what to expect from the Project in terms of LED and/ or community development projects; ▪ Continuously involve community and municipal structures in the development of any LED or community development projects.
	▪ Appoint CLOs to provide communities with an accessible communication mechanism; ▪ Establish grievance mechanism which is accessible to aggrieved members of the surrounding communities; and ▪ Use public media to inform and enlighten stakeholders with regard to project limitations, progress and outcomes.
Current uncertainties regarding land acquisition and displacement	▪ Follow a transparent consultation and negotiation process; and ▪ Adequately compensate landowners as well as displacement-affected people.
Threats to Umcebo's Social licence to operate	▪ Ensure on-going, transparent communications and mutual trust; ▪ Regularly assess if/ how/ why stakeholder opinions and perceptions change; and ▪ Invest in host communities through LED and CSI projects.
Spills / leaks from the dewatering pipeline.	▪ Regular inspections of the pipeline for any leaks. Seeping pipeline should be sealed; and ▪ Ensure that stormwater management structures are put in place to capture all spills and to convey to the PCD.
Contamination from the ROM and overburden stockpile.	▪ Ensure the implementation of clean and dirty water separation; ▪ Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals; and ▪ Ensure that stormwater management structures are put in place to capture all runoff from the ROM and overburden dumps and to convey to the PCD.

Unplanned event	Mitigation/ Management/ Monitoring
Flooding of Mine Infrastructure	▪ The conveyor and access road connecting Hendrina South and Mooivley West should be elevated above the floodline at a height of approximately 1 662 mamsl (height subject to more detailed and accurate elevation survey data). A culvert/ bridge for the road crossing should be constructed and sized appropriately. The fence should be designed and constructed to withstand a 1:100 year flood; and ▪ The proposed berm running along the haul road at Mooivley West, must be constructed above the floodline at a height of approximately 1 696 mamsl (height subject to more detailed and accurate elevation survey data), to ensure that flooding of infrastructure does not occur.

11.15 Cumulative Impacts

Cumulative impacts occur from in-combination effects of various impacts on the environment acting within a host of processes that result in an incremental effect. The importance of identifying and assessing cumulative impacts is that the whole is often greater than the sum of its parts. This implies that the total effect of multiple stressors or change processes acting simultaneously on a system may be greater than the sum of their effects when acting in isolation.

As indicated in the Gert Sibande District Municipality IDP (2012), the mining sector has been identified as a key growth area. The addition of mining operations, while in line with the strategic development plan for Mpumalanga; will significantly alter the primarily agrarian historical landscape into an industrial, mining landscape. The envisaged cumulative impacts are additive and space-crowding. These impacts are described as the sum of all the effects and the high spatial density of impacts on the environment resulting in negative cumulative impacts.

The most prominent existing and proposed future industrial and mining developments in the broader project area are listed below. Together, these developments are likely to contribute towards, and even accelerate, changes to the socio-economic environment which would not necessarily have been the case if the Project would operate in isolation:

- Muhanga Mines Coal Project (existing);
- Schoonoord Coal Mining (planned);
- Koornfontein Coal Mine (existing);
- Kranspoort Coal Mine (existing);
- Middelburg Mine (existing);
- New Clydesdale Colliery (existing);
- Optimum Colliery (existing);

- Tavistock Coal Mine (existing);
- Woestalleen Coal Colliery (existing);
- Weltevreden Coal Mine (existing);
- Arnot Coal Mine (existing);
- Spitzkop Colliery (existing);
- Eksom's Arnot Coal-fired Power Station (existing);
- Eskom's Hendrina Coal-fired Power Station (existing); and
- Eskom's Komati Coal-fired Power Station (existing).

- Hendrina;
- Kwazamokuhle settlement;
- Breyten;
- Hendrina power station;
- Local road networks resulting in vehicle emissions; and
- Agricultural farmsteads including high intensive farming.

11.15.1 Soils

One of the negative impacts associated with long term development is the disturbance of the soil environment, the naturally occurring layers of decomposed rock and accumulations of eroded materials as soil horizons. Rehabilitation of disturbed areas aims to restore land capability to as close as possible to its original state. Experience has however shown that the post development land capability is often of a lesser utilisable rating and compromises the end land use potential. The primary reason for this is poor management.

Soil quality deteriorates during storage and stockpiling, with nutrient and carbon loss due to leaching and the sterilisation of the resource by de-nitrification. Replacement of these soil materials into soil profiles during rehabilitation cannot replicate pre-construction conditions with the effective loss being of a financial consequence to the project if not well managed. Depth however can be replicated if sufficient soil is tripped at the construction phase and it is retained and managed against erosion. The resultant net loss of land capability due to these changes will forces a change in land use. The loss of this natural resource is considered high and negative, with the loss of Eco System Services being detrimental to the long term sustainability of both the physical and socio economic environments.

The utilisable soil is considered the upper portion of the vadose zone, and comprises the materials which naturally holds water, are able to liberate nutrients and contain the major rooting system for plants. These layers comprise the conventional topsoil or "A" horizon and a significant portion of the upper portion of the subsoil "B2/1" horizon. This is the layer that needs to be stripped, stored and well managed throughout the project if any meaningful rehabilitation is to be considered at closure.

Major impact associated with underground mining is subsidence. This could leave a lasting impact on a large area and could change drainage lines leading to land capability and land use changes. Subsidence mitigated thereby removing the potential for a loss of soil, land use and land capability. Potential site specific impacts of underground mining activities on land capability are low due to low impacts on soils. Cumulative impact on regional land capability and land use is high because there is existing commercial agriculture that is practised in some areas in the project and also land use will be impacted as some of the land is being used for grazing by sheep and cattle.

The resultant net loss of land capability due to these changes will lead to a change in land use.

11.15.2 Surface Water

Negative water quality impacts can result in the deterioration of surface water resources. All runoff draining from the project area via the Klein Olifants River will eventually report into the Olifants River.

The baseline water quality showed poor qualities of water as TDS, ammonia and chloride were exceeding the water quality guidelines for irrigation. The Klein Olifants River has several tributaries downstream of the project area before its confluence with the Olifants River; these streams are likely contributing on impacting the Klein Olifants River as there are different activities (irrigation, mining, domestic uses and livestock watering) taking place along these tributaries.

The Olifants River is already under stress regarding the quality status due to coal mines within the catchment. The Groundwater Report (Digby Wells, 2016) states that the project is likely to alter the natural geochemistry of the area by exposing the sulfides to oxygenation which could result in sulfate contamination. It is assumed that concentration could reach up to 2 500 mg/L and this has a potential to acidify the surface water resources.

The proposed project could potentially increase the impacts on the Klein Olifants River if management measures are not in place. However, this could greatly be prevented by implementing the recommended mitigation measures presented in this report. This will prevent further deterioration of water quality in the Klein Olifants River.

11.15.3 Groundwater

Although there are no mines in the immediate surroundings of the project site, a couple of mines and industrial plants operate within a radius of 30 km.

As discussed previously, the maximum water level drawdown at the project site will occur in the coal seam aquifer at the end of the operational phase as illustrated in Plan 21 in Appendix 3. The figure shows that the impact of the dewatering activities will not extend beyond the project site. The potential contamination plume 100 years after mine closure (Plan 22 in Appendix 3) also shows the same result.

However, depending on the mine size, depth, life of mine and mining method, and the cone of dewatering from the existing or future mines could possibility reach the project site. Considering the distance between the mines and the limited rock permeability, however, this is an unlikely scenario.

Decanting is expected to occur at the Mooivley East mine zone after mine closure. Decanting is also possible to occur at any of the mines in the catchment. The project site is within the Klein Olifants River catchment; a tributary of the Olifants River. All the mines within this catchment could potentially have a cumulative impact on the streams and surface water bodies. This river is essential for water supply and the ecological well-being of the environment. Cumulative impacts that could occur include:

- Deterioration of water quality in the Olifants River; and
- Decrease in the catchment yield, hence the total runoff flow.

Depending on the decant quality, each of the mines are recommended to seal or treat the decant water before joining the streams to minimise the cumulative impact on a regional scale.

11.15.4 Fauna and Flora

The cumulative impacts that are considered from a perspective of terrestrial biodiversity include the following:

- Loss of habitat on a national scale – the threatened ecosystems programme (described in section 8.4) outlines the most significant habitats that are important for conserving on a national scale. Minimal loss of the Eastern Highveld Grassland (correlating to the Eragrostis-dominated grassland in this report) is expected and the impact of this is regarded as minor; and
- Loss of diversity on a regional scale – the Eragrostis Grassland is a broad habitat that encompasses many smaller plant communities. Due to the loss of 58 ha of this unit, the regional impact will be minor.

11.15.5 Wetlands

Some of the major contributing factors to the decline of wetlands in South Africa include mining, industrial and agricultural activities as well as poor treatment of waste water from industry and mining (Oberholster *et al*., 2011). Coal mining causes destruction of wetlands via direct impacts such as removal of habitat, alteration of flow and contamination of water, but also indirectly through the drawdown of groundwater resources during the dewatering process (van Der Walt, 2011).

Dewatering has cumulative impacts on wetlands, which are complex, interlinked systems in the Highveld. Underground mining, particularly in Mpumalanga due to bord and pillar methods, has frequently resulted in unplanned surface collapse (Ochieng *et al*. 2010). This collapse has been the cause of ground and surface water contamination due to acidification and salinisation of nearby aquifers. Blodget and Kuipers (2002) elaborates that subsidence can cause fissures or pits which may result in loss of large volumes of ground or surface water if connected to the stream network. This is specifically applicable to the shallow coal mining proposed in places (32 m). The proposed project is likely to continue to contribute to these cumulative impacts to wetland resources in the Mpumalanga Province region.

11.15.6 Aquatics

The following cumulative impacts have been identified, and can occur due to the proposed development:

- Cumulative deterioration of water quality within the Klein Olifants headwaters; and
- Cumulative deterioration of aquatic habitat.

The PES of the river reach associated with the proposal is currently modified as a result of habitat quality modification compounded by moderate water quality modification. The proposed project will likely not affect water quality of this reach until the closure phase, where-after Acid Mine Water is expected to decant, thus resulting in further water quality degradation. When considering downstream regions, the impoundment located a few kilometres downstream (Middelburg Dam) of the proposed project will likely act to concentrate pollutants during this phase and therefore serve to largely impact local aquatic biota within this system (Kingsford, 2000).

Dissolved solids (salinity) of the rivers within the Upper Olifants River catchment have been increasing as a result of extensive coal mining operations (RHP, 2001). Therefore, it is probable that the proposed project will contribute toward these increasing dissolved solids and further degradation of water quality within the Olifants River. Considering this, if mitigation actions are not put in place to treat potential Acid Mine Drainage, the effects thereof will be significant.

11.15.7 Heritage

It has been determined that the regional and, more specifically, local project site is rich in cultural and natural history. In light of this, the Project cannot be viewed in isolation from the greater cultural landscape, and the current existing and proposed developments surrounding the project site. As identified in du Piesanie & Nel (2013) and within the HSR, several operations have been proposed or are currently operating within the project area. The current operations are summarised in Table 11-110.

Table 11-110: Current operations within proximity to the Project

Mining operations	Koornfontein Coal Mine
	Kranspoort Coal Mine
	Middelburg Mine
	New Clydesdale Colliery
	Optimum Colliery
	Tavistock Coal Mine
	Woestalleen Coal Colliery
	Arnot Coal Mine
Power generation	Eskom's Arnot Coal-fired Power Station
	Eskom's Hendrina Coal-fired Power Station
	Eskom's Komati Coal-fired Power Station

The cumulative impacts associated with the proposed project are discussed in Table 11-111.

Table 11-111: List of potential cumulative heritage impacts

Type	Cumulative Impact	Direction of Change	Extent of Impact
Additive Space crowding	Change to the sense-of-place of the cultural landscape	Negative	Local
Additive Space crowding	Increased industrialisation and potential urban sprawl that may encroach on the agrarian and archaeological landscape	Negative	Local
Additive Space crowding Synergistic	Sterilisation of tangible heritage resources, such as Rock Art sites and consequently the possible effect on the integrity of the local intangible heritage, i.e. Bushmen and Khoi histories	Negative	Local
Additive Synergistic	Increased significance of remaining *in situ* archaeological sites and accumulations regardless of integrity	Negative	Site specific and local

11.15.8 Socio-Economic

A list of potential cumulative impacts associated with the Project is provided in Table 11-112. It is expected that the contribution of the Project towards cumulative impacts will be incremental based on the development and implementation of the various project components over time. Actual impacts will also vary in terms of project phases (construction, operation and closure). Hence, the list below is of a general nature, and represents the most prominent combined impacts for the broader project area.

Table 11-112: Summary of Potential Socio-economic Cumulative Impacts

Nature	Direction of change	Extent of impact
Improved standard of living through increased employment, local business development and improved public infrastructure and community services and facilities (the latter will be dependent on government and private-sector contributions).	Positive	Local and district
Urban sprawl, housing backlog and/or growth of informal settlements.	Negative	Local
Added pressure on local public service delivery and infrastructure, including housing, roads, water and sewage treatment works, schools, police services and waste management facilities.	Negative	Local and district
Community disruption and impact on social cohesion as a result of population influx, the presence of a non-local workforce, lack of services and facilities, and potential political dynamics/leadership challenges.	Negative	Local
The use of non-local labour, due to unavailability of local skilled workers causing tension in local communities as a result of the expectation that the Project should provide local employment.	Negative	Local
Greater competition for natural resources, in particular water and agricultural land.	Negative	Local
Possible increase in poverty in the area due to water scarcity/pollution, greater influx of job seekers and inability of the economy to absorb job seekers or to generate local employment.	Negative	Local
The visual impact of mining infrastructure, associated coal-fired power plants and other industrial developments, and associated changes in land use, are significant and imprint an industrial character onto the rural landscape.	Negative	Local and district
Increased pressure on water resources to maintain the reserves required to supply basic human and ecological needs.	Negative	Local and district

Nature	Direction of change	Extent of impact
Compounded effects of lighting, noise, traffic, water and groundwater abstraction and physical reduction in habitat has cumulative impacts on the social and biophysical environment.	Negative	Local and district
Increased sterilisation of agricultural land and decrease in food security	Negative	Regional and national
Potential impact on climate change through emission of greenhouse gasses	Negative	Local, regional and national

11.15.9 Visual Impact

The Ermelo Coalfield is characterised by agriculture interspersed with coal mines and power stations and little of the natural Grassland vegetation remains. The receiving environment consists mainly of agricultural land interspersed with farm residences, farm workers houses and the Hendrina and Kwazamokuhle towns. Several mines occur in the vicinity of the project area and the majority of these are underground mines. The nearest operational mines are Weltevreden Coal located 5.4 km west of the project area and Spitzkop Colliery located 6.7 km south-east of the project area. The nearest power station is the Hendrina power station located 21.4 km north-north-west of the project area.

The project area has an agricultural sense of place. Land uses in the region include agriculture and tourism with isolated areas of mining and power generation. The project is expected to have a visual impact on the less industrial activities, i.e. agriculture and tourism. As more mining and power generation projects are developed in the region, the sense of place will change from agricultural to industrial/ mining. This will result in a loss of scenic character and increased visual disturbance. Over time the receiving environment will change from one dominated by agriculture to one dominated by mining and industry.

11.15.10 Noise Impact

Cumulative impacts should be considered for the overall improvement of ambient noise levels. The proposed project is considered a causative source of noise pollution of a minor significance, meaning an impact which is insufficient by itself to prevent the implementation of the project but requires mitigation to minimise the impact.

The existing noise sources in the area of the proposed project are typical noise sources such as from the vehicle activity on the N11 national road as well as surrounding district roads such as the Davel Road. Frequent heavy vehicle activity from the surrounding mining collieries also being the main existing noise source.

However the baseline assessment of the immediate area surrounding the project site indicates a very low ambient soundscape. The project is therefore expected to be a major contributor to the ambient noise levels in the area of which the impact significance can be decreased by implementing the recommended mitigation measures.

11.15.11 Traffic Impact

The significance of the cumulative traffic impacts associated with the proposed project activities during construction, operations and decommissioning are considered negligible to minor and have not been considered further.

12 Item 3(g)(vi): Methodology used in determining and ranking the nature, significance, consequence, extent, duration and probability of potential environmental impacts and risks

Details of the impact assessment methodology used to determine the significance of physical, bio-physical and socio-economic impacts are provided below.

The significance rating process follows the established impact/risk assessment formula:

Significance = Consequence x Probability x Nature

Where

Consequence = Intensity + Extent + Duration

And

Probability = Likelihood of an impact occurring

And

Nature = Positive (+1) or negative (-1) impact

Note: In the formula for calculating consequence, the type of impact is multiplied by +1 for positive impacts and -1 for negative impacts.

The matrix calculates the rating out of 147, whereby Intensity, Extent, Duration and Probability are each rated out of seven as indicated in Table 12-3. The weight assigned to the various parameters is then multiplied by +1 for positive and -1 for negative impacts.

Impacts are rated prior to mitigation and again after consideration of the mitigation measure proposed in this environmental impact assessment report. The significance of an impact is then determined and categorised into one of eight categories, as indicated in Table 12-2, which is extracted from Table 12-1. The description of the significance ratings is discussed in Table 12-3.

It is important to note that the pre-mitigation rating takes into consideration the activity as proposed, i.e. there may already be certain types of mitigation measures included in the design (for example due to legal requirements). If the potential impact is still considered too high, additional mitigation measures are proposed.

Table 12-1: Impact Assessment Parameter Ratings

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
7	Irreplaceable loss or damage to biological or physical resources or highly sensitive environments. Irreplaceable damage to highly sensitive cultural/social resources.	Noticeable, on-going natural and / or social benefits which have improved the overall conditions of the baseline.	International The effect will occur across international borders.	Permanent: The impact is irreversible, even with management, and will remain after the life of the project.	Definite: There are sound scientific reasons to expect that the impact will definitely occur. >80% probability.
6	Irreplaceable loss or damage to biological or physical resources or moderate to highly sensitive environments. Irreplaceable damage to cultural/social resources of moderate to highly sensitivity.	Great improvement to the overall conditions of a large percentage of the baseline.	National Will affect the entire country.	Beyond project life: The impact will remain for some time after the life of the project and is potentially irreversible even with management.	Almost certain / Highly probable: It is most likely that the impact will occur. <80% probability.

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	Positive Impacts (Nature = +1)			
5	Serious loss and/or damage to physical or biological resources or highly sensitive environments, limiting ecosystem function. Very serious widespread social impacts. Irreparable damage to highly valued items.	On-going and widespread benefits to local communities and natural features of the landscape.	<u>Province/ Region</u> Will affect the entire province or region.	Project Life (>15 years): The impact will cease after the operational life span of the project and can be reversed with sufficient management.	Likely: The impact may occur. <65% probability.
4	Serious loss and/or damage to physical or biological resources or moderately sensitive environments, limiting ecosystem function. On-going serious social issues. Significant damage to structures/ items of cultural significance.	Average to intense natural and / or social benefits to some elements of the baseline.	<u>Municipal Area</u> Will affect the whole municipal area.	Long term: 6-15 years and impact can be reversed with management.	Probable: Has occurred here or elsewhere and could therefore occur. <50% probability.

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
3	Moderate loss and/or damage to biological or physical resources of low to moderately sensitive environments and, limiting ecosystem function. On-going social issues. Damage to items of cultural significance.	Average, on-going positive benefits, not widespread but felt by some elements of the baseline.	Local Local extending only as far as the development site area.	Medium term: 1-5 years and impact can be reversed with minimal management.	Unlikely: Has not happened yet but could happen once in the lifetime of the project, therefore there is a possibility that the impact will occur. <25% probability.
2	Minor loss and/or effects to biological or physical resources or low sensitive environments, not affecting ecosystem functioning. Minor medium-term social impacts on local population. Mostly repairable. Cultural functions and processes not affected.	Low positive impacts experience by a small percentage of the baseline.	Limited Limited to the site and its immediate surroundings.	Short term: Less than 1 year and is reversible.	Rare/ improbable: Conceivable, but only in extreme circumstances. The possibility of the impact materialising is very low as a result of design, historic experience or implementation of adequate mitigation measures. <10% probability.

Rating	Intensity/ Replaceability		Extent	Duration/Reversibility	Probability
	Negative Impacts (Nature = -1)	**Positive Impacts (Nature = +1)**			
1	Minimal to no loss and/or effect to biological or physical resources, not affecting ecosystem functioning. Minimal social impacts, low-level repairable damage to commonplace structures.	Some low-level natural and / or social benefits felt by a very small percentage of the baseline.	Very limited/Isolated Limited to specific isolated parts of the site.	Immediate: Less than 1 month and is completely reversible without management.	Highly unlikely/ None: Expected never to happen. <1% probability.

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Table 12-2: Probability/Consequence Matrix

Significance

Probability	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
7	-147	-140	-133	-126	-119	-112	-105	-98	-91	-84	-77	-70	-63	-56	-49	-42	-35	-28	-21	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147
6	-126	-120	-114	-108	-102	-96	-90	-84	-78	-72	-66	-60	-54	-48	-42	-36	-30	-24	-18	18	24	30	36	42	48	54	60	66	72	78	84	90	96	102	108	114	120	126
5	-105	-100	-95	-90	-85	-80	-75	-70	-65	-60	-55	-50	-45	-40	-35	-30	-25	-20	-15	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	105
4	-84	-80	-76	-72	-68	-64	-60	-56	-52	-48	-44	-40	-36	-32	-28	-24	-20	-16	-12	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84
3	-63	-60	-57	-54	-51	-48	-45	-42	-39	-36	-33	-30	-27	-24	-21	-18	-15	-12	-9	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63
2	-42	-40	-38	-36	-34	-32	-30	-28	-26	-24	-22	-20	-18	-16	-14	-12	-10	-8	-6	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42
1	-21	-20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

Consequence

Table 12-3: Significance Rating Description

Score	Description	Rating
109 to 147	A very beneficial impact that may be sufficient by itself to justify implementation of the project. The impact may result in permanent positive change	Major (positive) (+)
73 to 108	A beneficial impact which may help to justify the implementation of the project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and / or social) environment	Moderate (positive) (+)
36 to 72	A positive impact. These impacts will usually result in positive medium to long-term effect on the natural and / or social environment	Minor (positive) (+)
3 to 35	A small positive impact. The impact will result in medium to short term effects on the natural and / or social environment	Negligible (positive) (+)
-3 to -35	An acceptable negative impact for which mitigation is desirable. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative medium to short term effects on the natural and / or social environment	Negligible (negative) (-)
-36 to -72	A minor negative impact requires mitigation. The impact is insufficient by itself to prevent the implementation of the project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the natural and / or social environment	Minor (negative) (-)
-73 to -108	A moderate negative impact may prevent the implementation of the project. These impacts would be considered as constituting a major and usually a long-term change to the (natural and / or social) environment and result in severe changes.	Moderate (negative) (-)
-109 to -147	A major negative impact may be sufficient by itself to prevent implementation of the project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts are likely to be irreversible and/or irreplaceable.	Major (negative) (-)

12.1 Item 3(g)(vii): The Positive and Negative Impacts that the Proposed Activity (in terms of the Initial Site Layout) and Alternatives will have on the Environment and the Community that may be affected

Section 8.1 and specifically Section 8.2.1 provides an explanation of the site layout and the sensitivity analysis, alternatives and aspects that were considered during the finalisation of the layout. The layout of the mine was therefore amended during the undertaking of the EIA to come up with a layout which has less significant impact on the environment and surrounding communities.

Section 11 describes all the expected impacts from the various project activities.

12.2 Item 3(g)(viii): The possible mitigation measures that could be applied and the level of risk

Mitigation measures for each identified impact have been proposed and are presented in Section 14.

12.3 Item 3(g)(ix): Motivation where no alternatives sites were considered

In terms of mining, alternative sites (i.e. locations) were not considered as the location of the mineral resource determines the location of the mining operation. However, alternative site layouts have been considered as discussed previously.

12.4 Item 3(g)(x): Statement motivating the alternative development location within the overall site

The preferred infrastructure layout was informed by previous environmental and technical studies, as well as due to the location of the mineral resource. The preferred layout has considered the placement of infrastructure in such manner as to avoid and minimise potential environmental impacts. Where impacts cannot be avoided, mitigation and management measures have been provided. Refer to Section 8.2 for details regarding alternatives considered.

The preferred site layout has been selected based on the following motivating factors as discussed in Table 12-4.

Table 12-4: Description of the Motivating Factors for the Preferred Site Layout

Mining Right Area	Sensitive Aspect Avoided	Relocation
Mooivley East	N11 – Safety Risk	The underground layout has moved relocated 100 m away from the N11 at Mooivley East so as to avoid undermining of a national highway
	Wetlands, Pans and Seeps	The topsoil stockpile on Mooivley East, adjacent to the office area, is positioned vertically to reduce the distance of the infrastructure from the pan and seep wetlands.
		The product stockpile, crushing and screening plant and tip on Mooivley East have been relocated to the south of the weighbridge parking area.
		The PCD on Mooivley East has now been moved approximately 150 m to the west.
	Visual	A long berm will be constructed south of the infrastructure at Mooivley East. It runs from the N11 and reduces the visual impact of the product stockpile, tip, crushing and screening plant, shafts and conveyors to sensitive receptors.
Mooivley West	Surface Water – Klein Olifants River and associated floodlines	The office area and its associated infrastructure, haul and access roads on Mooivley West have been relocated approximately 150 m to the east to avoid the delineated floodlines
		The PCD has been relocated outside of the 100 m buffer and/ or 1:100 year floodline
Hendrina South	Wetlands, Pans and Seeps	The site shaft office has been relocated out of the sensitive wetland area
	Surface Water – Klein Olifants River and associated floodlines	The Shaft has been relocated outside of the 100 m buffer and/ or 1:100 year floodline

13 Item 3(h): Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity

The mine layout was informed by various environmental and technical studies. The initial site layout that was presented during the scoping phase underwent a number of changes to ensure the sensitive areas identified by specialists were avoided. Additionally comments received from I&APs were considered and where possible changes to the infrastructure layout were made. Specific reference can be made to the relocation of the conveyer belt. The impacts and risks discussed in Section 11 are applicable to the final site layout plan (Plan 24 in Appendix 3).

14 Item 3(i): Assessment of each identified potentially significant impact and risk

The potential impacts per activity and per phase are detailed in the Table 14-1.

Table 14-1: Assessment of each identified impact as per each activity

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
Site Clearing	Loss of Eragrostis – dominated Grassland	Fauna and Flora	Construction	Moderate (negative)	▪ Rehabilitation of the disturbed area should take place after construction, whereby a mixture of native grass species harvested from climax Themeda grassland and native grass species (such as Cynodon dactylon) are planted immediately to prevent erosion; and ▪ The footprint area should be limited as far as possible.	Minor (negative)
	Removal of wetland soils and vegetation; totalling 18.7 ha.	Wetland	Construction	Moderate (negative)	▪ The infrastructure plan must be reviewed, the footprint kept as small as possible and all wetlands must be avoided as far as possible; particularly with respect to Mooivley East infrastructure that is within the seep wetlands draining into the natural pan; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	Minor (negative)
	Increased runoff and erosion within the Klein Olifants River	Aquatic ecology	Construction	Moderate (negative)	▪ Minimise and keep the footprint as small as possible; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; ▪ Stormwater from the adjacent area must be diverted around the construction site and activities to ensure that clean stormwater is not contaminated; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; ▪ Sequential removal of the vegetation (not all vegetation immediately); and ▪ The revegetation of unpaved roadsides.	Minor (negative)
	Noticeable to nearby receptors, Topsoil removal and stockpiling, generation of dust – Mooivley West, Hendrina South and Mooivley West	Visual	Construction	Minor (negative)	▪ Vegetation should only be removed when and where necessary; ▪ Topsoil should only be removed when and where necessary; ▪ Topsoil stockpiles should be vegetated with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum) where possible so as to blend into the surrounding landscape and reduce dust generation;	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					▪ Limit footprint area of topsoil stockpiles where possible; ▪ Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	
	Dust generation leads to poor air quality	Air Quality	Construction	Minor (negative)	▪ Application of wetting agents or dust suppressant on the dirt road and exposed areas to minimise emissions; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing or digging must occur; and ▪ Drop heights when loading and offloading material should be minimised (i.e. reduce distance between the excavator bucket and truck bed).	Negligible (negative)
	Lowering of the water table	Groundwater	Construction	Negligible (negative)	▪ If any trenches are excavated below the water table for any reason, dewatering of the aquifer to lower the water table locally can be considered to ensure that the construction takes place in a dry environment and the water quality remains acceptable. The abstracted water can be utilised for dust suppression, vegetation irrigation or discharged to local stream (if quality permits). Since the groundwater is not expected to be polluted at this stage, the utilisation of the water for activities such as dust suppression or irrigation will not cause negative environmental impacts; and ▪ Install long term monitoring boreholes.	Negligible (negative)
	Siltation of surface water resources leading to deteriorated water quality	Surface Water	Construction	Minor (negative)	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised so as to minimise construction of new access roads in these areas; ▪ If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing; ▪ The proposed topsoil and overburden stockpiles must be covered or vegetated as soon as possible to prevent sediment erosion. Location of measures as per SWMP ; ▪ Contaminated storm water runoff from this area will be routed through trenches to silt trap sumps at the bottom of the stockpiles; ▪ Contaminated storm water runoff from the sump will be routed through channels to the PCDs for reuse; ▪ Water quality monitoring should be implemented as an management option; Haul roads must be well	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					compacted to avoid erosion of the soil into the streams; ▪ Dust suppression on the haul roads and cleared areas must be regularly undertaken; and ▪ All dirty water channels must be constructed and placed within the dirty water infrastructure areas, such that all dirty water runoff emanating from these areas are captured and contained to a dirty water containment facility. The proposed channels should be lined and sized to cater for the 1:50 year storm event.	
Increased vehicular movement and noise on site	Disturbance to fauna on site (noise, roadkill)	Fauna and Flora	Operational	Minor (negative)	▪ Erect signage on site; ▪ Adhere to speed limits; and ▪ Minimise vehicle movement at night.	Negligible(negative)
	Increase in traffic volumes and vehicle delays.	Traffic	Operational	Negligible(negative)	▪ Maintenance of proposed road upgrades at the new proposed N11/ Mooivley East Access Road and Davel Road/ Mooivley West Access Road ; and ▪ Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions.	Negligible(negative)
	Increase in delays for cyclists and pedestrians	Traffic	Operational	Negligible(negative)	▪ Regular pedestrian and cycling activity awareness by drivers as part of the formal driver training and regular Health and Safety briefings; and ▪ Site related heavy vehicles need to avoid low order roads in residential areas, as far as reasonably practicable.	Negligible(negative)
	Road safety conditions	Traffic	Operational	Minor (negative)	▪ Regular driver awareness campaigns/ training; ▪ Prescribe routes for delivery vehicles; and ▪ Heavy vehicle deliveries to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of HGVs waiting to access the site or at road junctions.	Negligible(negative)
	Impact on road surface conditions	Traffic	Operational	Negligible(negative)	▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/ from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.	Negligible(negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
Construction of the Mine	Employment creation during construction	Socio-economic	Construction	Minor – positive	▪ It is recommended that Umcebo host a consultation meeting with the Hendrina community should their applications for the relevant authorizations be successful. This meeting should take place prior to the commencement of any construction activities. The objective of the meeting should be to share information relating to opportunities (jobs, procurement, LED projects etc.) and to establish communication lines between the mine and the community; ▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle); ▪ Promotion of local, female and youth employment; ▪ Where possible labour-intensive construction methods should be promoted; ▪ Verification of local status; ▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available; ▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit; ▪ Expand skills development to surrounding communities; ▪ Recruitment via a registry of job seekers and potentially coordinated through the DoL; ▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training; and ▪ Monitoring subcontractors in terms of local employment targets.	Moderate - positive
	Multiplier effects on the local economy	Socio-economic	Construction	Minor – positive	▪ Give preference first to capable local service providers; ▪ Develop local service provision capacity; ▪ Monitoring of sub-contractors procurement; ▪ Development of a register of local SMMEs; ▪ Linkages with skills development/ SMME development institutions and other mining operations; ▪ SMME skills development as part of mine SLP/ LED commitments; and ▪ Local procurement targets should be formalised in	Moderate - positive

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					Umcebo's procurement policy.	
	Community development and social upliftment	Socio-economic	Construction	Minor – positive	▪ Liaison with beneficiaries to ensure needs are met; ▪ Collaboration with other developmental role players during implementation; ▪ Expanding skills development and capacity building programmes to non-employees; ▪ Establish external monitoring system to regulate HDSA procurement; ▪ Where feasible, training should be NQF accredited; and ▪ A record of training courses completed per individual should be kept.	Moderate - positive
	Displacement related impacts	Socio-economic	Construction	Major - negative	▪ Umcebo should where possible endeavour to minimise the extent of displacement through project design, where displacement cannot be minimised the following measures are recommended to alleviate the adverse impacts; ▪ Umcebo should finalise the Project layout plan and determine its policy and approach to displacement, as this would inform the extent of resettlement, i.e. whether it will recognise both direct and indirect forms of displacement; ▪ Where a selling price cannot be determined by negotiation a sales agreement should be negotiated which reflects the holistic value (determined by a professional valuer) of the land and should also be inclusive of the potential relocation cost of commercial farms and/or business operations; ▪ The displacement of non-vulnerable households and individuals should be considered on a case-by-case basis; ▪ Areas impacted upon during construction should be rehabilitated upon completion of the construction activities to ensure that the land is returned in the same condition; ▪ Prior to finalising the sales agreement of land, it should be clear who will assume responsibility for the resettlement of the vulnerable household; ▪ If Umcebo assumes responsibility for the physically displaced household, due process should be followed when the household is relocated. It is recommended that the process be aligned to IFC PS 5; ▪ Consider including employees and other impacted businesses in the aforementioned process; and ▪ The conveyor between Mooivley West and Hendrina	Moderate - negative

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					South should be aligned along farm boundaries as far as practically possible to reduce the degree of property fragmentation.	
	Disruption of daily movement patterns	Socio-economic	Construction	Moderate - negative	▪ Measures to prevent deterioration of roads suggested in Traffic Impact Assessment; ▪ Regulation of traffic at intersections between the N11 and Davel road and access roads to construction and operational sites; ▪ Road upgrading measures should be investigated and implemented in conjunction with the relevant government department; ▪ Inform communities of planned construction activities that would affect vehicle/ pedestrian traffic; ▪ Ensure that access to key services in areas such as Hendrina are uninterrupted by providing alternative access routes; ▪ Construction of livestock crossings at suitable intervals should be incorporated into project design; and ▪ Livestock farmers and regular road users should be consulted with regard to placement of crossings.	Minor - negative
	Influx related impacts	Socio-economic	Construction	Moderate - negative	▪ Develop an Influx management plan together with other industry role players and government; ▪ Discourage influx of job-seekers by prioritising employment of unemployed members of local communities; ▪ Liaise with local municipalities to ensure that expected population influx is taken into account in infrastructure development and spatial development planning; ▪ Create synergies with local government IDP and other companies' SLP/ CSR projects to promote infrastructure development; ▪ Extensive HIV/ AIDS awareness and general health campaign; ▪ Identify if recorded criminal activities involved members of the mine's workforce; ▪ Establishment of anti-poaching mechanism in consultation with potentially affected land owners; ▪ Clear identification of workers; prevention of loitering; ▪ Liaison with police, community policing forum; ▪ Promote projects providing housing, especially low cost housing; and ▪ Measures to address potential conflict between locals and non-locals.	Minor - negative
	Impacts on community health	Socio-economic	Construction	Moderate - negative	▪ Access control to all project elements, including	Minor - negative

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	and safety				fencing; ▪ Notification of blasting activities; ▪ Storage of blasting and hazardous materials should adhere to prescribed regulation; ▪ Measures suggested minimising the impact of fly-rock on surrounding roads and structure (Blast Management and Consulting, 2016); ▪ Measures suggested in the Traffic Impact Assessment to minimize traffic related accidents (Aurecon, 2016); and ▪ Road maintenance.	
	Impact on surrounding land users	Socio-economic	Construction	Moderate - negative	▪ Refer to recommendations of specialist studies (see Visual Impact Assessment, Surface-and Ground Water Impact Assessment, Noise Impact Assessment, Air Quality Impact Assessment, Blasting and Vibration Impact Assessment and Traffic Impact Assessment); ▪ Optimise mine plan/infrastructure placement to avoid/minimise negative impacts, especially in terms of visual intrusion, displacement, air quality and disruptions of traffic; ▪ Implement measure to create an environment that can contribute positively to stakeholders affected by it. For example, farmers might have to fend against poachers stealing livestock from farms or fight veld fires. The Project has resources that can assist the farmers, and should reach an understanding with these stakeholders about how it could assist them in this regard; ▪ Undertake continuous information sharing and consultation with adjacent/affected farm owners; and ▪ Implement communication mechanisms to report changes in water quality/quantity, air quality or vibrations.	Minor - negative
	Opposition because of perceived negative impacts	Socio-economic	Construction	Minor - negative	▪ Communicate commitments regarding LED; ▪ Transparency regarding employment practices; ▪ Presentation of EIA findings in clear and understandable manner; ▪ Monitor community attitudes to anticipate/prevent active opposition through grievances lodged through community forum and a formal grievance mechanism; ▪ Establish a community forum; and ▪ Appointment of a CLO / Stakeholder Engagement / Community offices to enhance communication.	Negligible - negative
	Loss of farm/other labour to the mine	Socio-economic	Construction	Minor - negative	▪ Avoid recruitment on farms; ▪ Persons applying for jobs with construction or	Negligible - negative

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					operational contractors are to be informed that such jobs are temporary; and ▪ Adhere to labour legislation	
	Increase in traffic volumes and vehicle delays	Traffic	Construction	Minor - negative	▪ Upgrade at the new proposed N11/ Mooivley East Access Road intersection; ▪ The new proposed Davel Road and Mooivley West intersection is to be priority controlled with Davel Road having priority; and ▪ Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions.	Negligible - negative
	Increase in delays for cyclists and pedestrians	Traffic	Construction	Minor - negative	▪ Regular pedestrian and cycling activity awareness by drivers as part of the formal driver training and regular Health and Safety briefings; and ▪ Site related heavy vehicles need to avoid low order roads in residential areas, as far as reasonably practicable.	Negligible - negative
	Road safety conditions	Traffic	Construction	Minor - negative	▪ Regular driver awareness campaigns/ training; ▪ Prescribe routes for construction traffic; and ▪ Heavy vehicle deliveries to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of HGVs waiting to access the site or at road junctions.	Negligible - negative
	Impact on road surface conditions	Traffic	Construction	Minor - negative	▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.	Negligible - negative
Construction of surface infrastructure; and Power Generation	Loss of Utilisable Soil Resource due to – Erosion, Compaction and possible Contamination	Soil and Land Use Capability	Construction	Moderate (negative)	▪ Soils are to be stripped as per the stripping guidelines (contained within the soil utilisation and management section of this report) and erosion of stockpiles should be minimized by establishing vegetation on the stockpiles; and ▪ Compaction should be avoided.	Minor (negative)
	Degradation of habitat integrity for the construction of infrastructure within wetlands and the buffer areas	Wetland	Construction	Minor (negative)	▪ The infrastructure plan must be reviewed, the footprint kept as small as possible and all wetlands must be avoided as far as possible; particularly with respect to Mooivley East infrastructure that is within the seep wetlands draining into the natural pan;	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	
	The loss of aquatic habitat as a result of construction activities within a river channel	Aquatic ecology	Construction	Moderate (negative)	▪ No crossings over riffle/ rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured; ▪ All crossings should be designed in such a way that it will reduce the potential for erosion and downstream sedimentation; ▪ The crossing points should be stabilised with gabions to reduce the resulting erosion and downstream sedimentation; ▪ Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years; ▪ The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled and avoided; ▪ Erosion prevention mechanisms must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ▪ The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions; ▪ Diversion trenches and berms should convey dirty water to the PCD so as to contain runoff; and ▪ Soils adjacent to the river that have been compacted must be loosened to allow for germination.	Moderate (negative)
	Loss of integrity of rock art sites	Heritage	Construction	Moderate (negative)	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Major (positive)
	Noise disturbance (noise levels in excess of 45 dBA)	Noise	Construction	Minor (negative)	▪ Restricting construction activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Locating diesel generators away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Mining related machines and vehicles to be serviced to	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels; and ▪ Switching off equipment when not in use.	
	Change of land use from agriculture to mining resulting in a loss of sense of place, a loss of scenic character and increased visual disturbance -	Visual	Construction, mitigation measures applied during rehabilitation and closure	Major (negative)	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all the mitigation measures outlined in the Closure and Rehabilitation reports are conducted.	Moderate (negative)
	Change in sense of place due to surface infrastructure and increased lighting – Mooivley West, Hendrina South and Mooivley West	Visual	Construction	Moderate (negative)	▪ Ensure screening vegetation is left intact around the Project area and near receptors; ▪ Ensure the surface infrastructure does not exceed the proposed heights; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ▪ Down lighting must be implemented for construction activities taking place at night to minimise light pollution.	Moderate (negative)
	Deterioration of ambient air quality due to the construction	Air Quality	Construction	Minor (negative)	▪ Application of dust suppressant on the dirt road and exposed areas;	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	of surface infrastructure resulting in dust generation				▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging must occur; and ▪ The drop heights when loading onto trucks and at tipping points should be minimised (i.e. reduce distance between the excavator bucket and truck bed).	
	Reduction in air quality due to gaseous emissions (Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter)	Air Quality	Construction	Moderate (negative)	▪ Ensure generators are working at optimal conditions; ▪ Fitting of gas scrubbers; ▪ Use of low sulfur diesel; and ▪ Fitting electrostatic precipitators or bag house.	Negligible (negative)
	Deterioration of water quality due to dirty water reporting into natural water resources	Surface Water	Construction	Minor (negative)	▪ All fuel storage areas should be appropriately bunded and spill kits should be in place, and construction workers trained in the use of spill kits, to contain and immediately clean up any potential leakages or spills; ▪ Vehicles should regularly be maintained as per any good practice maintenance program. This should also be inspected on a daily basis before use to ensure there are no leakages underneath; ▪ Ablutions facility for construction workers and general waste bins should be provided. An accredited contractor should be appointed to dispose of the waste properly; and ▪ The ECO should be appointed to ensure implementation of the recommended mitigation/ management measures during construction	Negligible(negative)
Blasting and excavation	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Wetland	Operational	Moderate (negative)	▪ Avoid all undermining of channelled valley bottom wetlands and the Klein Olifants River if possible – see areas deemed as no-go according to the sensitivity analysis; ▪ The highest safety factor possible (towards a factor of 2) must be used for areas of shallow mining. This is mostly associated with the top seam where many wetlands are known to occur. The safety factors must be determined by the relevant engineers in a comprehensive geotechnical assessment. ▪ Underground dykes and sills must be carefully managed as this can lead to dewatering of wetlands if undesired aquifers are punctured.	Minor (negative)
	Subsidence of land within the river catchment and subsidence of land underneath river channels	Aquatic Ecology	Operational	Moderate (negative)	▪ Complete a geotechnical study to identify potentially high risk subsidence areas and avoid them where feasible or mitigate to support them through the abovementioned geotechnical study;	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					▪ Ensure sufficient pillar support and safety factors to prevent subsidence of undermined wetland areas; and ▪ The highest safety factor must possible must be used for areas of shallow mining (35 m to 70 m at least).	
	Degradation of intrinsic CS of burial grounds and graves	Heritage	Construction	Major (negative)	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Minor (positive)
	Damage to surface dressing of burial grounds and graves	Heritage	Operational	Minor (negative)	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Minor (positive)
	Generation of Dust – Mooivley West, Hendrina South and Mooivley East	Visual	Construction	Minor (negative)	▪ Apply dust suppression techniques to limit the dust generated from blasting.	Negligible (negative)
	Deterioration of ambient air quality due to underground blasting and mining	Air Quality	Operational	Minor (negative)	▪ Use of baghouse; and ▪ Use of wet scrubbers.	Negligible (negative)
Waste Storage and Generation	Runoff containing pollutants and increased water velocity resulting in water and habitat quality degradation in downstream river reaches	Aquatic Ecology	Construction	Minor (negative)	▪ Diversion trench and berm systems which diverts clean stormwater around pollution sources and convey and contain dirty water to central PCDs; ▪ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from entering the local aquatic systems. ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around PCD and structures should be completed as this has been shown to be effective in erosion and nutrient control.	Minor (negative)
	Reduction in air quality due to dust and gaseous emissions as a result of waste generation and disposal	Air Quality	Construction	Minor (negative)	▪ Application of dust suppressant on the dirt road and exposed areas; ▪ The drop heights when loading onto trucks and at tipping points should be minimised (i.e. reduce distance between the excavator bucket and truck bed); ▪ Handling and storage of hazardous waste in clearly labelled containers; ▪ Training on the handling and storage of hazardous materials; and ▪ Training on the emergency procedures and action plans i.e. spillage of dangerous substances.	Negligible (negative)
	Waste generation and storage	Air Quality	Operational	Minor (negative)	▪ Vegetation of stockpiles;	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	will result in release of dust and volatiles and result in a reduction in air quality				▪ Handling and storage of hazardous waste in clearly labelled containers; ▪ Training on the handling and storage of hazardous materials; and ▪ Training on the emergency procedures and action plans on the handling of leaks, spillages of hazardous materials.	
Stockpiling of material on the overburden stockpiles, waste rock berms and product stockpiles	Generation of Dust and change in landscape – Mooivley West, Hendrina South and Mooivley East	Visual	Operation	Moderate (negative)	▪ Ensure the overburden stockpiles do not exceed the proposed height of 18 m; ▪ Ensure the product stockpiles do not exceed the proposed height of 10 m; ▪ Ensure the waste rock berms do not exceed the proposed height of 3 m; ▪ Limit the quantity and time of ROM stored on site; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	Moderate (negative)
	Stockpiling will result in dust emissions and reduced air quality	Air Quality	Operational	Moderate (negative)	▪ Application of wetting agents or dust suppressant; ▪ Minimise drop heights when loading and offloading material; ▪ Set maximum speed limits and have these limits enforced on stockpiles; and ▪ Vegetation of side walls of overburden and topsoil.	Negligible (negative)
	Water Contamination leading to deterioration of water quality	Surface Water	Operational	Moderate (negative)	▪ All the dirty water emanating from the dirty water areas be collected via silt traps before entering the PCD for re-use within the mine, to prevent unnecessary discharge into the environment; ▪ The dirty water collection trenches (as detailed in section 9) should be cleaned regularly to reduce silt build up and ensure they are able to accommodate and convey the 1:50 year peak flows. ▪ Stockpiling should be monitored so that the side slopes do not encourage erosion of the slopes resulting in silt transported into the trenches from the stockpiles, allowing some silt to settle on the dirty water site rather than in the channels; ▪ In addition to the control of stormwater, water quality monitoring should form part of the system where water in the PCD's are monitored for quality. This ensures that pollution sources are monitored during the mining operational process and in the unlikely event of any spillages the downstream impacts can be estimated. The main constituents to check would be the TSS, EC, Salts and some chemical parameters that such as (pH, SO4 and other metals);	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					▪ Should a subsidence occur during operation, it should be rehabilitated as soon as possible to avoid impoundment of surface water; and ▪ Water quality monitoring on the upstream and downstream points of the proposed coal mine must continue as set out in Section 9.	
Hauling/conveying of coal, plant and equipment operations as well as power generation	Loss of Soil Usability/Utilisation Potential	Soil and Land Use Capability	Operational	Minor (negative)	▪ Maintenance on the soil stockpiles must be done monthly to check for compaction and erosion. Where prevalent, corrective measures must be taken so as to minimise the loss of utilisable soil as a resource and minimise the effects of sedimentation on the receiving water bodies. These would include keeping a soil balance, inspection for erosion and loss of soil, fertility of stockpiles and vegetation establishment on these stockpiles; ▪ Minimisation of disturbed areas; ▪ Replacement of the soils should occur regularly so as to minimise the area of disturbance (concurrent rehabilitation where possible); ▪ Adequate protection from erosion (wind and water) must be undertaken such as corrective actions (erosion berms) to minimise erosion; ▪ Effective vegetative and soil cover and protection from wind (dust) and dirty water contamination; ▪ Servicing of all vehicles on a regular basis and in well-constructed and bunded areas, well-constructed and maintained oil traps and dirty water collection systems; ▪ Cleaning of all roadways and haulage/conveyancing ways, drains and stormwater control facilities; ▪ Prevent any spills from occurring by having clean up kits in place, vehicles should be serviced off site or in a concrete area; ▪ Soil replacement and the preparation of a seed bed to facilitate and accelerate the re-vegetation program and to limit potential erosion; and ▪ Soil amelioration to enhance the growth capability of the soils on the topsoil stockpiles and sustain the soils ability to retain oxygen and nutrients, thus sustaining vegetative material during the storage stage.	Negligible (negative)
	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants	Wetland	Operational	Moderate (negative)	▪ The conveyor must be designed in such a way so as to minimise the windblown coal fines and any potential coal fallout and should be covered. If possible, the conveyor should be fully enclosed over the wetlands and within the 100 m buffer area;	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment. Stockpiling of coal also represents risks to the environment that much be managed.				▪ The conveyor servitude must also have a well-designed stream crossing and this should be maintained. The wetlands outside of this must be demarcated as no-go areas; ▪ The conveyor must be monitored and maintained to best operating standards and per the design criteria that capture mitigation measures; and ▪ The wetland must be monitored quarterly to ensure no residual impact to the wetland and river is realised; and if so that remediation measures are followed. It is recommended that at least 100 m on either side for the conveyor is assessed for any sign of ecological decline and pollution such as coal fines deposition and runoff, die back of vegetation and increased erosion.	
	Contamination of surface water through contaminated runoff and contaminated seepage influx	Aquatic Ecology	Operational	Moderate (negative)	▪ Effective surface water management (see surface water report); ▪ Clean, dirty water separation and stormwater management: Clean water should be managed in a manner according to the Department of Water and Sanitation Best Practice Guidelines; ▪ Exposed topsoil and soil stockpiles must be revegetated to reduce erosion and subsequent sedimentation; and ▪ PCD must allow for collection of classified dirty water in the event of a 1:50 year storm event.	Minor (negative)
	Employment creation during operation	Socio-economic	Operational	Minor - positive	▪ Measures to enhance local employment during construction (see measures to enhance employment during construction in Table 11-75); ▪ Provide focused training to construction phase employees from the host communities to increase their chances for employment during the operations; ▪ Measures recommended to maximise benefits from local employment, and economic multiplier effects (refer to Table 11-75); and ▪ The Project's database of the local labour pool should be updated to include people who were employed by the Project during the construction phase.	Moderate - positive
	Economic growth and diversification	Socio-economic	Operational	Minor - positive	▪ Measures recommended to maximise benefits from local employment, economic multiplier effects, as well as community, economic and skills development (refer to Table 11-76); ▪ Procure from local HDSA suppliers throughout the life of the mine; and ▪ Establish a monitoring system to ensure that the mine	Moderate - positive

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					and its contractors comply with government regulations.	
	Noise will emanate from the machinery and vehicles during the operational activities	Noise	Operational	Minor (negative)	▪ Locating of diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Fitting ventilation silencers to the ventilation fans; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Installation of low noise rollers for conveyor belts as well as enclosing the conveyor belt; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Maintenance of low noise rollers for conveyor belts; and ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels.	Minor (negative)
	Vehicular activity to haul coal including the generation of dust – Mooivley West, Hendrina South and Mooivley East	Visual	Operational	Minor (negative)	▪ Limit the speed of vehicles on the haul roads to reduce dust; and ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust.	Negligible (negative)
	Generation of dust from crushing and screening plant. Lighting from the overall operation of the mine – Mooivley West, Hendrina South and Mooivley East	Visual	Operational	Moderate (negative)	▪ Apply dust suppression techniques to limit the dust generated from the crushing and screening plant; and ▪ Down lighting must be implemented for operational activities taking place at night to minimise light pollution.	Moderate (negative)
	Hauling leads to emission and poor air quality	Air Quality	Operational	Moderate (negative)	▪ Application of wetting agents or dust suppressant (various grades depending on proximity to receptors) on the dirt road and exposed areas; and ▪ Set maximum speed limits and have these limits enforced.	Negligible (negative)
	Crushing of ore results in fugitive dust emissions	Air Quality	Operational	Moderate (negative)	▪ Application of wetting agents (water spray); and ▪ Enclosure of crusher will be considered only if emissions are in exceedance of the regulatory limits	Negligible (negative)
	Reduction in air quality due to gaseous emissions	Air Quality	Operational	Moderate (negative)	▪ Ensure generators are working at optimum conditions; ▪ Fitting of gas scrubbers; ▪ Use of low sulfur diesel; and	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					▪ Fitting electrostatic precipitators or bag house.	
	Groundwater contamination as a result of underground mining and, seepage from the PCD and waste stockpiling	Groundwater	Operational	Minor (negative)	▪ If subsidence is formed during operation, it should be rehabilitated as soon as possible to minimise water and oxygen inflow from the atmosphere; ▪ Management solutions should be provided following an agreement with the farmers with impacted groundwater or mine purchase land; ▪ The use of nitrate based explosives should be limited as far as practicable to minimise groundwater contamination; ▪ Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals. The following management activities can be implemented to minimise contamination that originates from the pollution control dam; ▪ Avoid placement of the PCD on areas with the potential for increased infiltration to groundwater, such as over fault zones; ▪ Implementation of adequate stormwater management to contain all waste water and/ or volatile organic compounds, for treatment and recycling; ▪ PCD should be lined to pro-actively prevent infiltration of contaminated seepage water; and ▪ PCD should be operated in such a way that it will not overflow more than once in 50 years.	Negligible (negative)
Mine dewatering and creation of cone of dewatering	Lowering of the water table	Groundwater	Operational	Minor (negative)	▪ Store the dewatered water in PCDs and ensure that the dams will have sufficient storage volume. If that is not possible, re-introduce treated water into the streams after ensuring that they meet the required standards as per specified by the WUL; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and groundwater inflow rates; and ▪ Update numerical model annually for the first five years as more information becomes available.	Minor (negative)
Construction of Overland Conveyor across an NFEPA channelled valley	Heavy machinery working with wetland channel and surrounds impacting upon soil,	Wetland	Construction	Moderate (negative)	▪ The infrastructure plan must be reviewed, the footprint kept as small as possible and all wetlands must be avoided as far as possible; particularly with respect to	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
bottom wetland	vegetation disturbing fauna.				Mooivley East infrastructure that is within the seep wetlands draining into the natural pan; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	
Dismantling and removal of infrastructure	Net loss of soil potential due to change in materials (Physical and Chemical) and loss of nutrient base	Soil and Land Use Capability	Decommissioning and Closure	Minor (negative)	▪ Only designated access routes are to be used to reduce any unnecessary compaction; ▪ Ensure proper storm water management designs are in place; ▪ Correction actions (erosion berms) must be taken to minimise any further erosion from taking place; ▪ Soils must be replaced according to the soil types; ▪ Deep rip compacted areas to allow for natural vegetation regrowth; ▪ A bowl scraper is to be avoided as this piece of machinery compacts soil; ▪ The positive impacts of rehabilitating an area are the reduction in the area previously disturbed, the amelioration of the affected soils and oxygenation of the growing medium; ▪ The stabilising of slopes and revegetation of areas decommissioned with a reduction in areas previously subjected to wind or water erosion; and ▪ Rehabilitate according to the approved rehabilitation plan (Appendix 17).	Negligible (negative)
	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the	Wetland	Decommissioning and Closure	Minor (negative)	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. A 100 m buffer from the edge of the wetland is recommended; and ▪ Wetland monitoring must be carried out during the rehabilitation phase to ensure there is no unnecessary impact to wetlands; and if so that a remedy is put in place as soon as possible.	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	hillslope seep wetland underlying the proposed infrastructure for Hendrina South.					
	Increased runoff and erosion within the Klein Olifants River	Aquatic Ecology	Decommissioning and Closure	Minor (negative)	▪ Established buffer zones: 100 m from wetland and 100 m from riparian areas; and ▪ Stormwater management plan.	Minor (negative)
	Alien plant invasion may take place	Fauna and Flora	Decommissioning and Closure	Minor (negative)	▪ An alien plant species management plan should be implemented for two years post closure.	Negligible (negative)
	Dependency on mine for sustaining local economy	Socio-Economic	Decommissioning and Closure	Moderate (negative)	▪ Develop alternative and sustainable livelihoods for instance through LED programmes listed in the Mine's SLP; ▪ Collaborate with other industries to support the diversification of the local economy; ▪ The Mine's SLP should provide strategies and measures that reduce job loss through redeployment at other operations; ▪ Where feasible alternatives to save jobs/avoid downscaling should be investigated beforehand, including LED, potential redeployment at other operation; ▪ Develop a Mine Closure Plan; ▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where; retrenchment and/or closure of the mine are certain. In particular through promoting economic diversification, portable skills development and local economic development where possible; and ▪ Partner with the relevant government departments, to jointly manage Closure process.	Minor - negative
	Noise will emanate from the machinery and vehicles operating during the decommissioning activities.	Noise	Decommissioning and Closure	Negligible (negative)	▪ Restricting decommissioning activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	Negligible (negative)
	Generation of dust during demolition process and surface rehabilitation – Mooivley West, Hendrina South and Mooivley East	Visual	Decommissioning and Closure	Minor (negative)	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all mitigation measures in the Closure and Rehabilitation reports are conducted.	
	Removal of Infrastructure results in dust emission	Air quality	Decommissioning and Closure	Negligible (negative)	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when offloading materials for rehabilitation must be minimised; ▪ Limit demolition activities to non-windy days (with wind speed less than 5.4 m/s); and ▪ Dust suppression on exposed surfaces.	Negligible (negative)
	Siltation Of Surface Water Resources Leading To Deteriorated Water Quality	Surface Water	Decommissioning and Closure	Minor (negative)	▪ Use of accredited contractors for removal or demolition of infrastructures; this will reduce the risk of waste generation and accidental spillages; ▪ The PCDs, constructed dirty water trenches and berms will have to remain until post closure should be removed last form the site so that the silt trap and the sot dirty water can contained for treatment before discharge until rehabilitation is completed; ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams; and ▪ Water quality monitoring on the upstream and downstream points of the coal mine must be undertaken and suspended solids and turbidity levels accessed.	Minor (negative)
Underground mine closure and rehabilitation	Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.	Wetland	Decommissioning and Closure	Major (negative)	▪ Groundwater and wetlands must be monitored post-mining for potential decant; and ▪ Long-term water treatment options will need to be investigated by Umcebo to prevent polluted decant water from entering the catchment.	Moderate (negative)
	Decant of severely contaminated water into local	Aquatic Ecology	Decommissioning and Closure	Major (negative)	▪ Decant treatment plan; and ▪ Water treatment options.	Minor (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
	aquatic ecosystems					
	Rehabilitation will result in dust emission	Air Quality	Decommissioning and Closure	Minor (negative)	▪ Drop heights should be minimised when offloading materials for rehabilitation; ▪ Limit rehabilitation activities to non-windy days; ▪ Rehabilitation in accordance with rehabilitation plan; and ▪ Dust suppression on exposed surfaces.	Negligible (negative)
	Groundwater contamination as a result of underground mining	Groundwater	Decommissioning and Closure	Minor (negative)	▪ Groundwater will flow away from the mine footprint if the hydraulic head within the mine is higher than the surrounding elevation. Ensure (through dewatering or decant management) that the hydraulic head in the mine void is always lower than that of the river or the regional head; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and mine inflow rates; and ▪ Update numerical model every three years for the life of the mine as more information becomes available.	Negligible (negative)
Mine decanting	Decanting of the closed mine resulting in contamination of surface water bodies	Groundwater	Decommissioning and Closure	Moderate (negative)	▪ Capture decanting water before it joins any streams; treat it and re-introduce it into the streams. As experienced from other coal mines, the decant quality could be up to 2 500 mg/L of sulfate; ▪ Management solutions should be provided by Umcebo following an agreement with the farmers or communities with impacted rivers; ▪ Monitoring of groundwater water levels in the weathered and coal seam aquifers; ▪ If sinkholes from subsidence are formed after closure, they should be rehabilitated as soon as possible to minimise water and oxygen inflow from the atmosphere; and ▪ Update numerical model every three years for the life of the mine as more information becomes available.	Negligible (negative)
	Mine decanting resulting in contamination of surface water bodies	Surface Water	Decommissioning and Closure	Moderate (negative)	▪ Capture decanting water before it flows into the stream, treat it and re-introduce it into the streams. Please refer to the ground water report for detailed decant simulation results and management measures; ▪ The decant should be treated to the acceptable water quality levels (Olifants RWQO); and ▪ Water quality monitoring on the upstream and downstream points of the coal mine must continue as	Negligible (negative)

Activity	Potential Impact	Aspects Affected	Phase	Significance	Mitigation Type	Significance
					set out in Section 9 of the Surface Impact Assessment (Appendix 5).	

15 Item 3(j): Summary of Specialist Reports

Numerous specialist impact assessments were undertaken for the proposed project, as set out in Table 15-1. Separate specialist reports were compiled and have been attached as appendices to this report. The specialist input included the baseline environment, potential impacts and the recommended mitigation measures.

Table 15-1: Specialist Studies undertaken for the proposed Hendrina Underground Coal Mine

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Soil Specialist Impact Assessment	▪ Stripping will only occur where soils are to be disturbed by activities that are described in the design report, and where a clearly defined end rehabilitation use for the stripped soil has been identified; ▪ It is recommended that all vegetation is stripped and stored as part of the utilisable according to the biodiversity action plan should be consulted; ▪ Soils will be handled in dry weather conditions so as to cause as little compaction as possible. Utilisable soil (Topsoil and upper portion of subsoil B2/1) must be handled and stockpiled separately from the lower B horizon and all softs (decomposed rock); ▪ Stockpiling areas will be identified in close proximity to the source of the soil to limit handling and to promote reuse of soils in the correct areas; ▪ Soils stockpiles will be demarcated, and clearly marked to identify both the soil type and the intended area of rehabilitation; ▪ Rapid growth of vegetation on the Soil Stockpiles will be promoted (by means of watering or fertilisation); ▪ Soil Stockpile heights will be restricted where possible to < 3 m so as to avid compaction and damage to the soil seed pool; ▪ Stockpiled soil will be used to rehabilitate disturbed sites either ongoing as disturbed areas become available for rehabilitation and/or at closure; ▪ A representative sampling of the stripped soils will be analysed to determine the nutrients status of the utilisable materials. As a minimum the following elements will be treated for: EC, CEC, pH, Ca, K, Na, P, Zn, Clay % and organic carbon; ▪ Erosion control measures will be implemented to ensure that the soil is not washed away and that erosion gulley's do not develop prior to vegetation establishment; ▪ If soil (whether stockpiled or in its undisturbed natural state) is polluted, the first management priority is to treat the pollution by means of in situ bioremediation. The acceptability of those option must be verified by an appropriate soils expert and by DWS, on a case by case basis, before it is implemented; and ▪ If in situ treatment is not possible or acceptable then the polluted soil must be classified according to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (DWAF, 1998) and disposed at an appropriate permitted, off-site waste facility.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Soil Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Surface Water Specialist Impact Assessment	▪ All dirty water channels must be constructed and placed within the dirty water infrastructure areas, such that all dirty water runoff emanating from these areas are captured and contained to a dirty water containment facility. The proposed channels should be lined and sized to cater for the 1:50 year storm event; ▪ As proposed, ensure all the dirty water emanating from the dirty water areas will be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment; ▪ Should the contained water be more than the water use requirement, the Best Practice Guidelines (BPGs) advise that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water; ▪ The constructed dirty water trenches will have to remain until post closure. This will ensure dirty water is captured and contained during removal of infrastructures; ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams; ▪ Decant capture and treatment prior to discharge into the stream; ▪ Ensure that monitoring is implemented to cover all mining activity areas. Recommended monitoring sites are shown in Section 9. It is also recommended to monitor water quality within the mine water system (PCD's) to determine the concentration levels in case of an overflow or need for discharge. Water quality parameters that need to be analysed include but not limited to the parameters shown in Table 9-2; ▪ Flow monitoring should be carried out in channels and pipelines on site just before the water enters the storage facilities such as PCDs. Monitoring water levels in dams and channels by visual assessments along the channels. Records of pit dewatering volumes must be kept; and ▪ Measure rainfall.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Surface Water Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Groundwater Specialist Impact Assessment	▪ Further hydrogeological assessments are recommended to gain site specific rock permeability values through borehole drilling and aquifer testing; ▪ The recommended mitigation plans during the construction phase include: ▪ Avoid constructing below the water table as far as possible; ▪ If trenches are going to be excavated below the water level, dewatering of the aquifer to lower the water table locally can be considered to ensure that the construction takes place above the groundwater level and the water quality remains acceptable. The abstracted water can be utilised for dust suppression, vegetation or discharged to PCD for evaporation. Since the groundwater is not expected to be polluted at this stage, the utilisation of the water for activities such as dust suppression or irrigation will not cause environmental impacts; and ▪ Install long term monitoring boreholes. ▪ The recommended mitigation plans during the operation phase include: ▪ Dewatered water stored in PCD and the dams should have sufficient storage volume. If that is not possible, re-introduce treated water into the streams; ▪ Umcebo will communicated with the farmers with impacted groundwater quality and levels to manage the impacts and provide solution provide a solution; ▪ If sinkholes from subsidence are formed during operation, they should be rehabilitated as soon as possible to minimise water and oxygen inflow from the atmosphere; ▪ The use of nitrate based explosives should be limited as far as practicable to minimise groundwater contamination; ▪ Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals; The following management activities can be implemented to minimise contamination that originates from the pollution control dam: ▪ Avoid placement of the PCD on areas with the potential for increased infiltration to groundwater, such as over fault zones. ▪ Implementation of adequate stormwater management to contain all waste water and/or volatile organic compounds, for treatment and recycling. ▪ PCD should be lined to pro-actively prevent infiltration of contaminated seepage water. ▪ Monitoring of groundwater water levels and groundwater inflow rates; and ▪ Update numerical model annually for the first five years as more information becomes available. ▪ The following management activities can be implemented to minimise contamination that originates from the pollution control dam: ▪ Avoid placement of the PCD on areas with the potential for increased	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Groundwater Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Air Quality Specialist Impact Assessment	▪ Use of suppressants and binders on exposed areas to reduce dust generation; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s); ▪ Activity must be carried out judiciously to ameliorate dust emissions; ▪ Wet drilling; ▪ Activity must be carried out judiciously to ameliorate dust emissions. Use of suppressants on exposed areas to reduce dust generation; ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required; ▪ The proposed project will exacerbate the ambient air quality of the area as indicated from the dispersion model predictions. However, if the crusher is enclosed with dust extraction system and fitted with water spray, use of dust suppressant on haul roads and exposed areas, use of selective catalytic technology, gas scrubbers and electrostatic precipitators for the generator emissions, and a baghouse is used for collecting emissions from underground released through the ventilation shafts, predicted impacts will be reduced to within compliance. ▪ Management should ensure that mitigation measures recommended in the air quality study (Appendix 7) are factored into the design and day to day operation of the proposed mine.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Air Quality Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.
Fauna and Flora Specialist Impact Assessment	▪ The site should be screened prior to construction, preferably between the months of November to March, for any plant SSC; ▪ If any plant SSC are recorded, these should be translocated with the involvement of a qualified botanist. The donor habitat should resemble the receiving habitat and the species/populations should be monitored monthly after translocation for up to one year; ▪ If any important fauna species (SSC) are identified (as listed in the expected species lists) that have not been included in the site-specific species lists, this should be reported to the Environmental Control Officer on site and the provincial authority (MPTA) for their reference. Further to this, measures should be undertaken to ensure that negative impacts to the species in question are not imposed due to the development; and ▪ The mine has an opportunity to reduce their overall liability in terms of spread of alien plant species. It is recommended that all alien plant species are controlled throughout the site as far as possible.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Fauna and Flora Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included

Wetland Specialist Impact Assessment	▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and all wetlands must be avoided as far as possible;
	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase;
	▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible;
	▪ A comprehensive geotechnical investigation should be undertaken for the following:
	  ▪ Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties,
	  ▪ Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters,
	  ▪ Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and
	  ▪ If the risk is deemed too high in a sensitive area the mine plan must be adjusted.
	▪ The impacted footprint kept as small as possible and thus areas outside of the designated surface infrastructure areas must be regarded as no go; especially with respect to all wetlands, which must be avoided.
		X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Wetland Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Aquatic Ecology Specialist Impact Assessment	▪ Buffer zone establishment: 50 m from delineated wetland areas and 100 m from riparian zones; ▪ Clean, dirty water separation and stormwater management: Clean water should be managed in a manner according to the DWS Best Practice Guidelines; ▪ Exposed topsoil's and soil stockpiles must be revegetated to reduce erosion and subsequent sedimentation; ▪ Although a basic geotechnical study has been completed, recommendations from the report indicate that a comprehensive geotechnical study must be conducted to assess the risk for subsidence in areas associated with the Klein Olifants River. Mitigation actions to increase stability should be used in delineated high risk areas. These mitigation actions include limiting roads underneath the river system and thicker support pillars, however, detailed mitigation actions should be defined in the geotechnical study. ▪ Based on the revision of the mining plan, the coal reserve which is located at a depth less than 40 m and associated with wetlands, will only be mined to a limited extent, with thick enough support pillars to avoid surface subsidence. This will reduce the risk of subsidence in local river catchments. ▪ PCD must be designed and operated in such a way that it will not spill more than once in 50 years. The dam must be able to contain the water required for operations, a storm event including a 0.8 m freeboard at all times; ▪ Groundwater mitigation actions for potential Acid Mine Drainage will be elaborated once the groundwater study of this project is completed; ▪ No crossings over riffle/ rapid habitats. These should be avoided as these are the most sensitive; slow deep/ shallow habitats should be favoured; ▪ Erosion prevention mechanisms must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ▪ Soils adjacent to the river that have been compacted must be loosened to allow for germination; ▪ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from entering the local aquatic systems; and ▪ Undermining of rivers or wetlands will be avoided. A single access from one side to the other side of a river into the resource will be used to access the resource. The necessary buffer areas will be implemented to avoid subsidence in the river and wetlands.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Aquatic Ecologist Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Socio-Economic Specialist Impact Assessment	▪ It is recommended that Umcebo host a consultation meeting with the Hendrina community should their applications for the relevant authorizations be successful. This meeting should take place prior to the commencement of any construction activities. The objective of the meeting should be to share information relating to opportunities (jobs, procurement, LED projects etc.) and to establish communication lines between the mine and the community; ▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts; ▪ Promotion of local, female and youth employment; ▪ Where possible labour-intensive construction methods should be promoted; ▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit; ▪ Monitoring subcontractors in terms of local employment targets; ▪ Local procurement targets should be formalised in Umcebo's procurement policy; ▪ Umcebo should where possible endeavour to minimise the extent of, displacement through project design, where displacement cannot be minimised management measures have been identified and discussed in the socio-economic study, 2016; ▪ Inform communities of planned construction activities that would affect vehicle/ pedestrian traffic; ▪ Construction of livestock crossings at suitable intervals should be incorporated into project design; ▪ Develop an Influx management plan together with other industry role players and government to discourage influx of job seekers; ▪ Development of awareness programs; ▪ Notification of blasting activities; ▪ Undertake continuous information sharing and consultation with adjacent/affected farm owners; ▪ Appointment of a CLO / Stakeholder Engagement / Community offices to enhance communication; ▪ The Mine’s SLP should provide strategies and measures that prevent job loss; ▪ Alternatives to save jobs/avoid downscaling should be investigated beforehand; ▪ Develop a Mine Closure Plan; and ▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where retrenchment and/or closure of the mine are certain.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Socio-economic Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Visual Specialist Impact Assessment	▪ Vegetation should only be removed when and where necessary; ▪ Topsoil should only be removed when and where necessary; ▪ Topsoil stockpiles should be vegetated with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum) where possible so as to blend into the surrounding landscape and reduce dust generation; ▪ Limit footprint area of topsoil stockpiles where possible; ▪ Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; ▪ Apply dust suppression techniques to limit the dust at the mine; ▪ Ensure the surface infrastructure and stockpiles does not exceed the proposed heights as recommended by the visual specialist impact assessment (Appendix 13); ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; ▪ Down lighting must be implemented for construction activities taking place at night to minimise light pollution; ▪ Limit the speed of vehicles on the haul roads to reduce dust; ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust; ▪ Ensure all infrastructure is demolished; and ▪ Limit the quantity and time of rubble stored on site.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Visual Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Noise Specialist Impact Assessment	▪ Day and night time upper limit level for the surrounding area be set according to SANS 10103:2008 for rural districts (day: 45 dBA and night:35 dBA); ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels; and ▪ Restricting construction and decommissioning activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Locating diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Switching off equipment when not in use. ▪ Installation of low noise rollers for conveyor belts as well as enclosing the conveyor belt; and ▪ Maintenance of low noise rollers for conveyor belts.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Noise Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.
Heritage Specialist Impact Assessment	▪ It is recommended that a Conservation Management Plan for the proposed project be developed and implemented during the pre-construction phase as a condition of authorisation; ▪ Specialist Phase 2 assessment of rock art sites be undertaken by qualified rock art specialists to fully record the sites prior to blasting activities; and ▪ Chapter XI of the SAHRA Regulations (Burial Grounds and Graves Consultation (BGGC) Process) must be implemented to identify bona fide Next-of-Kin and affected communities, and reach agreement on the future of the graves.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Heritage Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Traffic Specialist Impact Assessment	▪ One access point has been proposed off N11 (6 km north of Davel Road) to the Mooivley East site and another access off Davel Road (4 km west of N11) to serve both Mooivley West and Hendrina South sites. The proposed access roads will form a T-junctions with either N11 or Davel Road; ▪ The following intersection configuration is recommended at the new proposed N11/ Mooivley East Access Road intersection: ▪ The intersection to be priority controlled with the mine access road stop controlled; ▪ Separate 100 m left lane on the N11 northern approach; ▪ Separate 100 m right turn lane on the southern approach; and ▪ A 100 m right-turn refuge lane and 100 m taper acceleration lane are recommended on the northern and southern approaches respectively. ▪ The new proposed Davel Road and Mooivley West intersection to be priority controlled with Davel Road having priority; ▪ The queueing analysis results at the mine accesses show that vehicle stacking space for 2 vehicles will be required. It is, therefore recommended that a distance of at least 45 m should be provided between N11/ Davel Road and the proposed access gates to accommodate two 20 m trucks at the respective access points; ▪ Umcebo should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/ from Mooivley West site; and ▪ Umcebo should ensure that the access roads are maintained regularly and to acceptable maintenance standards.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Traffic Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.
Blasting Specialist Impact Assessment	▪ The blasting will need to be undertaken within the normal safety and control measures as per the regulatory requirements. At Mooivley West (Shaft No. 1) there are two points of interest observed within 500 m from the shaft area. All other points of interest observed are located at distances greater than 500 m. There are no surface infrastructures closer than 250 m from the shaft areas; and ▪ There will not be a specific requirement for monitoring of blasting operations but can still be undertaken for confirmation of ground vibration and air blast levels. No other specific management measures are recommended.	X - All recommendations have been considered and included in the EIA report.	Mitigation and management measures included in this report were recommended by the Blast Specialist, as well as the monitoring programmes. This includes the impact assessment and mitigation measures as discussed in Section 11, as well as the recommendations provided in Part B Sections 5, 6 and 7 and the monitoring provided in Section 9.

List of studies undertaken	Recommendations of specialist reports	Specialist Recommendations that have been included in the EIA report	Reference to applicable section of report where specialist recommendations have been included
Rehabilitation	It is recommended that the following actions be taken prior to the update of the Rehabilitation, Decommissioning and Mine Closure Plan: ▪ Care must be taken when stripping and stockpiling soil due to the sensitive nature of the soils on site; ▪ Soil stockpile locations need to be determined and sited away from sensitive landscapes, such as pans/wetlands; ▪ Implement the measures as outlined in the specialist studies to minimise the risk to surface/groundwater contamination from the operations during rehabilitation and closure; ▪ Further trials should be conducted during the operational phase to determine other rehabilitation options that could be considered for the closure and rehabilitation of the disturbed site; ▪ There should be a constant interaction and communication with local stakeholders, so that their requirements can be taken into consideration in the rehabilitation process; ▪ Regular audits should be undertaken by a soil scientist during the soil stripping process. This will guarantee that soils are stripped and stockpiled correctly; ▪ Regular monitoring of the groundwater should take place in order to determine if there is a potential for mine affected water to occur; ▪ Regular update of the ERA as more information becomes available; ▪ Invasive alien plants should be removed on an ongoing basis; and ▪ Monitoring and maintenance of the rehabilitated areas should take place on an annual basis for at least three years after closure.	X - All recommendations have been considered and included in the EIA report.	All mitigation and management measures included in this report were recommended by the Rehabilitation and Closure Specialist. The Rehabilitation and Closure Report is included in **Appendix 17**.
Closure	The following is recommended: ▪ A material balance should be completed to determine whether sufficient rehabilitation material (i.e. topsoil) is available; and ▪ The financial provision figures need to be updated on an annual basis as per the requirement of the NEMA. This will ensure that costs become more accurate over time and will reflect current market conditions.		

Copies of the specialist reports are attached as Appendices.

16 Item 3(k): Environmental Impact Statement

16.1 Item 3(k)(i): Summary if the key findings of the Environmental Impact Assessment

The Environmental Impact Statement is utilised to summarise all of the potential environmental impacts identified during each phase of the proposed Project. The significance of the impacts associated with the relevant project phases, pre-mitigation and post-mitigation, is summarised in Table 16-1, Table 16-2 and Table 16-3.

Table 16-1: Summary of the potential impacts during the construction phase

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Soil	Loss of utilisable soil as a resource through sterilisation, compaction, erosion, and salinization/ contamination.	Moderate (negative)	Negligible (negative)
Surface Water	Siltation of surface water resources leading to deteriorated water quality.	Minor (negative)	Minor (negative)
	Deterioration of water quality due to dirty water reporting into natural water resources.	Minor (negative)	Negligible (negative)
Groundwater	Site clearing for the development of surface infrastructure through the removal of the top soil and weathered rocks resulting in the lowering of the water table.	Negligible (negative)	Negligible (negative)
Air Quality	Site clearing results in the generation of dust.	Negligible (negative)	Negligible (negative)
	Construction of Surface Infrastructure results in dust generation.	Minor (negative)	Negligible (negative)
	Waste generation and disposal can result in dust and volatiles emissions.	Minor (negative)	Negligible (negative)
	Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter.	Moderate (negative)	Negligible (negative)
Fauna and Flora	Loss of Eragrostis-dominated Grassland as a result of site clearing.	Moderate (negative)	Minor (negative)
Wetlands	Loss of wetland soil and vegetation with degradation to ecological integrity and functioning.	Moderate (negative)	Minor (negative)
	Loss of habitat due to industrial activity resulting in habitat fragmentation, spreading of alien and invasive species, increased incidence of erosion, potential water quality deterioration and disturbance to avifauna and other fauna utilising the wetlands.	Minor (negative)	Negligible (negative)
	Activities with the wetland channel and the surrounds will impact negatively upon sensitive wetland soils as well as the vegetation.	Moderate (negative)	Minor (negative)
Aquatics	Increased runoff and erosion within the Klein Olifants River due to site clearance within associated wetland habitats and river catchment.	Moderate (negative)	Minor (negative)
	The loss of aquatic habitat as a result of construction activities within a river channel due to Construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat.	Moderate (negative)	Moderate (negative)
	Runoff containing pollutants and increased water velocity resulting in water and habitat quality degradation in downstream river reaches.	Minor (negative)	Minor (negative)
Heritage	Loss of integrity of rock art sites.	Moderate (negative)	Major (positive)
	Degradation of intrinsic CS of burial grounds and graves.	Major (negative)	Minor (Positive)
Socio-economic	Employment Creation During Construction.	Minor (Positive)	Moderate (positive)
	Multiplier Effects On The Local Economy.	Minor (Positive)	Moderate (positive)
	Community Development And Social Upliftment.	Minor (Positive)	Moderate (positive)
	Economic displacement Related Impacts.	Major (negative)	Moderate (negative)
	Disruption Of Daily Movement Patterns.	Moderate (negative)	Minor (negative)
	Influx Related Impacts.	Moderate (negative)	Minor (negative)
	Impacts On Community Health And Safety.	Moderate (negative)	Minor (negative)

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
	Loss Of Farm/Other Labour To The Mine.	Minor (negative)	Negligible (negative)
	Impact On Surrounding Land Users.	Moderate (negative)	Minor (negative)
	Opposition Because Of Perceived Negative Impacts.	Minor (negative)	Negligible (negative)
Visual	Mooivley West, Hendrina South and Mooivley East- Site clearance and vegetation removal will have a negative visual impact on the receiving environment as well as the generation of dust.	Minor (negative)	Minor (negative)
	Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment (Mooivley West and Hendrina South).	Minor (negative)	Minor (negative)
	Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment (Mooivley East).	Minor (negative)	Negligible (negative)
	Change of land use from agriculture to mining will have a negative visual impact on the receiving environment.	Major (negative)	Moderate (negative)
	Mooivley West and Hendrina South - The construction of surface infrastructure will have a negative visual impact on the receiving environment by impacting on the sense of place.	Moderate (negative)	Moderate (negative)
	Mooivley East - The construction of surface infrastructure will have a negative visual impact on the receiving environment by impacting on the sense of place.	Moderate (negative)	Moderate (negative)
Noise	Noise will emanate from the machinery and vehicles operating during the construction activities.	Minor (negative)	Minor (negative)
Traffic	Increase in traffic volumes and vehicle delays.	Minor (negative)	Negligible (negative)
	Increase in delays for cyclists and pedestrians as result of the additional traffic on the network.	Minor (negative)	Negligible (negative)
	Road safety conditions could be impacted negatively by an increase in heavy vehicles.	Minor (negative)	Negligible (negative)
	Impact on road surface conditions of the local road network as a result of an increase in heavy vehicles.	Negligible (negative)	Negligible (negative)

Table 16-2: Summary of the potential impacts during the operational phase

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Soil	The operation and maintenance of the utilisable soil and stockpiles will require the minimisation of compaction and erosion and the on-going management of contamination.	Minor (negative)	Negligible (negative)
Surface Water	Water Contamination leading to deterioration of water quality	Moderate (negative)	Negligible (negative)
Groundwater	Mine dewatering and creation of cone of dewatering resulting in the lowering of the water table.	Minor (negative)	Minor (negative)
	Groundwater contamination as a result of underground mining and, seepage from the PCD and waste stockpiling.	Minor (negative)	Negligible (negative)
Air Quality	Underground blasting and mining will result in poor air quality.	Minor (negative)	Negligible (negative)
	Stockpiling will result in dust emissions and reduced air quality.	Moderate (negative)	Negligible (negative)
	Hauling of coal leads to emission and poor air quality.	Moderate (negative)	Negligible (negative)
	Crushing of coal results in fugitive dust emissions.	Moderate (negative)	Negligible (negative)

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
	Waste generation and storage will result in release of dust and volatiles.	Minor (negative)	Negligible (negative)
	Generation of power leads to gaseous emissions: NOx, SO_2, CO and particulate matter.	Moderate (negative)	Negligible (negative)
Fauna and Flora	Disturbance to fauna on site (noise, roadkill) due to increased vehicular movement and noise on site.	Minor (negative)	Negligible(negative)
Wetlands	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Moderate (negative)	Minor (negative)
	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland (and is a tributary to the Klein Olifants River) will negatively impact water quality as coal fines that will very likely be transported from the conveyor into the surrounding environment. Negative impacts from maintenance of the conveyor servitude may also be incurred. Stockpiling of coal also represents risks to the environment that much be managed.	Moderate (negative)	Minor (negative)
Aquatics	Subsidence of land within the river catchment and subsidence of land underneath river channels (32 m to 128 m).	Moderate (negative)	Minor (negative)
	Contamination of surface water through contaminated runoff and contaminated seepage influx.	Moderate (negative)	Minor (negative)
Heritage	Damage to surface dressing of burial grounds and graves.	Minor (negative)	Minor (Positive)
Socio-economic	Employment Creation During Operation.	Minor (Positive)	Moderate (positive)
	Economic Growth And Diversification.	Minor (Positive)	Moderate (positive)
Visual	Mooivley West, Hendrina South and Mooivley East - Stockpiling of material on the overburden stockpiles, waste rock berms and product stockpiles will have a negative visual impact on the receiving environment.	Moderate (negative)	Moderate (negative)
	Mooivley West, Hendrina South and Mooivley East- Vehicular activity to haul coal will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact.	Minor (negative)	Negligible (negative)
	Mooivley West and Hendrina South - Dust from the crushing and screening plants will have a negative visual impact on the receiving environment.	Moderate (negative)	Moderate (negative)
	Mooivley East - Dust from the crushing and screening plants will have a negative visual impact on the receiving environment.	Moderate (negative)	Moderate (negative)
Noise	Noise will emanate from the machinery and vehicles during the operational activities.	Minor (negative)	Minor (negative)
Traffic	Increase in traffic volumes and vehicle delays.	Negligible (negative)	Negligible (negative)
	Increase in delays for cyclists and pedestrians as result of the additional traffic on the network due to the proposed development.	Negligible (negative)	Negligible (negative)
	Road safety conditions could be impacted negatively by an increase in heavy vehicles due the proposed development.	Minor (negative)	Negligible (negative)
	Impact on road surface conditions of the local road network.	Negligible (negative)	Negligible (negative)

Table 16-3: Summary of the Potential Impacts during the Decommissioning and Closure Phase

Aspect Affected	Potential Impact/Risk	Pre-Mitigation Significance	Post Mitigation Significance
Soil	Decommissioning and rehabilitation phase of the project could cause compaction and erosion if rehabilitation is not done correctly.	Minor (negative)	Negligible (negative)
Surface Water	Siltation Of Surface Water Resources Leading To Deteriorated Water Quality.	Minor (negative)	Minor (negative)
	Mine decanting resulting in contamination of surface water bodies.	Moderate (negative)	Negligible (negative)
Groundwater	Mine decanting and contamination of surface water bodies after mine closure.	Moderate (negative)	Negligible (negative)
	Groundwater contamination as a result of underground mining.	Minor (negative)	Negligible (negative)
Air Quality	Removal of Infrastructure results in dust emission.	Negligible (negative)	Negligible (negative)
	Rehabilitation will result in dust emission.	Minor (negative)	Negligible (negative)
Fauna and Flora	Alien plant invasion may take place during dismantling and removal of infrastructure.	Minor (negative)	Negligible (negative)
Wetlands	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the hillslope seep wetland underlying the proposed infrastructure for Hendrina South.	Minor (negative)	Minor (negative)
	Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.	Major (negative)	Moderate (negative)
Aquatic	Increased runoff and erosion within the Klein Olifants River due to the removal of infrastructure and surface rehabilitation.	Minor (negative)	Minor (negative)
	Decant of severely contaminated water into local aquatic ecosystems.	Major (negative)	Minor (negative)
Socio-economic	Dependency On Mine For Sustaining Local Economy.	Moderate (negative)	Minor (negative)
Visual	Mooivley West, Hendrina South and Mooivley East - Removal of infrastructure will have a negative visual impact on the receiving environment. Dust from the demolition process will also have a negative visual impact.	Minor (negative)	Minor (negative)
	Mooivley West, Hendrina South and Mooivley East - Removal of infrastructure will have a negative visual impact on the receiving environment. Dust from the demolition process will also have a negative visual impact.	Minor (negative)	Minor (negative)
Noise	Noise will emanate from the machinery and vehicles operating during the decommissioning activities.	Negligible (negative)	Negligible (negative)

16.2 Item 3(k)(ii): Final Site Map

The infrastructure layout plan for the Project is provided in Plan 24 in Appendix 3.

16.3 Item 3(k)(iii): Summary of the Positive and Negative Implications and Risks of the Proposed Activity and Identified Alternatives

During the *construction phase* of the proposed project the majority of the negative impacts are associated with site clearance and vegetation removal activities. The loss of land capability and land use was determined to be significant (moderate negative) although the impact became less significant after mitigation. The increase of gaseous emissions, NOx, SO_2, CO and particulate matter, was also indicated to have a moderate negative impact. Other significant impacts include the loss of topsoil, habitat specifically the loss of *Eragrostis*-dominated Grassland as a result of site clearing. The exposure of soil could further result in an increase in erosion (water and wind) resulting in the possible siltation of surface water resources and the generation of fugitive dust. The most significant impact was identified to be the degradation of intrinsic CS of burial grounds and graves, however no heritage resources were identified within the primary study areas therefore with appropriate mitigation implementation the impact became a minor positive.

General construction activities will also change the sense of place and the landscape. Noise levels and traffic volumes are expected to increase but these impacts were rated as minor (negative).

According to the Social Impact Assessment (Appendix 12) the development of the mine will have a (minor) positive impact on employment creation, economic and social upliftment and community development. An increase in employment opportunities, household income and skills development will contribute to a positive growth in the local economy. Moderate to Minor negative impacts are expected on property values and the surrounding agricultural industries.

As discussed in the Social Impact Assessment (Appendix 12), job creation, community development and social upliftment are positive impacts expected to result from the proposed project. Negative social impacts include a disruption of daily movement patterns, displacement related issues, influx of people putting pressure on services, resources and facilities and an increase in social pathologies and competition/conflict.

The majority of the impacts identified for the *operational phase* are associated with the operation of the underground mine. The undermining of wetlands could potentially lead to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts. The undermining activities could also result in subsidence of land within the river catchment and subsidence of land underneath river channels. These impacts were identified as the most significant (moderate negative). Should appropriate mitigation measures be implemented and all recommendations provided in the geotechnical study this impact was considered to be less significant (minor negative). Other significant impacts associated with the proposed project are a reduction in the catchment yield, lowering of groundwater levels due to dewatering, dust and emission generation, reduced air quality, deterioration in surface water quality loss in the sense of place. A possible negative impact on the damage to surface dressing of burial grounds and graves could become positive provided the recommended mitigation measures are implemented and adhered to.

Some of the positive impacts include the socio economic impacts relating to the creation of employment and economic growth and diversification.

During the *decommissioning phase* the expected impacts are associated with the movement of machinery to dismantle and remove equipment and infrastructure and rehabilitate the disturbed areas. Negligible to moderately negative impacts resulting from soil loss, erosion, dust emissions and spillages were identified. Post closure monitoring is essential to determine if rehabilitation was successful and sustainable.

The most significant impact includes the potential for decant of underground water which may result in acid mine drainage which could potentially have a major negative impact of water quality of wetlands and the Klein Olifants River.

17 Item 3(l): Proposed Impact Management Objectives and the Impact Management Outcomes for inclusion in the EMPR

The EMP seeks to achieve a required end state and describes how activities that have, or could have, an adverse impact on the environment will be mitigated, controlled and monitored.

The EMP will address the environmental impacts during the construction, operational, decommissioning and post-closure phases of the Project. Due regard must be given to environmental protection during the entire Project; a number of environmental recommendations are made to achieve environmental protection. These recommendations are aimed at ensuring that the contractor maintains adequate control over the Project to:

- Minimise the extent of an impact during the life of the Project;
- Ensure appropriate restoration of areas affected by the Project; and
- Prevent long term environmental degradation.

18 Item 3(m): Final Proposed Alternatives

As the layout for the Project was informed by previous environmental and technical studies, and due to the location of the mineral resource, the initial layout already considered the placement of infrastructure in such a manner as to avoid and minimise potential environmental impacts (see Section 8). Where impacts cannot be avoided, mitigation and management measures have been provided.

Although the mine design has been altered to avoid certain sensitivities it should be noted that some wetland areas could not be avoided and will be lost. Where any wetlands will be undermined, it is recommended that a safety factor which must be determined by a rock engineer must be utilised when mining underground. This will need to be determined in later stages of the project design.

If the mining project is to go ahead, the mine will need to make provision for long term water quality impacts and remediation of this. This is particularly related to potential decant of acidic underground water post-mining. It can be concluded that the project will have a residual negative impact to the wetlands and their catchment areas. Umcebo will need to take this into consideration and manage the residual impact with adequate rehabilitation actions and if need be with an offsetting strategy to ensure no nett loss of wetland functionality is realised.

Refer to Plan 24 in Appendix 3 for the final layout, as well as the description of the preferred layout in Section 8 and 12.4.

19 Item 3(n): Aspects for inclusion as Conditions of Authorisation

It is not foreseen that any additional aspects other that what has been included and discussed in this document, are required.

20 Item 3(o): Description of any Assumptions, Uncertainties and Gaps in Knowledge

This section highlights the assumptions, uncertainties, limitations and knowledge gaps relevant to the various specialist studies undertaken.

20.1 EIA Assessment

During the EIA process it was confirmed that no discard dump will be required for the undertaking of the mining activities on the proposed Hendrina Underground Coal Mine. Further authorisations and assessments will be required should a discard dump be required.

20.2 Surface Water Impact Assessment

Limited information was available and a number of assumptions were made for the water balance calculations. This study is therefore recommended to be updated as more information becomes available. A summary of limitations and further work required is listed below:

- Generation of runoff will vary substantially season to season and year to year and it is recommended that runoff volume measurements are collected and used to calibrate the water balance model particularly in the water storage structures such as PCDs;

- The model is based on conservative values, assuming the maximum areas for runoff. It will be necessary to update with an operational mine water balance when mining commences;
- Underground water uses have been based on assumptions; actual water requirements should be determined;
- The dust suppression water demand should be recorded and used to calibrate the model; and
- In addition to runoff and groundwater inflow, monitoring of the other key water transfers should be undertaken on monthly basis and used to calibrate the water balance model.

The water balance assumed the following:

- Sewage water from the offices and workshops is not reused in the system, but disposed of into a soak away system after treatment at the Package STP;
- Rainfall related inflows and evaporation related losses for the wet and dry conditions were estimated for each month;
- Monthly rainfall and evaporation used in the water balance are based on WR2005 data which is representative of the entire quaternary catchment area. This is therefore a generalised description of the climate and does not necessarily depict onsite rainfall and evaporation rates, which currently are not available;
- Runoff and evaporation coefficients for each surface were fixed and not influenced by antecedent climatic conditions;
- The wet season is defined by the three wettest months (November, December and January) and the dry season as the three driest months (June, July and August);
- The yearly water balance summary is based on a full 12 operational months in each year;
- The groundwater ingress was available for the entire Life of Mine from the estimated inflows in the Groundwater Report (Digby Wells, 2016), for the purpose of this water balance, average values were used for each of the underground mining areas;
- All footprint areas used in the water balance calculation are based on the provided infrastructure plan;
- The water used at the offices, workshops and underground will be sourced from treatment plant distributed from the Jo Jo tanks. An allocation of 100 L/day per person for the employees has been assumed;
- As per the project description, it is assumed that water that will be required for all activities will be less than 2 000 m^3/day during the operational phase in addition to the 100 L/day allocated to employees;

- The total water requirement of 2 000 m^3/day for all underground areas is assumed to be for the underground water and haul road dust suppression uses with a one third (1/3) distribution amongst the three mines;
- Dust suppression requirement was determined from the assumption that 3 mm of water will be used daily for the total area of the haul roads as well as the conveyor discharge and transfer points;
- The Continuous Miner and the Roof bolter water requirements are included in the 2 000 m^3/day water requirements considered in the calculations; and
- The water from the PCD will be used for the on surface dust suppression.

20.3 Groundwater Impact Assessment

The following are lists of assumptions and limitations associated with the groundwater impact assessment:

- The southern and western boundary of the project site is owned by a different company and this area was not accessible for hydrocensus or baseline assessments. The water level, groundwater flow direction and baseline water quality in the area could not be confirmed;
- Discard dumps are one of the main sources of groundwater contamination during operation and after closure. No discard dump is assumed to exist at the site and has been excluded from the contamination plume simulation;
- Shanduka Coal (May, 2012) reported that at least 417 boreholes have been drilled all over the project site for coal seam prospecting. It is currently unknown how many of these are properly backfilled and sealed. If some or all of these holes are open, there is a risk of water from the top weathered aquifer to seep and flood the underlying underground workings;
- The hydraulic properties (such as permeabilities and storage coefficients) of the aquifers outside the mine area, particularly in areas where no field data was available is not known;
- The hydraulic connection between the different aquifer systems and coal seams, expressed by vertical hydraulic conductivity is not known;
- No major faults have been identified during this study. This, however, does not mean that no such structures exist at the site. If faults that have not been detected during the drilling and aquifer testing have been intercepted by the mine, increased inflow rates can be expected more than what have been predicted during this study;
- Although a total of 15 boreholes (five for each mine zone) were proposed to be drilled, only six boreholes were eventually drilled due to accessibility problems and cost issues. This would mean that only one borehole was drilled per 11.19 km^2, considering that the total footprint area of the underground mine is 67.14 km^2. The

hydrogeological information obtained from such sparse boreholes (such as aquifer permeability) is assumed to be representative of the entire area. The Karoo aquifer is however not homogenous. The orientation, density and aperture or thickness of fractures and dykes are likely to be different. Sufficient hydrogeological information cannot be obtained from six boreholes only. The model results, including the predicted groundwater ingress rates, decant rates and pollution plumes have a confidence level that is proportional to the model accuracy, estimated to be around 60%; and

- Six rock samples were collected for acid mine drainage from two boreholes. The rock chemistry is expected to be heterogeneous and these samples may not be adequate to represent the entire mine area. As the mine starts and more samples become available, additional samples are recommended to be analysed for a long-term acid mine drainage assessments.

Based on the conceptual model a best approximation of the ‘real world’ site conditions was simulated and calibrated with available information until a reasonable fit of simulated and measured data was obtained. A model sensitivity analysis was then carried out to give an indication of which assumptions in model input parameters were most likely to affect the model output.

20.4 Air Quality Impact Assessment

The following assumptions and limitations were identified:

- Modelled data was used as site-specific meteorological data was not available for the impact assessment study of the project area;
- Data input into the model was based on all documentation provided by the applicant;
- Stack parameters and emission rates were based on the capacity of three CAT 5 000 KVA Diesel Generators (amounting to 15 MW specified for the proposed operation);
- The gaseous pollutants assessment was limited to pollutants associated with the CAT 5 000 KVA Diesel Generators as specified by the manufacturers;
- Measurement of dust deposition was limited to three months; and
- Lack of ambient air quality data to assess baseline and cumulative impacts.

20.5 Fauna and Flora Impact Assessment

The following limitations were encountered during this fauna and flora study:

- Whilst every effort was made to cover as much of the site as possible, representative sampling was done and it is possible that some plant and animal species that are present on site were not recorded during the field investigations, due to seasonality;
- During faunal field sampling no pitfall traps were used due to excessive rain conditions which meant pitfalls flooded and no trapping was achieved; and

- Access to certain infrastructure areas (Tweefontein 203 and portion 2) was not granted at the onset of the project and as a result, these areas were assessed during the winter season. This places a limitation on the plant species identification, since many of the identifying features are not present during winter as most of flora species are dormant during the cold winter months in the highveld.

20.6 Wetlands Impact Assessment

The following assumptions or limitations were noted during the assessment;

- Fieldwork was undertaken in the late summer and autumn season (March - May) of 2016. Not all grasses and forbs were in full flower and therefore not all of them were identifiable; and
- Field assessments were completed to assess as much of the site as possible; however it was not possible to ground-truth every wetland boundary and thus some extrapolation was required. This was due to the extent of the project area (~7 000 ha) and the vast presence of wetlands encountered on site; and in addition the vegetation was largely modified due to agriculture and the soil indicators thus became the major determinant. The proposed infrastructure areas, shallow coal zones and the sensitive wetlands identified on desktop level (e.g. the Klein Olifants River) were focussed upon.

20.7 Aquatics Impact Assessment

The methods outlined in this study assume that aquatic ecology within the associated river courses is evenly distributed. Access to several sites was not permissible due to land owner's refusal to allow aquatic specialists on site during the March 2016 survey. These sites included several points on the lower reaches of the Klein Olifants River. These were however, accessible during the dry season.

20.8 Heritage Impact Assessment

The following constraints and limitations were experienced as part of the compilations of the heritage impact assessment report:

- Historical aerial imagery does not cover the project site or project area as defined, therefore the changes to the landscape through time could not be identified, nor the relative age of identified built structures;
- Given the large areal extent of the project site, the nature of the proposed project (i.e. primarily underground mining with limited surface infrastructure) comprehensive, transect pedestrian survey of the project site's extent was not completed. The pre-disturbance surveys were limited to the areas earmarked for proposed surface infrastructure construction and other surface disturbances. In addition to these areas, natural landscape features with known heritage potential were also surveyed in detail, such as rock outcrops or shelters; and

- The inherent nature of many heritage resources, i.e. occurring at sub-surface levels with no or limited trace evidence on the surface, highlights the potential of subsurface occurrences. To investigate these occurrences, permits regulated under Section 35 of the NHRA are required. No permits were held by the specialists, and as such, it is possible that archaeological sites may be identified during the construction phase of the project.

20.9 Socio-Economic Impact Assessment

At the time of writing this report, certain aspects of the project planning had not yet been finalised (e.g. likelihood of surface subsidence from undermining, conveyor and access road alignments, focus of LED planning, geographical distribution of Project expenditure, etc.). This is the result of the inevitable trade-off in environmental and social assessments. It is advisable to conduct project environmental and social assessments early in the project planning cycle so that significant negative impacts and potential fatal flaws can be identified and plans modified to avoid or reduce them. Similarly positive impact triggers can be modified or re-directed to off-set negative impacts, especially where these cannot be mitigated.

The EIA process for the Project did not include a specialist Economic Impact Assessment. Hence, while the SIA identifies and addresses potential socio-economic impacts, it was not possible to (a.) quantify these impacts and (b.) provide a comparative analysis of the economic contribution or costs of various land uses.

The SIA report is based on available information obtained from Umcebo, secondary sources, specialists' assessments, as well as a sample of stakeholders consulted during the site visit. The sources consulted are not exhaustive, although deemed sufficient to meet the ToR for this assessment. The results of StatsSA's 2016 Community Survey were not yet published at the time of writing this report. It is recommended that the relevant sections of this report be updated once this data is released.

Social impacts associated with the eventual closure and decommissioning of the Project are addressed but were not subject to a detailed assessment. This omission is motivated by the fact that predictions concerning the characteristics of the receiving social environment at the time of closure and decommissioning are subject to a large margin of error, thus significantly reducing the accuracy of an impact assessment.

20.10 Visual Impact Assessment

The following assumptions and limitations were experienced as part of the compilations of the visual impact assessment report:

- A VIA is open to subjectivity. A receptor may be partial to the fact that a proposed project is occurring in an area, which becomes a source of economic upliftment for a community, whereas another receptor may view a proposed project as a negative factor which could hamper tourism or recreational activities;

- Many factors can enhance or reduce the visual impact of a proposed project. Vegetation near a receptor's viewpoint can greatly reduce that receptor's view of a proposed project. Other factors such as weather/ climatic conditions and seasonal change can also affect a receptor's view of a proposed project;
- It is difficult to determine the visual impact of the Project from the viewpoint, as well as the perspective of each individual receptor. Consequently, this report focuses on the size of the viewshed area and the number of receptors within the viewshed area as an indication of the significance of the visual impacts of the Project. Five key viewpoints were selected for the photomontages to provide an example of the expected views of the Project;
- Some infrastructure heights specifically the crushing and screening plant, ventilation shafts, product stockpile, PCD, Tip of and topsoil stockpile were not available for this study and assumptions were made. These assumptions were based on the heights of infrastructure from similar projects and confirmed by Umcebo; and
- A night time site visit to assess the impacts of night time lighting did not form part of the scope of work for this VIA. It was therefore not possible to create a practical viewshed model indicating the extent of the night time lighting impacts;

20.11 Noise Impact Assessment

The following assumptions and limitations are included as part of the noise impact assessment:

- Mooivley West and Hendrina South will be mined simultaneously and have therefore been modelled as one scenario. Mooivley East has been modelled as a separate scenario;
- The construction phase is assumed to be carried out during daytime hours (06:00-18:00), therefore only daytime scenarios were modelled for the construction phase;
- The resulting noise contours represent worst case LAeq at any receiver located 360 degrees in the horizontal plane around the noise sources. The noise modelling software is limited to calculating the predominant wind direction (or downwind conditions of propagation) per single receptor only. Calm wind conditions have therefore been included in the model due to the number of surrounding receptors. Thus, the noise dispersion plots do not represent a typical seasonal scenario in the predominant wind direction but rather a yearly average of the area's meteorological conditions in all directions; and
- In essence the modelling follows a conservative worst case scenario approach assuming all activities for each phase are being carried out simultaneously.

20.12 Traffic Impact Assessment

The distribution of the traffic generated by the proposed additional activities at the Hendrina Underground Coal Mine project was assumed based on the location of the towns and villages that will provide accommodation for labour; the location of potential suppliers and neighbouring towns as well as the end destination of the mined coal at Eskom power stations: Kusile, Kendal, Kriel and Grootvlei.

It was also assumed that the road network that is likely to be used for the transportation of the mined coal from the proposed Hendrina Underground Coal Mine site is expected to be towards the Hendrina Central Business District (CBD), using Davel Road, N11, and thereafter either branching toward the west onto R38 or proceeding along N11 to branch off west onto N4.

There is a limitation in forecasting future background traffic growth after five years as the predictability of future spatial and economic growth, which are the fundamental elements from which travel demand is derived, are uncertain and subject to change and speculative at best.

20.13 Rehabilitation and Closure

The compilation of this Final Rehabilitation, Decommissioning and Mine Closure Plan has been based on the following assumptions and limitations:

- The information contained within this Final Rehabilitation, Decommissioning and Mine Closure Plan is based on the current plans provided. If there is a significant change or addition of other infrastructure areas the Plan will need to be updated to cater for this change;
- Information provided in this report and mitigation measures and recommendations given are based on the specialist studies that have been conducted in support of the application process;
- The commitments contained within this report currently exclude any comments or issued raised by Stakeholders and/ or I&APs. This report will be updated once the public review process is complete taking these comments into account; and
- It must be noted that the proposed project is a Greenfields project, thus some of the information contained within this report is based as a conceptual level. As the mine progresses and more information becomes available, this report should be updated, thus this report should be considered as a living document and should be reviewed and updated, if required on an annual basis.

20.14 Financial Provision

The assumptions made as part of the Hendrina financial provision assessment are as follows:

- All infrastructure measurements and survey data (footprints, volumes, etc.) provided by Glencore is correct;
- The DMR rates received from Glencore is correct;
- All buildings will be mobile park home type with concrete slabs;
- The closure cost estimate was only calculated for Year 1 of operation. This is only related to Mooivley West;
- The infrastructure and mining areas of Hendrina South and Mooivley East will commence after year 1 of the operation hence not included in the Year 1 closure cost estimate;
- Assume that there will be no subsidence potential at year 1, as no mining would have taken place;
- No due diligence was undertaken to determine whether Glencore is responsible for any other areas not specified in this report;
- The calculations do not account for any value recovered from the sale of plant, steel or other material;
- A 12% allowance has been included for preliminary and general fees. These fees account for the costs required to manage the closure and rehabilitation process as well as provide personnel to monitor and maintain the rehabilitated areas after closure;
- A 10% contingency has been included as there is always the possibility that areas have been left out of the financial provision assessment or that areas may have been overlooked; and
- Maintenance and aftercare costs of rehabilitation have been included.

21 Item 3(p): Reasoned Opinion as to whether the proposed activity should or should not be authorised

21.1 Item 3(p)(i): Reasons why the activity should be authorised or not

Following the completion of the various specialist studies appended to this report and the identification and weighing of the expected impacts, it is the opinion of Digby Wells that the proposed Project should be authorised. This opinion holds provided all the recommendations proposed in the specialist studies and the EIA and EMP as well as legislative requirements are implemented and adhered to.

The findings of the impact assessment have shown that the proposed project may result in certain negative impacts to the environment; however, adequate mitigations measures have been included into this EIA and EMP Report to reduce the significance of all the identified negative impacts. Most negative impacts can be reduced through the implementation of mitigation measures.

The potential positive impacts include the creation of jobs, generation of wealth within the community and an additional coal resource towards the economy. The quality of coal makes it suitable for use in the domestic thermal market (Eskom). The proposed project will thus facilitate the planned mining activities and will have knock-on benefits in terms of local employment, local economic development and, increased government revenue and taxes. In light of recent events, it is estimated that current coal supplies to Eskom are insufficient and demand for coal is set to increase by 2018.

The potential negative impacts relate specifically to the loss and degradation of the wetlands which makes up 42% of the mining right area. Mitigation measures have been proposed and must be implemented to ensure minimal damage to the wetland environments. These wetlands have been designated potential no-go areas and it is recommended that mine designs consider these highly sensitive wetlands and avoid the risk of subsidence in these areas. The project has the potential to result in significant negative impacts on the natural wetlands and has the potential to alter the functioning of these systems and compromise their ecosystem services provided. However, should the recommendations for correct safety factors be adhered to, as per the recommendations from a comprehensive geotechnical assessment (yet to be completed); the impact can be considerably reduced to a minor impact.

If the mining project is to go ahead, the mine will need to make provision for long term water quality impacts and remediation of this. This is particularly related to potential decant of acidic underground water post-mining. It can be concluded that the project will have a residual negative impact to the wetlands and their catchment areas. Umcebo will need to take this into consideration and manage the residual impact with adequate rehabilitation actions and if need be with an offsetting strategy to ensure not nett loss of wetland functionality is realised. The monitoring plans throughout the life of the mine must also inform Umcebo on the impacts to the wetlands and the remedial actions required. Should these measures be put in place however the negative impact of this proposed project can be managed.

21.2 Item 3(p)(ii): Conditions that must be included in the authorisation

21.2.1 Specific conditions to be included into the compilation and approval of EMPR

The following specific conditions are proposed:

- A comprehensive geotechnical investigation should be undertaken for the following:

  - Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties,
  - Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters,
  - Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and
  - If the risk is deemed too high in a sensitive area the mine plan must be adjusted.
- The impacted footprint kept as small as possible and thus areas outside of the designated surface infrastructure areas must be regarded as no go; especially with respect to all wetlands, which must be avoided;
- The edge of the wetlands and a 100 m buffer must be demarcated where they are in close proximity to the infrastructure areas and at risk of being impacted from undesirable activities.
- Wetland monitoring must be carried out to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible;
- Where any wetlands are to be being undermined, it is recommended that the best possible underground mining safety factor which must be determined by a rock engineer will be utilised;
- Umcebo will need to take this into consideration and manage the residual impact with adequate rehabilitation actions and if need be with an offsetting strategy to ensure not nett loss of wetland functionality is realised;
- Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, Umcebo may also be required to monitor PM10;
- PCD must be designed and operated in such a way that it will not spill more than once in 50 years. The dam must be able to contain the water required for operations, a storm event including a 0.8 m freeboard at all times;
- It is recommended that a Conservation Management Plan for the proposed project be developed and implemented during the pre-construction phase as a condition of authorisation;
- Specialist Phase 2 assessment of rock art sites be undertaken by qualified rock art specialists to fully record the sites prior to blasting activities;
- It is recommended that once the final infrastructure designs are finalised or when the first year of mining has taken place that a follow-up financial provision calculation be completed;

- Further hydrogeological assessments are recommended to gain site specific rock permeability values through borehole drilling and aquifer testing;
- Bi-annual monitoring for subsidence should be conducted after closure. Any subsidence formed as a result of the mining operation should be rehabilitated as soon as possible to minimise water and oxygen inflow from the atmosphere;
- Due to the geochemical heterogeneity, the six rock samples are not expected to provided conclusive and representative information on the long-term acid generation potential of the entire mine site. More samples are recommended to be tested from a number of boreholes across the entire project site and a long-term kinetic test work should be conducted on the overburden, coal seam and underburden to determine the potential of pollution and acid mine drainage;
- All mitigation measures proposed in this report and attached specialist report should be implemented; and
- Environmental monitoring should take place as recommended.

21.2.2 Rehabilitation requirements

The post-mining land use should be restored to either grazing and/or cultivation and should represent the pre-mining land use, if possible.

The closure and rehabilitation objectives for the Project are listed below and should be met.

- Return land that has been mined by underground methods to a land use that is sustainable and accepted both from a legal requirement perspective and meets both the environmental and social needs identified;
- Capture decanting mine water before it joins the streams; treat it and thereafter, if the quality is acceptable, re-introduce it into the streams. As experienced from other coal mines in the region, the decant quality could be up to 2 500 mg/L of sulfate;
- Monitoring of groundwater water levels in the weathered and coal seam aquifers;
- If sinkholes from subsidence are formed after closure, they should be rehabilitated as soon as possible to minimise water and oxygen inflow from the atmosphere;
- Update numerical model every three years for the life of the mine as more information becomes available;
- All mining infrastructure will need to be free from contamination and then decommissioned. Infrastructure that can be re-used or sold should be removed to defray costs. The areas that are demolished will be rehabilitated to at least a grazing land capability or the prescribed pre-mining land use. Where buildings can be used by a third party, arrangements will be made to ensure their long term sustainable use;

- Roads that can and will be used for rehabilitation/monitoring or by other users post-closure should be left in situ provided this is agreed upon by all parties concerned. If there is no future use for roads on site, they will require to be removed;
- Any overburden material extracted during operation that was stockpiled will be used to rehabilitate the incline shafts once mining is complete;
- Follow a process of closure that is progressive and that is integrated into the short and long term mine plans. The process must assess the closure impacts proactively at regular intervals throughout the project life;
- Leave a safe and stable environment for both humans and animals;
- Prevent any soil, surface water, and groundwater contamination by managing all water on site;
- Comply with local and national regulatory requirements;
- Form active partnerships where possible with local communities to take responsibility for the management of the land after mining; and
- Maintain and monitor all rehabilitated areas following re-vegetation or capping, and if monitoring shows that the objectives have been met, then an application for closure can be made.

22 Item 3(q): Period for which the Environmental Authorisation is required

Table 22-1 outlines the project's anticipated timeframe should environmental authorisation, Integrated Water Use License (IWUL) and WML be granted. The project is proposed to commence once the environmental authorisation; IWUL and WML have been granted. The estimated LoM will be in excess of 30 years but the environmental authorisation will be required for an initial period of 36 years.

Table 22-1: Project Timeframes

Activity	Time Period
Construction	3 years
Commence Production	36 years

23 Item 3(r): Undertaking

Please refer to Part B, Section 13 for the complete undertaking applicable to the EIA and EMP sections of this report.

24 Item 3(s): Financial Provision

The Closure Cost Report is included in Appendix 17. The cost for rehabilitation and closure of Hendrina that is based on the DMR method of calculation for 1 year of operation is **R 24 461 018.00** (incl. VAT), see summary in Table 24-1 below.

The financial provision estimates does not include VAT. The detailed sheets are attached in Appendix B within the Closure Cost Report (Appendix 17 of this EIA report).

Table 24-1: Hendrina financial provision summary as per the DMR methodology

		Digby Wells Environmental	
		Umcebo Mining (Pty) Ltd, Hendrina, XST3791	
		DMR Closure Cost Assessment, 2016, Rev 1	
		Calculation of the First year Quantum	
Component	**Description**	**Listed and Specified Activities**	**Total**
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	Crushing and screening plant 0.2 ha x 10 m height (Activity 21, GNR 984); Conveyer - 2.5 km in length and assumed height of 2 m and width of 1 m totalling 5000 m3 [Activity 17, 7&8, GNR984 and GNR985]	R 1 161 592
2 (A)	Demolition of steel buildings & Structures		R 484 475
2 (B)	Demolition of reinforced concrete buildings & structures	Concrete slabs for the following temporary structures: Office area - 4.9 ha; Sewage treatment plant – 22 m^2 (Activity 25, GNR 983); Water treatment plant – 22 m^2; Diesel generator set – 32 m^2 (Activity 2, GNR 983); Storage of fuel, Lubricants and Explosives – 366 m^2 (Activity 4, GNR 984)	R 4 409 678
3	Rehabilitation of access roads	Access road combined length of 7.2 km and an average width of 13 m (Activity 24, GNR 983)	R 3 325 853
4(A)	Demolition & rehabilitation of electrified railway lines		R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines		R 0
5	Demolition of housing &/or administration facilities		R 1 016 971
6	Open pit rehabilitation including final voids & ramps	Incline portals 0.5 ha (Activity 17, GNR984)	R 148 612
7	Sealing of shafts, adits & inclines	2 x Incline shafts - 0.5 ha each (Activity17, GNR 984); 1 x Ventilation shaft - 0.25 ha (Activity 12, GNR 985)	R 296 972

		Digby Wells Environmental	
		Umcebo Mining (Pty) Ltd, Hendrina, XST3791	
		DMR Closure Cost Assessment, 2016, Rev 1	
		Calculation of the First year Quantum	
Component	**Description**	**Listed and Specified Activities**	**Total**
8(A)	Rehabilitation of overburden & spoils	Topsoil – 3 ha; Overburden Stockpile – 1 ha; Product stockpile - 3.66 ha (Activity 6 and 17, GNR 984)	R 1 042 106
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)		R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	PCD - 0.6 ha (Activity 6, GNR 984)	R 295 318
9	Rehabilitation of subsided areas		R 0
10	General surface rehabilitation		R 3 161 816
11	River diversions		R 0
12	Fencing		R 747 579
13	Water management		R 369 211
14	2 to 3 years of maintenance & aftercare		R 290 037
Total cost + Weighting Factor 2			**R 17 587 732**
12% Preliminary and General			R 2 110 528
10% Contingency			R 1 758 773
Total (Excl. VAT)			**R 21 457 033**
VAT (14%)			R 3 003 985

DIGBY WELLS ENVIRONMENTAL		**Digby Wells Environmental**	
		Umcebo Mining (Pty) Ltd, Hendrina, XST3791	
		DMR Closure Cost Assessment, 2016, Rev 1	
		Calculation of the First year Quantum	
Component	**Description**	**Listed and Specified Activities**	**Total**
	Grand Total (Incl. VAT)		**R 24 461 018.00**

24.1 Item 3(s)(i): Explain how the aforesaid amount was derived

Glencore requested that the financial provision be calculated in line with the methodology applied to other Glencore operations as previously approved by DMR and which follows the DMR methodology.

For the Hendrina financial provision assessment to be completed, a number of tasks had to be completed.

24.1.1 Cost Methodology

The DMR Guideline format makes use of a set template for which defined rates and multiplication factors are used. The multiplication and weighting factors which ultimately define the rate to be used are determined by amongst others the topography, the classification of the mine according to mineral mined, the risk class of the mine and its proximity to built-up or urban areas.

Quantities for certain defined items e.g. plant and related infrastructure, are then inserted and the cost for closure is calculated. Contingencies and VAT are applied to the cost.

24.1.2 Rates

The 2005 DMR Master Rates published by the DMR are no longer accurate. The 2005 rates have therefore been escalated with CPI% that was provided by Glencore. Table 24-2 displays the escalation percentages used and Table 24-3 display the rates that were supplied by Glencore and reviewed by Digby Wells.

Table 24-2: Glencore Annual Escalation Percentage

Year	Dec 2005	Dec 2006	Dec 2007	Dec 2008	Dec 2009	Dec 2010	Dec 2011	Dec 2012	Dec 2013	Dec 2014	Dec 2015	Predicted Dec 2016
CPI (%)	3.6	5.8	9.0	9.5	6.3	3.5	6.1	5.7	5.8	6.3	5.0	7.5

Table 24-3: Glencore Annual Escalated Rates

Glencore Rates		2016
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	R 14
2 (A)	Demolition of steel buildings & Structures	R 195
2 (B)	Demolition of reinforced concrete buildings & structures	R 287

Glencore Rates		2016
3	Rehabilitation of access roads	R 35
4(A)	Demolition & rehabilitation of electrified railway lines	R 338
4(B)	Demolition & rehabilitation of non-electrified railway lines	R 184
5	Demolition of housing &/or administration facilities	R 389
6	Opencast rehabilitation including final voids & ramps	R 198 149
7	Sealing of shafts, adits & inclines	R 105
8(A)	Rehabilitation of overburden & spoils	R 136 061
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	R 169 462
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	R 492 197
9	Rehabilitation of subsidised areas	R 113 931
10	General surface rehabilitation	R 107 783
11	River diversions	R 107 783
12	Fencing	R 123
13	Water management	R 40 982
14	2 to 3 years of maintenance & aftercare	R 13 561

24.1.3 DMR Classification

The DMR Guideline Document classifies a mine according to a number of factors which allows one to determine the appropriate weighting factors to be used during the quantum calculation. The following factors are considered:

- The mineral mined;
- The risk class of the mine;
- Environmental sensitivity of the mining area;
- Type of mining operation; and
- Geographic location.

Once the risk class (Class A, B or C) and the sensitivity of the area where the mine is located (Low, Medium or High) had been determined using the appropriate tables (in the DMR guideline) the unit rates for the applicable closure components were identified

The classification of Hendrina has been summarised in Table 24-4.

It must be noted, however, that of the 18 closure components that exist only 3 are influenced by the risk class and sensitivity, the remaining 15 have a standard multiplication factor, irrespective of the class or sensitivity.

Table 24-4: Classification

Mine	Type of Mineral Mined	Risk Class	Sensitivity	Terrain	Proximity to Urban Area
Hendrina Mooivley West	Coal	A	High	Flat [1]	Peri-Urban [1.05]

24.1.4 DMR Components

Activities associated with Hendrina as per the DMR guidelines are summarized in Table 24-5.

Table 24-5: Activities Associated with Hendrina as per DMR Guidelines

Component	Description	Applicable
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	Crushing and screening plant; Conveyer
2 (A)	Demolition of steel buildings & structures	Workshop, car ports and tanks
2 (B)	Demolition of reinforced concrete buildings & structures	Concrete slabs for the temporary structures; Water treatment plant; Diesel generator set; Storage of fuel, Lubricants and Explosives
3	Rehabilitation of access roads	Access and haul roads
4(A)	Demolition & rehabilitation of electrified railway lines	Not applicable
4(B)	Demolition & rehabilitation of non-electrified railway lines	Not applicable
5	Demolition of housing &/or administration facilities	Brick walls
6	Opencast rehabilitation including final voids & ramps	Incline portals

Component	Description	Applicable
7	Sealing of shafts, adits & inclines	2 x Incline shafts and 1 x Ventilation shaft
8(A)	Rehabilitation of overburden & spoils	Topsoil; Overburden Stockpile; Product stockpile
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)	Not applicable
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	Pollution control dam
9	Rehabilitation of subsided areas	Not applicable
10	General surface rehabilitation	Plant area, buildings and roads
11	River diversions	Not applicable
12	Fencing	Fences
13	Water management	Components 6, 8(A) and 8(C)
14	2 to 3 years of maintenance & aftercare	All disturbed areas

24.2 Item 3(s)(ii): Confirm that this amount can be provided for from operating expenditure

Provided the mining right is approved, Umcebo will provide for closure as per the legal requirements. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

25 Item 3(t): Deviations from the approved scoping report and plan of study

25.1 Item 3(t)(i): Deviations from the methodology used in determining the significance of potential environmental impacts and risks

There was one change from the plan of study as stipulated in the Scoping Report. The blast designs were amended which meant that a full scale box cut was no longer required. This significantly reduced the possibility of influence associated with drilling and blasting. The impact which was initially considered high was considerably reduced to a negligible impact.

The full blasting impact assessment has been included however; this would be considered a worst case scenario (Appendix 16).

25.2 Item 3(t)(ii): Motivation for the deviation

The possible impact from drilling and blasting operations had to be reviewed due to a change in development of the decline shafts. The development of the decline shafts may be possible without establishing a box-cut. The development will consist of removing soft material to a level where a free face can be drilled and blasted for the declines only. An addendum to the Blast and Vibration Assessment Report for the Proposed Development of an Underground Coal Mine and Associated Infrastructure near Hendrina (June 2016) was developed. The original report (June 2016) is considered a worst case scenario for the influences evaluated. The blasting report an associated addendum can be found in Appendix 16.

26 Item 3(u): Other Information required by the competent authority

26.1 Item 3(u)(i)(1): Impact on the socio-economic conditions of any directly affected person

The potential socio-economic impacts expected to arise as a result of the proposed project have been investigated and assessed in the Social Impact Assessment (Appendix 12). The impacts were also quantified based on the pre-determined baseline conditions.

People in the vicinity of the mine will experience the positive and negative impacts of the proposed project. The impacts and relevant mitigation measures for all the phases of the proposed project are discussed in Section 11.9 and Section 5, 6, and 7.

26.2 Item 3(u)(i)(2): Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.

The Heritage Impact Assessment (Appendix 11) completed as part of this project investigated and assessed the potential impacts on heritage resources associated with the proposed project. The identified impacts associated with all the phases of the project are discussed in Section 10.1.10, Section 11.7.3, Section 5, 6, and 7.

27 Item 3(v): Other matters required in terms of sections 24(4)(a) and (b) of the Act

This section is considered to be not applicable.

Part B: Environmental Management Programme Report

1 Item 1(a): Details of the EAP

Digby Wells and Associates South Africa (Pty) Ltd (Digby Wells) has been appointed as the independent Environmental Assessment Practitioner (EAP) to undertake the EIA process and associated WULA. The details of the EAP are provided in below.

Table 1-1: Contact Details of the EAP

Name of Practitioner:	Ms Barbara Wessels
Telephone:	011 789 9495
Fax:	011 069 6801
Postal Address	Private Bag X10046, Randburg, 2125, South Africa
Email:	barbara.wessels@digbywells.com

2 Item 1(b): Description of the aspects of the activity

Refer to Part A: Section 10 for the list of aspects.

3 Item 1(c): Composite Map

The composite plan for the project area, indicating sensitive areas, heritage resources watercourse buffers, is included as Plan 7 in Appendix 3.

4 Item 1(d): Description of Impact management objectives including management statements

4.1 Item 1(d)(i): Determination of closure objectives

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure:

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Follow a process of closure that is progressive and integrated into the short and long term plans, and that will assess the closure impacts proactively at regular intervals throughout project life;
- Maintain and monitor all rehabilitated areas following re-vegetation and, if this monitoring shows that the objectives have been met, make an application for closure;

- Comply with local, district and national regulatory requirements; and
- Follow a comprehensive consultation and communication process with all stakeholders.

Rehabilitation and closure objectives have been tailored to the project at hand. This Rehabilitation, Decommissioning and Mine Closure Plan aims to assist Umcebo in carrying out successful rehabilitation for the project.

4.2 Item 1(d)(ii): The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity

An Environmental Response Plan is a process to respond rapidly and effectively to and manage emergency situations that may arise at the mine. The Environmental Response Plan must have the following objectives:

- Categorisation of emergency situations through hazard identification and to define procedures for responses to the situations;
- Assigning responsibilities for responding to emergency situations;
- Implementation of an effective system to receive, record and communicate reports of environmental incidents and emergencies; and
- Ensuring that all environmental incidents or emergencies are investigated and the necessary procedures are in place to implement corrective and preventative actions to avoid a recurrence of the incident.

The Emergency Preparedness and Response Code of Practice will be compiled in accordance with the following:

- Occupational Health and Safety OHSAS 18001; and
- The Mine Health and Safety Act, 1996 (Act No. 29 of 1996).

In the event of an emergency, the Emergency Response Plan/Procedure will be consulted and the required actions implemented. To facilitate the effective implementation of the procedures, copies of the Emergency Response Plan will be placed in accessible and visible locations around the site. Figure 4-1 provides a general overview of the Emergency Response Procedure.

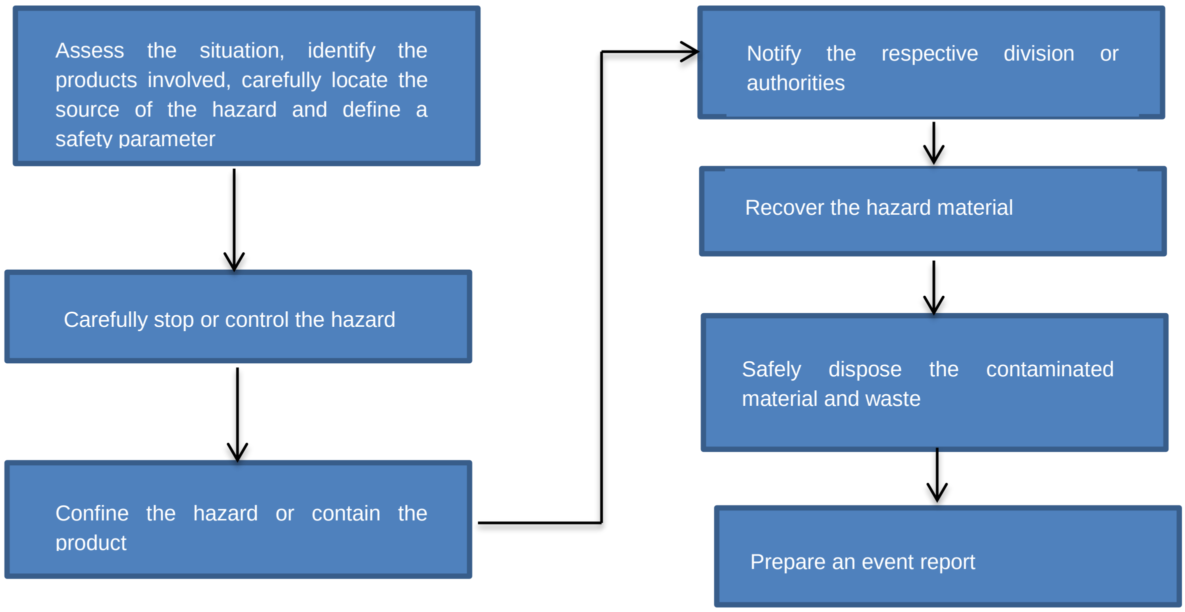

Figure 4-1: Emergency response procedure overview

4.2.1 Communication

A list of emergency contact numbers will be displayed at various locations around the site. If the emergency has the potential to affect surrounding communities, the communities will be alerted via alarm signals or contacted in person.

4.2.2 Training and emergency situation

The efficiency of the Emergency Response Plan must be tested by running training programmes and frequent emergency simulations. This will aid to prepare employees to respond in case of emergencies.

4.3 Item 1(d)(iii): Potential risk of acid mine drainage

Six rock samples that are considered to be representative of the project area were collected for acid mine drainage assessment. The samples were collected from two newly drilled boreholes, namely BKBH6 and TFBH1. This means that three samples were collected from each of the boreholes.

The six samples represent:

- Two samples from the coal seam;
- Two samples from the overburden (rocks immediately above the coal seam that could be exposed after mining); and
- Two samples from the underburden (rocks immediately below the coal seam that could be exposed after mining).

The results from the test are listed below.

4.3.1 Acid – Base accounting

The laboratory certificates of the geochemical tests are available in Appendix E within the groundwater report (Appendix 6). The results are discussed below.

4.3.1.1 Rock mineralogy and composition

Kaolinite and quartz are the primary minerals composing the samples, while microcline and muscovite are secondary. These minerals are common for both of the sampled boreholes (i.e. BKBH6 and TFBH1).

The boreholes are distinct based on their carbonate and pyrite contents. All the samples from borehole BKBH6 (from Hendrina South) are enriched in carbonates (siderite) and have the potential to buffer acid. No pyrite is detected in these samples. Siderite is an iron carbonate which will contribute alkalinity to the neutralisation potential; less acidic conditions should be expected in Mooivley West, depending on the limited number of samples.

Pyrite is detected in all of the samples from borehole TFBH1 (from Mooivley West) and has the potential to generate acid which may result in acid mine drainage. No carbonate minerals were detected in these samples. The presence of pyrite and absence of carbonate minerals in borehole TFBH1 may indicate that an acidic environment can be expected in the Hendrina South underground mine.

4.3.1.2 Paste pH

The paste pH of the samples was found to be slightly alkaline, ranging between 8.3 and 9.2. None of the samples was found to have acidic paste pH, although it is worth noting that borehole BKBH6 is more alkaline than TFBH1.

This may indicate that once the different layers are oxidised, the coal seams, and the underlying and overlying rocks could potentially be acid neutralising, at least in the short-term depending on the sulfide mineral content. However, the paste pH alone is not a conclusive methodology for ABA classification. The sulfide content, and the acid generating and acid neutralisation materials of the samples need to be quantified for more comprehensive ABA evaluations.

4.3.1.3 Sulfate speciation

The Sulfide-S content of the tested samples shows that:

- All three samples (i.e. overburden, coal seam and underburden) of borehole BKBH6 have less than 0.3% S and are unlikely to generate acid sustainably due to the limited sulfide content;
- All three samples (i.e. overburden, coal seam and underburden) of borehole TFBH1 have higher than the 0.3% benchmark required to generate acid sustainably, unless they contain sufficient buffering alkalinity; and

- In conclusion, the sulfur results are in line with the mineralogy results. While the rocks in the area of BKBH6 (Hendrina South) are unlikely to generate acid sustainably, the rocks in the area of TFBH1 (Mooivley West) have sufficient sulfide to generate acid. The samples confirmed that the site geochemistry is heterogeneous. More samples are recommended to be tested from a number of boreholes across the entire project site and a long-term kinetic test work should be conducted on the overburden, coal seam and underburden to determine the cumulative potential of pollution and acid mine drainage development over a longer period.

4.3.1.4 Net neutralisation potential

The samples from borehole BKBH6 have an average NNP of 7.07 kg $CaCO_3$/tonne and could be classified in the uncertain zone. However, the NNP of the samples from TFBH1 have an average NNP of -22.4 kg $CaCO_3$/tonne and is potentially acid generating.

4.3.1.5 Neutralisation potential ratio

The NPR of the samples is plotted in Figure 4-2. The NPR of the rocks from BKBH6 was quantified to be between 1.7 and 5.5, with an average of 3.0. This, together with the limited sulfide amount of less than 0.3%, is indicative of none or low potential of acid generation.

On the other hand, the rocks from TFBH1 are characterised with NPR ranging between 0.3 and 1.9, with average of 0.6. This, along with the sulfide amount of more than 0.3%, is indicative of potential acid generation.

Borehole BKBH6 is located in Hendrina South and TFBH1 is located in Mooivley East. The two mine zones will not be connected hydraulically and are expected to have different geochemical properties. While the water in the Mooivley East is expected to be acidic, the water in Hendrina South is likely to be neutral. It should, however, be noted that this is based on limited number of samples that does not include the Mooivley West. More samples from across the entire project site will be required for a comprehensive conclusion.

Another method for classifying non-potentially acid-generating materials from the potentially acid-generating materials is based on the ratio of NPR versus sulfide-sulfur or total sulfur content (Soregaroli and Lawrence, 1998). Should the NPR be less than 1 and the total sulfur content greater than 0.3%, the sample is considered potentially acid generating. As can be seen in Figure 4-3, the samples from borehole BKBH6 fell into the acid neutralising zone while those from TFBH1 fell in the acid generating zone.

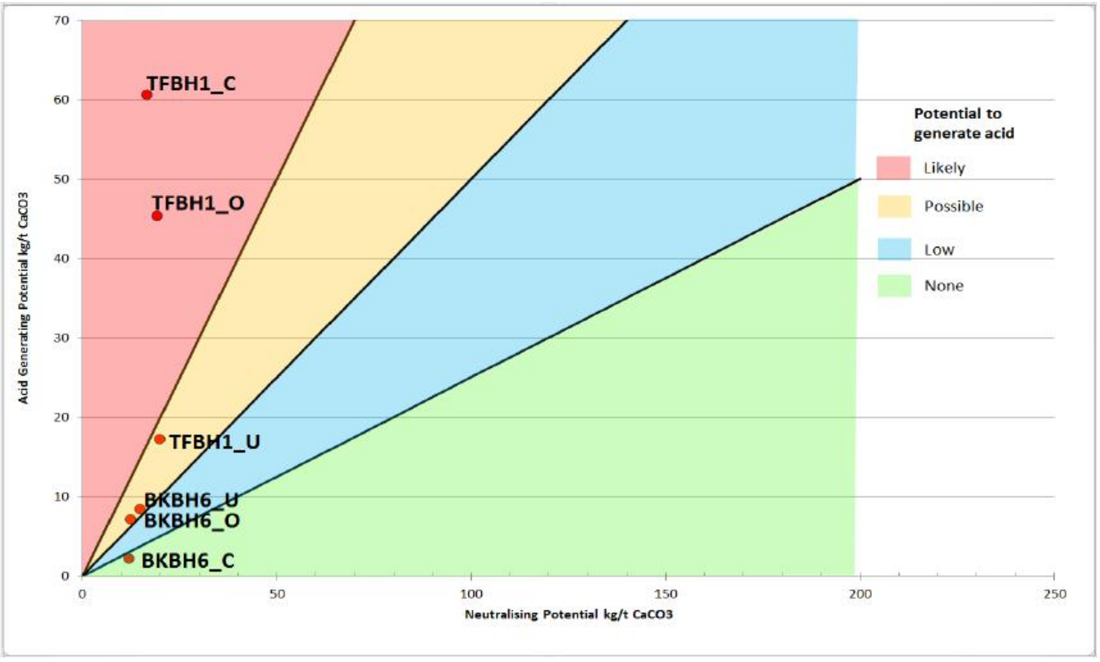

Figure 4-2: Comparison of the Acid Neutralisation and Generation Potential of the Samples

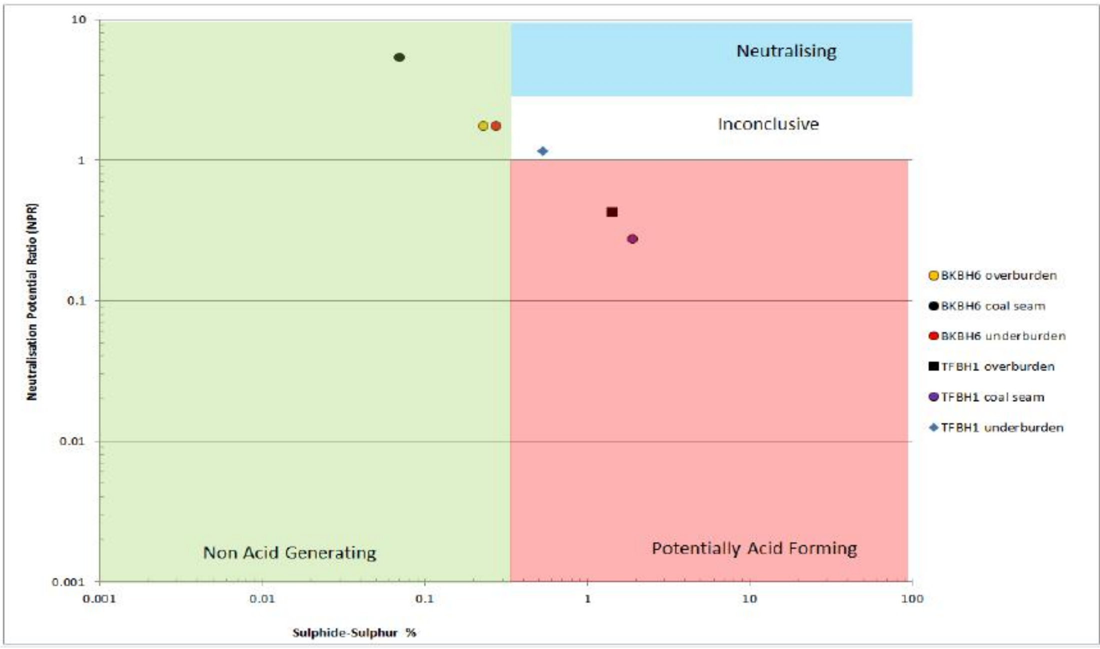

Figure 4-3: Total Sulfur vs NPR

4.4 Item 1(d)(iv): Steps taken to investigate, assess, and evaluate the impact of acid mine drainage

The geochemistry tests completed and the results obtained are discussed in Sections 10.1.4.5 and Part B 4.3.

4.5 Item i(d)(v): Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage

Based on the classification method mentioned in the NEM: WA, the samples are classified as Type 3 waste because the total concentration of one or more constituent is between the TCT0 and TCT1 threshold values. The leachable concentrations of all constituents are below the LCT0 threshold value though. Disposal is therefore required at a Class C or GLB- lined waste facility, unless an exemption is granted from the relevant authorities. The Type C waste rock dump is to be designed.

4.6 Item 1(d)(vi): Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage

Although the potential for the formation of acid mine drainage is very low, facilities will be designed as per the NEM: WA guidelines. These designs will limit/prevent seepage of poor quality into the environment. At closure the facilities will be rehabilitated as per the Rehabilitation Plan (Appendix 17) to prevent erosion and contaminated run off into the environment. AMD will need to be actively managed onsite and treated to an acceptable standard prior to any discharge.

4.7 Item 1(d)(vii): Volumes and rate of water use required for the mining, trenching or bulk sampling operation

Water is required for use in crushing and screening plant, on various stockpiles as well as for potable use. It is therefore planned for water to be abstracted from the underground water reserve and various boreholes located within the project site. The total water required for the entire mining operation is estimated at 2 000 m^3/per day (20 333 m^3/month). The water balance calculations indicate that the water requirements (2 000 m^3/day) at the mine will not be met by the water from the underground water reserve which ranges between 0 and 1 000 m^3/day. The deficit will therefore be in the order of magnitude of 1 000 m^3/day in total and more specifically, the deficits were calculated to be in the dry season between 8 000 and 18 000 m^3/month per site; and in the wet season between 7 000 and 15 000 m^3/month per site.

4.8 Item 1(d)(viii): Has a water use licence has been applied for

Umcebo is in the process of applying for an IWULA from DWS as per the requirements of the NWA.

5 Item 1(d)(ix): Impacts to be mitigated in their respective phases

The proposed mitigation measures for the risks associated with the proposed project which are presented in Table 5-1

Table 5-1: Impacts to be mitigated

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Site Clearing	Soil and Land Use Capability	Construction phase	Shaft Complex Footprint(s), Conveyer Servitude and associated Support Infrastructure Footprint – 37 ha	▪ Ensure proper stormwater management designs are in place; ▪ If any erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; ▪ If erosion has occurred, soil should be sourced and replaced and the area shaped and protected to reduce the recurrence of erosion; ▪ Only the designated access routes are to be used so as to reduce any unnecessary compaction; ▪ Compacted areas are to be ripped to loosen the soil structure; ▪ The utilisable soil should be stripped by means of an excavator bucket, and loaded onto dump trucks; ▪ Soil stockpiles are to be kept to a maximum height of 3 m where possible, or terraced and kept below 3 m if not; ▪ Soil is to be stripped when the soil is dry, so as to reduce compaction; ▪ Bush clearing contractors will only clear bushes and trees larger than 1 m and the remaining vegetation will be stripped with the utilisable soil to conserve as much of the nutrient cycle, organic matter and seed bank as possible; ▪ The handling of the stripped soil will be minimized to ensure the soil's structure does not deteriorate significantly; ▪ Compaction of the removed soil must be avoided by restricting traffic on stockpiles; ▪ Stockpiles should only be used for their designated final purposes; and ▪ The stockpiles will be vegetated (details contained in rehabilitation plan) to reduce the risk of erosion, prevent weed growth and to reinstitute the ecological processes within the soil.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.	Design and construction phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Fauna and Flora	Construction phase	58 ha	▪ Relocation of infrastructure; ▪ Rehabilitation with native grass species; and ▪ Relocation of Red Data species, should any species be recorded in developing footprint area during vegetation clearing	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	Rehabilitation should take place after decommissioning as outlined in the Rehabilitation Plan Report. Relocation of Red Data flora species prior to vegetation clearing – screening of areas prior to vegetation clearance
			37 ha – combined area	▪ Alien management plan.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEM: BA), 2004 (Act10 of 2004) Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983)	Alien management plan to be implemented after construction quarterly for two years and after decommissioning quarterly for two years.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Wetland	Construction phase	18.7 ha	▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer. However should this not be possible as no alternative location is available specifically for Mooivley East and Hendrina South, the conditions highlighted in the WUL should be adhered to. Additionally these wetlands should be closely monitored as discussed in Section 9.1.6 to ensure minimal impact occurs to these wetlands; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Wetland monitoring must be carried out during the construction phase by a wetland specialist to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible; and ▪ Where wetlands cannot be avoided, a wetland offset strategy should be implemented.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Design and construction phase
	Aquatic Ecology	Construction phase	18.7 ha	▪ Revegetation of the construction footprint as soon as possible; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ Sequential removal of the vegetation (not all vegetation immediately); and the vegetation of unpaved roadsides.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);	Design and construction phase
	Visual	Construction phase	37 ha	▪ Vegetation should only be removed when and where necessary.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Design and construction phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Visual	Construction phase	37 ha	▪ Topsoil should only be removed when and where necessary; ▪ Topsoil stockpiles should be vegetated with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum) where possible so as to blend into the surrounding landscape and reduce dust generation; ▪ Limit footprint area of topsoil stockpiles where possible; ▪ Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Design and construction phase
	Air Quality	Construction phase	25 % of the area cleared at a time. Impact is limited to the site and immediate surrounding.	▪ Site clearing must be done in phases; ▪ Use of suppressants and binders on exposed areas to reduce dust generation; ▪ The area of disturbance at all times must be kept to a minimum and no unnecessary clearing, digging or scraping must occur, especially on windy days (with wind speed ≥ 5.4 m/s); and ▪ The drop heights when loading onto trucks and at tipping points should be minimised.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures should be implemented at the commencement of this activity.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Groundwater	Construction	<0.5 km2	▪ Fill the area with soil if it is low-laying and is below the water table. This will ensure that the construction takes place above the water table; ▪ If trenches are going to be excavated below the water level, dewatering of the aquifer to locally lower the water table can be considered to ensure that the construction takes place above the groundwater level and the water quality remains acceptable. The abstracted water can be utilised for dust suppression, vegetation irrigation or discharged to PCD for evaporation. Since the groundwater is not expected to be polluted at this stage, the utilisation of the water for activities such as dust suppression or irrigation is not expected to cause environmental impacts; and ▪ Groundwater monitoring.	Compliance to the approved WULA	Groundwater monitoring must commence from the start of the construction phase Protection of the water table and groundwater quality should commence with the start of the construction phase
	Surface Water	Construction	<0.5 km2	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised so as to minimise construction of new access roads in these areas; ▪ If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing; ▪ The proposed topsoil and overburden stockpiles must be covered or vegetated as soon as possible to prevent sediment erosion. Location of measures as per SWMP ; ▪ Contaminated storm water runoff from this area will be routed through trenches to silt trap sumps at the bottom of the stockpiles; ▪ Contaminated storm water runoff from the sump will be routed through channels to the PCDs for reuse; ▪ Water quality monitoring should be implemented as an management option; Haul roads must be well compacted to	Based on the GN 704 requirements regarding stormwater management for mining activities it is noted that all clean and dirty water must be separated. The clean water diversion will be sized to accommodate the 1:50 year storm event. The containment facility should be sized to accommodate the anticipated dirty water runoff as a result of the 1:50 year storm event.	Water storage and conveyance structures should be sized accurately for the life of project.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				avoid erosion of the soil into the streams; ▪ Dust suppression on the haul roads and cleared areas must be regularly undertaken; and ▪ All dirty water channels must be constructed and placed within the dirty water infrastructure areas, such that all dirty water runoff emanating from these areas are captured and contained to a dirty water containment facility. The proposed channels should be lined and sized to cater for the 1:50 year storm event.		
Increased vehicular activities	Fauna and Flora	Construction, operation and decommissioning phases	15 291 m	▪ Erection of signage; ▪ Implementing speed limit on site; and ▪ Restricting driving at night.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)	Signage should be erected before the operational phase.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Blasting and excavation	Wetland	Operational Phase	900 ha	▪ Where possible avoid all undermining of channelled valley bottom wetlands and the Klein Olifants River; especially if vary shallow. (Plan 16 in Appendix 3); ▪ Due to the potential risk of subsidence associated with shallow mining a safety factor must be determined by a rock engineer and used for areas of shallow mining (35 to 100 m at least). This is mostly associated with the top seam where many wetlands are known. The safety factors and final mine plan must be determined by the relevant engineers; and ▪ A comprehensive geotechnical investigation must be undertaken for the following: ▪ Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties, ▪ Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters, ▪ Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and ▪ If the risk is deemed too high in a sensitive area the mine plan must be adjusted. ▪ Mining through underground dykes and sills must be undertaken carefully since the puncturing of aquifers could lead to the dewatering of wetlands.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Design and operational phase
	Aquatic Ecology	Operation phase	Immediate and surrounding areas (Municipality)	▪ Complete a geotechnical study to identify high risk subsidence areas and avoid them; ▪ A safety factor which must be determined by a rock engineer must be used for areas of shallow mining. This is mostly associated with the top seam where many wetlands are known. The safety factors and final mine plan must be determined by the relevant engineers.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);	Operation phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Heritage	Construction phase	Per Mining Area: 2 x incline shafts – 0.5 ha and 1x ventilation shaft – 0.25 ha	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards	Pre-construction
	Heritage	Operational phase	6 714 ha	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards	Pre-construction
	Blasting	Construction and Operational Phase	6 714 ha	▪ The blasting will need to be undertaken within the normal safety and control measures as per the regulatory requirements. At Mooivley West (Shaft No. 1) there are 2 points of interest observed within 500 m from the shaft area. All other points of interest observed are located at distances greater than 500 m. There are no surface infrastructures closer than 250 m from the shaft areas. ▪ There will not be a specific requirement for monitoring of blasting operations but can still be undertaken for confirmation of ground vibration and air blast levels. No other specific management measures are recommended.	Explosives Act, 1956 (Act No. 26 of 1956)	Construction and Operation
	Visual	Construction Phase	Per Mining Area: 2 x incline shafts – 0.5 ha and 1x ventilation shaft – 0.25 ha	▪ Apply dust suppression techniques to limit the dust generated from blasting.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Construction Phase
	Air Quality	Construction Phase	Local Impact	▪ Activity must be carried out judiciously to ameliorate dust emissions; and ▪ Wet drilling.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures should be implemented at the start of this activity

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Air Quality	Operational Phase	Impact will be localized, extending across the site to nearby settlements.	▪ Use of baghouse to collect underground emissions from the ventilation shaft; and ▪ Use of wet scrubbers to filter gaseous pollutants from underground operations.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)	Mitigation measures should run concurrently with this activity and for the project life
Construction of surface infrastructure; and Power Generation	Wetland	Construction Phase		▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer; particularly with respect to Mooivley East infrastructure that is within the seep wetlands draining into the natural pan; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, minimal bright lights should be left on at night time and they should be facing outwards of the site; and an alien and invasive plant species management programme must be in place from the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Design and construction phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Aquatic Ecology	Construction Phase	Limited	▪ No crossings over riffle/rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured; ▪ The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation; ▪ Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years; ▪ The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled; ▪ Erosion prevention mechanisms must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ▪ The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions; and ▪ Diversion trenches and berms should convey dirty water to the PCD so as to contain runoff.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);	Design and construction phase
	Heritage	Construction Phase	37 ha – combined area	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards	Pre-construction

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Noise	Construction Phase	Within 2 000 m from Mooivley West/Hendrina South footprint; and Within 1 000 m from Mooivley East footprint	▪ Restricting construction activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Locating of diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels; and ▪ Switching off equipment when not in use.	National Noise Control Regulations	Upon commencement of the construction phase
	Visual	Construction Phase	86 ha	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all the mitigation measures outlined in the Closure and Rehabilitation reports are conducted.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Decommissioning and Closure Phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Visual	Construction Phase	86 ha	▪ Ensure screening vegetation is left intact around the Project area and near receptors; ▪ Ensure the surface infrastructure does not exceed the proposed heights in Table 5 above; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ▪ Down lighting must be implemented for construction activities taking place at night to minimise light pollution.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Construction Phase
	Air Quality	Construction Phase	Within the immediate vicinity of the construction site	▪ Activity must be carried out judiciously to ameliorate dust emissions; and ▪ Use of suppressants on exposed areas to reduce dust generation.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures should be implemented at the commencement of this activity
	Air Quality	Construction Phase	The region generally can be affected by emissions from this source	▪ Use of low sulfur diesel; ▪ Selective catalytic reduction technology; and ▪ Gas scrubbers.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures should be implemented at the start of this activity

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Surface Water	Construction Phase	All surface infrastructure amounts to 1.5 km^2	▪ Ensure all the dirty water emanating from the dirty water areas will be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment. ▪ Should the contained water be more than the water use requirement, the Best Practice Guidelines (BPGs) advise that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water.	DWS Best Practice Guideline G4: Impact prediction Based on GN 704, the mine infrastructure in question should fall outside of the 1:100 year floodline or 100 m, whichever is greater.	During the construction and operation of the entire infrastructure.
Waste generation and disposal	Aquatic Ecology	Construction Phase	75 m^2	▪ Diversion trench and berm systems which diverts clean stormwater around pollution sources and convey and contain dirty water to central pollution control dams; ▪ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from entering the local aquatic systems. ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around pollution control impoundments and structures should be completed as this has been shown to be effective in erosion and nutrient control.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);	Design and construction phase
	Air Quality	Operational Phase	Impact will be localized, extending across the site to nearby settlements	▪ Vegetation of stockpiles; ▪ Handling and storage of hazardous waste in clearly labelled containers; and ▪ Training on the emergency procedures and action plans on the handling of leaks, spillages of hazardous materials.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)	Mitigation measures should run concurrently with this activity and for the project life

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Hauling/Conveying of coal; Plant and equipment operations; and Power Generation	Wetland	Operational Phase		▪ The conveyor must be designed in such a way so as to minimise the windblown coal fines and any potential coal fallout and should be covered. If possible, the conveyor should be fully enclosed over the wetlands and within the 100 m buffer area; ▪ The conveyor servitude must also have a well-designed stream crossing and this should be maintained. The wetlands outside of this must be demarcated as no-go areas; ▪ The conveyor must be monitored and maintained to best operating standards and per the design criteria that capture mitigation measures.; and ▪ The wetland must be monitored quarterly to ensure no residual impact to the wetland and river is realised; and if so that remediation measures are followed. It is recommended that at least 100 m on either side for the conveyor is assessed for any sign of ecological decline and pollution such as coal fines deposition and runoff, die back of vegetation and increased erosion.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*, 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Design and operational phase
	Aquatic Ecology	Operational Phase	Local	▪ Clean and dirty water separation; ▪ Clean, dirty water separation and stormwater management: Clean water should be managed in a manner according to the Department of Water and Sanitation Best Practice Guidelines; ▪ Exposed topsoil's and soil stockpiles must be revegetated to reduce erosion and subsequent sedimentation; ▪ Although a basic geotechnical study has been completed, recommendations from the report indicate that a comprehensive geotechnical study must be conducted to assess the risk for subsidence in areas associated with the Klein Olifants River. Mitigation actions to increase stability should be used in delineated high risk areas. These mitigation actions include limiting roads underneath the river system	Department of Water and Sanitation Best Practice Guidelines	Operational Phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				and thicker support pillars, however, detailed mitigation actions should be defined in the geotechnical study. ▪ Based on the revision of the mining plan, the coal reserve which is located at a depth less than 40 m and associated with wetlands will only be mined to a limited extent, with thick enough support pillars to avoid surface subsidence. This will reduce the risk of subsidence in local river catchments. ▪ PCD must be designed and operated in such a way that it will not spill more than once in 50 years. The dam must be able to contain the water required for operations, a storm event including a 0.8 m freeboard at all times; ▪ Channel systems must be made with concrete to reduce seepage; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around PCD and structures should be completed as this has been shown to be effective in erosion and nutrient control.		

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Noise	Operational phase	Within 1 500 m from Mooivley West/Hendrina South footprint during daytime; Within 3 000 m from Mooivley West/Hendrina South footprint during night time; Within 1 300 m from Mooivley East footprint during daytime; and Within 3 300 m from Mooivley East footprint during night time	▪ Locating of diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Fitting ventilation silencers to the ventilation fans; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Maintenance of low noise rollers for conveyor belts; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; and ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels.	National Noise Control Regulations	Upon commencement of the operational phase
	Visual	Operational Phase	0.4 ha	▪ Limit the speed of vehicles on the haul roads to reduce dust; and ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Operational Phase
	Visual	Operational Phase	0.4 ha	▪ Apply dust suppression techniques to limit the dust generated from the crushing and screening plant; and ▪ Down lighting must be implemented for operational activities taking place at night to minimise light pollution.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Operational Phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Air Quality	Operational Phase	Impact will be localized, extending across the site to nearby settlements.	▪ The drop heights when loading and tipping points should be minimised; ▪ The use of dust suppressants and binders on exposed areas; ▪ Routine maintenance and vegetation of side walls of storage facilities i.e. topsoil and waste stockpile throughout the lifespan of the project; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)	Mitigation measures should run concurrently with this activity and for the project life
	Air Quality	Operational Phase	Impact will be localized, extending across the site to nearby settlements	▪ Use of water sprays; ▪ Enclosure of crushers; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures must commence at the start of the operation and for the project life
	Air Quality	Operational Phase	The impact can be localized extending across the site	▪ Use of low sulfur diesel; ▪ Selective catalytic reduction technology; ▪ Use of electrostatic precipitators; and ▪ Gas scrubbers.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures should be implemented at the start of this activity

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Groundwater	Operational Phase	<0.5 km2	▪ Avoid placement of the PCD on areas with the potential for increased infiltration to groundwater, such as over fault zones; ▪ All contaminant, stormwater, waste and hazardous waste storage facilities and other contaminated water storage areas (pollution control dams) should be lined to prevent infiltration of contaminated seepage water proactively; ▪ Monitoring of groundwater quality and water levels is recommended with continuous refining and updating of the monitoring network based on the results obtained; and ▪ All PCD should be operated in such a way that it does not overflow more than once in 50 years.	DWS Best Practice Guideline A4: Pollution Control Dams	PCD design should be completed before the construction starts. Groundwater monitoring must commence from the start of the construction phase.
	Surface Water	Operational Phase	<0.5 km^2	▪ Vehicles must only be serviced within designated service bays; ▪ The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by approved contractors for disposal to the appropriate disposal sites; ▪ The fuel, lubricant and explosives storage facilities must be located on a hard standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilization of leaked hazardous substances; and ▪ An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for the Life of Mine for reference to anytime in terms of handling, storage and disposal of materials.	SANS1200 specifications.	During the entire project life.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep	Wetland	Operational Phase		▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. This area must receive particular attention and a careful construction approach to minimize all impacts; ▪ Wetland monitoring must be carried out to ensure no unnecessary impact to wetlands is realised. If an impact is realised and recorded during monitoring, a remedial action must put in place as soon as possible and reported upon; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, an alien and invasive plant species management programme must be in place from the construction phase; ▪ Construction must be done in the dry season (late March to November); ▪ The conveyor should be placed on plinths above the ground so as to allow movement safely underneath for faunal species utilising the wetland and to prevent hydrological alterations to the stream channel and; ▪ The conveyor must be closed to ensure that coal fallout does not reach wetlands.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Design, construction and operational phase
Construction over watercourses	Surface Water	Construction Phase	Limited	▪ Construction over sensitive riparian habitats resulting in the loss or degradation of aquatic habitat. There is also a Risk of contamination of water on the stream	Based on Reg. 704, the mine infrastructure in question should fall outside of the 1:100 year floodline or 100 m, whichever is greater.	During the construction and operation of the entire infrastructure.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Operation and maintenance of the Soil and Overburden Stockpiles.	Soil and Land Use Capability	Operational Phase	Shaft Complex Footprint(s), Conveyer Servitude and associated Support Infrastructure Footprint	▪ Ensure proper stormwater management designs are in place and managed (kept clean); ▪ If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; ▪ Only the designated access routes are to be used to reduce any unnecessary impacts (contamination and sterilisation); and ▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.	Design and operational phase
	Visual	Operational Phase	Shaft Complex Footprint(s), Conveyer Servitude and associated Support Infrastructure Footprint	▪ Ensure the overburden stockpiles do not exceed the proposed height of 18 m; ▪ Ensure the product stockpiles do not exceed the proposed height of 10 m; ▪ Ensure the waste rock berms do not exceed the proposed height of 3 m; ▪ Limit the quantity and time of ROM stored on site; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Operational Phase
	Air Quality	Operational Phase	Impact will be localized, extending across the site to nearby settlements.	▪ The drop heights when loading and tipping points should be minimised; ▪ The use of dust suppressants and binders on exposed areas; ▪ Routine maintenance and vegetation of side walls of storage facilities i.e. topsoil and waste stockpile throughout the lifespan of the project; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)	Mitigation measures should run concurrently with this activity and for the project life

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Groundwater	Operational Phase	<1 km^2	▪ Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals; and ▪ Groundwater monitoring.	DWS Best Practice Guideline G4: Impact prediction	Stockpile design should be completed before the construction starts. Groundwater monitoring must commence from the start of the construction phase.

Activities	**Aspect Affected**	**Phase**	**Size and scale of disturbance**	**Mitigation Measures**	**Compliance with standards**	**Time period for implementation**
Employment and capital expenditure; and Construction of surface infrastructure Implementation of SLP and Social Performance Policies	Socio-economic	Construction and operation	About 600 jobs during construction, with additional indirect employment. However, the latter can only be determined with an Economic Impact Assessment	▪ It is recommended that Umcebo host a consultation meeting with the Hendrina community should their applications for the relevant authorizations be successful. This meeting should take place prior to the commencement of any construction activities. The objective of the meeting should be to share information relating to opportunities (jobs, procurement, LED projects etc.) and to establish communication lines between the mine and the community; ▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle); ▪ Promotion of local, female and youth employment; ▪ Where possible labour-intensive construction methods should be promoted; ▪ Verification of local status; ▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available; ▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit; ▪ Expand skills development to surrounding communities; ▪ Recruitment via a registry of job seekers and potentially coordinated through the DoL; ▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training; and ▪ Monitoring subcontractors in terms of local employment targets.	Mineral and Petroleum Resource Development Act (Act of 2002). National Environmental Management Act (Act of 1998 Employment Equity Act, 1998 (Act No. 55 of 1998); Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); Skills Development Act (Act No. 97 of 1998 as amended); and Company employment policies.	Prior to start of construction and on-going

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Socio-economic	Construction and operation	Will include some local, but mostly regional and provincial impacts	▪ As for maximising employment benefits; ▪ Give preference first to capable local service providers; ▪ Develop local service provision capacity; ▪ Monitoring of sub-contractors procurement; ▪ Development of a register of local SMMEs; ▪ Linkages with skills development/ SMME development institutions and other mining operations; ▪ SMME skills development as part of mine SLP/ LED commitments; and ▪ Local procurement targets should be formalised in Umcebo's procurement policy.	Yes. Mineral and Petroleum Resource Development Act (Act of 2002); IDPs and SPFs of affected municipalities; Company Procurement Policy; Skills Development Act (Act No. 97 of 1998 as amended); and Company SLP.	At the start of construction and on-going
	Socio-economic	Construction and operation	All employees as well as some members of the local community will benefit from actions outlined in the Mine's SLP and other social performance policies	▪ Liaison with beneficiaries to ensure needs are met; ▪ Collaboration with other developmental role players during implementation; ▪ Expanding skills development and capacity building programmes to non-employees; ▪ Establish external monitoring system to regulate HDSA procurement; ▪ Where feasible, training should be NQF accredited; and ▪ A record of training courses completed per individual should be kept.	Yes. Mineral and Petroleum Resource development Act (Act of 2002); Employment Equity Act, 1998 (Act No. 55 of 1998); Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); and Skills Development Act (Act No. 97 of 1998 as amended). Company employment policies IDPs and SPFs of affected municipalities Company CSI Policy	At the start of construction and on-going
Land acquisition; Undermining of surface and business structures; Site clearance; and Blasting and excavation.	Socio-economic	Pre-construction	A substantial number of individuals in the primary study area will be directly displaced, with a comparatively larger number of people being exposed to indirect displacement impacts	▪ Umcebo should where possible endeavour to minimise the extent of, displacement through project design, where displacement cannot be minimised the following measures are recommended to alleviate the adverse impacts; ▪ Umcebo should finalise the Project layout plan and determine its policy and approach to displacement, as this would inform the extent of resettlement, i.e. whether it will recognise both direct and indirect forms of displacement; ▪ Where a selling price cannot be determined by negotiation a sales agreement should be	Yes. Mineral and Petroleum Resource Development Act (Act of 2002); IFC PS 5: Land Acquisition and Involuntary Resettlement; Mine Health and Safety Act (Act of 1996); Extension of Security of Tenure Act, 1997 (Act No. 62 of 1997); National Environmental Management Act (Act of 1998); and Constitution of South Africa	Pre-construction

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				negotiated which reflects the holistic value (determined by a professional valuer) of the land and should also be inclusive of the potential relocation cost of commercial farms and/or business operations; ▪ The displacement of non-vulnerable households and individuals should be considered on a case-by-case basis; ▪ Areas impacted upon during construction should be rehabilitated upon completion of the construction activities to ensure that the land is returned in the same condition; ▪ Prior to finalising the sales agreement of land, it should be clear who will assume responsibility for the resettlement of the vulnerable household; If Umcebo assumes responsibility for the physically displaced household, due process should be followed when the household is relocated. It is recommended that the process be aligned to IFC PS 5; ▪ Consider including employees and other impacted businesses in the aforementioned process; and ▪ The conveyor between Mooivley West and Hendrina South should be aligned along farm boundaries as far as practically possible to reduce the degree of property fragmentation.		
Blasting and excavation; Construction of surface Infrastructure; and Hauling/conveying of Coal	Socio-economic	Construction, operation, and decommissioning	Will mostly affect road users using the N11, Davel Road and affected gravel roadways; as well as movement of livestock across the Davel Road	▪ Measures to prevent deterioration of roads suggested in Traffic Impact Assessment; ▪ Regulation of traffic at intersections between the N11 and Davel road and access roads to construction and operational sites; ▪ Road upgrading measures should be investigated and implemented in conjunction with the relevant government department; ▪ Inform communities of planned construction activities that would affect vehicle/ pedestrian traffic; ▪ Ensure that access to key services in areas such as Hendrina are uninterrupted by	Yes. Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); National Environmental Management Act (Act of 1998); and Constitution of South Africa	Construction and on-going

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				providing alternative access routes; ▪ Construction of livestock crossings at suitable intervals should be incorporated into project design; and ▪ Livestock farmers and regular road users should be consulted with regard to placement of crossings.		
- Employment and operational expenditure; - Construction of surface Infrastructure; and - Plant and equipment operations.	Socio-economic	Pre-construction, construction and operation	Will mostly affect settlements within the primary and secondary study area (e.g. Lesedi), as well as remaining property owners and administrative authorities	▪ Develop an Influx management plan together with other industry role players and government; ▪ Discourage influx of job-seekers by prioritising employment of unemployed members of local communities; ▪ Liaise with local municipalities to ensure that expected population influx is taken into account in infrastructure development and spatial development planning; ▪ Create synergies with local government IDP and other companies' SLP/ CSR projects to promote infrastructure development; ▪ Extensive HIV/ AIDS awareness and general health campaign; ▪ Identify if recorded criminal activities involved members of the mine's workforce; ▪ Establishment of anti-poaching mechanism in consultation with potentially affected land owners; ▪ Clear identification of workers; prevention of loitering; ▪ Liaison with police, community policing forum; ▪ Promote projects providing housing, especially low cost housing; and ▪ Measures to address potential conflict between locals and non-locals.	Yes. Mineral and Petroleum Resource Development Act (Act of 2002); National Environmental Management Act (Act of 1998); SPLUMA (Act 16 of 2013); IFC Guidelines on Project-induced in-migration; IDPs and SPFs of affected municipalities; and Company CSI Policy.	Pre-construction

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Blasting and excavation; Construction of surface infrastructure; Water abstraction and use; Underground blasting and mining; Hauling/conveying of coal; Plant and equipment operations ; Water use and storage; and Waste generation and storage	Socio-economic	Construction, operation, and decommissioning	Will mostly affect the population within primary study area and some users of local roads	▪ Access control to all project elements, including fencing; ▪ Notification of blasting activities; ▪ Storage of blasting and hazardous materials should adhere to prescribed regulation; ▪ Measures suggested minimising the impact of fly-rock on surrounding roads and structure (Blast Management and Consulting, 2016); ▪ Measures suggested in the Traffic Impact Assessment to minimize traffic related accidents (Aurecon, 2016); and ▪ Road maintenance.	Mineral and Petroleum Resource Development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); Occupational Health and Safety, 1993 (Act no. 85 of 1993) (OHS); International Human Rights Guiding Principles; IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998). Explosives Act, 1956 (Act No. 26 of 1956)	At start of construction and on-going
	Socio-economic	Construction, operation, and decommissioning	Land users adjacent to the Project area and neighbouring settlements could be affected	▪ Refer to recommendations of specialist studies (see Visual Impact Assessment, Surface-and Ground Water Impact Assessment, Noise Impact Assessment, Air Quality Impact Assessment, Blasting and Vibration Impact Assessment and Traffic Impact Assessment); ▪ Optimise mine plan/infrastructure placement to avoid/minimise negative impacts, especially in terms of visual intrusion, displacement, air quality and disruptions of traffic; ▪ Implement measure to create an environment that can contribute positively to stakeholders affected by it. For example, farmers might have to fend against poachers stealing livestock from farms or fight veld fires. The Project has resources that can assist the farmers, and should reach an understanding with these stakeholders about how it could assist them in this regard; ▪ Undertake continuous information sharing and consultation with adjacent/ affected farm owners; and ▪ Implement communication mechanisms to report changes in water quality/ quantity, air quality or vibrations.	Uncertain. Mineral and Petroleum Resource Development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); Occupational Health and Safety, 1993 (Act no. 85 of 1993) (OHS); International Human Rights Guiding Principles; IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998). Explosives Act, 1956 (Act No. 26 of 1956)	Construction and on-going

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Socio-economic	Pre-construction, construction and operation	Will not only elicit opposition from primary study area, but stakeholders in the broader area	▪ Communicate commitments regarding LED; ▪ Transparency regarding employment practices; ▪ Presentation of EIA findings in clear and understandable manner; ▪ Monitor community attitudes to anticipate/prevent active opposition through grievances lodged through community forum and a formal grievance mechanism; ▪ Establish a community forum; and ▪ Appointment of a CLO / Stakeholder Engagement / Community offices to enhance communication.	Yes. Mineral and Petroleum Resource Development Act (Act of 2002); IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998).	Pre-construction, construction and operation
Workers transportation and the transportation of construction materials, produced coal during operation and decommissioning materials	Traffic	Construction, operational and decommissioning	**Construction –** 116 additional vehicle trips during AM and PM peak hour **Operation –** 99 additional vehicle trips during AM and PM peak hour **Decommissioning** – 39 additional vehicle trips during AM and PM peak hour	▪ Introduce the following road upgrades at the new proposed N11/ Mooivley East Access Road intersection: ▪ The intersection to be priority controlled with the mine access road stop controlled; ▪ Separate 100 m left lane is proposed on the N11 northern approach; ▪ Separate 100 m right turn lane; and ▪ 100 m right-turn refuge lane and 100 m taper acceleration lane are recommended on the northern and southern approaches respectively. ▪ The new proposed Davel Road and Mooivley West intersection to be priority controlled with Davel Road having priority; ▪ Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions; ▪ Prescribe routes for construction traffic to: ▪ Discourage right turns by heavy vehicles on busy roads where heavy vehicles have to give way to fast moving vehicles; and ▪ Discourage routing of heavy vehicles through residential areas.	SANRAL and local roads authorities standards	Commencement of construction.

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Traffic	Construction, operational and decommissioning	**Construction** – 125 additional pedestrian trips during AM and PM peak hour **Operation** – 99 additional pedestrian trips during AM and PM peak hour pedestrian trips during AM and PM peak hour	▪ Regular pedestrian and cycling activity awareness for staff working on site during all project stages, as part of regular Health and Safety briefings.	SANRAL and local roads authorities standards	Commencement of construction and throughout the project to closure
	Traffic	Construction, operational and decommissioning	**Construction** – 6 heavy vehicles trips per day **Operation** – 26 heavy vehicle trips per day	▪ Drivers of heavy vehicles are required to attend a specialised road safety and driving course that sensitises them to the impact that they have on driving conditions for other vehicles and NMT users on these roads.	Road safety standards	Commencement of construction and throughout the project to closure
	Traffic	Construction, operational and decommissioning	**Construction** – 6 heavy vehicles trips per day **Operation** – 26 heavy vehicle trips per day	▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/ from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.	SANRAL and local roads authorities standards	Commencement of construction and throughout the project to closure
Employment and project expenditure; Payment of royalties and taxes; Successful implementation of SLP; and Plant and equipment operations	Socio-economic	Construction and Operation	Socio-economic development impacts will be concentrated in the secondary study area and the Districts, however, diluted impacts will occur in the Province and country	▪ Measures to enhance local employment during construction (see measures to enhance employment during construction in Table 11-75); ▪ Provide focused training to construction phase employees from the host communities to increase their chances for employment during the operations; ▪ Measures recommended to maximise benefits from local employment, and economic multiplier effects (refer to Table 11-75); and ▪ The Project's database of the local labour pool should be updated to include people who were employed by the Project during the construction phase.	National Environmental Management Act (Act of 1998) Constitution of South Africa IDPs and SPFs of affected municipalities; National and Provincial Development Planning Policies Company Employment and Procurement Policies	Operation

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Socio-economic	Operation and Decommissioning	Will most severely affect employees and service providers from the local municipal area	▪ Develop alternative and sustainable livelihoods for instance through LED programmes listed in the Mine's SLP; ▪ Collaborate with other industries to support the diversification of the local economy; ▪ The Mine's SLP should provide strategies and measures that reduce job loss through redeployment at other operations; ▪ Where feasible alternatives to save jobs/avoid downscaling should be investigated beforehand, including LED, potential redeployment at other operation; ▪ Develop a Mine Closure Plan; ▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where; retrenchment and/or closure of the mine are certain. In particular through promoting economic diversification, portable skills development and local economic development where possible; and ▪ Partner with the relevant government departments, to jointly manage Closure process.	Mineral and Petroleum Resource Development Act (Act of 2002); Mine's SLP and Project Closure Plan; Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); and Skills Development Act (Act No. 97 of 1998 as amended).	Operation and closure
Employment and operational expenditure; and Dismantling of major equipment and infrastructure	Socio-economic	Operational and Decommissioning	Will mostly affect the commercial farmers and employers within the primary study area	▪ Avoid recruitment on farms; ▪ Persons applying for jobs with construction or operational contractors are to be informed that such jobs are temporary; and ▪ Adhere to labour legislation.	International Human Rights Guiding Principles; Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); and Labour Relations Act, 1995 (Act No. 66 of 1995)	Construction and on-going
Removal of infrastructure and surface rehabilitation	Soil and Land Use Capability	Decommissioning and Closure	Shaft Complex Footprint(s), Conveyer Servitude and associated Support Infrastructure Footprint – 86 ha	▪ Ensure proper stormwater management designs are in place and that it is functional at all times; ▪ If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; ▪ If erosion has occurred, utilisable soil should be sourced and replaced and shaped to reduce the recurrence of erosion; ▪ Only the designated access routes are to be used to reduce any unnecessary compaction and/or contamination;	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.	Decommissioning and Closure Phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
				▪ Compacted areas are to be ripped to loosen the soil structure and vegetation cover re-instated; ▪ Implement land rehabilitation measures as defined in rehabilitation report. ▪ Follow rehabilitation guidelines; ▪ The utilisable soil should be moved by means of an excavator and loaded onto trucks; ▪ Soil should be moved when dry wherever possible; ▪ On completion of the project disturbed areas need to be cleared of all infrastructure; ▪ Foundations need to be removed; ▪ Utilisable soil needs to be replaced for rehabilitation purposes; ▪ The handling of the stripped soil will be minimized to ensure the soil's structure does not deteriorate; and ▪ Stockpiles should only be used for their designated final purposes.		
	Wetland	Decommissioning and Closure		▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. This area must receive particular attention and a careful construction approach to minimize all impacts; ▪ The rehabilitation footprint kept as small as possible and non-impacted wetlands must be avoided; ▪ Careful attention must be given to handling wetland soils, if any; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Upon commencement of the closure phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Aquatic Ecology	Decommissioning and Closure	Local	▪ Stormwater management plan.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);	Decommissioning and Closure phase
	Noise	Decommissioning and Closure	Local, not extending beyond project area	▪ Restricting decommissioning activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	National Noise Control Regulations	Upon commencement of the closure phase
	Visual	Decommissioning and Closure	Local	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all mitigation measures in the Closure and Rehabilitation reports are conducted.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes	Decommissioning and Closure Phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Air Quality	Decommissioning and Closure	Impact will be limited to the site and immediate surroundings.	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when offloading must be minimised; ▪ Limit demolition activities to non-windy days (with wind speed less than 5.4 m/s); and ▪ Profiling and vegetation of open areas.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012	Mitigation measures should run concurrently with this activity
	Surface Water	Decommissioning and Closure	Impact will be limited to the site and immediate surroundings.	▪ Use of accredited contractors for removal or demolition of infrastructures must be ensured; ▪ Seeding of the backfilled area must be implemented, where seeding is not effective, this must be repeated until it becomes sustainable; and ▪ The constructed dirty water trenches will have to remain until post closure. This will ensure dirty water is captured and contained during removal of infrastructures.	GN 704 Condition 9 describes the temporary or permanent cessation of mine or activity. At cessation of operations, the persons operating a mining activity should ensure that all pollution control measures have been designed, modified, constructed and maintained so as to comply with these regulations.	During cessation of operations
Underground mine closure and rehabilitation	Wetland	Decommissioning and Closure		▪ Groundwater and wetlands must be monitored post-mining for potential decant; and ▪ Long-term water treatment options will need to be investigated by Umcebo to prevent polluted decant water from entering the catchment.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)	Upon commencement of the closure phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
	Aquatic Ecology	Decommissioning and Closure	Local project area to surrounding areas (municipality)	▪ Decant capture and treatment.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);	Decommissioning and Closure phase
	Groundwater	Decommissioning, Closure and Post-closure	38 km2	▪ No impact to farms is foreseen based on the available information and numerical model results. However, if any impacts are confirmed through monitoring, the mine should supply equal/better amount of water to affected parties; ▪ The use of nitrate based explosives should be limited as far as practicable to minimise groundwater contamination; ▪ Mine dewatering to intercept the contamination plume to within the mine area; ▪ Monitoring of groundwater quality and water levels; and ▪ Update the numerical model as more groundwater information is collected.	SANS: River quality objectives. South African water quality guidelines for drinking, irrigation and livestock watering.	Mine should supply clean water when contamination is detected in the private boreholes. Groundwater monitoring must commence from the start of the construction phase. Refine the conceptual and numerical models yearly in the first four years and thereafter every five years based on groundwater monitoring results.
	Surface Water	Decommissioning, Closure and Post-closure	Local project area to surrounding areas (municipality)	▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.	GN 704 *Condition* 9 describes the temporary or permanent cessation of mine or activity. At cessation of operations, the persons operating a mining activity should ensure that all pollution control measures have been designed, modified, constructed and maintained so as to comply with these regulations.	Post closure or after cessation of operations
	Surface Water	Decommissioning, Closure and Post-closure	Local project area to surrounding areas (municipality)	▪ Decant capture and treatment prior to discharge into the stream	Section 19 of the National Water Act (NWA), 1998 (Act No. 36 of 1998);	Rehabilitation and closure phase

Activities	Aspect Affected	Phase	Size and scale of disturbance	Mitigation Measures	Compliance with standards	Time period for implementation
Post-closure monitoring and rehabilitation of disturbed areas	Soil and Land Use Capability	Decommissioning and Closure	Shaft Complex Footprint(s), Conveyer Servitude and associated Support Infrastructure Footprint	▪ The rehabilitated area must be assessed once a year for compaction, fertility, and erosion; ▪ The soils fertility must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) so as to correct any nutrient deficiencies; ▪ Compacted areas are to be ripped to loosen the soil structure, and vegetation cover re-instated; ▪ If erosion occurs, corrective actions (erosion berms) must be taken to minimize any further erosion from taking place; ▪ If erosion has occurred, soil should be sourced and replaced and landscaped to reduce the recurrence of erosion; and ▪ Only the designated access routes are to be used to reduce any unnecessary compaction.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.	Post Closure
Underground mine development - Dewatering	Groundwater	Decommissioning, Closure and Post-closure	38 km^2	▪ Mine should supply better amount of water to affected parties; ▪ Monitoring of water levels on a monthly basis; and ▪ Updating of the numerical model as aquifer properties become available.	▪ N/A	Mine should supply clean water when contamination is detected in the private boreholes. Groundwater monitoring must commence from the start of the construction phase. Model updating should be conducted annually for the first 4 years. Thereafter on 5 years frequency.
	Groundwater	Decommissioning, Closure and Post-closure	7 m^3/d	▪ Capture the decant before joining the streams, treat it and re-introduce it into the streams; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and mine inflow rates; and ▪ Update numerical model and decant rates as aquifer information becomes available.	SANS: River quality objectives. South African water quality guidelines for drinking, irrigation and livestock watering. Olifants River Water Quality Objectives	When the decant starts (approximately 30 years after closure).

6 Item 1(e): Impact management outcomes

A description of the objectives and outcomes of the EMP is outlined in Table 6-1, taking into account the impact and mitigation type.

Table 6-1: Outcomes and Objectives of the EMP

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Site Clearing	Loss of utilisable soil as a resource – Disturbance, Erosion, Sterilisation, Salinisation, Contamination and Compaction as well as loss of Land capability, and Land Use	Soil and Land Use Capability	Construction Phase	▪ Stormwater Management Plan; ▪ Site Clearing Procedures; and ▪ Rehabilitation Plan.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
	Habitat loss for flora and fauna Loss of species diversity Potential loss of Red Data species Loss of Eragrostis Grassland	Fauna and Flora	Construction phase	▪ Relocation of infrastructure; ▪ Rehabilitation with native grass species; and ▪ Relocation of Red Data species, should any species be recorded in developing footprint area during vegetation clearing.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)
	Flora – alien plant invasion Habitat fragmentation and increased establishment of alien plant species.			▪ Alien plant species management plan.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983)
	Removal of wetland soils and vegetation; totalling 18.7 ha.	Wetland	Construction phase	▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer. However should this not be possible as no alternative location is available specifically for Mooivley East and Hendrina South, the conditions highlighted in the WUL should be adhered to. Additionally these wetlands should be closely monitored as discussed in Section 9.1.6 to ensure minimal impact occurs to these wetlands; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Wetland monitoring must be carried out during the construction phase by a wetland specialist to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible; and ▪ Where wetlands cannot be avoided, a wetland offset strategy should be implemented.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Visual impact due to removal of vegetation resulting in the site becoming noticeable to nearby receptors	Visual	Construction phase	▪ Vegetation should only be removed when and where necessary.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Noticeable to nearby receptors, Topsoil removal and stockpiling, generation of dust	Visual	Construction phase	▪ Topsoil should only be removed when and where necessary; ▪ Topsoil stockpiles should be vegetated with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum) where possible so as to blend into the surrounding landscape and reduce dust generation; ▪ Limit footprint area of topsoil stockpiles where possible; ▪ Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Increased runoff resulting in erosion and sedimentation of downstream habitats. Increased runoff from manmade structures resulting in the erosion and sedimentation of downstream river reaches	Aquatic Ecology	Construction Phase	▪ Buffer zones (100 m wetlands and 100 m riparian), where these areas cannot be avoided a Wetland offset strategy should be implemented; ▪ Revegetation of the construction footprint as soon as possible; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ Sequential removal of the vegetation (not all vegetation immediately); and the vegetation of unpaved roadsides.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);
	Site clearing results in the generation of dust	Air Quality	Construction phase	▪ It was assumed that clearing would occur in phases i.e. 25 % of the area cleared at a time; and ▪ Impact is limited to the site and immediate surrounding.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Groundwater depletion	Groundwater	Construction phase	▪ Fill the area with soil if it is low-laying and is below the water table. This will ensure that the construction takes place above the water table; ▪ If trenches are going to be excavated below the water level, dewatering of the aquifer to locally lower the water table can be considered to ensure that the construction takes place above the groundwater level and the water quality remains acceptable. The abstracted water can be utilised for dust suppression, vegetation or discharged to PCD for evaporation. Since	N/A

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
				the groundwater is not expected to be polluted at this stage, the utilisation of the water for activities such as dust suppression or irrigation is not expected to cause environmental impacts; and ▪ Groundwater monitoring.	
	Siltation of surface water resources leading to deteriorated water quality	Surface Water	Construction phase	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised so as to minimise construction of new access roads in these areas; ▪ If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing; ▪ The proposed topsoil and overburden stockpiles must be covered or vegetated as soon as possible to prevent sediment erosion. Location of measures as per SWMP ; ▪ Contaminated storm water runoff from this area will be routed through trenches to silt trap sumps at the bottom of the stockpiles; ▪ Contaminated storm water runoff from the sump will be routed through channels to the PCDs for reuse; ▪ Water quality monitoring should be implemented as an management option; Haul roads must be well compacted to avoid erosion of the soil into the streams; ▪ Dust suppression on the haul roads and cleared areas must be regularly undertaken; and ▪ All dirty water channels must be constructed and placed within the dirty water infrastructure areas, such that all dirty water runoff emanating from these areas are captured and contained to a dirty water containment facility. The proposed channels should be lined and sized to cater for the 1:50 year storm event.	Based on the GN 704 requirements regarding stormwater management for mining activities it is noted that all clean and dirty water must be separated. The clean water diversion will be sized to accommodate the 1:50 year storm event. The containment facility should be sized to accommodate the anticipated dirty water runoff as a result of the 1:50 year storm event.
Increased vehicular activities	Potential loss of fauna diversity Roadkill and disturbance of fauna	Fauna and Flora	Construction, operation and decommissioning phases	▪ Erection of signage; ▪ Implementing speed limit on site; and ▪ Restricting driving at night.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Blasting and excavation	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Wetland	Construction phase	▪ Where possible avoid all undermining of channelled valley bottom wetlands and the Klein Olifants River; especially if vary shallow. (Plan 16 in Appendix 3); ▪ Due to the potential risk of subsidence associated with shallow mining a safety factor must be determined by a rock engineer and used for areas of shallow mining (35 to 100 m at least). This is mostly associated with the top seam where many wetlands are known. The safety factors and final mine plan must be determined by the relevant engineers; and ▪ A comprehensive geotechnical investigation must be undertaken for the following: ▪ Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties, ▪ Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters, ▪ Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and ▪ If the risk is deemed too high in a sensitive area the mine plan must be adjusted. ▪ Mining through underground dykes and sills must be undertaken carefully since the puncturing of aquifers could lead to the dewatering of wetlands.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014) Explosives Act, 1956 (Act No. 26 of 1956)
	Loss of integrity of Rock Art sites	Heritage	Construction phase	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Degradation of intrinsic CS of burial grounds and graves	Heritage	Construction phase	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Loss of integrity of Rock Art panels	Heritage	Operational phase	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Damage to surface dressing of burial grounds and graves	Heritage	Operational Phase	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Sound, ground vibration and air blast within the immediate vicinity of the shaft	Blasting	Construction and Operational Phase	▪ The blasting will need to be undertaken within the normal safety and control measures as per the regulatory requirements. At Mooivley West (Shaft No. 1) there are 2 points of interest observed within 500 m from the shaft area. All other points of interest observed are located at distances greater than 500 m. There are no surface infrastructures closer than 250 m from the shaft areas; and ▪ There will not be a specific requirement for monitoring of blasting operations but can still be undertaken for confirmation of ground vibration and air blast levels. No other specific management measures are recommended.	Explosives Act, 1956 (Act No. 26 of 1956)
	Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment.	Visual	Construction Phase	▪ Apply dust suppression techniques to limit the dust generated from blasting.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Undermining of wetlands and rivers leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Aquatic Ecology	Operation phase	▪ Complete a geotechnical study to identify high risk subsidence areas and avoid them; and ▪ A safety factor which must be determined by a rock engineer must be used for areas of shallow mining (35 to 100 m at least). This is mostly associated with the top seam where many wetlands are known. The safety factors and final mine plan must be determined by the relevant engineers.	The National Water Act (NWA), 1998 (Act No. 36 of 1998).
	Blasting and Mining will result in poor air quality	Air Quality	Construction Phase	▪ Activity must be carried out judiciously to ameliorate dust emissions; and ▪ Wet drilling.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Blasting and Mining will result in poor air quality	Air Quality	Operational Phase	▪ Use of baghouse to collect underground emissions from the ventilation shaft; and ▪ Use of wet scrubbers to filter gaseous pollutants from underground operations.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Construction of surface infrastructure; and Power Generation	Loss of soil as a resource – Disturbance, Erosion, Sterilisation, Salinisation, Contamination and Compaction as Well as Loss of Land capability, and Land Use	Soil and Land Use Capability	Construction Phase	▪ Stormwater Management Plan; and ▪ IWWMP.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
	Industrial activity within a natural ecosystem is a negative impact to habitat integrity.	Wetland	Construction phase	▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer; particularly with respect to Mooivley East infrastructure that is within the seep wetlands draining into the natural pan; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, minimal bright lights should be left on at night time and they should be facing outwards of the site; and an alien and invasive plant species management programme must be in place from the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Degradation of intrinsic CS of burial grounds and graves	Heritage	Construction phase	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Noise disturbance (noise levels in excess of 45 dBA)	Noise		▪ Restricting construction activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Locating diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels; and ▪ Switching off equipment when not in use.	National Noise Control Regulations
	Change of land use from agriculture to mining resulting in a loss of sense of place, a loss of scenic character and increased visual disturbance	Visual	Construction phase	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all the mitigation measures outlined in the Closure and Rehabilitation reports are conducted.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Change in sense of place due to surface infrastructure and increased lighting	Visual	Construction phase	▪ Ensure screening vegetation is left intact around the project area and near receptors; ▪ Ensure the surface infrastructure does not exceed the proposed heights in Table 5 above; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ▪ Down lighting must be implemented for construction activities taking place at night to minimise light pollution.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat	Aquatic Ecology	Construction phase	▪ No crossings over riffle/rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured; ▪ The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation; ▪ Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years; ▪ The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled; ▪ Erosion prevention mechanisms must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ▪ The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions (plinths); and ▪ Diversion trenches and berms should convey dirty water to the PCD so as to contain runoff.	The National Water Act (NWA), 1998 (Act No. 36 of 1998);
	Construction of Surface Infrastructure results in Dust Generation	Air Quality	Construction phase	▪ Activity must be carried out judiciously to ameliorate dust emissions; and ▪ Use of suppressants on exposed areas to reduce dust generation.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Generation of power leads to gaseous emissions: NOx, SO2, CO and particulate matter	Air Quality	Construction phase	▪ Use of low sulfur diesel; ▪ Selective catalytic reduction technology; and ▪ Gas scrubbers.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Deterioration of water quality due to dirty water reporting into natural water resources	Surface Water	Construction phase	▪ As proposed, ensure all the dirty water emanating from the dirty water areas will be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment. ▪ Should the contained water be more than the water use requirement, the Best Practice Guidelines (BPGs) advise that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water.	DWS Best Practice Guideline G4: Impact prediction Based on GN 704, the mine infrastructure in question should fall outside of the 1:100 year floodline or 100 m, whichever is greater.
The construction of stockpiles.	Loss of utilisable soil as a resource – Disturbance, Erosion, Compaction and Contamination.	Soil and Land Use Capability	Construction Phase	▪ Rehabilitation Plan.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
Waste Generation and Storage	Runoff containing pollutants and solid waste resulting in water and habitat quality degradation in downstream river reaches.	Aquatic Ecology	Construction Phase	▪ Diversion trench and berm systems which diverts clean stormwater around pollution sources and convey and contain dirty water to central pollution control dams; ▪ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from entering the local aquatic systems. ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around pollution control impoundments and structures should be completed as this has been shown to be effective in erosion and nutrient control.	The National Water Act (NWA), 1998 (Act No. 36 of 1998).
	Waste Generation and Storage will result in release of Dust and Volatiles	Air Quality	Operational Phase	▪ Vegetation of stockpiles; ▪ Handling and storage of hazardous waste in clearly labelled containers; and ▪ Training on the emergency procedures and action plans on the handling of leaks, spillages of hazardous materials.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Hauling/Conveying of coal; Plant and equipment operations; and Power Generation	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment. Stockpiling of coal also represents risks to the environment that must be managed.	Wetland	Operational phase	▪ The conveyor must be designed in such a way so as to minimise the windblown coal fines and any potential coal fallout and should be covered. If possible, the conveyor should be fully enclosed over the wetlands and within the 100 m buffer area; ▪ The conveyor servitude must also have a well-designed stream crossing and this should be maintained. The wetlands outside of this must be demarcated as no-go areas; ▪ The conveyor must be monitored and maintained to best operating standards and per the design criteria that capture mitigation measures.; and ▪ The wetland must be monitored quarterly to ensure no residual impact to the wetland and river is realised; and if so that remediation measures are followed. It is recommended that at least 100 m on either side for the conveyor is assessed for any sign of ecological decline and pollution such as coal fines deposition and runoff, die back of vegetation and increased erosion.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Noise disturbance (noise levels in excess of 45 dBA during the daytime and 35 dBA during the night time)	Noise	Operational phase	▪ Locating of diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Fitting ventilation silencers to the ventilation fans; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Maintenance of low noise rollers for conveyor belts; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; and ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels.	National Noise Control Regulations
	Vehicular activity to haul coal will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact.	Visual	Operational phase	▪ Limit the speed of vehicles on the haul roads to reduce dust; and ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Generation of dust from crushing and screening plant. Lighting from the overall operation of the mine	Visual	Operational phase	▪ Apply dust suppression techniques to limit the dust generated from the crushing and screening plant; and ▪ Down lighting must be implemented for operational activities taking place at night to minimise light pollution.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Runoff water which may come into contact with the carboniferous material will contain various pollutants that may contaminate downstream river reaches.	Aquatic Ecology	Operational phase	▪ Clean and dirty water separation; ▪ Clean, dirty water separation and stormwater management: Clean water should be managed in a manner according to the Department of Water and Sanitation Best Practice Guidelines; ▪ Exposed topsoil's and soil stockpiles must be revegetated to reduce erosion and subsequent sedimentation; ▪ Although a basic geotechnical study has been completed, recommendations from the report indicate that a comprehensive geotechnical study must be conducted to assess the risk for subsidence in areas associated with the Klein Olifants River. Mitigation actions to increase stability should be used in delineated high risk areas. These mitigation actions include limiting roads underneath the river system and thicker support pillars, however, detailed mitigation actions should be defined in the geotechnical study. ▪ Based on the revision of the mining plan, the coal reserve which is located at a depth less than 40 m and associated with wetlands will only be mined to a limited extent, with thick enough support pillars to avoid surface subsidence. This will reduce the risk of subsidence in local river catchments. ▪ PCDs must be designed and operated in such a way that it will not spill more than once in 50 years. The dam must be able to contain the water required for operations, a storm event including a 0.8 m freeboard at all times; ▪ Channel systems must be made with concrete to reduce seepage; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around PCDs and structures should be completed as this has been shown to be effective in erosion and nutrient control.	The National Water Act (NWA), 1998 (Act No. 36 of 1998).

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Hauling leads to emission and poor air quality	Air Quality	Operational phase	▪ The drop heights when loading and tipping points should be minimised; ▪ The use of dust suppressants and binders on exposed areas; ▪ Routine maintenance and vegetation of side walls of storage facilities i.e. topsoil and waste stockpile throughout the lifespan of the project; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)
	Crushing of ore results in fugitive dust emissions	Air Quality	Operational phase	▪ Use of water sprays; ▪ Enclosure of crushers; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Generation of power leads to gaseous emissions: NO_x, SO_2, CO and particulate matter	Air Quality	Operational phase	▪ Use of low sulfur diesel; ▪ Selective catalytic reduction technology; ▪ Use of electrostatic precipitators; and ▪ Gas scrubbers.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Groundwater contamination	Groundwater	Operational phase	▪ Avoid placement of the PCDs on areas with the potential for increased infiltration to groundwater, such as over fault zones; ▪ All contaminant, stormwater, waste and hazardous waste storage facilities and other contaminated water storage areas (pollution control dams) should be lined to pro-actively prevent infiltration of contaminated seepage water; and ▪ Monitoring of groundwater quality and water levels is recommended with continuous refining and updating of the monitoring network based on the results obtained.	DWS Best Practice Guideline A4: Pollution Control Dams.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Potential spillages on Storage of fuel areas, workshops and heavy machinery on site resulting in water quality deterioration	Surface Water	Operational phase	▪ Vehicles must only be serviced within designated service bays. ▪ The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by approved contractors for disposal to the appropriate disposal sites. ▪ The fuel, lubricant and explosives storage facilities must be located on a hard standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilization of leaked hazardous substances. ▪ An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for the Life of Mine for reference to anytime in terms of handling, storage and disposal of materials.	SANS1200 specifications.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep	Heavy machinery working with wetland channel and surrounds impacting upon soil, vegetation disturbing fauna.	Wetland	Operational phase	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. This area must receive particular attention and a careful construction approach to minimize all impacts; ▪ Wetland monitoring must be carried out to ensure no unnecessary impact to wetlands is realised. If an impact is realised and recorded during monitoring, a remedial action must put in place as soon as possible and reported upon; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, an alien and invasive plant species management programme must be in place from the construction phase; ▪ Construction must be done in the dry season (late March to November); ▪ The conveyor should be placed on plinths above the ground so as to allow movement safely underneath for faunal species utilising the wetland and to prevent hydrological alterations to the stream channel and; ▪ The conveyor must be closed to ensure that coal fallout does not reach wetlands.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
Construction over watercourses	Siltation of surface water resources leading to deteriorated water quality.	Surface Water	Construction phase	▪ Construction over sensitive riparian habitats resulting in the loss or degradation of aquatic habitat. There is also a Risk of contamination of water on the stream	Based on Reg. 704, the mine infrastructure in question should fall outside of the 1:100 year floodline or 100 m, whichever is greater.
Operation and maintenance of the topsoil and overburden stockpiles.	Loss of utilisable soil as a resource – Sterilisation, Salinisation, Contamination, Erosion and Compaction	Soil and Land Use Capability	Operational Phase	▪ Stormwater Management Plan; ▪ IWWMP; and ▪ Rehabilitation Plan.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Generation of Dust and change in landscape –	Visual	Operational Phase	▪ Ensure the overburden stockpiles do not exceed the proposed height of 18 m; ▪ Ensure the product stockpiles do not exceed the proposed height of 10 m; ▪ Ensure the waste rock berms do not exceed the proposed height of 3 m; ▪ Limit the quantity and time of ROM stored on site; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Stockpiling will result in dust emissions and reduced air quality	Air Quality	Operational Phase	▪ The drop heights when loading and tipping points should be minimised; ▪ The use of dust suppressants and binders on exposed areas; ▪ Routine maintenance and vegetation of side walls of storage facilities i.e. topsoil and waste stockpile throughout the lifespan of the project; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)
	Groundwater contamination	Groundwater	Operational Phase	▪ Avoid placement of the PCDs on areas with the potential for increased infiltration to groundwater, such as over fault zones; ▪ All contaminant, stormwater, waste and hazardous waste storage facilities and other contaminated water storage areas (pollution control dams) should be lined to pro-actively prevent infiltration of contaminated seepage water; and ▪ Monitoring of groundwater quality and water levels is recommended with continuous refining and updating of the monitoring network based on the results obtained.	DWS Best Practice Guideline A4: Pollution Control Dams.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
- Employment and capital expenditure; and - Construction of surface infrastructure - Implementation of SLP and Social Performance Policies	Employment creation during construction	Socio-economic	Construction and operation	▪ It is recommended that Umcebo host a consultation meeting with the Hendrina community should their applications for the relevant authorizations be successful. This meeting should take place prior to the commencement of any construction activities. The objective of the meeting should be to share information relating to opportunities (jobs, procurement, LED projects etc.) and to establish communication lines between the mine and the community; ▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle); ▪ Promotion of local, female and youth employment; ▪ Where possible labour-intensive construction methods should be promoted; ▪ Verification of local status; ▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available; ▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit; ▪ Expand skills development to surrounding communities; ▪ Recruitment via a registry of job seekers and potentially coordinated through the DoL; ▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training; and ▪ Monitoring subcontractors in terms of local employment targets.	Mineral and Petroleum Resource Development Act (Act of 2002). National Environmental Management Act (Act of 1998 Employment Equity Act, 1998 (Act No. 55 of 1998); Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); Skills Development Act (Act No. 97 of 1998 as amended); and Company employment policies.
	Multiplier effects on the local economy	Socio-economic	Construction and operation	▪ As for maximising employment benefits; ▪ Give preference first to capable local service providers; ▪ Develop local service provision capacity; ▪ Monitoring of sub-contractors procurement; ▪ Development of a register of local SMMEs; ▪ Linkages with skills development/ SMME development institutions and other mining operations; ▪ SMME skills development as part of mine SLP/LED commitments; and ▪ Local procurement targets should be formalised in Umcebo's procurement policy.	Yes. Mineral and Petroleum Resource Development Act (Act of 2002); IDPs and SPFs of affected municipalities; Company Procurement Policy; Skills Development Act (Act No. 97 of 1998 as amended); and Company SLP.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Community development and social upliftment	Socio-economic	Construction and operation	▪ Liaison with beneficiaries to ensure needs are met; ▪ Collaboration with other developmental role players during implementation; ▪ Expanding skills development and capacity building programmes to non-employees; ▪ Establish external monitoring system to regulate HDSA procurement; ▪ Where feasible, training should be NQF accredited; and ▪ A record of training courses completed per individual should be kept	Mineral and Petroleum Resource development Act (Act of 2002); Employment Equity Act, 1998 (Act No. 55 of 1998); Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); and Skills Development Act (Act No. 97 of 1998 as amended). Company employment policies IDPs and SPFs of affected municipalities Company CSI Policy
- Land acquisition; - Undermining of surface and business structures; - Site clearance; and - Blasting and excavation.	Displacement related impacts	Socio-economic	Pre-construction	▪ Umcebo should where possible endeavour to minimise the extent of displacement through project design, where displacement cannot be minimised the following measures are recommended to alleviate the adverse impacts; ▪ Umcebo should finalise the Project layout plan and determine its policy and approach to displacement, as this would inform the extent of resettlement, i.e. whether it will recognise both direct and indirect forms of displacement; ▪ Where a selling price cannot be determined by negotiation a sales agreement should be negotiated which reflects the holistic value (determined by a professional valuer) of the land and should also be inclusive of the potential relocation cost of commercial farms and/or business operations; ▪ The displacement of non-vulnerable households and individuals should be considered on a case-by-case basis; ▪ Areas impacted upon during construction should be rehabilitated upon completion of the construction activities to ensure that the land is returned in the same condition; ▪ Prior to finalising the sales agreement of land, it should be clear who will assume responsibility for the resettlement of the vulnerable household; ▪ If Umcebo assumes responsibility for the physically displaced household, due process should be followed when the household is relocated. It is recommended that the process be aligned to IFC PS 5; ▪ Consider including employees and other impacted businesses in the aforementioned process; and ▪ The conveyor between Mooivley West and Hendrina South should be aligned along farm boundaries as far	Mineral and Petroleum Resource development Act (Act of 2002); IFC PS 5: Land Acquisition and Involuntary Resettlement; Mine Health and Safety Act (Act of 1996); Extension of Security of Tenure Act, 1997 (Act No. 62 of 1997); National Environmental Management Act (Act of 1998); and Constitution of South Africa Explosives Act, 1956 (Act No. 26 of 1956)

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
				as practically possible to reduce the degree of property fragmentation.	
- Blasting and excavation; - Construction of surface Infrastructure; and - Hauling/conveying of Coal	Disruption of daily movement patterns	Socio-economic	Construction, operation, and decommissioning	▪ Measures to prevent deterioration of roads suggested in Traffic Impact Assessment; ▪ Regulation of traffic at intersections between the N11 and Davel road and access roads to construction and operational sites; ▪ Road upgrading measures should be investigated and implemented in conjunction with the relevant government department; ▪ Inform communities of planned construction activities that would affect vehicle/ pedestrian traffic; ▪ Ensure that access to key services in areas such as Hendrina are uninterrupted by providing alternative access routes; ▪ Construction of livestock crossings at suitable intervals should be incorporated into project design; and ▪ Livestock farmers and regular road users should be consulted with regard to placement of crossings.	Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); National Environmental Management Act (Act of 1998); and Constitution of South Africa Explosives Act, 1956 (Act No. 26 of 1956)
- Employment and operational expenditure; - Construction of surface Infrastructure; and - Plant and equipment operations.	Influx related impacts	Socio-economic	Pre-construction, construction and operation	▪ Develop an Influx management plan together with other industry role players and government; ▪ Discourage influx of job-seekers by prioritising employment of unemployed members of local communities; ▪ Liaise with local municipalities to ensure that expected population influx is taken into account in infrastructure development and spatial development planning; ▪ Create synergies with local government IDP and other companies' SLP/CSR projects to promote infrastructure development; ▪ Extensive HIV/ AIDS awareness and general health campaign; ▪ Identify if recorded criminal activities involved members of the mine's workforce; ▪ Establishment of anti-poaching mechanism in consultation with potentially affected land owners; ▪ Clear identification of workers; prevention of loitering; ▪ Liaison with police, community policing forum; ▪ Promote projects providing housing, especially low cost housing; and ▪ Measures to address potential conflict between locals and non-locals	Mineral and Petroleum Resource development Act (Act of 2002); National Environmental Management Act (Act of 1998); SPLUMA (Act 16 of 2013); IFC Guidelines on Project-induced in-migration; IDPs and SPFs of affected municipalities; and Company CSI Policy.

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
-Blasting and excavation; -Construction of surface infrastructure; -Water abstraction and use; -Underground blasting and mining; -Hauling/conveying of coal; -Plant and equipment operations ; -Water use and storage; and -Waste generation and storage	Health and Safety impacts	Socio-economic	Construction, operation, and decommissioning	▪ Access control to all project elements, including fencing; ▪ Notification of blasting activities; ▪ Storage of blasting and hazardous materials should adhere to prescribed regulation; ▪ Measures suggested minimising the impact of fly-rock on surrounding roads and structure (Blast Management and Consulting, 2016); ▪ Measures suggested in the Traffic Impact Assessment to minimize traffic related accidents (Aurecon, 2016); and ▪ Road maintenance.	Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); Occupational Health and Safety, 1993 (Act no. 85 of 1993) (OHS); International Human Rights Guiding Principles; IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998). Explosives Act, 1956 (Act No. 26 of 1956)
	Impact on surrounding land users	Socio-economic	Construction, operation, and decommissioning	▪ Refer to recommendations of specialist studies (see Visual Impact Assessment, Surface-and Ground Water Impact Assessment, Noise Impact Assessment, Air Quality Impact Assessment, Blasting and Vibration Impact Assessment and Traffic Impact Assessment); ▪ Optimise mine plan/infrastructure placement to avoid/minimise negative impacts, especially in terms of visual intrusion, displacement, air quality and disruptions of traffic; ▪ Implement measure to create an environment that can contribute positively to stakeholders affected by it. For example, farmers might have to fend against poachers stealing livestock from farms or fight veld fires. The Project has resources that can assist the farmers, and should reach an understanding with these stakeholders about how it could assist them in this regard; ▪ Undertake continuous information sharing and consultation with adjacent/affected farm owners; and ▪ Implement communication mechanisms to report changes in water quality/quantity, air quality or vibrations.	Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); Occupational Health and Safety, 1993 (Act no. 85 of 1993) (OHS); International Human Rights Guiding Principles; IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998).
	Opposition because of perceived negative impacts	Socio-economic	Pre-construction, construction and operation	▪ Communicate commitments regarding LED; ▪ Transparency regarding employment practices; ▪ Presentation of EIA findings in clear and understandable manner; ▪ Monitor community attitudes to anticipate/prevent active opposition through grievances lodged through community forum and a formal grievance mechanism; ▪ Establish a community forum; and ▪ Appointment of a CLO / Stakeholder Engagement / Community offices to enhance communication.	Mineral and Petroleum Resource development Act (Act of 2002); IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998).

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Workers transportation and the transportation of construction materials, produced coal during operation and decommissioning materials	Increase in traffic volumes and vehicle delays	Traffic	Construction, operational and decommissioning	▪ Introduce the following road upgrades at the new proposed N11/ Mooivley East Access Road intersection: ▪ The intersection to be priority controlled with the mine access road stop controlled; ▪ Separate 100 m left lane is proposed on the N11 northern approach; ▪ Separate 100 m right turn lane; and ▪ 100 m right-turn refuge lane and 100 m taper acceleration lane are recommended on the northern and southern approaches respectively. ▪ The new proposed Davel Road and Mooivley West intersection to be priority controlled with Davel Road having priority; ▪ Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions. ▪ Prescribe routes for construction traffic to: ▪ Discourage right turns by heavy vehicles on busy roads where heavy vehicles have to give way to fast moving vehicles; and ▪ Discourage routing of heavy vehicles through residential areas.	SANRAL and local roads authorities standards
	Increase in delays for cyclists and pedestrians as result of the additional traffic on the network.	Traffic	Construction, operational and decommissioning	▪ Regular pedestrian and cycling activity awareness for staff working on site during all project stages, as part of regular Health and Safety briefings.	SANRAL and local roads authorities standards
	Road safety conditions could be impacted negatively by an increase in heavy vehicles.	Traffic	Construction, operational and decommissioning	▪ Drivers of heavy vehicles must be required to attend a specialised road safety and driving course that sensitises them to the impact that they have on driving conditions for other vehicles and NMT users on these roads.	Road safety standards
	Impact on road surface and road structures conditions of the local road network as a result of an increase in heavy vehicles.	Traffic	Construction, operational and decommissioning	▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.	SANRAL and local roads authorities standards

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Employment and project expenditure; - Payment of royalties and taxes; - Successful implementation of SLP; and - Plant and equipment operations	Economic growth and diversification	Socio-economic	Construction and Operation	▪ Measures to enhance local employment during construction (see measures to enhance employment during construction); ▪ Provide focused training to construction phase employees from the host communities to increase their chances for employment during the operations; ▪ Measures recommended to maximise benefits from local employment, economic multiplier effects, as well as community, economic and skills development (refer to Table 11-76); and ▪ The Project's database of the local labour pool should be updated to include people who were employed by the Project during the construction phase.	National Environmental Management Act (Act of 1998) Constitution of South Africa IDPs and SPFs of affected municipalities; National and Provincial Development Planning Policies Company Employment and Procurement Policies
	Dependency on mine for sustaining local economy	Socio-economic	Operation and Decommissioning	▪ Develop alternative and sustainable livelihoods for instance through LED programmes listed in the Mine's SLP; ▪ Collaborate with other industries to support the diversification of the local economy; ▪ The Mine's SLP should provide strategies and measures that reduce job loss through redeployment at other operations; ▪ Where feasible alternatives to save jobs/avoid downscaling should be investigated beforehand, including LED, potential redeployment at other operation; ▪ Develop a Mine Closure Plan; ▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where; retrenchment and/or closure of the mine are certain. In particular through promoting economic diversification, portable skills development and local economic development where possible; and ▪ Partner with the relevant government departments, to jointly manage Closure process.	Mineral and Petroleum Resource Development Act (Act of 2002); Mine's SLP and Project Closure Plan; Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); and Skills Development Act (Act No. 97 of 1998 as amended).
- Employment and operational expenditure; and - Dismantling of major equipment and infrastructure	Loss of farm/other labour to the mine	Socio-economic	Operation and Decommissioning	▪ Avoid recruitment on farms; ▪ Persons applying for jobs with construction or operational contractors are to be informed that such jobs are temporary; and ▪ Adhere to labour legislation.	International Human Rights Guiding Principles; Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); and Labour Relations Act, 1995 (Act No. 66 of 1995)

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
Demolition of infrastructure and Rehabilitation of the project area.	Loss of utilisable soil as a resource – Disturbance, Sterilisation, Salinisation, Contamination, Erosion, and Compaction as well as loss of Land capability, and Land Use	Soil and Land Use Capability	Decommissioning and Closure	▪ Rehabilitation Plan; and ▪ Closure Plan.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
Removal of infrastructure and surface rehabilitation	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the hillslope seep wetland underlying the proposed infrastructure for Hendrina South.	Wetland	Decommissioning and Closure	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the rehabilitation phase; ▪ The rehabilitation footprint kept as small as possible and non-impacted wetlands must be avoided; ▪ Careful attention must be given to handling wetland soils, if any; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Noise disturbance (noise levels in excess of 45 dBA)	Noise	Decommissioning and Closure	▪ Restricting decommissioning activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	National Noise Control Regulations

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Dust from the demolition process and surface rehabilitation will also have a negative visual impact.	Visual	Decommissioning and Closure	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Use shade cloth / netting to screen the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all mitigation measures in the Closure and Rehabilitation reports are conducted.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the hillslope seep wetland underlying the proposed infrastructure for Hendrina South.	Aquatic Ecology	Decommissioning and Closure	▪ Stormwater Management Plan	The National Water Act (NWA), 1998 (Act No. 36 of 1998).
	Removal of Infrastructure and rehabilitation results in dust emission	Air Quality	Decommissioning and Closure	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when offloading must be minimised; ▪ Limit demolition activities to non-windy days (with wind speed less than 5.4 m/s); and ▪ Profiling and vegetation of open areas.	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Siltation of surface water resources leading to deteriorated water quality.	Surface Water	Decommissioning and Closure	▪ Use of accredited contractors for removal or demolition of infrastructures; this will reduce the risk of waste generation and accidental spillages; ▪ The PCDs, constructed dirty water trenches and berms will have to remain until post closure should be removed last form the site so that the silt trap and the sot dirty water can contain for treatment before discharge until rehabilitation is completed. ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams; ▪ Water quality monitoring on the upstream and downstream points of the coal mine must be undertaken and suspended solids and turbidity levels accessed	GN 704 *Condition* 9 describes the temporary or permanent cessation of mine or activity. At cessation of operations, the persons operating a mining activity should ensure that all pollution control measures have been designed, modified, constructed and maintained so as to comply with these regulations.
Underground mine closure and rehabilitation	Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.	Wetland	Decommissioning and Closure	▪ Groundwater and wetlands must be monitored post-mining for potential decant; and ▪ Long-term water treatment options will need to be investigated by Umcebo to prevent polluted decant water from entering the catchment.	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Post-mining decant of groundwater will have negative impacts on the downstream water quality	Aquatic Ecology	Decommissioning, Closure and Post-closure	▪ Decant capture and treatment.	The National Water Act (NWA), 1998 (Act No. 36 of 1998).

Activities	Potential impacts	Aspects affected	Phase	Mitigation type	Standard to be achieved
	Groundwater, wetland and surface water contamination	Groundwater	Decommissioning, Closure and Post-closure	▪ Mine should supply better amount of water to affected parties; ▪ The use of nitrate based explosives should be limited as far as practicable to minimise groundwater contamination; ▪ Mine dewatering to intercept the contamination plume to within the mine area; ▪ Monitoring of groundwater quality and water levels; and ▪ Update the numerical model as more groundwater information is collected.	SANS: River quality objectives. South African water quality guidelines for drinking, irrigation and livestock watering.
Post-closure monitoring of rehabilitated areas. .	Re-instatement of soil as a resource.	Soil and Land Use Capability	Post-Closure Phase	▪ Rehabilitation Plan; and ▪ Closure Plan.	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
Underground mine development - Dewatering	Groundwater, wetland and surface water depletion	Groundwater	Decommissioning, Closure and Post-closure	▪ Mine should supply better amount of water to affected parties; ▪ Monitoring of water levels; and ▪ Updating of the numerical model as aquifer properties become available.	N/A
	Wetland and surface water contamination	Groundwater	Decommissioning, Closure and Post-closure	▪ Capture the decant water before joining the streams, treat it and re-introduce it into the streams; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and mine inflow rates; and ▪ Update numerical model and decant rates as aquifer information becomes available.	SANS: River quality objectives. South African water quality guidelines for drinking, irrigation and livestock watering.
	Deterioration of surface water quality on the surrounding streams	Surface Water	Decommissioning and Closure	▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.	GN 704 *Condition* 9 describes the temporary or permanent cessation of mine or activity. At cessation of operations, the persons operating a mining activity should ensure that all pollution control measures have been designed, modified, constructed and maintained so as to comply with these regulations.

7 Item 1(f): Impact Management Actions

A description of impact management actions, identifying the manner in which the impact management objectives and outcomes referenced in Sections 5 and 6 will be achieved, is provided in Table 7-1.

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Table 7-1: Impact Management Actions

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Site Clearing	Site clearance and removal of utilisable soil prior to the commencement of physical construction activities.	Soil and Land Use Capability	▪ Stormwater Management Plan; ▪ Site Clearing Procedures; and ▪ Rehabilitation Plan.	Design and construction phase	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
	Habitat loss for flora and fauna Loss of species diversity Potential loss of Red Data species Loss of Eragrostis Grassland	Fauna and Flora	▪ Relocation of infrastructure ▪ Rehabilitation with native grass species; and ▪ Relocation of Red Data species, should any species be recorded in developing footprint area during vegetation clearing.	Rehabilitation should take place after decommissioning as outlined in the Rehabilitation Plan Report. Relocation of Red Data flora species prior to vegetation clearing – screening of areas prior to vegetation clearance	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)
	Flora – alien plant invasion Habitat fragmentation and increased establishment of alien plant species.		▪ Alien plant species management plan.	Alien plant management plan to be implemented after construction quarterly for 2 years and after decommissioning quarterly for two years.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) Conservation of Agriculture Resources Act, 1983 (Act No. 43 of 1983)
	Removal of wetland soils and vegetation; totalling 18.7 ha.	Wetland	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Wetland monitoring must be carried out during the construction phase by a wetland specialist to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible; and ▪ Where wetlands cannot be avoided, a wetland offset strategy should be implemented.	Design and construction phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Visual impact due to removal of vegetation resulting in the site becoming noticeable to nearby receptors	Visual	▪ Vegetation should only be removed when and where necessary.	Construction Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Noticeable to nearby receptors, Topsoil removal and stockpiling, generation of dust	Visual	▪ Topsoil should only be removed when and where necessary; ▪ Topsoil stockpiles should be vegetated with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum) where possible so as to blend into the surrounding landscape and reduce dust generation; ▪ Limit footprint area of topsoil stockpiles where possible; ▪ Limit the height of topsoil stockpiles to 3 m to prevent the soil from becoming compacted; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	Construction Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Increased runoff resulting in erosion and sedimentation of downstream habitats. Increased runoff from manmade structures resulting in the erosion and sedimentation of downstream river reaches	Aquatic Ecology	▪ Buffer zones (100 m wetlands and 100 m riparian), where these areas cannot be avoided a Wetland offset strategy should be implemented; ▪ Revegetation of the construction footprint as soon as possible; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ Sequential removal of the vegetation (not all vegetation immediately); and the vegetation of unpaved roadsides.	Design and construction phase	The National Water Act (NWA), 1998 (Act No. 36 of 1998).
	Site clearing results in the generation of dust	Air Quality	▪ It was assumed that clearing would occur in phases i.e. 25 % of the area cleared at a time; and ▪ Impact is limited to the site and immediate surrounding.	Mitigation measures should be implemented at the commencement of this activity	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Groundwater depletion	Groundwater	▪ Fill the area with soil if it is low-laying and is below the water table. This will ensure that the construction takes place above the water table; ▪ If trenches are going to be excavated below the water level, dewatering of the aquifer to locally lower the water table can be considered to ensure that the construction takes place above the groundwater level and the water quality remains acceptable. The abstracted water can be utilised for dust suppression, vegetation or discharged to PCDs for evaporation. Since the groundwater is not expected to be polluted at this stage, the utilisation of the water for activities such as dust suppression or irrigation is not expected to cause environmental impacts; and ▪ Groundwater monitoring.	Groundwater monitoring must commence from the start of the construction phase Protection of the water table and groundwater quality should commence with the start of the construction phase	N/A
	Siltation of surface water resources leading to deteriorated water quality	Surface Water	▪ Clearing of vegetation must be limited to the development footprint area, and the use of existing access roads must be prioritised so as to minimise construction of new access roads in these areas; ▪ If possible, construction activities must be prioritised to the dry months of the year (May-October) to limit mobilisation of sediments or hazardous substances from construction vehicles used during site clearing; ▪ The proposed topsoil and overburden stockpiles must be covered or vegetated as soon as possible to prevent sediment erosion. Location of measures as per SWMP ; ▪ Contaminated storm water runoff from this area will be routed through trenches to silt trap sumps at the bottom of the stockpiles; ▪ Contaminated storm water runoff from the sump will be routed through channels to the PCDs for reuse; ▪ Water quality monitoring should be implemented as an management option; Haul roads must be well compacted to avoid erosion of the soil into the streams; and	Water storage and conveyance structures should be sized accurately for the life of project.	Based on the GN 704 requirements regarding stormwater management for mining activities it is noted that all clean and dirty water must be separated. The clean water diversion will be sized to accommodate the 1:50 year storm event. The containment facility should be sized to accommodate the anticipated dirty water runoff as a result of the 1:50 year storm event.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			▪ Dust suppression on the haul roads and cleared areas must be regularly undertaken ▪ All dirty water channels must be constructed and placed within the dirty water infrastructure areas, such that all dirty water runoff emanating from these areas are captured and contained to a dirty water containment facility. The proposed channels should be lined and sized to cater for the 1:50 year storm event.		
Increased vehicular activities	Potential loss of fauna diversity Roadkill and disturbance of fauna	Fauna and Flora	▪ Erection of signage; ▪ Implementing speed limit on site; and ▪ Restricting driving at night.	Signage should be erected before the operational phase.	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004)

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Blasting and excavation	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Wetland	▪ Where possible avoid all undermining of channelled valley bottom wetlands and the Klein Olifants River; especially if vary shallow. (Plan 16 in Appendix 3); ▪ Due to the potential risk of subsidence associated with shallow mining a safety factor must be determined by a rock engineer and used for areas of shallow mining (35 to 100 m at least). This is mostly associated with the top seam where many wetlands are known. The safety factors and final mine plan must be determined by the relevant engineers; and ▪ A comprehensive geotechnical investigation must be undertaken for the following: ▪ Provide appropriate design parameters for pillar and overburden stability, in line with the actual geotechnical rockmass properties, ▪ Indicate any areas (undermining of the wetlands) that may fall outside of these design parameters, ▪ Following the geotechnical investigation, where required a provision must be made for the rehabilitation of these areas in the event of a possible risk of subsidence / intersection collapse; and ▪ If the risk is deemed too high in a sensitive area the mine plan must be adjusted. ▪ Mining through underground dykes and sills must be undertaken carefully since the puncturing of aquifers could lead to the dewatering of wetlands.	Design and operational phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Loss of integrity of Rock Art sites	Heritage	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Pre-construction	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Degradation of intrinsic CS of burial grounds and graves	Heritage	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Pre-construction	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Loss of integrity of Rock Art panels	Heritage	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Pre-construction	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Damage to surface dressing of burial grounds and graves	Heritage	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Pre-construction	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Sound, ground vibration and air blast within the immediate vicinity of the shaft	Blasting	▪ The blasting will need to be undertaken within the normal safety and control measures as per the regulatory requirements. At Mooivley West (Shaft No. 1) there are 2 points of interest observed within 500 m from the shaft area. All other points of interest observed are located at distances greater than 500 m. There are no surface infrastructures closer than 250 m from the shaft areas; and ▪ There will not be a specific requirement for monitoring of blasting operations but can still be undertaken for confirmation of ground vibration and air blast levels. No other specific management measures are recommended.	Construction and Operation	Explosives Act, 1956 (Act No. 26 of 1956)
	Dust from blasting and excavation for shaft development will have a negative visual impact on the receiving environment.	Visual	▪ Apply dust suppression techniques to limit the dust generated from blasting.	Construction Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Undermining of wetlands and rivers leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	Aquatic Ecology	▪ Complete a geotechnical study to identify high risk subsidence areas and avoid them; and ▪ The highest safety factor must possible must be used for areas of shallow mining (35 m to 70 m at least).	Operation phase	The National Water Act (NWA), 1998 (Act No. 36 of 1998).

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Blasting and Mining will result in poor air quality	Air Quality	▪ Activity must be carried out judiciously to ameliorate dust emissions; and ▪ Wet drilling.	Mitigation measures should be implemented at the commencement of this activity	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Blasting and Mining will result in poor air quality	Air Quality	▪ Use of baghouse to collect underground emissions from the ventilation shaft; and ▪ Use of wet scrubbers to filter gaseous pollutants from underground operations.	Mitigation measures should be implemented at the commencement of this activity	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)
Construction of surface infrastructure; and Power Generation	Loss of utilisable soil as a resource – Disturbance, Sterilisation, Salinisation, Contamination, Erosion, Compaction and loss of Land capability, and Land Use	Soil and Land Use Capability	▪ Stormwater Management Plan; and ▪ IWWMP.	Design and operational phase	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
	Industrial activity within a natural ecosystem is a negative impact to habitat integrity.	Wetland	▪ The infrastructure plan must be reviewed and the footprint kept as small as possible and wetlands must be avoided as far as possible; i.e. move all infrastructures out of wetlands and the 100 m buffer; particularly with respect to Mooivley East infrastructure that is within the seep wetlands draining into the natural pan; ▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, minimal bright lights should be left on at night time	Design and construction phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			and they should be facing outwards of the site; and an alien and invasive plant species management programme must be in place from the construction phase; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.		
	Degradation of intrinsic CS of burial grounds and graves	Heritage	▪ Reduce the intensity of potential negative impacts through the establishment and implementation of a CMP relative to the SAHRA Minimum Standards.	Pre-construction	Compliance with Section 35 and 36 of the NHRA, Chapter XI of the NHRA Regulations (GN R 548), and SAHRA Minimum Standards
	Noise disturbance (noise levels in excess of 45 dBA)	Noise	▪ Restricting construction activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Locating of diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels; and ▪ Switching off equipment when not in use.	Upon commencement of the construction phase	National Noise Control Regulations

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Change of land use from agriculture to mining resulting in a loss of sense of place, a loss of scenic character and increased visual disturbance -	Visual	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all the mitigation measures outlined in the Closure and Rehabilitation reports are conducted.	Decommissioning and Closure	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Change in sense of place due to surface infrastructure and increased lighting	Visual	▪ Ensure screening vegetation is left intact around the project area and near receptors; ▪ Ensure the surface infrastructure does not exceed the proposed heights; ▪ Surface infrastructure should be painted natural hues so as to blend into the surrounding landscape where possible; ▪ Pylons and metal structures should be galvanised so as to weather to a matt grey finish rather than be painted silver. If the pylons and metal structures are painted, it is recommended that a neutral matt finish be used; and ▪ Down lighting must be implemented for construction activities taking place at night to minimise light pollution.	Construction Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Construction over sensitive riparian habitats resulting in the loss of degradation of aquatic habitat	Aquatic Ecology	▪ No crossings over riffle/rapid habitats. These should be avoided as these are the most sensitive; slow deep/shallow habitats should be favoured; ▪ The crossing points should be stabilised to reduce the resulting erosion and downstream sedimentation; ▪ Structures must not be damaged by floods exceeding the magnitude of those which may occur on average once in every 50 years; ▪ The indiscriminate use of heavy vehicles and machinery within the instream and riparian habitat will result in the compaction of soils and vegetation and must be controlled; ▪ Erosion prevention mechanisms must be employed to ensure the sustainability of all structures to prevent instream sedimentation; ▪ The crossing points should be unobtrusive (outside riparian and instream habitat) to prevent the obstruction and subsequent habitat modification of downstream portions (plinths); and ▪ Diversion trenches and berms should convey dirty water to the PCDs so as to contain runoff.	Design and construction phase	The National Water Act (NWA), 1998 (Act No. 36 of 1998).
	Construction of Surface Infrastructure results in Dust Generation	Air Quality	▪ Activity must be carried out judiciously to ameliorate dust emissions; ▪ Use of suppressants on exposed areas to reduce dust generation.	Mitigation measures should be implemented at the commencement of this activity	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Generation of power leads to gaseous emissions: NOx, SO2, CO and particulate matter	Air Quality	▪ Use of low sulfur diesel; ▪ Selective catalytic reduction technology; and ▪ Gas scrubbers.	Mitigation measures should run concurrently with this activity and for the project life	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Deterioration of water quality due to dirty water reporting into natural water resources	Surface Water	▪ As proposed, ensure all the dirty water emanating from the dirty water areas will be collected via silt traps before entering the PCD. This water should be stored for re-use within the mine so as to prevent unnecessary discharge into the environment. ▪ Should the contained water be more than the water use requirement, the Best Practice Guidelines (BPGs) advise that the water be recycled or as the last resort be treated to acceptable levels and discharged either to the natural environment or be supplied to other industries as a lower grade of water.	During the construction and operation of the entire infrastructure.	DWS Best Practice Guideline G4: Impact prediction Based on GN 704, the mine infrastructure in question should fall outside of the 1:100 year floodline or 100 m, whichever is greater.
The construction of stockpiles.	Loss of utilisable soil as a resource – Disturbance, Erosion, contamination and Compaction.	Soil and Land Use Capability	▪ Rehabilitation Plan.	Design and operational phase	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
Waste Generation and Storage	Runoff containing pollutants and solid waste resulting in water and habitat quality degradation in downstream river reaches.	Aquatic Ecology	▪ Diversion trench and berm systems which diverts clean stormwater around pollution sources and convey and contain dirty water to central pollution control dams; ▪ Barrier systems, including synthetic, clay and geological or other approved mitigation methods to minimise contaminated seepage and runoff from entering the local aquatic systems. ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around pollution control impoundments and structures should be completed as this has been shown to be effective in erosion and nutrient control.	Design and construction phase	The National Water Act (NWA), 1998 (Act No. 36 of 1998).

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Waste Generation and Storage will result in release of Dust and Volatiles	Air Quality	▪ Vegetation of stockpiles; ▪ Handling and storage of hazardous waste in clearly labelled containers; and ▪ Training on the emergency procedures and action plans on the handling of leaks, spillages of hazardous materials.	Mitigation measures should run concurrently with this activity and for the project life	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)
Operation and maintenance of the topsoil and overburden stockpiles.	Loss of utilisable soil as a resource – Erosion, Compaction, sterilisation and salinisation	Soil and Land Use Capability	▪ Stormwater Management Plan; ▪ IWWMP; and ▪ Rehabilitation Plan.	Design and operational phase	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
	Generation of Dust and change in landscape –	Visual	▪ Ensure the overburden stockpiles do not exceed the proposed height of 18 m; ▪ Ensure the product stockpiles do not exceed the proposed height of 10 m; ▪ Ensure the waste rock berms do not exceed the proposed height of 3 m; ▪ Limit the quantity and time of ROM stored on site; and ▪ Apply dust suppression techniques to limit the dust generated from stockpiles.	Operational Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Stockpiling will result in dust emissions and reduced air quality	Air Quality	▪ The drop heights when loading and tipping points should be minimised. ▪ The use of dust suppressants and binders on exposed areas. ▪ Routine maintenance and vegetation of side walls of storage facilities i.e. topsoil and waste stockpile throughout the lifespan of the project. and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	Mitigation measures should run concurrently with this activity and for the project life	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)
	Groundwater contamination	Groundwater	▪ Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals; and ▪ Groundwater monitoring.	Stockpile design should be completed before the construction starts. Groundwater monitoring must commence from the start of the construction phase.	DWS Best Practice Guideline G4: Impact prediction

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Hauling/Conveying of coal; Plant and equipment operations; and Power Generation	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment. Stockpiling of coal also represents risks to the environment that much be managed.	Wetland	▪ The conveyor must be designed in such a way so as to minimise the windblown coal fines and any potential coal fallout and should be covered. If possible, the conveyor should be fully enclosed over the wetlands and within the 100 m buffer area; ▪ The conveyor servitude must also have a well-designed stream crossing and this should be maintained. The wetlands outside of this must be demarcated as no-go areas; ▪ The conveyor must be monitored and maintained to best operating standards and per the design criteria that capture mitigation measures.; and ▪ The wetland must be monitored quarterly to ensure no residual impact to the wetland and river is realised; and if so that remediation measures are followed. It is recommended that at least 100 m on either side for the conveyor is assessed for any sign of ecological decline and pollution such as coal fines deposition and runoff, die back of vegetation and increased erosion.	Design and operational phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Noise disturbance (noise levels in excess of 45 dBA during the daytime and 35 dBA during the night time)	Noise	▪ Locating of diesel generator away from noise sensitive receptors, as well as placing generators on isolation mounts and installation of secondary silencers; ▪ Fitting ventilation silencers to the ventilation fans; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; ▪ Maintenance of low noise rollers for conveyor belts; ▪ Reversing alarms on vehicles should be broadband reversing alarms which emit directional, lower, less intrusive sound; and ▪ Environmental noise monitoring to establish compliance with the regulations and to verify the predicted noise levels.	Upon commencement of the operational phase	National Noise Control Regulations

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Vehicular activity to haul coal will have a negative visual impact on the receiving environment. Dust from vehicular activity will also have a negative visual impact.	Visual	▪ Limit the speed of vehicles on the haul roads to reduce dust; and ▪ Haul roads should be wetted frequently by means of a water bowser to suppress dust.	Operational Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Generation of dust from crushing and screening plant. Lighting from the overall operation of the mine	Visual	▪ Apply dust suppression techniques to limit the dust generated from the crushing and screening plant; and ▪ Down lighting must be implemented for operational activities taking place at night to minimise light pollution.	Operational Phase	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Runoff water which may come into contact with the carboniferous material will contain various pollutants that may contaminate downstream river reaches.	Aquatic Ecology	▪ Clean and dirty water separation; ▪ Clean, dirty water separation and stormwater management: Clean water should be managed in a manner according to the Department of Water and Sanitation Best Practice Guidelines; ▪ Exposed topsoil's and soil stockpiles must be revegetated to reduce erosion and subsequent sedimentation; ▪ Although a basic geotechnical study has been completed, recommendations from the report indicate that a comprehensive geotechnical study must be conducted to assess the risk for subsidence in areas associated with the Klein Olifants River. Mitigation actions to increase stability should be used in delineated high risk areas. These mitigation actions include limiting roads underneath the river system and thicker support pillars, however, detailed mitigation actions should be defined in the geotechnical study. ▪ Based on the revision of the mining plan, the coal reserve which is located at a depth less than 40 m and associated with wetlands will only be mined to a limited extent, with thick enough support pillars to avoid surface subsidence. This will reduce the risk of subsidence in local river catchments. ▪ PCDs must be designed and operated in such a way that it will not spill more than once in 50 years. The dam must be able to contain the water required for operations, a storm event including a 0.8 m freeboard at all times; ▪ Channel systems must be made with concrete to reduce seepage; ▪ Stormwater must be diverted from construction activities and managed in such a manner to disperse runoff and prevent the concentration of stormwater flow; and ▪ The planting of indigenous vegetation around PCDs and structures should be completed as this has been shown to be effective in erosion and nutrient control.	Operation phase	The National Water Act (NWA), 1998 (Act No. 36 of 1998).

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Hauling leads to emission and poor air quality	Air Quality	▪ The drop heights when loading and tipping points should be minimised; ▪ The use of dust suppressants and binders on exposed areas; ▪ Routine maintenance and vegetation of side walls of storage facilities i.e. topsoil and waste stockpile throughout the lifespan of the project; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	Mitigation measures should run concurrently with this activity and for the project life	National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012 South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013)
	Crushing of ore results in fugitive dust emissions	Air Quality	▪ Use of water sprays; ▪ Enclosure of crushers; and ▪ Monitoring of dust deposition rates in the vicinity of the proposed mine is recommended. However, if the dust deposition rates are in violation of the permissible frequency of exceedance on several occasions, monitoring of PM10 may be required.	Mitigation measures must commence at the start of the operation and for the project life	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Generation of power leads to gaseous emissions: NOx, SO2, CO and particulate matter	Air Quality	▪ Use of low sulfur diesel; ▪ Selective catalytic reduction technology; ▪ Use of electrostatic precipitators; and ▪ Gas scrubbers.	Mitigation measures should be implemented at the start of this activity	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012
	Groundwater contamination	Groundwater	▪ Avoid placement of the PCDs on areas with the potential for increased infiltration to groundwater, such as over fault zones; ▪ All contaminant, stormwater, waste and hazardous waste storage facilities and other contaminated water storage areas (pollution control dams) should be lined to pro-actively prevent infiltration of contaminated seepage water; and ▪ Monitoring of groundwater quality and water levels is recommended with continuous refining and updating of the monitoring network based on the results obtained.	PCD design should be completed before the construction starts. Groundwater monitoring must commence from the start of the construction phase.	DWS Best Practice Guideline A4: Pollution Control Dams

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Potential spillages on Storage of fuel areas, workshops and heavy machinery on site resulting in water quality deterioration	Surface Water	▪ Vehicles must only be serviced within designated service bays. ▪ The management of general and other forms of waste must ensure collection and disposal into clearly marked skip bins that can be collected by approved contractors for disposal to the appropriate disposal sites. ▪ The fuel, lubricant and explosives storage facilities must be located on a hard standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilization of leaked hazardous substances. ▪ An emergency spillage response plan and spill kits should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for the Life of Mine for reference to anytime in terms of handling, storage and disposal of materials.	During the entire project life.	SANS1200 specifications.
Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep	Heavy machinery working with wetland channel and surrounds impacting upon soil, vegetation disturbing fauna.	Wetland	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the construction phase. This area must receive particular attention and a careful construction approach to minimize all impacts; ▪ Wetland monitoring must be carried out to ensure no unnecessary impact to wetlands is realised. If an impact is realised and recorded during monitoring, a remedial action must put in place as soon as possible and reported upon; ▪ Refer to the Surface Water Report (Digby Wells, 2016) for details on a Stormwater Management Plan that is to be carried out. This must be in operation during construction phase and wetlands must be highlighted as sensitive receptors; ▪ Refer to the Fauna and Flora Report (Digby Wells, 2016) for mitigation measures relating to habitat impacts as well as faunal species disturbances. For example, an alien and invasive plant species management	Design and operational phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			programme must be in place from the construction phase; ▪ Construction must be done in the dry season (late March to November); ▪ The conveyor should be placed on plinths above the ground so as to allow movement safely underneath for faunal species utilising the wetland and to prevent hydrological alterations to the stream channel and; ▪ The conveyor must be closed to ensure that coal fallout does not reach wetlands.		
Construction over watercourses	Siltation of surface water resources leading to deteriorated water quality.	Surface Water	▪ Construction over sensitive riparian habitats resulting in the loss or degradation of aquatic habitat. There is also a Risk of contamination of water on the stream	During the construction and operation of the entire infrastructure.	Based on Reg. 704, the mine infrastructure in question should fall outside of the 1:100 year floodline or 100 m, whichever is greater.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Employment and capital expenditure; Construction of surface infrastructure Implementation of SLP and Social Performance Policies	Employment creation during construction	Socio-economic	▪ It is recommended that Umcebo host a consultation meeting with the Hendrina community should their applications for the relevant authorizations be successful. This meeting should take place prior to the commencement of any construction activities. The objective of the meeting should be to share information relating to opportunities (jobs, procurement, LED projects etc.) and to establish communication lines between the mine and the community; ▪ Assign preferred employment status to those experiencing the bulk of the negative project impacts (communities located within and surrounding the Project footprint e.g. Mooivley and Elim Community as well as Hendrina and Kwazamokuhle); ▪ Promotion of local, female and youth employment; ▪ Where possible labour-intensive construction methods should be promoted; ▪ Verification of local status; ▪ Consult neighbouring businesses/mines to determine if they would be willing to make their skills registers available; ▪ Identify required skills, expand skills audits to community and align and implement training and skills development initiatives to findings of audit; ▪ Expand skills development to surrounding communities; ▪ Recruitment via a registry of job seekers and potentially coordinated through the DoL; ▪ Provide local employees with reference letters certificates of completion for in-house (on-the-job) training; and ▪ Monitoring subcontractors in terms of local employment targets.	Prior to start of construction and on-going	Mineral and Petroleum Resource Development Act (Act of 2002). National Environmental Management Act (Act of 1998 Employment Equity Act, 1998 (Act No. 55 of 1998); Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); Skills Development Act (Act No. 97 of 1998 as amended); and Company employment policies.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Multiplier effects on the local economy	Socio-economic	▪ As for maximising employment benefits; ▪ Give preference first to capable local service providers; ▪ Develop local service provision capacity; ▪ Monitoring of sub-contractors procurement; ▪ Development of a register of local SMMEs; ▪ Linkages with skills development/ SMME development institutions and other mining operations; ▪ SMME skills development as part of mine SLP/LED commitments; and ▪ Local procurement targets should be formalised in Umcebo's procurement policy.	At the start of construction and on-going	Mineral and Petroleum Resource Development Act (Act of 2002); IDPs and SPFs of affected municipalities; Company Procurement Policy; Skills Development Act (Act No. 97 of 1998 as amended); and Company SLP.
	Community development and social upliftment	Socio-economic	▪ Liaison with beneficiaries to ensure needs are met; ▪ Collaboration with other developmental role players during implementation; ▪ Expanding skills development and capacity building programmes to non-employees; ▪ Establish external monitoring system to regulate HDSA procurement; ▪ Where feasible, training should be NQF accredited; and ▪ A record of training courses completed per individual should be kept.	At the start of construction and on-going	Mineral and Petroleum Resource development Act (Act of 2002); Employment Equity Act, 1998 (Act No. 55 of 1998); Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); and Skills Development Act (Act No. 97 of 1998 as amended). Company employment policies IDPs and SPFs of affected municipalities Company CSI Policy
Land acquisition; Undermining of surface and business structures; Site clearance; and Blasting and excavation.	Displacement related impacts	Socio-economic	▪ Umcebo should where possible endeavour to minimise the extent of, displacement through project design, where displacement cannot be minimised the following measures are recommended to alleviate the adverse impacts; ▪ Umcebo should finalise the Project layout plan and determine its policy and approach to displacement, as this would inform the extent of resettlement, i.e. whether it will recognise both direct and indirect forms of displacement; ▪ Where a selling price cannot be determined by negotiation a sales agreement should be negotiated which reflects the holistic value (determined by a professional valuer) of the land and should also be inclusive of the potential relocation cost of commercial	Pre-construction	Mineral and Petroleum Resource development Act (Act of 2002); IFC PS 5: Land Acquisition and Involuntary Resettlement; Mine Health and Safety Act (Act of 1996); Extension of Security of Tenure Act, 1997 (Act No. 62 of 1997); National Environmental Management Act (Act of 1998); and Constitution of South Africa

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
			farms and/or business operations; ▪ The displacement of non-vulnerable households and individuals should be considered on a case-by-case basis; ▪ Areas impacted upon during construction should be rehabilitated upon completion of the construction activities to ensure that the land is returned in the same condition; ▪ Prior to finalising the sales agreement of land, it should be clear who will assume responsibility for the resettlement of the vulnerable household; ▪ If Umcebo assumes responsibility for the physically displaced household, due process should be followed when the household is relocated. It is recommended that the process be aligned to IFC PS 5; ▪ Consider including employees and other impacted businesses in the aforementioned process; and ▪ The conveyor between Mooivley West and Hendrina South should be aligned along farm boundaries as far as practically possible to reduce the degree of property fragmentation.		
Blasting and excavation; Construction of surface Infrastructure; and Hauling/conveying of Coal	Disruption of daily movement patterns	Socio-economic	▪ Measures to prevent deterioration of roads suggested in Traffic Impact Assessment; ▪ Regulation of traffic at intersections between the N11 and Davel road and access roads to construction and operational sites; ▪ Road upgrading measures should be investigated and implemented in conjunction with the relevant government department; ▪ Inform communities of planned construction activities that would affect vehicle/ pedestrian traffic; ▪ Ensure that access to key services in areas such as Hendrina are uninterrupted by providing alternative access routes; ▪ Construction of livestock crossings at suitable intervals should be incorporated into project design; and ▪ Livestock farmers and regular road users should be consulted with regard to placement of crossings.	Construction and on-going	Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); National Environmental Management Act (Act of 1998); and Constitution of South Africa

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Employment and operational expenditure; Construction of surface Infrastructure; and Plant and equipment operations.	Influx related impacts	Socio-economic	▪ Develop an Influx management plan together with other industry role players and government; ▪ Discourage influx of job-seekers by prioritising employment of unemployed members of local communities; ▪ Liaise with local municipalities to ensure that expected population influx is taken into account in infrastructure development and spatial development planning; ▪ Create synergies with local government IDP and other companies' SLP/CSR projects to promote infrastructure development; ▪ Extensive HIV/ AIDS awareness and general health campaign; ▪ Identify if recorded criminal activities involved members of the mine's workforce; ▪ Establishment of anti-poaching mechanism in consultation with potentially affected land owners; ▪ Clear identification of workers; prevention of loitering; ▪ Liaison with police, community policing forum; ▪ Promote projects providing housing, especially low cost housing; and ▪ Measures to address potential conflict between locals and non-locals.	Pre-construction	Mineral and Petroleum Resource development Act (Act of 2002); National Environmental Management Act (Act of 1998); SPLUMA (Act 16 of 2013); IFC Guidelines on Project-induced in-migration; IDPs and SPFs of affected municipalities; and Company CSI Policy.
Blasting and excavation; Construction of surface infrastructure; Water abstraction and use; Underground blasting and mining; Hauling/conveying of coal; Plant and equipment operations ; Water use and storage; and -Waste generation and storage	Health and Safety impacts	Socio-economic	▪ Access control to all project elements, including fencing; ▪ Notification of blasting activities; ▪ Storage of blasting and hazardous materials should adhere to prescribed regulation; ▪ Measures suggested minimising the impact of fly-rock on surrounding roads and structure (Blast Management and Consulting, 2016); ▪ Measures suggested in the Traffic Impact Assessment to minimize traffic related accidents (Aurecon, 2016); and ▪ Road maintenance.	At start of construction and on-going	Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); Occupational Health and Safety, 1993 (Act no. 85 of 1993) (OHS); International Human Rights Guiding Principles; IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998).

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Impact on surrounding land users	Socio-economic	▪ Refer to recommendations of specialist studies (see Visual Impact Assessment, Surface-and Ground Water Impact Assessment, Noise Impact Assessment, Air Quality Impact Assessment, Blasting and Vibration Impact Assessment and Traffic Impact Assessment); ▪ Optimise mine plan/infrastructure placement to avoid/minimise negative impacts, especially in terms of visual intrusion, displacement, air quality and disruptions of traffic; ▪ Implement measure to create an environment that can contribute positively to stakeholders affected by it. For example, farmers might have to fend against poachers stealing livestock from farms or fight veld fires. The Project has resources that can assist the farmers, and should reach an understanding with these stakeholders about how it could assist them in this regard; ▪ Undertake continuous information sharing and consultation with adjacent/affected farm owners; and ▪ Implement communication mechanisms to report changes in water quality/quantity, air quality or vibrations.	Construction and on-going	Mineral and Petroleum Resource development Act (Act of 2002); Mine Health and Safety Act (Act of 1996); Occupational Health and Safety, 1993 (Act no. 85 of 1993) (OHS); International Human Rights Guiding Principles; IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998).
	Opposition because of perceived negative impacts	Socio-economic	▪ Communicate commitments regarding LED; ▪ Transparency regarding employment practices; ▪ Presentation of EIA findings in clear and understandable manner; ▪ Monitor community attitudes to anticipate/prevent active opposition through grievances lodged through community forum and a formal grievance mechanism; ▪ Establish a community forum; and ▪ Appointment of a CLO / Stakeholder Engagement / Community offices to enhance communication.	Pre-construction, construction and operation	Mineral and Petroleum Resource development Act (Act of 2002); IFC PS 4: Community Health, Safety and Security; and National Environmental Management Act (Act of 1998).

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
Workers transportation and the transportation of construction materials, produced coal during operation and decommissioning materials	Increase in traffic volumes and vehicle delays	Traffic	▪ Introduce the following road upgrades at the new proposed N11/ Mooivley East Access Road intersection: ▪ The intersection to be priority controlled with the mine access road stop controlled; ▪ Separate 100 m left lane is proposed on the N11 northern approach; ▪ Separate 100 m right turn lane; and ▪ 100 m right-turn refuge lane and 100 m taper acceleration lane are recommended on the northern and southern approaches respectively. ▪ The new proposed Davel Road and Mooivley West intersection to be priority controlled with Davel Road having priority; ▪ Heavy vehicle to be scheduled outside peak hours to minimise the potential for platooning and, therefore, queues of heavy vehicles waiting to access the site or at road junctions; ▪ Prescribe routes for construction traffic to: ▪ Discourage right turns by heavy vehicles on busy roads where heavy vehicles have to give way to fast moving vehicles; and ▪ Discourage routing of heavy vehicles through residential areas.	Construction, operational and decommissioning	SANRAL and local roads authorities standards
	Increase in delays for cyclists and pedestrians as result of the additional traffic on the network.	Traffic	▪ Regular pedestrian and cycling activity awareness for staff working on site during all project stages, as part of regular Health and Safety briefings.	Construction, operational and decommissioning	SANRAL and local roads authorities standards
	Road safety conditions could be impacted negatively by an increase in heavy vehicles.	Traffic	▪ Drivers of heavy vehicles are required to attend a specialised road safety and driving course that sensitises them to the impact that they have on driving conditions for other vehicles and NMT users on these roads.	Construction, operational and decommissioning	Road safety standards

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Impact on road surface and road structures conditions of the local road network as a result of an increase in heavy vehicles.	Traffic	▪ The developer should engage with the planning authorities concerning maintenance of public roads near the development sites, this includes the existing bridges/ culverts along Davel Road to/from Mooivley West site; and ▪ The developer should ensure that the access roads are maintained regularly and to acceptable maintenance standards.	Construction, operational and decommissioning	SANRAL and local roads authorities standards
▪ Develop alternative and sustainable livelihoods; ▪ Collaborate with other industries to support the diversification of the local economy; ▪ The Mine's SLP should provide strategies and measures that prevent job loss; ▪ Alternatives to save jobs/ avoid downscaling should be investigated beforehand; ▪ Develop a Mine Closure Plan;	Economic growth and diversification	Socio-economic	▪ Measures to enhance local employment during construction (see measures to enhance employment during construction); ▪ Provide focused training to construction phase employees from the host communities to increase their chances for employment during the operations; ▪ Measures recommended to maximise benefits from local employment, economic multiplier effects, as well as community, economic and skills development (refer to Table 11-76); and ▪ The Project's database of the local labour pool should be updated to include people who were employed by the Project during the construction phase.	Operation	National Environmental Management Act (Act of 1998) Constitution of South Africa IDPs and SPFs of affected municipalities; National and Provincial Development Planning Policies Company Employment and Procurement Policies

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where retrenchment and/or closure of the mine are certain; and Partner with the relevant government departments, to jointly manage Closure process.	Dependency on mine for sustaining local economy	Socio-economic	▪ Develop alternative and sustainable livelihoods for instance through LED programmes listed in the Mine's SLP; ▪ Collaborate with other industries to support the diversification of the local economy; ▪ The Mine's SLP should provide strategies and measures that reduce job loss through redeployment at other operations; ▪ Where feasible alternatives to save jobs/avoid downscaling should be investigated beforehand, including LED, potential redeployment at other operation; ▪ Develop a Mine Closure Plan; ▪ Proactively assess and manage the social and economic impacts on individuals, regions and economies where; retrenchment and/or closure of the mine are certain. In particular through promoting economic diversification, portable skills development and local economic development where possible; and ▪ Partner with the relevant government departments, to jointly manage Closure process.	Operation and closure	Mineral and Petroleum Resource Development Act (Act of 2002); Mine's SLP and Project Closure Plan; Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); Labour Relations Act, 1995 (Act No. 66 of 1995); and Skills Development Act (Act No. 97 of 1998 as amended).
Employment and operational expenditure; and Dismantling of major equipment and infrastructure	Loss of farm/other labour to the mine	Socio-economic	▪ Avoid recruitment on farms; ▪ Persons applying for jobs with construction or operational contractors are to be informed that such jobs are temporary; and ▪ Adhere to labour legislation.	Construction and on-going	International Human Rights Guiding Principles; Basic Conditions of Employment Act, 1997 (Act No. 75 of 1997); and Labour Relations Act, 1995 (Act No. 66 of 1995)
Removal of infrastructure and surface rehabilitation	Loss of utilisable soil as a resource – Disturbance, Sterilisation, Contamination, Erosion, Compaction and loss of Land capability, and Land Use	Soil and Land Use Capability	▪ Rehabilitation Plan; and ▪ Closure Plan.	Upon commencement of the closure phase	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the hillslope seep wetland underlying the proposed infrastructure for Hendrina South.	Wetland	▪ The edge of the wetlands and at least a 100 m buffer must be clearly demarcated in the field that will last for the duration of the rehabilitation phase; ▪ The rehabilitation footprint kept as small as possible and non-impacted wetlands must be avoided; ▪ Careful attention must be given to handling wetland soils, if any; and ▪ Wetland monitoring must be carried out during the construction phase to ensure no unnecessary impact to wetlands is realised; and if so that a remedy is put in place as soon as possible.	Upon commencement of the closure phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Noise disturbance (noise levels in excess of 45 dBA)	Noise	▪ Restricting decommissioning activities to daylight hours (06:00 – 18:00) and not during weekends and public holidays where possible; ▪ Mining related machines and vehicles to be serviced to the designed requirements of the machinery/vehicles to ensure noise suppression mechanisms are effective e.g. installed exhaust mufflers; and ▪ Switching off equipment when not in use.	Upon commencement of the closure phase	National Noise Control Regulations

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Dust from the demolition process will also have a negative visual impact.	Visual	▪ Apply dust suppression techniques to limit the dust from the demolition area; ▪ Ensure all infrastructure is demolished; ▪ Limit the quantity and time of rubble stored on site; ▪ Ensure that the shafts are backfilled with material from the overburden stockpiles and waste rock berms; ▪ Rehabilitate all disturbed areas; ▪ Ensure that the rehabilitated area is re-contoured and profiled to create a free-draining topography; ▪ Spread topsoil over the rehabilitated area; ▪ Ensure that surface water and drainage lines are rehabilitated; ▪ Re-vegetate the rehabilitated areas with grasses (Cynodon dactylon, Digitaria eriantha, Chloris gayana, Eragrostis chloromelas and Panicum maximum); and ▪ Ensure all mitigation measures in the Closure and Rehabilitation reports are conducted.	Rehabilitation and Closure	National Environmental Management Act (NEMA),1998 (Act 107 of 1998) Guideline for involving visual and aesthetic specialists in EIA processes
	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the associated aquatic ecosystems	Aquatic Ecology	▪ Stormwater Management Plan	Rehabilitation and Closure	The National Water Act (NWA), 1998 (Act No. 36 of 1998).
	Removal of Infrastructure and rehabilitation results in dust emission	Air Quality	▪ The dismantling area disturbed must be kept to a minimum; ▪ Drop heights when offloading must be minimised; ▪ Limit demolition activities to non-windy days (with wind speed less than 5.4 m/s); and ▪ Profiling and vegetation of open areas.	Decommissioning and Closure	South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) National Standard for Ambient Air Quality 2009; 2012

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Siltation of surface water resources leading to deteriorated water quality.	Surface Water	▪ Use of accredited contractors for removal or demolition of infrastructures; this will reduce the risk of waste generation and accidental spillages; ▪ The PCDs, constructed dirty water trenches and berms will have to remain until post closure should be removed last form the site so that the silt trap and the sot dirty water can contain for treatment before discharge until rehabilitation is completed. ▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams; ▪ Water quality monitoring on the upstream and downstream points of the coal mine must be undertaken and suspended solids and turbidity levels accessed	During cessation of operations	GN 704 *Condition* 9 describes the temporary or permanent cessation of mine or activity. At cessation of operations, the persons operating a mining activity should ensure that all pollution control measures have been designed, modified, constructed and maintained so as to comply with these regulations.
Underground mine closure and rehabilitation	Post-mining decant of groundwater will have negative impacts on the wetlands as this water is likely to be of a poor water quality.	Wetland	▪ Groundwater and wetlands must be monitored post-mining for potential decant; and ▪ Long-term water treatment options will need to be investigated by Umcebo to prevent polluted decant water from entering the catchment.	Upon commencement of the closure phase	The National Water Act, 1998 (Act No. 36 of 1998) Section 21 (c), (g) and (i) of the National Water Act, 1998 (Act No. 36 of 1998) Section 24 of the Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996) National Environmental Biodiversity Act (NEMBA),2004 (Act10 of 2004) National Environmental Management Act (NEMA),1998 (Act 107 of 1998)Department of Water and Forestry (DWAF) guidelines for the delineation of wetlands (2005); Mining and Biodiversity Guideline (DEA *et al*., 2013); Mpumalanga Biodiversity Sector Plan (MTPB, 2014)
	Post-mining decant of groundwater will have negative impacts on the downstream water quality	Aquatic Ecology	▪ Decant capture and treatment.	Rehabilitation and closure	The National Water Act (NWA), 1998 (Act No. 36 of 1998).

Activities	Potential impacts	Aspects affected	Mitigation type	Time period for implementation	Compliance with standards
	Groundwater, wetland and surface water contamination	Groundwater	▪ Mine should supply equal/ better amount of water to affected parties; ▪ The use of nitrate based explosives should be limited as far as practicable to minimise groundwater contamination; ▪ Mine dewatering to intercept the contamination plume to within the mine area; ▪ Monitoring of groundwater quality and water levels; and ▪ Update the numerical model as more groundwater information is collected.	Mine should supply clean water when contamination is detected in the private boreholes. Groundwater monitoring must commence from the start of the construction phase. Refine the conceptual and numerical models yearly in the first four years and thereafter every five years based on groundwater monitoring results.	SANS: River quality objectives South African water quality guidelines for drinking, irrigation and livestock watering.
Post-closure monitoring of rehabilitated areas.	Re-instatement of utilisable soil as a resource.	Soil and Land Use Capability	▪ Rehabilitation Plan; and ▪ Closure Plan.	Post-Closure Phase	Guidelines for the Rehabilitation of Mined Land in accordance with the Chamber of Mines of South Africa, 2007.
Underground mine development - Dewatering	Groundwater, wetland and surface water depletion	Groundwater	▪ Mine should supply equal/ better amount of water to affected parties; ▪ Monitoring of water levels; and ▪ Updating of the numerical model as aquifer properties become available.	Mine should supply clean water when contamination is detected in the private boreholes. Groundwater monitoring must commence from the start of the construction phase. Model updating should be conducted annually for the first 4 years. Thereafter on 5 years frequency.	N/A
	Wetland and surface water contamination	Groundwater	▪ Capture decant water before joining the streams, treat it and re-introduce it into the streams; ▪ Management solutions will be provided upon agreement between Umcebo and the affected stakeholders; ▪ Monitoring of groundwater water levels and mine inflow rates; and ▪ Update numerical model and decant rates as aquifer information becomes available.	When the decant starts (approximately 30 years after closure).	SANS: River quality objectives. South African water quality guidelines for drinking, irrigation and livestock watering.
	Deterioration of surface water quality on the surrounding streams	Surface Water	▪ Surface inspection on the fully rehabilitated areas must be undertaken to ensure a surface profile that allows good drainage. This will ensure improvement or increased catchment yield on to the surrounding streams.	Post closure or after cessation of operations	GN 704 *Condition* 9 describes the temporary or permanent cessation of mine or activity. At cessation of operations, the persons operating a mining activity should ensure that all pollution control measures have been designed, modified, constructed and maintained so as to comply with these regulations.

8 Financial Provision

8.1 Item (i)(1): Determination of the amount of Financial Provision

As part of the EIA, Digby Wells calculated the financial provision for Hendrina on the new financial provision regulations. During the EIA process Glencore requested that the financial provision should be calculated in line with the methodology applied to other Glencore operations as previously approved by DMR and which follows the DMR methodology.

The financial provision is done in accordance with the requirements of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) as amended[12] and associated regulations.[13] These Regulations provide that the holder of a mining right must make full financial provision for rehabilitation of negative environmental impacts. The methodology used was based on the Department of Mineral Resources (DMR) *"Guideline Document for the Evaluation of the Quantum of Closure- related Financial Provision provided by a Mine"* (DME, 2005), as per the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA).

The regulations for the determination of financial provision for mine rehabilitation and closure were promulgated on 20 November 2015 (GN R1147) under the NEMA, as amended. This assessment of the financial provision did not address any of the requirements of these promulgated regulations.

In terms of the new Financial Provision Regulations, a holder will have 39 months to assess, review and adjust the sum of the financial provision in accordance with Regulation 9 and 11. Failure to do so will mean that the existing approved financial provision will lapse after 45 calendar days after the lapsing of the 39 month period. Thus the implementation date is extended to February 2019.

8.1.1 Item (i)(1)(a): Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein

Closure and rehabilitation is a continuous series of activities that begin with planning prior to the project's design and construction, and end with achievement of long-term site stability and the establishment of a self-sustaining ecosystem. Not only will the implementation of this concept result in a more satisfactory environmental conclusion, but it will also reduce the financial burden of closure and rehabilitation. The following points outline the main objectives for rehabilitation and closure:

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[12] Previously, closure methodology was prescribed in Section 41 (1) of the Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002) (MPRDA) and its Regulations, but these provisions have been repealed. Section 24P in NEMA as amended provides that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts arising from mining activities

[13] Environmental Impact Assessment Regulations, 2014, GN R982 in Government Gazette 38282 of 4 December 2014

- Make all areas safe for both humans and animals;
- Make all areas stable and sustainable;
- Follow a process of closure that is progressive and integrated into the short and long term plans, and that will assess the closure impacts proactively at regular intervals throughout project life;
- Maintain and monitor all rehabilitated areas following re-vegetation and, if this monitoring shows that the objectives have been met, make an application for closure;
- Comply with local, district and national regulatory requirements; and
- Follow a comprehensive consultation and communication process with all stakeholders.

Rehabilitation and closure objectives have been tailored to the project at hand. This Rehabilitation, Decommissioning and Mine Closure Plan aims to assist Umcebo in carrying out successful rehabilitation for the project.

8.1.2 Item (i)(1)(b): Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties

The Closure report was available for public review and comment with the draft EIA and comments were captured in this Final EIA Report submitted to the DMR for consideration.

8.1.3 Item (i)(1)(c): Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure

Refer to Appendix 17 for the complete Rehabilitation Plan associated with the Project.

8.1.4 Item (i)(1)(d): Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives

The Rehabilitation Plan has been compiled in support of the primary closure objectives which are to remove unwanted infrastructure and rehabilitate the land to a suitable mixed end land use which provides a safe and stable environment for surrounding receptors.

8.1.5 Item (i)(1)(e): Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline

The Closure Cost Report is included in Appendix 17. The cost for rehabilitation and closure of Hendrina that is based on the DMR method of calculation for 1 year of operation is **R 24 461 018.00** (incl. VAT), see summary in Table 8-1 below.

The financial provision estimates does not include VAT. The detailed sheets are attached in Appendix B within the Closure Cost Report (Appendix 17 of this EIA report).

Table 8-1: Hendrina financial provision summary as per the DMR methodology

		Digby Wells Environmental	
		Umcebo Mining (Pty) Ltd, Hendrina, XST3791	
		DMR Closure Cost Assessment, 2016, Rev 1	
		Calculation of the First year Quantum	
Component	**Description**	**Listed and Specified Activities**	**Total**
1	Dismantling of processing plant & related structures (incl. overland conveyors & Power lines)	Crushing and screening plant 0.2 ha x 10 m height (Activity 21, GNR 984); Conveyer - 2.5 km in length and assumed height of 2 m and width of 1 m totalling 5000 m^3 [Activity 17, 7&8, GNR984 and GNR985]	R 1 161 592
2 (A)	Demolition of steel buildings & Structures		R 484 475
2 (B)	Demolition of reinforced concrete buildings & structures	Concrete slabs for the following temporary structures: Office area - 4.9 ha; Sewage treatment plant – 22 m^2 (Activity 25, GNR 983); Water treatment plant – 22 m^2; Diesel generator set – 32 m^2 (Activity 2, GNR 983); Storage of fuel, Lubricants and Explosives – 366 m^2 (Activity 4, GNR 984)	R 4 409 678
3	Rehabilitation of access roads	Access road combined length of 7.2 km and an average width of 13 m (Activity 24, GNR 983)	R 3 325 853
4(A)	Demolition & rehabilitation of electrified railway lines		R 0
4(B)	Demolition & rehabilitation of non-electrified railway lines		R 0
5	Demolition of housing &/or administration facilities		R 1 016 971
6	Open pit rehabilitation including final voids & ramps	Incline portals 0.5 ha (Activity 17, GNR984)	R 148 612
7	Sealing of shafts, adits & inclines	2 x Incline shafts - 0.5 ha each (Activity 17, GNR 984); 1 x Ventilation shaft - 0.25 ha (Activity 12, GNR 985)	R 296 972
8(A)	Rehabilitation of overburden & spoils	Topsoil – 3 ha; Overburden Stockpile – 1 ha; Product stockpile - 3.66 ha (Activity 6 and 17, GNR 984)	R 1 042 106

DIGBY WELLS ENVIRONMENTAL		Digby Wells Environmental Umcebo Mining (Pty) Ltd, Hendrina, XST3791 DMR Closure Cost Assessment, 2016, Rev 1 Calculation of the First year Quantum	
Component	**Description**	**Listed and Specified Activities**	**Total**
8(B)	Rehabilitation of processing waste deposits & evaporation ponds (basic, salt producing waste)		R 0
8(C)	Rehabilitation of processing waste deposits & evaporation ponds (acidic, metal-rich waste)	PCD - 0.6 ha (Activity 6, GNR 984)	R 295 318
9	Rehabilitation of subsided areas		R 0
10	General surface rehabilitation		R 3 161 816
11	River diversions		R 0
12	Fencing		R 747 579
13	Water management		R 369 211
14	2 to 3 years of maintenance & aftercare		R 290 037
Total cost + Weighting Factor 2			**R 17 587 732**
12% Preliminary and General			R 2 110 528
10% Contingency			R 1 758 773
Total (Excl. VAT)			**R 21 457 033**
VAT (14%)			R 3 003 985
Grand Total (Incl. VAT)			**R 24 461 018.00**

8.1.6 Item (i)(1)(f): Confirm that the financial provision will be provided as determined

Provided the mining right is granted, Umcebo will be responsible to provide for closure as per the legal requirements. A liability assessment will also need to be undertaken annually to ensure the financial provision is in line with the closure cost.

9 Monitoring Compliance with and performance assessment

Umcebo will be responsible for the implementation of all monitoring, mitigation and management measures, as well as compliance with the EMP. The recommended monitoring for the identified impacts is detailed below. The applicant will keep a record of all environmental monitoring taken on site. A summary of the environmental monitoring to be undertaken is included in Table 9-4.

9.1 Item 1(g): Monitoring of Impact Management Actions

9.1.1 Soil

During the rehabilitation exercise preliminary soil sampling should be carried out to determine the fertilizer requirements more accurately. Additional soil sampling should also be carried out annually until the levels of nutrients are at the required level. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling be increased. An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem.

Sampling should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer.

All of the soil samples should be analysed for the following parameters:

- pH (H_2O);
- Electrical conductivity;
- Calcium mg/kg;
- Magnesium mg/kg;
- Potassium mg/kg;
- Sodium mg/kg;
- Cation exchange capacity;
- Phosphorus (Bray I);
- Zinc mg/kg;
- Clay %; and
- Organic matter content (C %).

9.1.2 Surface Water

A monitoring programme is essential as a management tool to detect negative impacts as they arise and to ensure that the necessary mitigation measures are implemented. It also ensures that stormwater management structures are in working order. Monitoring should be implemented throughout the life of the mine. Continuous water quality monitoring should be undertaken, the monitoring data should be benchmarked with the Olifants RWQO and the South African Water Quality Guidelines for Agricultural Use: Irrigation (DWAF, 1996), to determine deviations from the baseline water quality so as to establish if the mine is impacting on the surface water resources.

Water quality monitoring is recommended at the locations where sampling was undertaken during this study and also at the proposed additional locations. Table 9-1 provides the coordinates of these monitoring locations and are also shown in the Surface Water report, 2016.

Table 9-1: Surface Water Monitoring Locations

Point Name	Latitude*	Longitude*
SW01	26°13'58.88"S	29°46'35.67"E
SW02	26°14'40.47"S	29°46'56.78"E
SW03	26°13'6.39"S	29°46'7.33"E
SW04*	26°11'41.19"S	29°47'52.50"E
SW05	26°17'30.89"S	29°50'14.73"E
SW06	26°8'49.83"S	29°45'8.31"E
SW07*	26°10'38.67"S	29°44'8.39"E
SW08*	26°10'35.23"S	29°45'40.46"E
SW09*	26°14'33.40"S	29°47'21.35"E
SW10*	26°15'8.81"S	29°47'58.76"E
SW11*	26°16'17.29"S	29°46'57.20"E
SW12*	26°17'6.28"S	29°48'8.84"E

*Proposed monitoring points
Geographic Coordinate System WGS84 Datum

The constituents in Table 9-2 should be analysed to determine the water quality.

Table 9-2: Water Quality Analysis

pH Value @ 20°C	Bicarbonate, HCO_3
Sodium, Na	Sodium Absorption Ratio (SAR)
Conductivity mS/m @ 25°C	Chloride, Cl
Potassium, K	Aluminium, Al
Total Dissolved Solids	Sulfate, SO_4
Free and Saline Ammonia as NH_4	Manganese, Mn
Calcium, Ca	Nitrate, NO_3
Magnesium Hardness as $CaCO_3$	Iron, Fe
Calcium Hardness as $CaCO_3$	Fluoride, F
Total Hardness as $CaCO_3$	Chromium, Cr
Langelier Saturation Index (pH-pHs)	Total Suspended Solids
Total Alkalinity as $CaCO_3$	Phosphorus, P

9.1.3 Groundwater

Groundwater monitoring has to continue during all phases of the mine operation to identify impacts over time, and that effective measures can be undertaken at the early stage before negative impacts to the environment takes place.

9.1.3.1 Proposed Monitoring Boreholes

The positions of the recommended monitoring points have been included within the Groundwater Specialist Study (Appendix 6). The points are composed of existing boreholes, with additional recommended boreholes in areas of borehole scarcity. Considering the project size and closeness of the receiving environment, a total of 24 monitoring points are recommended for the purpose of groundwater monitoring.

9.1.3.2 Water Level

Groundwater levels must be recorded on a monthly basis using an electrical contact tape or pressure transducer, to detect any changes or trends in groundwater elevation and flow direction.

9.1.3.3 Water Sampling and Preservation

When sampling the following procedures are proposed:

- One litre plastic bottles with a cap are required for the sampling exercises;
- Glass bottles are required if organic constituents are to be tested; and

- Sample bottles should be marked clearly with the borehole name, date of sampling, sampling depth and the sampler's name and submitted to a SANAS accredited laboratory.

9.1.3.4 Sampling Frequency

Groundwater is a slow-moving medium and drastic changes in the groundwater composition are not normally encountered within days. Considering the proximity of private boreholes and streams to the proposed mine, monitoring should be conducted monthly to reflect influences of wet and dry seasons. The sampling frequency could be adjusted following the trend analysis.

Samples should be collected by using best practice guidelines and should be analysed by a SANAS accredited laboratory.

It is suggested that quarterly samples be collected, extending up to two years post closure and based on the results. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities.

9.1.3.5 Parameters to be monitored

At coal mining facilities, analyses of the following constituents are recommended:

- Macro Analysis i.e. Ca, Mg, Na, K, SO_4, NO_3, F, Cl;
- Initial full suite metals and then Al, Fe, Mn and other metals identified according to results of the initial analyses;
- pH and Alkalinity; and
- TDS and EC.

9.1.3.6 Data Storage

During any project, good hydrogeological decisions require good information developed from raw data. The production of good, relevant and timely information is the key to achieve qualified long-term and short-term plans. For the minimisation of groundwater contamination it is necessary to utilize all relevant groundwater data.

The generation and collection of this data is very expensive as it requires intensive hydrogeological investigations and therefore the data has to be managed in a centralised database if funds are to be used in the most efficient way. Digby Wells has compiled a WISH-based database during the course of this investigation and it is highly recommended that the applicant utilise this database and continuously update and manage it as new data becomes available.

9.1.4 Air Quality

The proposed Project will be responsible for the implementation of all monitoring programmes (Table 9-4). The mine management will also be responsible for keeping a record of all environmental monitoring undertaken for the project.

The existing dust monitoring networks in the area should be maintained during the life of the project. As and when necessary, the mine management can undertake a regular review and update of the dust monitoring networks.

The ECO should continue with the ambient monitoring of dust deposition. However, should the dust deposition rates violate the permissible frequency of exceedance on several occasions during the year, a continuous PM_{10} monitor may be required – to establish ambient levels of these pollutants in the vicinity of the proposed operational. Such data will be useful, if in future the project comes under scrutiny from regulatory authorities. Monitoring sites should be placed judiciously downwind and preferably at a residential receptor site(s). There must be a programme in place to ensure the PM_{10} sampler monitors is calibrated annually to ensure the integrity of the measured data.

Regular passive sampling of ground level concentrations of gaseous pollutants i.e. SO_2, and NOX should be conducted. The proposed ambient monitoring must be a continuous process for the life of the project to assess ambient concentrations and public exposure at the mine boundary and at sensitive receptor(s).

9.1.5 Fauna and Flora

The only aspect requiring monitoring, based on the flora and fauna assessment, is the establishment of alien plant species. This should be completed by a qualified botanical specialist. The monitoring should be undertaken quarterly over a two year period.

9.1.6 Wetlands

Monitoring of the wetlands and mining activities are important to detect any predicted or unforeseen impacts to these sensitive systems and to understand the impact so that a remedial action can be carried out. Mining is an important activity for the economic growth of South Africa but has the potential to have impacts far beyond the boundaries of the project area and longer than the life of mine. It is important to manage impacts to the environment and protect the ecosystem services that it provides; and this is particularly important with regards to wetlands and water resources. The following impacts require a monitoring programme:

- All impacts and threats to wetlands predicted or not;
- Removal of wetland soils and vegetation; totalling 18.7 ha;
- Industrial activity within a natural ecosystem is a negative impact to habitat integrity;
- Heavy machinery working with wetland channel and surrounds impacting upon soil, vegetation disturbing fauna;

- Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts;
- The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment. Stockpiling of coal also represents risks to the environment that much be managed; and
- Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems.

Table 9-4 summarises the recommended monitoring plan for the project.

9.1.7 Aquatic Ecology

An aquatic biomonitoring programme is an essential management tool. The monitoring programme should be designed to enable the detection of potential negative impacts brought about by the project. Table 9-3 highlights some important aspects to monitor in reference to aquatic biota for the duration of the proposal.

Table 9-3: Aquatic Ecology Monitoring Programme

Location	Monitoring objectives	Frequency of monitoring	Parameters to be monitored
Current sites used in this study.	Overall PES of the Klein Olifants River	Bi-annual (dry and wet season)	Standard River Ecosystem Monitoring Programme (Eco status) methods. The precise methods stipulated in this study. See section 4.
Current sites used in this study (see Appendix 10).	Determine if water quality deterioration is occurring.	Bi-annual	SASS5 scores should not decrease more than 25 % and be related to mining activities.
Site used in this study and the surface water assessment.	Determine if water quality deterioration is occurring.	Monthly	Standard water quality monitoring, as per the surface water specialist report.

Location	Monitoring objectives	Frequency of monitoring	Parameters to be monitored
Current sites used in this study.	Determine if water/habitat quality deterioration is occurring.	Bi-annual	Standard River Ecosystem Monitoring Programme (Eco status) methods. The precise methods stipulated in this study. See section 4

9.1.8 Heritage

Project specific Chance Find Protocols (CFPs) must be developed for the proposed project. The purpose of the CFPs is to establish procedures that aim to minimise damage and destruction to any heritage resources that may be accidentally exposed during the course of development activities.

The CFPs must clearly describe the type of heritage resources that may occur within the site specific project area, the protocol to follow in the event of accidental exposure of previously unidentified heritage resources, and the appropriate management measures and reporting structures to be adhered to. The CFP at a minimum should include the following:

- Definitions as defined by Section 2 and 38(1) of the NHRA;
- Proactive archaeological monitoring procedures;
- Procedures that detail the following:
  - How to spot a chance find;
  - Steps to be undertaken when a chance find is made;
  - Internal reporting structures;
  - Recording of chance finds; and
  - Legal processes and requirements.

The CFPs must be defined and established as a condition of authorisation prior to the pre-construction phase of the proposed Project.

A CMP must be developed to monitor and gauge any potential negative impact to identified heritage resources during the construction and operational phases of the Project.

The CMP must at a minimum include:

- All identified heritage resources within the site-specific study area;
- Identify all heritage resources within a 100 m buffer of proposed infrastructure and 500 m blasting radius;

- Identify all heritage resources that fall within the underground mining development footprint;
- Have a detailed baseline record of the condition of identified heritage resources;
- Establish a roles and responsibilities matrix;
- Establish a monitoring process and schedule;
- Define conditions and protocols for access; and
- Define the project specific management and monitoring protocol.

The CMP must be defined and established prior to the pre-construction phase of the proposed Project. A summary of the proposed monitoring plan is presented in Table 9-4.

9.1.9 Socio-economic

It is proposed that a monitoring programme be developed and implemented to monitor the implementation of social management actions. Furthermore, it is recommended that this is conducted by a competent Monitoring and Evaluation (M&E) officer as the implementation of monitoring tools (surveys, databases, etc.) will require specialised skills. The following indicators must be monitored:

- Employment creation (Employment during construction and operation);
- Economic development (i.e. multiplier effects on the local economy and diversification and growth of the economy);
- Displacement-related impacts;
- Disruption of movement patterns;
- Influx related impacts;
- Impacts on community health and safety;
- Community development and social upliftment; and
- Dependency on the Project for sustaining local economy (Social Closure).

Table 9-4 provides a framework for monitoring the implementation and performance of social management actions. Objective means of verification, optimal frequency of reporting and responsibility for verification are also defined. The framework for monitoring the implementation and performance of social management actions will need to be undated once all social programmes and structures are in place for the project. A detailed example is provided in Social Impact Assessment, 2016 (Appendix 12).

9.1.10 Visual

Umcebo will be responsible for the implementation of all monitoring actions. The recommended monitoring actions for the identified impacts are detailed below. Umcebo will also be responsible for keeping a record of all environmental monitoring undertaken for the Project.

The following monitoring activities should be undertaken on a monthly basis for the life of the Project:

- Dust monitoring and management as per the Air Quality Monitoring Plan (reducing the dust on site will reduce the visual impact of dust);
- The existing rows of trees planted near some farm residences as windbreaks/ vegetation screens need to be maintained and protected against fire and utilisation of the vegetation for fire wood, etc.; and
- Grievances from visual receptors must be monitored and addressed through a Grievance Mechanism.

9.1.11 Noise

Due to the minor significant nature of the potential noise impact, it is recommended that a noise monitoring programme be implemented upon commencement of the project. Monitoring must be conducted on a quarterly basis. Noise levels propagating from the proposed project should not measure above 45 dBA during the daytime and 35 dBA during the night time at any of the monitoring locations.

A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required regulations and standards. Components to be included when monitoring are presented in Table 9-4 below.

9.1.12 Rehabilitation and Closure

The purpose of monitoring is to ensure that the objectives of rehabilitation are met and that the rehabilitation process is followed. The physical aspects of rehabilitation should be carefully monitored during the operational phase as well as during the progress of establishment of the desired final ecosystem.

The following items should be monitored continuously:

- Topography
  - Alignment of actual final topography to agreed planned landform.
- Soils
  - Depth of topsoil stripped and placed;
  - Chemical, physical and biological status of replaced soil; and
  - Erosion status.

- Water
  - Surface drainage systems and surface water quality; and
  - Groundwater quality at agreed locations.
- Vegetation
  - Vegetation basal cover;
  - Species diversity; and
  - Alien Invasive species.
- Other:
  - Faunal re-colonisation (Sherman and pitfall trapping); and
  - Proportion of land that has been fully rehabilitated.

9.1.12.1 Final Topography

The topography that is achieved during rehabilitation should be monitored and compared to the planned topography. The final profile achieved should be acceptable in terms of the surface water drainage requirements and the end land use objectives.

9.1.12.2 Soils

9.1.12.2.1 Depth of Topsoil Stripped and Replaced

The recovery and effective use of the usable topsoil available is very important. It is also important to undertake regular reconciliation of the volumes stripped, stockpiled and returned to the rehabilitated areas. A topsoil balance can be used to keep track of soil resources. The sensitivity of the soils on site makes this section vital for successful rehabilitation.

9.1.12.2.2 Chemical, physical and biological status of replaced soil

A final rehabilitation performance assessment should be done and information should be adequate for closure applications that involve:

- Assessment of rehabilitated soil thickness and soil characteristics by means of auger observations using a detailed grid;
- Erosion occurrences;
- Soil acidity and salt pollution analyses (pH, electrical conductivity and sulphate) at 0-250 mm soil depth every 10 ha; and
- Fertility analysis (exchangeable cations K, Ca, Mg and Na and phosphorus) every 16 ha (400 x 400 m).

9.1.12.2.3 Erosion

Erosion monitoring of rehabilitated areas should be undertaken and zones with excessive erosion should be identified. Erosion can either be quantified or the occurrence there-of simply recorded for the particular location.

9.1.12.3 Water

9.1.12.3.1 Surface Drainage Systems

The functionality of the surface water drainage systems should be assessed on an annual basis. This should preferably be done after the first major rains of the season and then after any major storm. An assessment of these structures will ensure that the drainage on the recreated profile matches the Rehabilitation, Decommissioning and Mine Closure Plan as well as to detect early on when any drainage structures are not functioning efficiently. These can then be repaired or replaced before it causes significant erosion damage.

9.1.12.4 Ground water

The groundwater levels and quality should be measured and monitored in a similar way to the surface water to determine the impact of the mining activities on the groundwater resources. A hydrogeologist, together with the relevant authorities, should determine the locations of the monitoring boreholes. The monitoring frequency will be approved by the regulator.

9.1.12.5 Vegetation

9.1.12.5.1 Basal Cover

Basal cover refers to the proportion of ground at root level which is covered by vegetation and by the rooting portion of the cover plants. The line-transect (or the quadrat bridge) method can be used to establish sampling positions. A target of at least 15 % basal cover should be set for fully established vegetation. It is important to note the difference between basal cover and canopy cover, shown in Figure 9-1.

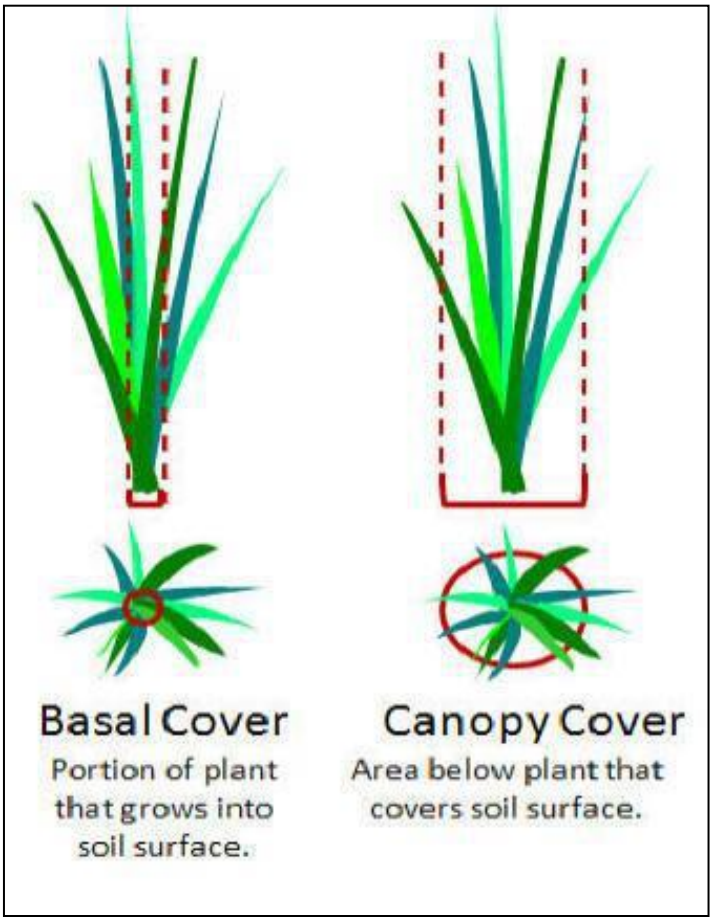

Figure 9-1: Diagram Comparing Basal Cover and Canopy Cover

(Image from Principles of Vegetation Measurement and Assessment and Ecological Monitoring & Analysis http://www.webpages.uidaho.edu/veg_measure/index.htm)

9.1.12.5.2 *Species*

Biodiversity assessments and surveys should be undertaken by external experts to establish the full range of plants that have become established. Summer and winter samplings should be done during these assessments. These rehabilitated areas are to remain as “No Go” areas initially to allow recolonization of the vegetation and all livestock animals must be kept out. Ensure continual monitoring and maintenance. Basal cover should be 10-15 %. Assessments should be carried out after each growing season. Bare areas of >4 m^2 need to be reseeded with the grass species in Table 11-3 of the rehabilitation and closure report (Appendix 17).

9.1.12.5.3 *Alien Invasive Plant Monitoring*

The following monitoring measures are recommended in order to prevent the future introduction or spread of alien species, and to ensure the rehabilitation of transformed areas:

- Annual surveys, aimed at updating the alien plant list and establishing and updating the invasive status of each of the alien species, should be carried out (can be done by Hendrina staff); and
- Follow-up control of alien plant seedlings, saplings and coppice regrowth is essential to maintain the progress made with initial control work, and to prevent suppression of planted or colonizing grasses. Before starting new control operations on new infestations, all required follow-up control and rehabilitation work must be completed in areas that are originally prioritized for clearing and rehabilitation.

9.2 Item 1(h): Monitoring and reporting frequency

Table 9-4 discusses the monitoring and reporting frequency.

9.3 Item 1(i): Responsible persons

The roles and responsibilities associated with the monitoring programme are set out in Table 9-4.

9.4 Item 1(j): Time period for implementing impact management actions

Table 9-4 captures the time period for implementing impact management actions.

9.5 Item 1(k): Mechanism for monitoring compliance

Table 9-4 sets out the method of monitoring the implementation of the impact management actions, the frequency of monitoring the implementation of the impact management actions, an indication of the persons who will be responsible for the implementation of the impact management actions, the time periods within which the impact management actions must be implemented and the mechanism for monitoring compliance with the identified impact management actions.

Table 9-4: Monitoring and Management of Environmental Impacts

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities	General - All impacts and threats to wetlands predicted or not.	▪ Wetlands should be monitored through all phases of the project. The wetlands should be demarcated in the field that are at particular risk of impacts and these area must be monitored regularly. Signs of ecological impact must be assessed including deposition of coal fines, die back of vegetation, increased erosion, decreased water quality and other indicators identified by a wetland specialist; ▪ The natural wetlands of high and very high sensitivity should be monitored on a regular basis to detect if the mining activities are having any residual or unforeseen impact on the functioning of these important systems. The natural pans and the Klein Olifants channelled valley bottom wetland are the most important here. The functional aspects of the wetland should be assessed such as floral diversity, water quality, use of wetland by faunal species (notably Flamingos), erosion and more; and ▪ Monitoring for all risks as highlighted in Section 11.1 including uncontrolled erosion, hydrocarbon spills etc. must be done and remediated where needed.	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Internal monitoring should be done as often as possible according to the management practices of the mine. Recommended timing is at least once a quarter. External independent wetland specialist monitoring should be done regularly and when needed, i.e. after an incident.
	Degradation of aquatic resources	▪ The monitoring of river reaches associated with the various mining right areas should be completed. Important areas to consider are the reaches downstream of the mining rights. The monitoring of these reaches can provide information on whether the proposed project is having an impact on water resources.	The Environmental Control Officer is responsible for the monitoring of aquatic ecology. The responsible person conducting the monitoring needs to be professionally registered, SASS5 accredited and hold relevant qualification in biological or water sciences.	Bi-annual (twice a year)
	General - All impacts and threats to air quality predicted or not.	▪ Dust monitoring using the ASTM Method; and ▪ Existing locations where baseline dust deposition data were collected (2016).	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance	Monitoring should be undertaken on a monthly basis
	General - All impacts and threats to air quality predicted or not.	▪ Passive sampling; and ▪ Existing dust monitoring locations where baseline data were collected.	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance	Passive sampling of gases: SO_2 and NO_2

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
	General - All impacts and threats to groundwater	▪ 33 Boreholes must be monitored to determine the movement of polluted groundwater migrating away from the mine area and the lowering of the water table and the radius of influence; ▪ Groundwater levels must be recorded on a monthly basis; ▪ Samples should be collected by using best practice guidelines and should be analysed by a SANAS accredited laboratory; ▪ At coal mining facilities, analyses of the following constituents are recommended: ▪ Macro Analysis i.e. Ca, Mg, Na, K, SO4, NO3, F, Cl; ▪ Initial full suite metals and then Al, Fe, Mn and other metals identified according to results of the initial analyses; ▪ pH and Alkalinity; and ▪ TDS and EC.	The Environmental Control Officer is responsible for the collection of the groundwater samples for submission to the laboratory. The data interpretation and report writing will need to be conducted by an external consultant to maintain neutrality. Samples should be collected by using best practice guidelines and should be analysed by a SANAS accredited laboratory.	It is suggested that quarterly samples be collected, extending up to two years post closure and based on the results. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities;
	General - All impacts and threats to water quality	▪ Ensure that monitoring is implemented to cover all mining activity areas. Recommended monitoring sites are shown in Figure 6 3. ▪ It is also recommended to monitor water quality within the mine water system (PCD's) to determine the concentration levels in case of an overflow or need for discharge. ▪ Water quality parameters that need to be analysed include but not limited to the parameters shown in Table 6 8.	Environmental Control Officer	Monthly during construction and operational phase. Reduce to quarterly on rehabilitated areas. This can further be reduced to biannually (wet and dry season) when most of the project area is rehabilitated. Monitoring needs to carry on after the project has ceased until such time that the DWS approves closure.
	General - All impacts and threats to water quality	▪ Flow monitoring should be carried out in channels and pipelines on site just before the water enters the storage facilities such as PCDs. ▪ Monitoring water levels in dams and channels by visual assessments along the channels. ▪ Records of pit dewatering volumes must be kept.	Environmental Control Officer	Instantaneous where automatic flow meters are in place for real time measurements. Where there are no automatic flowmeters weekly monitoring needs to be done. In operational areas, daily records need to be kept.
Site Clearance within wetlands and their buffer areas	Removal of wetland soils and vegetation; totalling 18.7 ha.	▪ Wetland monitoring should: Ensure that the wetlands are demarcated in the field and that no impact is extended beyond the infrastructure area; monitor for all risks at highlighted in Section 11.1 including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Construction activities should be monitored monthly by a wetland specialist.
Soil disturbance	Establishment of alien plant species	▪ Alien plant monitoring.	Qualified botanist	Quarterly monitoring for two years

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Blasting and excavation	Loss of integrity of Rock Art panels	▪ Baseline condition recording; ▪ Monitoring after blasting activities; ▪ Reporting on possible manifestation of negative impacts; and ▪ Implementation of mitigation measures to reduce impacts.	To be developed as part of the CMP	After blasting activities
	Degradation of intrinsic CS of burial grounds and graves	▪ N/A		N/A
Underground blasting and mining	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	▪ As mining progresses, wetlands should be monitored for evidence of loss of functionality due to groundwater changes. Monitoring for all risks as highlighted in Section 11.1 including uncontrolled erosion, hydrocarbon spills etc. must be done and remediated where needed.	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Undermined wetlands should be monitored annually
	Loss of integrity of Rock Art panels	▪ Baseline condition recording; ▪ Monitoring after blasting activities; ▪ Reporting on possible manifestation of negative impacts; and ▪ Implementation of mitigation measures to reduce impacts.	To be developed as part of the CMP	After blasting activities Quarterly
	Damage to surface dressing of burial grounds and graves			
Construction of surface infrastructure	Degradation of intrinsic CS of burial grounds and graves	▪ N/A	To be developed as part of the CMP	N/A
	Industrial activity within a natural ecosystem is a negative impact to habitat integrity.	▪ Wetland monitoring should: Ensure that the wetlands are demarcated in the field and that no impact is extended beyond the infrastructure area; monitor for all risks as highlighted in Section 11.1 including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Construction activities should be monitored monthly by a wetland specialist.

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Construction and operational of the Hendrina Underground Coal Mine	Noise disturbance	▪ Sampled in accordance with the National Noise Control Regulations in conjunction with the SANS 10103:2008 guidelines; and ▪ Noise measurements should be taken for a period not less than 10 min at each location.	Environmental Control Officer	Monitoring to be conducted on a quarterly basis. Noise levels propagating from the project should not measure above 45 dBA during the daytime and 35 dBA during the night time at any of the monitoring locations. A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required regulations and standards.
	Visual Disturbance	▪ The existing rows of trees planted near some farm residences as windbreaks/ vegetation screens need to be maintained and protected against fire and utilisation of the vegetation for fire wood, etc.	Environmental Control Officer	Monitoring as and when required
	Visual Disturbance	▪ Grievances from visual receptors must be monitored and addressed through a Grievance Mechanism.	Environmental Control Officer	Monitoring as and when required
	Stormwater Monitoring	▪ Personnel should have a walk around the facilities to determine the facilities conditions and pick out any anomalies such as leaks or overflows and system malfunctions; and ▪ SWMP structures and dams should be inspected for silting and blockages of inflows, pipelines for hydraulic integrity; monitor the overall SWMP performance.	Environmental Control Officer	As often as is possible, most preferable daily. Quarterly or monthly with the general maintenance schedule at the mine.
	Meteorological Data	▪ Measure rainfall.	Environmental Control Officer /Technician	Real time automatic weather system if in place, otherwise collect rainfall readings after every rainfall event or monthly.
Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland and associated hillslope seep	Heavy machinery working with wetland channel and surrounds impacting upon soil, vegetation disturbing fauna.	▪ Monitoring of the construction over this channelled valley bottom must ensure that all activities are done according to the detailed design and are implemented with the least possible impacts to the wetlands. Monitoring for all risks at highlighted in Section 11.1 including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils. It is recommended that 100 m on either side of the conveyor be demarcated and monitored.	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Construction activities should be monitored monthly by a wetland specialist.

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Hauling, Conveying and Stockpiling of Coal	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment. Stockpiling of coal also represents risks to the environment that much be managed.	▪ Monitoring of the operation of the conveyor over a sensitive wetland is important to ensure all impacts are remediated as soon as possible; thus preventing and long term residual impacts to the system that compromises the ability of the wetland to function; and ▪ Runoff from areas of coal handling and stockpiling are to be managed according to the SWMP (Surface Water report; Digby Wells, 2016).	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	The conveyor must be monitored internally with the maintenance regime. Specialist monitoring can be undertaken annually to ensure no residual impact is being experienced.
Removal of infrastructure and surface rehabilitation.	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems. Wetlands at risk include the hillslope seep linked to a pan in Mooivley East, hillslope seep wetlands associated with infrastructure at Mooivley West and the hillslope seep and channelled valley bottom wetland traversed by the proposed conveyor, as well as the hillslope seep wetland underlying the proposed infrastructure for Hendrina South.	▪ Wetland monitoring should: ensure that the wetlands are demarcated in the field and that no impact is extended beyond the infrastructure area; monitor for all risks at highlighted in Section 11.1 including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.	The Environmental Control Officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Rehabilitation activities should be monitored monthly by a wetland specialist.

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
	Mining activities during the construction and operational phase may have an impact on the soils	▪ During the rehabilitation exercise preliminary soil sampling should be carried out to determine the fertilizer requirements more accurately; ▪ Additional soil sampling should also be carried out annually until the levels of nutrients are at the required level. Once the desired nutritional status has been achieved, it is recommended that the interval between sampling be decreased; ▪ An annual environmental audit should be undertaken. If growth problems develop, ad hoc, sampling should be carried out to determine the problem; ▪ Sampling should always be carried out at the same time of the year and at least six weeks after the last application of fertilizer; ▪ All of the soil samples should be analysed for the following parameters: ▪ pH (H2O); ▪ Electrical conductivity; ▪ Calcium mg/kg; ▪ Magnesium mg/kg; ▪ Potassium mg/kg; ▪ Sodium mg/kg; ▪ Cation exchange capacity; ▪ Phosphorus (Bray I); ▪ Zinc mg/kg; ▪ Clay %; and ▪ Organic matter content (C %).	The Environmental Control Officer of the mine should monitor the rehabilitated areas at all times as part of managing the site and the surrounding area. Independent soil specialist should carry out monitoring on a regular basis during the rehabilitation and closure phase of the mining project and provide recommended remedial actions where required.	Soil sampling and audits should be carried out on an annual basis by a soil specialist
Employment creation	Employment during construction and operation	▪ Local Employment Policy is developed that assigns preferential status to local, female and youth employment, as well as associated targets.	HR Department	Once-off
		▪ Applicable requirements of the existing Recruitment and Selection Policy are applied when employing locally by Umcebo and its contractors.	HR Department	Every six months
		▪ Local employment requirements are included in contractor management plans.	Procurement and Supply Chain Management Department	Monthly
		▪ Engagement with relevant groups to ensure that all understand the Project's employment requirements in terms of skills, type of employment.	CLO, HR Department, and Social Manager	Prior to construction, thereafter every six months
		▪ Compilation and implementation of Structured Stakeholder Engagement Plan and Grievance mechanism.	Consultant, Social Manager and CLO	Prior to construction,

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
		▪ Labour pool database is developed and kept up-to-date.	Procurement and Supply Chain Management Department	Every six months
		▪ Targets in terms of local recruitment are met by Project and contractors.	HR Department	Monthly
		▪ All locally recruited employees are recruited by means of the database.	HR Department	Annually
		▪ Percentage of locally-recruited employees increases on an annual basis.	HR Department	Annually
		▪ Turnover among locally-recruited employees is below 5 %.	HR Department	Annually
Economic development	Multiplier effects on the local economy and diversification and growth of the economy	▪ Project design parameter has avoided/minimised displacement.	Senior management	Pre-construction
		▪ A realistic exclusion zone has been identified and approved.	Land Acquisition/access Manager	Pre-construction
		▪ A transparent negotiation process has been implemented.	Land Acquisition/access Manager Public relations manager	Pre-construction
		▪ Compensation and resettlement is implemented.	Land Acquisition/access Manager Social Manager CLO	Every 3 months at completion
		▪ Develop Company policy to manage various displacement impacts.	Consultant	Once off
		▪ Implement policy when cases of displacement occur, to ensure that affected people are not worse-off after displacement.	Social Manager, CLO	Directly after displacement
		▪ An ARAP or similar plan has been developed (if applicable).	Social Manager RAP consultant	Once-off (ARAP report)
		▪ Improved quality of life of those affected by displacement impacts.	Consultant , social manager	Three years after displacement
Disruption of movement patterns	Movement Patterns of people may have an impact on the socio-economic environment	▪ Complete Traffic Management Plan.	Consultant	Once off
		▪ Implement mitigation measures of specialist reports (especially traffic impact assessment).	SHEQ Manager Social Manager	Monthly
		▪ Measures implemented (e.g. Grievance procedure).	SHEQ Manager Social Manager	Once off
		▪ Grievance Procedures implemented.	SHEQ Manager Social Manager	Every 3 months
		▪ Number of grievances related to disruption in movement.	SHEQ Manager	Monthly
Influx related impacts	Influx of people may	▪ Develop Influx management Plan.	SHEQ Manager	Pre-construction

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
	have an impact on the socio-economic environment	▪ Implement recommendations and mitigation outlined in the Influx Management Plan.	Social Manager Senior Management	
		▪ Investigate partnerships with local authorities.	Social Manager Public Relations Manager Legal Department	Once-off during construction, thereafter annually
		▪ Develop partnership agreements.	Social Manager; Senior Management; and Public Relations Manager	Once-off
		▪ Sign agreements with local authorities on assistance with IDPs and SDFs.	Senior Management	Once-off
Impacts on community health and safety (Socio-economic)	Community health and safety may be impacted by the construction and operation of the mine	▪ Technical Consultant is appointed to develop a Community Health Safety and Security Plan (CHSSP), which should include an awareness campaign.	Procurement and Supply Chain Management Department; Social Manager	Once-off at start of construction, and with a detailed revision when operation commences
		▪ CHSSP is adopted.	Senior management	Once-off at start of construction, and with a detailed revision when operation commences
		▪ CHSSP is implemented.	SHEQ Manager Social Manager	Every 4 months and annually
		▪ Relevant mitigation measures in the EMP are implemented.	SHEQ Manager Social Manager	Annually
		▪ Policing Forum is established.	Social Manager	Once-off at start of operation
		▪ Policing Forum actively participates in addressing community safety and security issues.	Policing Forum; Social Manager	Every 3 months
		▪ HIV/AIDS policy is expanded to include HIV awareness campaigns in communities and provision of Voluntary Counselling and Testing (VCT) for communities.	SHEQ Department; senior management	Once-off
		▪ Service providers appointed to implement HIV awareness campaigns in communities and provide VCT for communities.	Procurement and Supply Chain Management Department; Social Manager	Once-off
		▪ HIV awareness campaigns in communities and provision of VCT for communities are implemented.	Service provider; Social Manager	Annually
		▪ HIV awareness in communities is improved, and VCT services are accessed.	Service provider; Social Manager	Annually
Community development and social upliftment (Socio-economic)	Community development and social upliftment may be impacted by the	▪ Detailed skills inventory is prepared for the Project.	SLP Manager HR Department, with input from the Power plant's technical departments	Once-off, reviewed every 3 years

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
	construction and operation of the mine	▪ Appoint qualified Technical Consultant for Skills Survey.	Procurement and Supply Chain Management Department; Social Manager	Once-off prior to construction
		▪ Skills survey is undertaken in the local communities and local skills database is developed.	Consultant; Social Manager	Once-off prior to construction, updated every five years
		▪ Qualified Training Consultant is appointed to develop training programmes.	HR Department; Procurement and Supply Chain Management Department.	Once-off prior to construction
		▪ Training programme is developed based on the skills gaps identified for the Project.	Consultant; HR Department; Social Manager	Once-off at start of construction, updated every five years
		▪ Training programme is implemented.	HR Department	Annually
		▪ Staff skills levels and job performance improve.	HR Department, with input from line managers	Annually
		▪ Locally recruited construction workforce who received skill training is employed during the operation of the Power plant.	HR Department	Once-off at start of construction
		▪ Skills levels in local communities improve.	HR Department, with input from line managers	Every two years
		▪ AET programmes are implemented for both workers and people from local communities.	SLP Manager Training Service Provider; Social Manager; CLO	Annually
		▪ Locals who received training (and qualified) are employed on the Project or receive procurement contracts with the Project.	HR Department; Supply chain management	Annually
Mine Rehabilitation and Closure	Dependency on the Project for sustaining local economy (Social Closure)	▪ Plan on file.	Consultant, Social Manager	5 years before closure
		▪ Closure Plan implementation report.	Consultant, Social Manager	At closure
Rehabilitation and Closure Monitoring				
Soil disturbance	Establishment of alien plant species	▪ Alien plant monitoring	Qualified botanist	Quarterly monitoring for two years
Operation and decommissioning	Blasting, drilling, hauling, plant operation, demolition	▪ Dust monitoring using the ASTM Method. Monitoring must meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013).	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance.	Monthly at existing locations where baseline dust deposition data were collected (2016)
		▪ Continuous PM_{10} monitoring. Monitoring must meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013).	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance.	At a sensitive receptor location (i.e. Hendrina Community)
		▪ Passive sampling of gases: SO_2 and NO_2. Monitoring must meet the South African National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) Dust Control Regulations (2013).	A designated air quality officer to collect data/analyse and reporting to regulatory authorities on compliance.	Existing dust monitoring locations where baseline data were collected

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities	Groundwater quality	▪ Macro Analysis i.e. Ca, Mg, Na, K, SO4, NO_3, F, Cl; ▪ Initial full suite metals and then Al, Fe, Mn and other metals identified according to results of the initial analyses; ▪ pH and Alkalinity; and TDS and EC.	Samples should be collected by an independent groundwater consultant, using best practice guidelines and should be analysed by a SANAS accredited laboratory.	It is suggested that quarterly samples be collected, extending up to five years post closure and based on the results. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities.
All activities	Groundwater levels	▪ Groundwater levels must be recorded using an electrical contact tape or pressure transducer, to detect any changes or trends in groundwater elevation and flow direction.	Samples should be collected by an independent groundwater consultant, using best practice guidelines and should be analysed by a SANAS accredited laboratory.	It is suggested that quarterly samples be collected, extending up to five years post closure and based on the results. Post closure monitoring should continue until a sustainable situation is reached and after it has been signed off by the authorities.
All activities	Degradation of aquatic resources	▪ The monitoring of river reaches associated with the various mining right areas should be completed. Important areas to consider are the reaches downstream of the mining rights. The monitoring of these reaches can provide information on whether the proposed project is having an impact on water resources.	The environmental officer is responsible for the monitoring of aquatic ecology. The responsible person conducting the monitoring needs to be professionally registered, SASS5 accredited and hold relevant qualification in biological or water sciences.	Bi-annual (twice a year)
Post-closure	Erosion, loss of soil fertility, compaction	▪ The rehabilitated area must be assessed for compaction, fertility, and erosion and must meet the Chamber of Mines Guidelines	The soils must be assessed by a soil specialist yearly (during the dry season so that recommendations can be implemented before the start of the wet season) so as to correct any nutrient deficiencies.	The rehabilitated area must be assessed once a year for compaction, fertility, and erosion during the dry season
Construction and operation	Noise disturbance	▪ Sampled in accordance with the National Noise Control Regulations in conjunction with the SANS 10103:2008 guidelines; ▪ Noise measurements should be taken for a period not less than 10 min at each location	Environmental Coordinator	Monitoring to be conducted on a quarterly basis. Noise levels propagating from the project should not measure above 45 dBA during the daytime and 35 dBA during the night time at any of the monitoring locations. A report must be compiled after the monitoring has been carried out then submitted to management to ascertain compliance with the required regulations and standards.
Construction and operation	Dust	▪ Dust monitoring and management as per the Air Quality Monitoring Plan (reducing the dust on site will reduce the visual impact of dust).	Environmental Coordinator	Monthly. Grievances from visual receptors must be monitored and addressed through a Grievance Mechanism.

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
All activities	General - All impacts and threats to wetlands predicted or not.	Wetlands should be monitored through all phases of the project. The wetlands should be demarcated in the field that are at particular risk of impacts and these area must be monitored regularly. The natural wetlands of high and very high sensitivity should be monitored on a regular basis to detect if the mining activities are having any residual or unforeseen impact on the functioning of these important systems. The natural pans and the Klein Olifants channelled valley bottom wetland are the most important here. The functional aspects of the wetland should be assessed such as floral diversity, water quality, and use of wetland by faunal species (notably Flamingos), erosion and more. ▪ Monitoring for all risks at highlighted in Wetland Assessment Report including uncontrolled erosion, hydrocarbon spills etc. must be done and remediated where needed.	The environmental officer of the mine should monitor the wetlands at all times as part of managing the site and the surrounding area. Independent wetland specialist should carry out monitoring on a regular basis during all phases of the mining project and provide recommended remedial actions where required.	Internal monitoring should be done as often as possible according to the management practices of the mine. External independent wetland specialist monitoring should be done regularly and when needed, i.e. after an incident.
Removal of infrastructure and surface rehabilitation.	Similarly to the construction phase, the removal of the infrastructure will lead to potential negative impacts on the integrity of the natural wetland systems.	▪ Wetland monitoring should: Ensure that the wetlands are demarcated in the field and that no impact is extended beyond the infrastructure area; monitor for all risks at highlighted in Wetland Assessment Report including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.		Rehabilitation activities should be monitored monthly by a wetland specialist.
Hauling, Conveying and Stockpiling of Coal	The movement of coal over the channelled valley bottom that is highlighted as an NFEPA wetland and is a tributary to the Klein Olifants has a significant threat to water quality and coal fines that will be transported from the conveyor into the surrounding environment.	▪ Monitoring of the operation of the conveyor over a sensitive wetland is important to ensure all impacts are remediated as soon as possible; thus preventing and long term residual impacts to the system that compromises the ability of the wetland to function.		The conveyor must be monitored internally with the maintenance regime. Specialist monitoring can be undertaken annually to ensure no residual impact is being experienced.

Activities	Impacts requiring monitoring programmes	Functional requirements for monitoring	Roles and responsibilities (For the execution of the monitoring programmes)	Monitoring and reporting frequency and time periods for implementing impact management actions
Underground Blasting and Mining	Undermining of wetlands leading to hydrological and geomorphic changes to the functioning of the ecosystem; particularly related to groundwater impacts.	▪ As mining progresses, wetlands should be monitored for evidence of loss of functionality due to groundwater changes. Monitoring for all risks at highlighted in Section Wetland Assessment Report including uncontrolled erosion, hydrocarbon spills etc. must be done and remediated where needed.		Undermined wetlands should be monitored annually
Site Clearance within wetlands and their buffer areas	Removal of wetland soils and vegetation; totalling 18.7 ha.	▪ Wetland monitoring should: Ensure that the wetlands are demarcated in the field and that no impact is extended beyond the infrastructure area; monitor for all risks at highlighted in Wetland Assessment Report including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.		Construction activities should be monitored monthly by a wetland specialist.
Construction of general infrastructure within wetlands and their buffer areas	Industrial activity within a natural ecosystem is a negative impact to habitat integrity.			
Construction of Overland Conveyor across and NFEPA channelled valley bottom wetland	Heavy machinery working with wetland channel and surrounds impacting upon soil, vegetation disturbing fauna.	▪ Monitoring of the construction over this channelled valley bottom must ensure that all activities are done according to the detailed design and are implemented with the least possible impacts to the wetlands. Monitoring for all risks at highlighted in Wetland Assessment Report including uncontrolled erosion, hydrocarbon spills etc. and remediate; ensure proper handling and storage of wetland soils.		
Auditing against the conditions outlined within the approved EMP and EA (EMP Performance Assessment)	EMP Conditions	▪ To determine compliance to EMP conditions	Environmental Officer/Independent Third Party	Annual Performance Assessment
Annual update of financial provision	Financial Provision Update.	▪ To ensure that the mine is compliant with the financial provision regulations and that there is sufficient funding provided by the mine for closure and rehabilitation cost and meets the requirements as stipulated in Regulation 11 (1) of the New Financial Provision Regulations.	Environmental Officer/Independent Third Party	Annually and must be audited by an independent auditor.

10 Item 1(l): Indicate the frequency of the submission of the performance assessment report

A performance assessment will be undertaken on an annual basis after which a Performance Assessment Report will be submitted to the DMR and other relevant governmental departments.

11 Item 1(m): Environmental Awareness Plan

The purpose of an Environmental Awareness Plan is to outline the methodology that will be used to inform the mine's employees of any environmental risks which may result from their work and the manner in which the risks must be dealt with to avoid contamination or the degradation of the environment. The environmental awareness plan is primarily a tool to introduce and describe the requirements of the range of environmental and social plans for the proposed project during the life of the Project.

The environmental awareness plan ensures that training needs are identified and appropriate training is provided. The environmental awareness plan should communicate:

- Importance of conformance with the environmental policy, procedures and other requirements of good environmental management;
- The significant environmental impacts and risks of an individual's work activities and the environmental benefits of improved performance;
- Individual's roles and responsibilities in achieving the aims and objectives of the environmental policy; and
- The potential consequences of not complying with environmental procedures.

Umcebo proposes to utilise the Glencore Environmental Awareness Plan and environmental policy which is a universal Glencore policy implemented at the various mines located around the country.

This Environmental Awareness Plan titled "Environmental Induction" includes all elements in terms of induction and environmental awareness, as well as the requirements of Glencore's international standards and obligations. In addition, a more basic video titled "Environmental and Community Awareness DVD" has been developed and will be available from the mine upon request once it begins operation. This DVD will be shown to all employees and contractors at induction. The subject of Environmental Awareness will also addressed at weekly orientation sessions which will be held at the Hendrina underground Coal Mine.

The objective of this Environmental Awareness Plan is to:

- Inform employees and contractors of any environmental risks which may result from their work; and
- Inform employees and contractors of the manner in which the identified possible risks must be dealt with to prevent degradation of the environment.

In general, the purpose of implementing an Environmental Awareness Plan is to optimise the awareness of those partaking in the mining and related activities which have the potential to impact negatively on the environment and in doing so, promote the global goal of sustainable development.

The awareness training of employees, supervisors, sub-contractors, contractors and visitors will ensure that co-operation in terms of environmental management will occur. This will contribute to the successful implementation of the conditions set out in the EMPR and Environmental Authorisation, and thus to the environmental sustainability of the project. In addition, it will ensure the success of the proposed project regarding compliance with legislation, and avoid possible future liabilities and legal action due to a lack of environmental awareness.

11.1 Item 1(m)(1): Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work

An Emergency Response Plan has been developed and is the approach used by Umcebo to respond to risks that may pollute or degrade the environment during the operational phase.

The unplanned events that may happen at the project site and the proposed mitigation plan are listed in Table 11-1.

Table 11-1: Unplanned events, risks and their management measures

Unplanned event	Mitigation / Management / Monitoring
Accidental exposure of previously unidentified heritage resources during the construction of the Project. Accidental exposure of human remains during the construction phase of the Project.	▪ Project specific CFPs must be developed and included in the EMP as a condition of authorisation; ▪ The CFPs must clearly describe the type of heritage resources that may occur within the site specific project area, the protocol to follow in the event of accidental exposure of previously unidentified heritage resources, and the appropriate management measures and reporting structures to be adhered to; and ▪ The CFPs must be defined and established prior to the construction phase of the proposed Project.
Blasting will create fly rock that may result in accidental damage to historic structures or werfs situated within a 500 m blasting radius	A CMP must be developed to monitor and gauge any potential negative impact to identified heritage resources during the construction and operational phases of the Project. The CMP must at a minimum include: ▪ All identified heritage resources within the site-specific project site;

<table>
<tr><th>Unplanned event</th><th>Mitigation / Management / Monitoring</th></tr>
<tr><td>Voids created through underground mining have the potential to result in subsidence that could potentially affect the status quo of heritage resources protected under Section 34 – 36 of the NHRA that are being under-mined.</td><td rowspan="3">▪ Identify all heritage resources within a 100 m buffer of proposed infrastructure and 500 m blasting radius;
▪ Identify all heritage resources that fall within the underground mining development footprint;
▪ Have a detailed baseline record of the condition of identified heritage resources;
▪ Establish a roles and responsibilities matrix;
▪ Establish a monitoring process and schedule;
▪ Define conditions and protocols for access; and
▪ Define the project specific management and monitoring protocol.
The CMP must be defined and established prior to the pre-construction phase of the proposed Project.</td></tr>
<tr><td>Access to heritage resources protected under Section 34 – 36 of the NHRA by non-employees of the mine pose a health and safety risk to visitors.</td></tr>
<tr><td>Hauling of coal along access routes pose a risk to heritage resources protected under Section 34 - 36 of the NHRA in proximity to the established routes that could be damaged in the event a vehicular accident occurs.</td></tr>
<tr><td>Ineffectiveness or failure of fitted silencers on generators and ventilation fans.</td><td>▪ Implement monitoring programme to assess effectiveness of noise abatement measures;
▪ Regular servicing of generators as per maintenance manual; and
▪ Enclosing generators in isolation mounts and installing secondary silencers;</td></tr>
</table>

Unplanned event	Mitigation / Management / Monitoring
Hydrocarbon spills from bulk storage tanks, vehicles and heavy machinery or hazardous materials or waste storage facilities.	▪ Hydrocarbons and hazardous substances must be stored in bunded areas and refuelling should take place in contained areas; ▪ The fuel, lubricant and explosives storage facilities must be located on a hard standing area (paved or concrete surface that is impermeable), roofed and bunded in accordance with SANS1200 specifications. This will prevent mobilization of leaked hazardous substances. ▪ Ensure that the bunded areas can contain 110 % of the largest container and are constructed according the necessary SANS standards; ▪ An emergency spillage response plan should be in place and accessible to the responsible monitoring team. The Material Safety Data Sheets (MSDS) should be kept on site for the Life of Mine for reference to anytime in terms of handling, storage and disposal of materials. ▪ A spill response kit must be available at all times. The incident must be reported on and if necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations. Areas of high risk must be managed with particular care and impact must be kept to the smallest area possible; for example areas where planned inspection of vehicles is carried out; ▪ Ensure that oil traps are well maintained; ▪ Vehicles and heavy machinery should be serviced and checked on a regularly basis to prevent leakages and spills; ▪ Monitoring boreholes, particularly those located within the construction area, have to be monitored for both water level and quality to detect any changes in quality; and ▪ If a considerable amount of fluid is accidentally spilled, the contaminated soil should be scraped off and disposed of at an acceptable dumping facility. The excavation should be backfilled with soil of good quality.
Uncontrolled erosion	▪ Erosion control measures must be put in place and if necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.

Unplanned event	Mitigation / Management / Monitoring
PCD overflow	▪ Spill protection berms must be in place to manage such an event and protect the water resources. The overflow must be stopped immediately as soon as possible and the impacted area remediated. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations. Monitoring of the impact to wetlands and success of the remediation actions must be carried as often as needed; and ▪ Paddocks should be placed adjacent to the PCD spillway to contain any spill and prevent erosion and water reporting in to the nearby stream
Airborne coal dust settling in wetlands	▪ Wetland monitoring must be done throughout the life of the project to ensure that this impact is not reaching a critical level. All areas of coal handling and stockpiling must be seen as high risk areas and monitored. Dust suppression will need to be improved and the wetland rehabilitated as far as possible. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Illegal activities within wetlands from staff or other parties; such as dumping, squatting; burning of rubbish; washing of clothes and more.	▪ The edge of the wetlands and a 100 m buffer must be demarcated where they are in close proximity to the infrastructure areas and at risk of being impacted from illegal activities; ▪ The impact must be identified, investigated and removed as soon as possible. Mine staff must be educated if they identified as the source of the impact; ▪ Wetland monitoring must be done throughout the life of the project to ensure that this impact is not reaching a critical level. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Failure in the functioning of the clean-dirty water separation and stormwater management plan leading to uncontrolled spilling of polluted material (including oils, coal fines etc.) from the infrastructure areas (such as the coal stockpiles)	▪ The spilling of the contaminant must be stopped immediately and the impacted area remediated. Spill protection berms must be in place as well. If necessary a wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations.

Unplanned event	Mitigation / Management / Monitoring
Subsidence of undermined areas, particularly where coal resource was shallow (above 50)	▪ Ensure that sufficient pillars are left in place for high extraction underground mining areas to prevent surface subsidence; ▪ A geotechnical study should be undertaken to determine possibilities of subsidence. Mitigation measures should the recommended, should there be chance of subsidence. ▪ A wetland specialist must investigate the extent of the impact and provide rehabilitation recommendations; and ▪ An aquatic ecologist specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Community expectations and actions	▪ Expectations of communities must be managed by informing them what to expect from the Project in terms of LED and/or community development projects; ▪ Continuously involve community and municipal structures in the development of any LED or community development projects.
	▪ Appoint CLOs to provide communities with an accessible communication mechanism; ▪ Establish grievance mechanism which is accessible to aggrieved members of the surrounding communities; and ▪ Use public media to inform and enlighten stakeholders with regard to project limitations, progress and outcomes.
Current uncertainties regarding land acquisition and displacement	▪ Follow a transparent consultation and negotiation process; and ▪ Adequately compensate landowners as well as displacement-affected people.
Threats to Umcebo's Social licence to operate	▪ Ensure on-going, transparent communications and mutual trust; ▪ Regularly assess if/how/why stakeholder opinions and perceptions change; and ▪ Invest in host communities through LED and CSI projects.
Spills / leaks from the dewatering pipeline.	▪ Regular inspections of the pipeline for any leaks. Seeping pipeline should be sealed; and ▪ Ensure that stormwater management structures are put in place to capture all spills and to convey to the PCD.
Contamination from the ROM and overburden stockpile.	▪ Ensure the implementation of clean and dirty water separation; ▪ Overburden and topsoil stockpiles should be managed to minimise infiltration of contaminants to the groundwater. Mitigation methods that should be considered include the vegetation of the stockpile and covering them with soil to minimise rainfall infiltration and mobilisation of dissolved metals; and ▪ Ensure that stormwater management structures are put in place to capture all runoff from the ROM and overburden dumps and to convey to the PCD.

Unplanned event	Mitigation / Management / Monitoring
Flooding of Mine Infrastructure	▪ The conveyor and access road connecting Hendrina South and Mooivley West, should be elevated above the floodline at a height of approximately 1 662 mamsl (height subject to more detailed and accurate elevation survey data). A culvert/ bridge for the road crossing should be constructed and sized appropriately. The fence should be designed and constructed to withstand a 1:100 year flood; and ▪ The proposed berm running along the haul road at Mooivley West, must be constructed above the floodline at a height of approximately 1 696 mamsl (height subject to more detailed and accurate elevation survey data), to ensure that flooding of infrastructure does not occur.

11.2 Item 1(m)(2): Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment

Management shall establish and maintain procedures for the internal communication between the various levels and functions of the organisation, and receiving, documenting and responding to relevant communication from external I&APs. The organisation shall consider processes for external communication on its significant environmental aspects and record its decision.

Communication is a management responsibility. All line supervisors are responsible for effective communication within their own sections. Environmental risks will be dealt with through training and communication to ensure minimal degradation of the environment.

12 Item 1(n): Specific information required by the Competent Authority

The financial provision for the environmental rehabilitation and closure requirements of mining operations is governed by NEMA, as amended, which provides in Section 24P that the holder of a mining right must make financial provision for rehabilitation of negative environmental impacts. The financial provision will be reviewed annually.

13 Item 2: Undertaking

The EAP herewith confirms:-

- 2(a) the correctness of the information provided in the reports
- 2(b) the inclusion of comments and inputs from stakeholders and I&APs ;
- 2(c) the inclusion of inputs and recommendations from the specialist reports where relevant; and
- 2(d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed.

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Appendix 1: EAP CV

Appendix 2: Public Participation

Appendix 3: Plans

Appendix 4: Soil, Land Use and Land Capabilities Assessment

Appendix 5: Surface Water Assessment

Appendix 6: Groundwater Assessment

Appendix 7: Air Quality Assessment

Appendix 8: Fauna and Flora Assessment

Appendix 9: Wetland Assessment

Appendix 10: Aquatic Ecology Assessment

Appendix 11: Heritage Assessment

Appendix 12: Socio-Economic Assessment

Appendix 13: Visual Assessment

Appendix 14: Noise Assessment

Appendix 15: Traffic Assessment

Appendix 16: Blasting and Vibration Assessment

Appendix 17: Rehabilitation and Closure Assessment

Appendix 18: SAHRA Comments